BWX Technologies, Inc.
Babcock & Wilcox, a McDermott company

3005-02D1300002 **Babcock & Wilcox of Ohio, Inc.**
1 Mound Road
P.O. Box 3030
Miamisburg, Ohio 45343-3030
(937) 865-4020

ESC-083/99
April 20, 1999

99-TC/04-20

Mr. Richard B. Provencher, Director
Miamisburg Environmental Management Project
U.S. Department of Energy
P.O. Box 66
Miamisburg, OH 45343-0066

ATTENTION: Dewain Eckman

SUBJECT: Contract No. DE-AC24-97OH20044
BUILDINGS 35/59: RELEASE OF FINAL ON-SCENE COORDINATOR REPORT

REFERENCE: Statement of Work Requirement C 7.1e -- Regulator Reports

Dear Mr. Provencher:

The attached Final On-Scene Coordinator Report for Buildings 35/59 has been authorized for release to USEPA, OEPA, and ODH by Ron Church of MEMP.

Please advise if additional copies are required for distribution within DOE. If you require further information, please contact Dave Rakel at extension 4203.

Sincerely,

Linda R. Bauer, Ph.D.
Manager, Environmental Safeguards & Compliance

LRB/nmg

Enclosures as stated

cc: Tim Fischer, USEPA, (1) w/attachments
Dave Meredith, TechLaw, (1) w/attachments
Brian Nickel, OEPA, (1) w/attachments
Ruth Vandergrift, ODH, (1) w/attachments
Art Kleinrath, MEMP, (1) w/attachments
Terrence Tracy, DOE/HQ, (1) w/attachments
Joe Bartee, BWO, (2) w/attachments
Public Reading Room, (5) w/attachments
Administrative Record, (2) w/attachments
DCC

3005-0201300002

ON SCENE COORDINATOR (OSC) REPORT

BUILDINGS 35 & 59

REMOVAL ACTION

MOUND PLANT
MIAMISBURG, OHIO

April 1999

Final

(Revision 0)

Department of Energy

Babcock & Wilcox of Ohio

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EXECUTIVE SUMMARY

The Californium Multiplier Facility (CFX) was located in Buildings 35 and 59. This facility provided a variety of non-destructive testing capabilities including neutron radiography and neutron activation analysis. CFX operation ceased in 1990. The californium source, uranium plates, and cadmium blades were removed from the CFX in 1995-96. In 1997, the Core Team decided a removal action was warranted to address soil near Building 59 possibly contaminated by neutron activation products and soil near Building 35 possibly contaminated by photo-processing chemicals. The objective of the removal action was dismantlement and demolition of Buildings 35 and 59 and removal of contaminated soil as needed. Demolition of the buildings was completed in May 1998. No contamination by photo-processing chemicals was discovered by sampling of the soil near Building 35. Soil surrounding the storage location for the Building 59 neutron source was removed. Verification sampling confirmed the cleanup goal was achieved.

Art Kleinrath, On-Scene Coordinator
U.S. Department of Energy
Miamisburg, Ohio

Tim Fischer, Remedial Project Manager
U.S. EPA
Chicago, Illinois

Brian Nickel, Project Manager
Ohio EPA
Dayton, Ohio

1 SUMMARY OF EVENTS

1.1 SITE CONDITIONS AND BACKGROUND

Buildings 35 and 59 were physically connected and comprised the Californium Multiplier (CFX) facility. Building 35, a single-story concrete building, was constructed in 1967 and housed the control room for CFX, offices, x-ray units, dark room, helium leak testing station, and eddy current nondestructive testing laboratory. Building 59, a two-story concrete block structure, was constructed in 1977 and housed the neutron radiography and neutron activation facility. Operation of the CFX ended in 1990 and at that time the californium source was stored 10 feet below Building 59 in a metal storage tube. In 1995 the californium source was removed from the storage tube and shipped off-site. In 1996 the uranium plates, cadmium blades, and the CFX unit were removed from Building 59. Building 35 was used to support both the 1995 and 1996 activities.

Building 35 was a 50-foot square (2,500 square feet) concrete structure with a flat roof supported by roof joists spanning the interior masonry wall and an interior column line.

Building 59 was a two-story, concrete block structure, 18-foot square (324 square feet) and approximately 36 feet high. It had 12 inch-thick first floor walls, 8 inch-thick second floor walls, and a poured concrete roof. The floor separating the two stories was cast-in-place, reinforced concrete 16 inches thick that supported the CFX and biological shielding. Part of this shielding was a concrete "donut" which was 4' -8" high with an 11'-4" outside diameter and a 3'-4" inside diameter and was one piece with the floor.

On November 19, 1997, the Core Team consisting of representatives of DOE/MEMP, USEPA, and OEPA recommended a RESPONSE ACTION for Buildings 35 and 59. This recommendation was available for public review and comment from January 15 to

February 15, 1998. On March 5, 1998, the Core Team signed the Action Memorandum for Buildings 35 and 59. This was available for public review and comment from March 4 to April 4, 1998.

Since the DOE is the sole responsible party for the cleanup of contamination in Buildings 35 and 59, no other Potentially Responsible Parties (PRPs) were sought to clean up the site. EG&G Mound Applied Technologies was the operating contractor at the site from October 1, 1988 until September 30, 1997. Babcock & Wilcox of Ohio (BWO) became the contractor for the Mound Exit Project on October 1, 1997.

1.2 ORGANIZATION OF THE RESPONSE

Table 1 lists the groups responding to this Action, and their responsibilities.

Table 1. Organization of the Response

Agencies or Parties Involved	Contact	Description of Participation
US EPA SFR-5J 77 W. Jackson Chicago, IL 60604	Tim Fischer 312-886-5787	Federal agency responsible for response oversight.
Ohio EPA 401 E. Fifth St. Dayton, OH 45402-2911	Brian Nickel 937-285-6468	State agency responsible for response oversight.
DOE-MEMP P.O. Box 66 1 Mound Road Miamisburg, OH 45343-0066	Art Kleinrath 937-865-3597	Lead agency for the response.
BWO 1 Mound Road Miamisburg, OH 45343-3030	Joe Bartee 937-865-4812	Performed planning and field work for the response. Provided the OSC with technical assistance, administrative support, photo (see Appendix A) and site documentation, and preparation of OSC report.

1.3 OBJECTIVES

The Action Memorandum/Engineering Evaluation/Cost Analysis (DOE April, 1998, p 5-1) identified the objective of this removal action as the dismantlement, demolition, and removal of Buildings 35 and 59 and associated contaminated soil plus adjacent asphalt and concrete within the soil removal boundaries. The contaminants of concern for soil near Building 35 were photo-processing chemicals. The results of verification sampling are included in Appendix B and summarized in Table 2. None of the contaminants of concern for photo-processing chemicals was observed in sampling the soil near Building 35 above

action levels. The contaminants of concern for soil near Building 59 were possible neutron activation products. The contaminants of concern were identified during the building demolition activities. The Action Memo/EE/CA also indicated "A Verification Plan will be developed to identify what, if any, contaminants are present. Because of the possibility of activation products, the elements of concern can not all be identified beforehand. The Verification Plan will also identify the steps to determine the concentration of those contaminants to compare to appropriate risk based guideline criteria and ARARs." (DOE April, 1998, page 5-2) The Verification Sampling and Analysis Plan (VSAP) indicated the objective for radionuclides encountered would be the concentration that results in 10^{-5} (or less) excess cancer risk. The VSAP identified these concentrations for three radionuclides that might be encountered. These values are listed in Table 3. The verification sampling results are in Appendix C and are summarized in Table 3. Verification sampling confirmed the cleanup goals for these radionuclides were achieved.

Table 2. Verification Sample Results for Building 35 Pipe Trench

Contaminant of Concern	Action Level mg/kg	Maximum Observed mg/kg	Guideline Value for Hazard Index of 1	Ratio $\frac{MaxObserved}{GuidelineValue}$
Arsenic	8.6	5.8	64	.09
Cadmium	2.1	<0.07	210	.01
Chromium	20.0	11.0	1100	.02
Lead	48.0	13.4		
Silver	1.7	<0.08	1100	.01
Mercury	0.15	<0.06	64	.01
Reactive Sulfide	500	<10.6		
			TOTAL	0.14

Table 3. Verification Sample Results for Building 59 Soils

Radionuclide	Cleanup Goal* (pCi/g)	Verification Sampling Results+ (pCi/g)	Corresponding MDA (pCi/g)
^{238}Pu	55	1.85	2.74
^{60}Co	1.0	Not detected	0.05
^{152}Eu	2.4	0.28	0.22

*10^{-5} Excess Cancer Risk Guideline Value
+ Maximum observed value

1.4 CHRONOLOGICAL NARRATIVE OF RESPONSE ACTIONS

The following is a chronological narrative of events, as they occurred for the Buildings 35 & 59 Removal Action.

1967: Building 35 is constructed.

1977: Building 59 is constructed.

November 1989: Mound Plant is placed on the National Priorities List (NPL).

November 1997: Core Team designates Buildings 35 and 59 for RESPONSE ACTION.

January 1998: The RESPONSE ACTION recommendation starts formal public review period.

March 1998: Action Memo/Engineering Evaluation/Cost Analysis for Buildings 35 and 59 released for formal public review and comment. Asbestos abatement completed. Fiberglass panels removed. Freon removed from air conditioning unit. Steam and condensate lines for Building 35 were blocked off and reconnected for Buildings 49 and

63. Electric power to Buildings 35 and 59 was disconnected.

April 1998: Domestic water, fire protection water, and sanitary sewer lines to Building 35 were cut and blocked off. Demolition of Building 35 and 59 was initiated mid-month. By the end of the month, only the slabs and foundations of Building 35 and 59 remained in place. The tube in which the californium source had been stored was removed.

May 1998: Samples of the soil were taken from the area near the tube in which the californium source had been stored. The slabs and foundations for Buildings 35 and 59 were removed. Soil samples from beneath the former location of Building 35 were taken to determine the presence of contamination from photo chemicals. The HAZWOPER postings were removed from the project site. The Verification Sampling and Analysis Plan was submitted to the regulators for review and comment.

June 1998: The regulators' comments on the Verification Sampling and Analysis Plan were received and incorporated into the plan. Results of sampling of the Building 35 floor drain pipe trench for chemical contamination were received. No contamination was observed. The Analytical Data Summary is attached in Appendix B.

July 1998: Gamma-ray Spectrometry results for the soil samples taken from the Building 59 soils near the tube in which the californium source had been stored indicated the presence of ^{152}Eu, ^{60}Co and ^{210}Pb. This location was resampled for ^{210}Pb; this sample will be analyzed by low energy photon analysis. The excavation was extended an additional four feet in depth and the new base of the excavation was sampled.

August 1998: The results of sampling the new base of the excavation were received, validated, and compared to the cleanup goals. The cleanup goals were achieved. The Building 59 Cleanup Verification Sample Results report is attached in Appendix C.

November 1998: The results of the low energy photon analysis of the samples from the soils from Building 59 near the tube in which the californium source had been stored were received and reviewed. The "Lead-210 Measurement Results Observed from Building 59 Cleanup Verification Sampling" report is attached in Appendix D. ^{210}Pb was observed at 20-28 pCi/g concentrations in two samples measured by independent means taken from the original base of the excavation. The sample from the final base of the excavation indicates a ^{210}Pb concentration of 0.8 pCi/g. This is comparable to the background level of 1 pCi/g.

1.5 RESOURCES COMMITTED

Table 3 summarizes the disposition of materials from the demolition of Building 35 and 59. The cost summary for the removal action is in Table 4.

Table 4. Materials and Disposition

Waste Type	Volume (cy)	Disposal Costs ($)	Destination
Asbestos	20	540	Stony Hollow
Light Ballasts	0.3	300	Laidlaw Env.
Glycol	0.08	85	Laidlaw Env.
Construction Debris	200	2000	Stony Hollow
Scrap metal for recycle	160	0	Franklin Metal
Rad debris (concrete & soil)	410	107,000	Envirocare of Utah
Concrete debris (non-rad)	240	0	Spoils area at Mound
Totals	1030.38	109,925	

Table 5. Removal Project Cost Summary

Total Clean-up Contractor Costs	$399,854

2 EFFECTIVENESS OF THE REMOVAL ACTION

2.1 ACTIONS TAKEN BY MOUND PERSONNEL

BWO personnel planned and performed the site demolition and dismantlement, on-site transportation and staging of soil and debris, and site restoration. BWO personnel reviewed the results of the analysis of the Verification samples. As Appendix B indicates, no analytes were observed above the action limits for the Building 35 pipe trench samples. Appendix C indicates that the contaminants of concern (^{152}Eu, ^{238}Pu, ^{60}Co) are observed at levels less than the cleanup goal. Table 2 lists the cleanup goals and the measurement results for the Building 59 samples. The objectives of the removal action were achieved.

2.2 ACTIONS TAKEN BY LOCAL, STATE, AND FEDERAL AGENCIES

DOE/MEMP was the lead agency for the removal action. US EPA, and OEPA had oversight responsibility for the removal action.

2.3 ACTIONS TAKEN BY CONTRACTORS

Quanterra Environmental Services in Earth City, Missouri performed the analysis of the verification samples.

3 DIFFICULTIES ENCOUNTERED

3.1 ITEMS THAT AFFECTED THE RESPONSE

The nature and extent of soil contamination near the californium source storage location was uncertain because this contamination was the result of neutron activation of materials in the soil. The initial Verification Sampling of this site in June indicated the presence of ^{152}Eu in excess of acceptable levels. This location was further excavated and resampled in July, and met the acceptable levels.

During the initial sampling (May 13, 1998), gamma-ray spectrometry measurements of one soil sample (B59-S2A, see Figure C-2) indicated the presence of ^{210}Pb at 20 pCi/g. Before this location was further excavated in July, another sample was taken from this location (B59-S2L). This sample was analyzed by low energy photon spectral analysis and indicated the presence of ^{210}Pb at 28 pCi/g. After the additional excavation was complete, another sample was obtained and analyzed for ^{210}Pb by the same method. The measurement results indicate 0.8 pCi/g ^{210}Pb and the background concentration of ^{210}Pb is ~1 pCi/g. These results are summarized in Table 6.

These observations of ^{210}Pb were from soil samples taken from beneath the southeastern corner of Building 59. PRS 72 (Area 13, Polonium Contaminated Wood from Dayton Unit IV) lies to the east of this location. (See Figure 1.) ^{210}Pb is associated with the process history of the Dayton Units. These results will be considered in the assessment of PRS 72.

Table 6. Summary of ^{210}Pb Results

Sample ID*	Observed Concentration of 210Pb (pCi/g)
B59-S2A	20.20
B59-S2L	28.30
B59-S2M	0.855

*Refer to Figure C-2 for sample location.

3.2 ISSUES OF INTERGOVERNMENTAL COORDINATION

There were no issues of intergovernmental coordination.

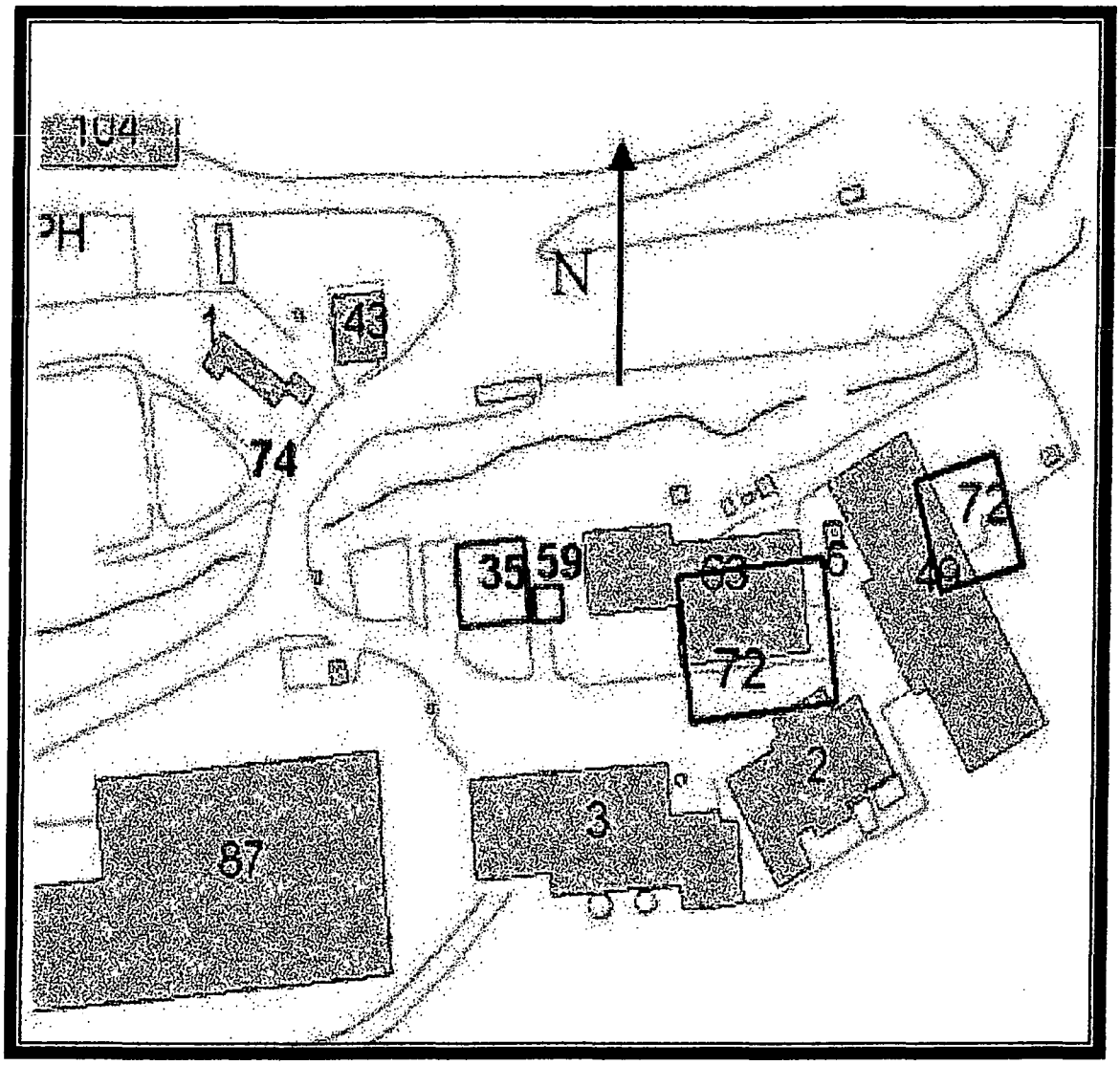


Figure 1. Location of Buildings 35, 59, and PRS 72

4 RECOMMENDATIONS

4.1 MEANS TO PREVENT A RECURRENCE OF THE DISCHARGE OR RELEASE

This section does not apply at Mound. This removal action was part of the remediation and closure of the Mound Plant. Buildings 35 and 59 and surrounding contaminated soils were removed and disposed of. There is not another facility on-site similar to Buildings 35 and 59.

5 REFERENCE LIST OF SUPPLEMENTAL DOCUMENTS

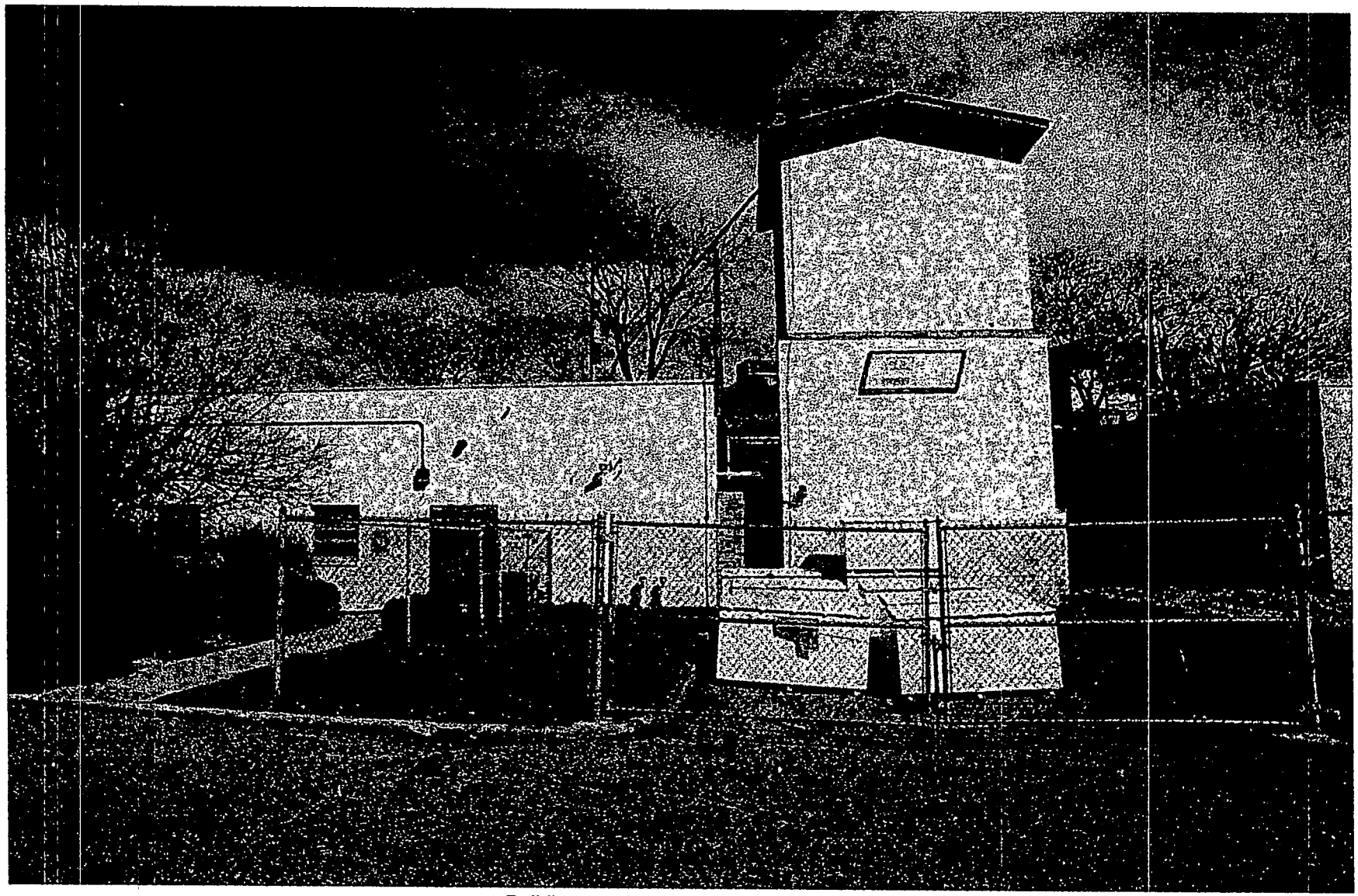
The following reports and documents are pertinent to the removal action and can be found in the CERCLA public reading room at the Miamisburg Senior Adult Center, 305 Central Avenue, Miamisburg or by contacting Arthur Kleinrath, On-Scene Coordinator for Buildings 35 & 59 Removal Action, at 937-865-3597.

- Action Memorandum/Removal Site Evaluation, Buildings 35 and 59 (DOE Final April, 1998)
- Buildings 35 and 59, Removal Action Work Plan (BWO Final February, 1998)
- Verification Sampling and Analysis Plan, Buildings 35 and 59 (BWO Revision 2 July 15, 1998)
- Building Data Package Buildings 35 and 59 (DOE Final March, 1998)

APPENDIX A

PHOTOGRAPH DOCUMENTATION

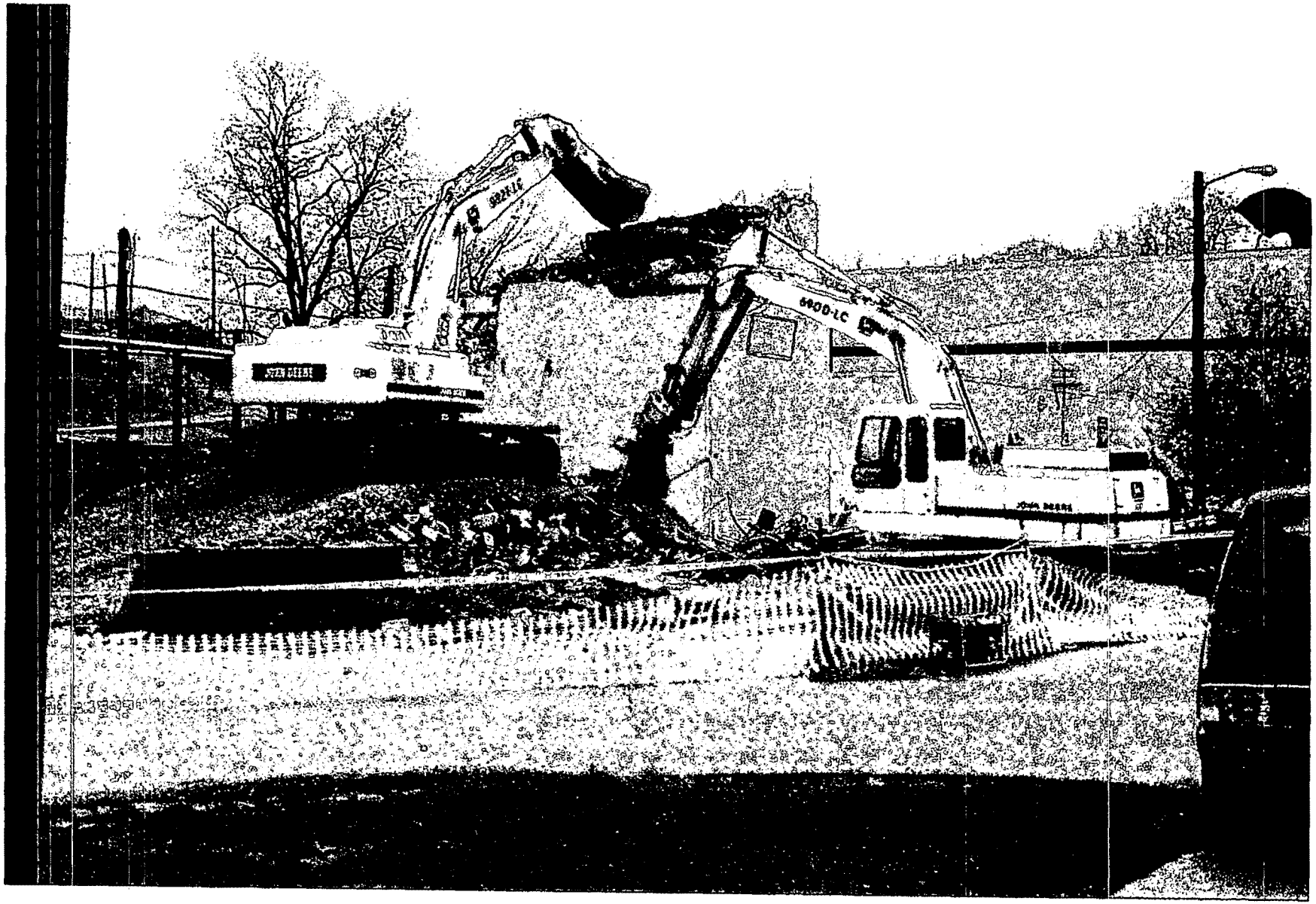
1. Buildings 35 and 59
2. Building 35 demolition
3. Building 35 demolition
4. Building 59 demolition
5. Building 59 demolition
6. Site after demolition
7. Site after demolition



Buildings 35 (on the left) and 59.
Photographer is south of the buildings. (March 6, 1996)

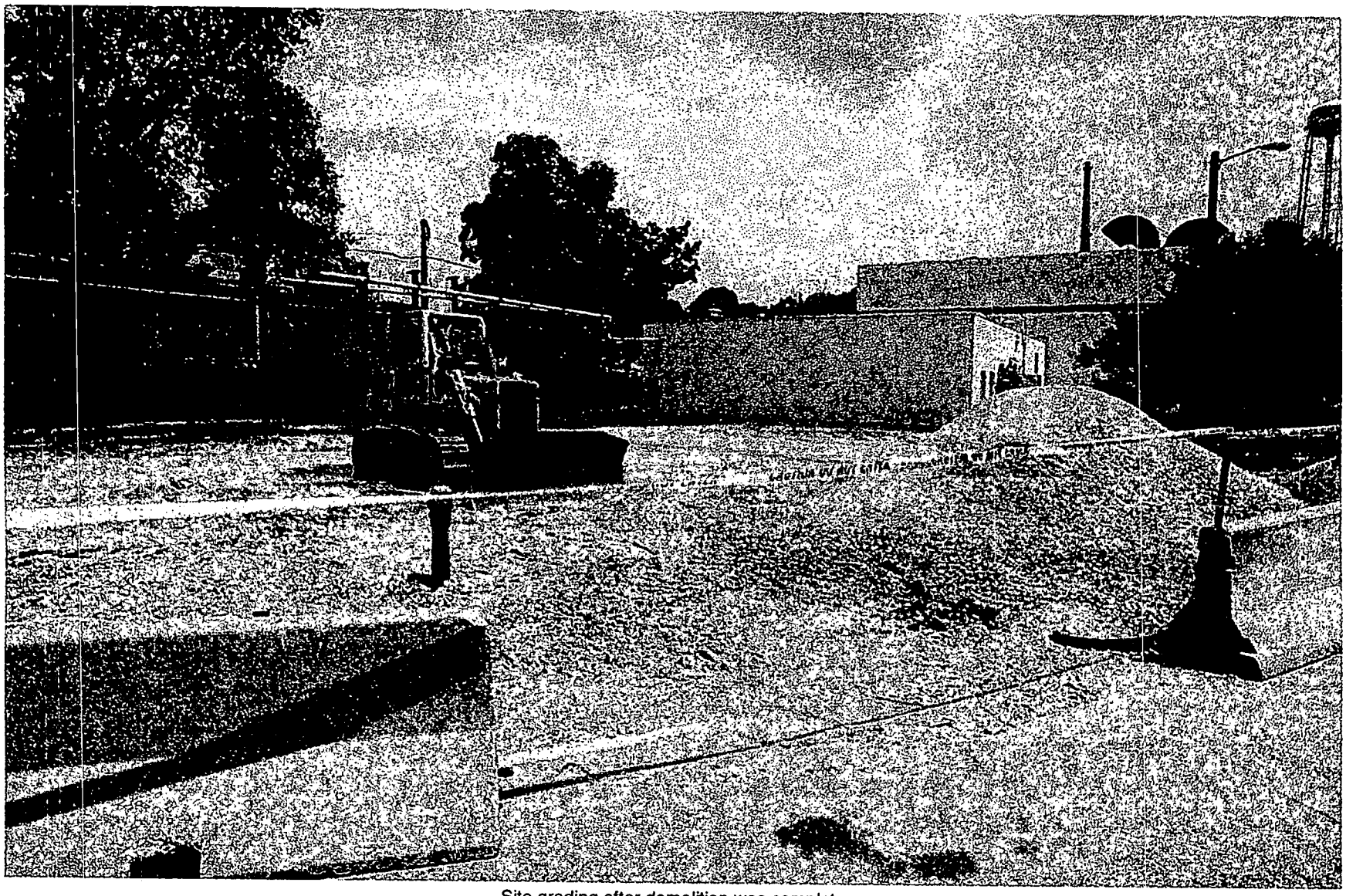
Demolition of Building 35 in progress.
(April 13, 1998)

Demolition of Building 35 in progress.
(April 13, 1998)

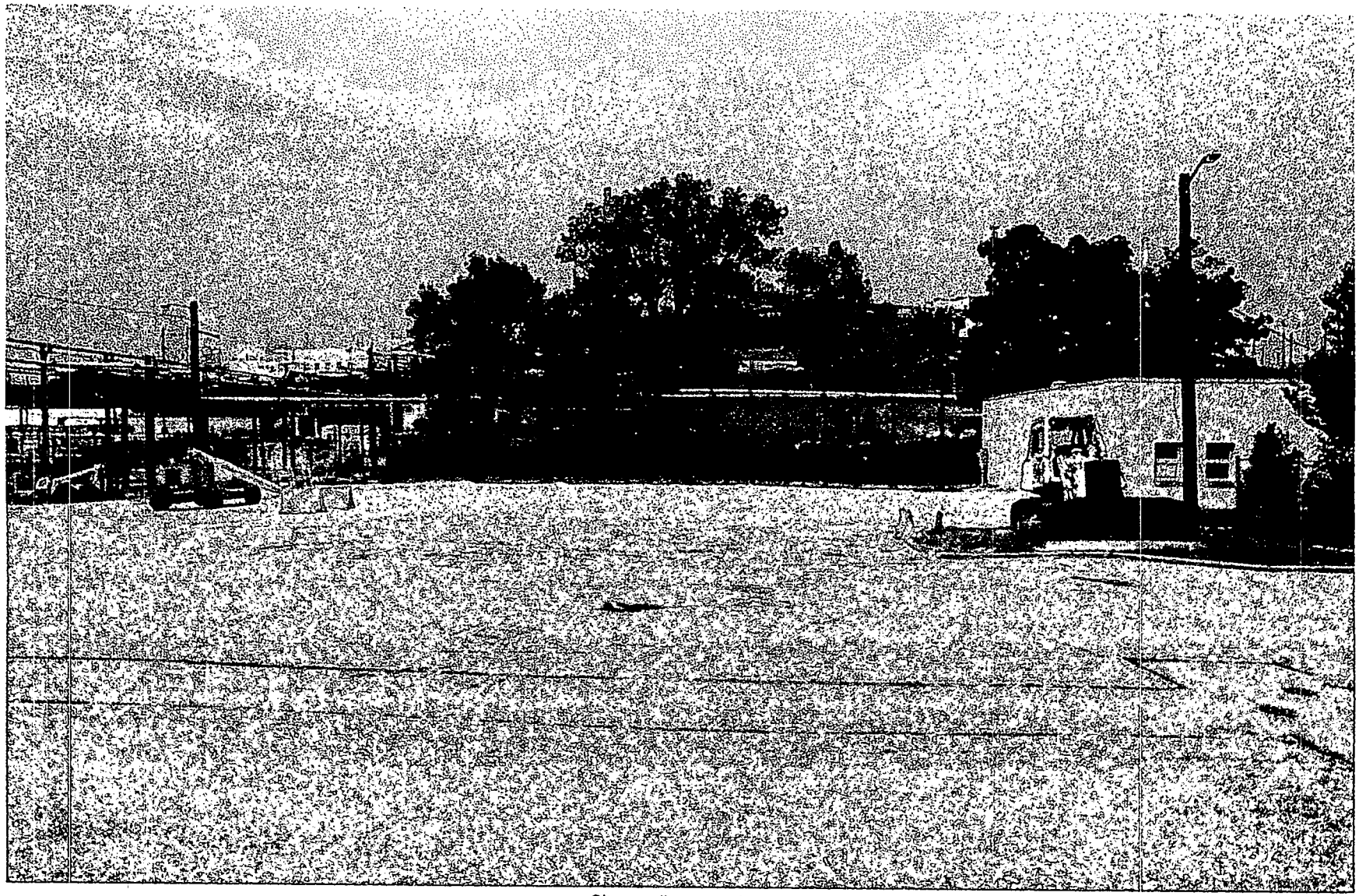


Demolition of Building 59.
The heavy duty equipment is removing the structure surrounding the "donut." (April 15, 1998)

Further progress in demolition of Building 59.
The "donut" is clearly visible at the top of the structure. (April 15, 1998)



Site grading after demolition was complete.
(May 26, 1998)



Site grading complete.
(July 16, 1998)

APPENDIX B

SAMPLING RESULTS FOR BUILDING 35 PIPE TRENCH

MOUND

INTEROFFICE CORRESPONDENCE

Date: June 16, 1998

From: E. F. Jendrek

Subject: Validation of Building 35 Pipe Trench Soil Analysis Data
Sampled May 13, 1998

To: Dave Adkins
Test Fire Valley Environmental Coordinator

Composite samples were taken on May 13, 1998 from 8 equal segments of a pipe trench formed by the removal of a floor drain in Building 35. These samples were taken as part of the Building 35 Floor Drain Sample and Analysis Plan written by Dave Adkins and received May 6, 1998. The samples were sent to Quanterra Environmental Services, St. Louis, on May 14, 1998 for RCRA Metals, Percent Moisture and Reactive Sulfide analysis using SW-846 compliant methods.

The results have been verified and validated according to MD-70743, Waste Sampling Procedures, Operation 195. Validating Analytical Results. . A description of the soil sampling procedure, process knowledge of the area, the sampling technique and the sample analyses are contained in the Building 35 Floor Drain Sampling and Plan. The results of the data verification and validation process are as follows.

1. **Verification:**
   Eight soil samples, one field duplicate and an equipment rinsate were shipped to Quanterra. No trip blank was sent. The Chain-of-Custody and Analytical Request Forms were checked. All requested analyses were completed within the proper hold times. There were no irregularities connected to the sample preservation, shipment or receipt.

2. **Validation:**
   A. **Total Metals Analysis:** The zinc recovery in the Matrix Spike (MS) was above (143%) QC limits. Recovery for this analyte in the Matrix Spike Duplicate (MSD) was within QC limits. All other QC criteria were met. Since the duplicate was within limits and zinc was not an analyte of prime concern (i.e., no associated remediation action limits) there is no reason to qualify the data for the analytes of prime concern. No metal analytes were observed above the action limits.

   B. **Reactive Sulfide Analysis:** Sulfur recovery (41%) in the MS was below QC guidelines (75-125%). All other QC criteria were met. Reactive sulfide was below detectable limits in all samples. The reactive sulfide detection limit was 10.6 mg/kg, well below the action limit of 500 mg/kg.

   C. **Quality Control Samples:** The Field Duplicate Samples (35-05 and 35-09) were in good agreement. No contamination was found in the equipment rinsate.

The analytical data can be used as presented without qualification. I have reviewed the analytical data, and certify that the samples contain no analytes at or above the action levels specified in the sampling and analysis plan.

E. F. Jendrek
Waste Management Specialist
Waste Management Operations

Building 35 Floor Drain Pipe Trench Sampling
Test Fire Valley Project
Sampled May 13, 1998

Verification/Validation Report
Analytical Data Summary
Analytical Data Package

Prepared by E. F. Jendrek
June 16, 1998

Inorganic Analysis
LSDG 17842 Bld 35 Pipe Drain
Sampled 5/14/98

6/16/98

Sample Id	Arsenic	Barium	Cadmium	Chromium	Lead	Selenium	Silver	Mercury	Copper	Zinc
Action Level mg/kg	8.6		2.1	20.0	48.0		1.7	0.15 *		
PQL mg/kg	1.2	23.2	0.58	1.2	0.35	0.58	1.2	0.12	2.9	2.3
35-01	4.6	42.0	<0.07	11.0	6.6	0.47	<0.08	<0.06	14.2	39.9
35-02	5.8	39.4	<0.07	8.9	9.2	<0.38	<0.08	<0.06	14.1	39.2
35-02 MS	90%	95%	84%	90%	102%	88%	89%	106%	103%	143%
35-02MSD	90%	94%	84%	90%	83%	88%	90%	106%	104%	89%
35-03	5.8	38.2	<0.07	9.4	13.4	<0.38	<0.08	<0.06	12.8	35.1
35-04	5.2	41.2	<0.07	8.0	7.3	<0.38	<0.08	<0.06	11.3	30.4
35-05	5.1	46.0	<0.07	7.7	5.5	0.38	<0.08	<0.06	11.9	34.5
35-06	4.0	29.9	<0.07	5.7	6.3	<0.38	<0.08	<0.06	8.8	24.1
35-07	4.0	27.5	<0.07	8.1	7.3	<0.38	<0.08	<0.06	9.1	33.6
35-08	5.1	35.5	<0.07	7.5	5.6	<0.38	<0.08	<0.06	10.7	27.6
35-09	5.4	62.3	<0.07	9.5	6.1	<0.38	<0.08	<0.06	12.8	36.9
PREP BLANK	<0.19	<0.10	<0.07	0.23	0.15	<0.38	<0.08	<0.06	<0.34	<0.18
LCS	106%	106%	108%	107%	102%	106%	110%	96%	112%	108%
35-10 Equ. Rins.mg/L	<1.9	1.9	<0.60	2.6	8.1	<3.1	<0.70	<0.10	324	547
	* a background could not be calculated for Hg due to the large number of non-detects									
	Zn recovery from MS sample was above QC guidelines									

Inorganic Analysis
I.SDG 17842 Bld 35 Pipe Drain
Sampled 5/14/98

Sample Id	% Mositure	Reactive Sulfide								
Action Level mg/kg		500								
PQL mg/kg		10.6								
35-01	13.7%	<10.6								
35-02	16.8%	<10.6								
35-03	18.3%	<10.6								
35-04	13.3%	<10.6								
35-05	16.2%	<10.6								
35-06	11.6%	<10.6								
35-07	13.4%	<10.6								
35-07 Duplicate	NA	<10.6								
35-07 MS	NA	41%								
35-08	15.2%	<10.6								
35-09	16.2%	<10.6								
PREP BLANK	NA	<10.6								
LCS	NA	99%								
35-10 Equ. Rins.mg/L	NA	<4.0								
	S recovery from MS sample was below QC guidelines									

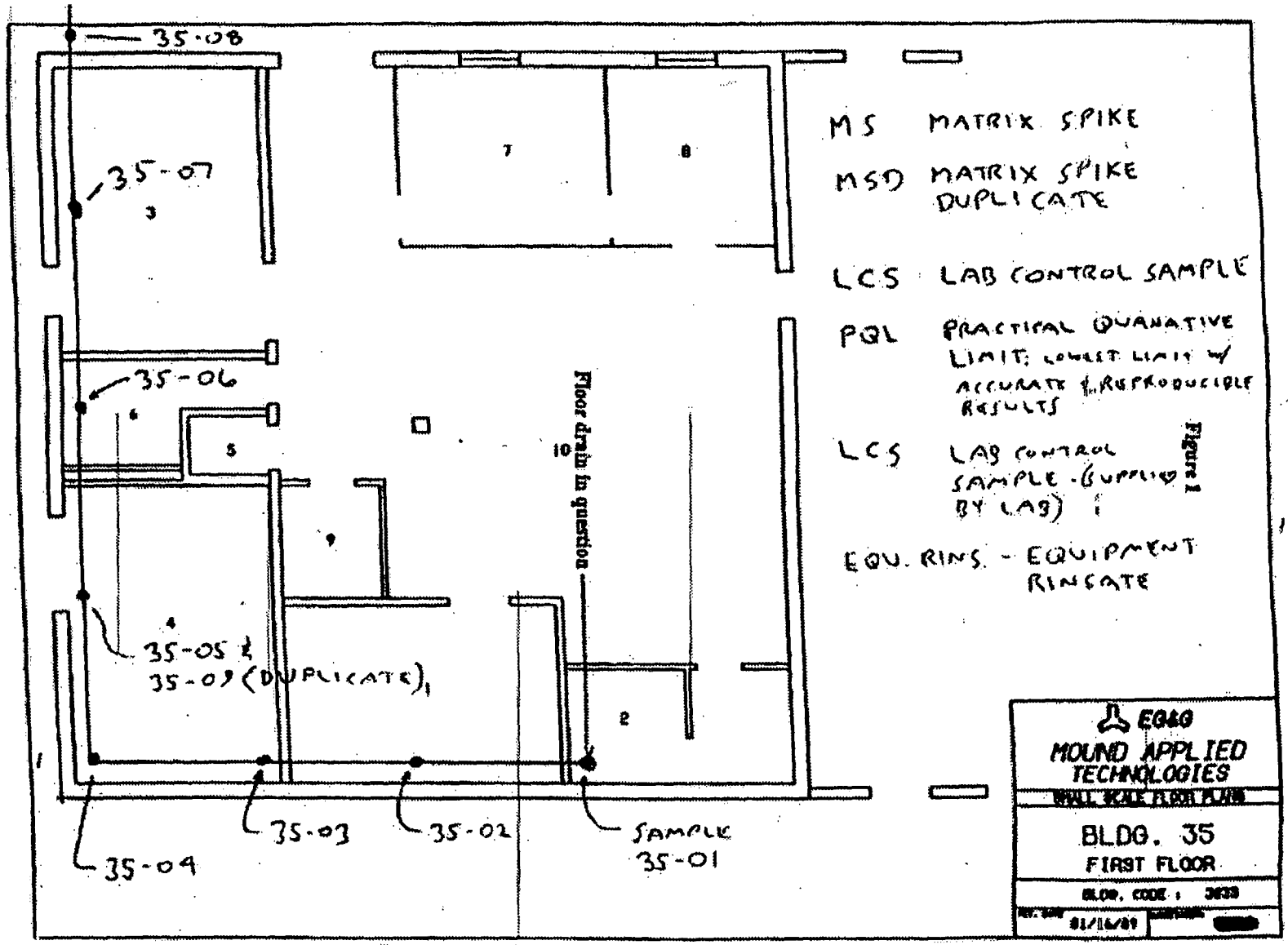

35-08
35-07
35-06
35-05 &
35-09 (DUPLICATE)
35-04
35-03
35-02
SAMPLE
35-01
Floor drain in question
MS MATRIX SPIKE
MSD MATRIX SPIKE DUPLICATE
LCS LAB CONTROL SAMPLE
PQL PRACTICAL QUANATIVE LIMIT: LOWEST LIMIT W/ ACCURATE & REPRODUCIBLE RESULTS
LCS LAB CONTROL SAMPLE - (SUPPLIED BY LAB)
EQU. RINS. - EQUIPMENT RINSATE
EG&G
MOUND APPLIED TECHNOLOGIES
BLDG. 35
FIRST FLOOR
BLDG. CODE : 3633
01/16/89

Figure 1

APPENDIX C

SAMPLING RESULTS FOR SOILS NEAR BUILDING 59 NEUTRON SOURCE STORAGE

BUILDING 59 SOILS CLEANUP
VERIFICATION SAMPLE RESULTS:

DATA VALIDATION AND DATA ASSESSMENT (PART 2)

Joseph C. Miles

Babcock & Wilcox of Ohio

August 26, 1998

BACKGROUND

Building 59 was demolished and removed as a remedial action to remove radioactively contaminated materials from the Mound site. A "***Verification Plan, Building 59 Soils***" [1] Verification Sample and Analysis Plan (VSAP) was prepared that specified the samples, radionuclide analyses and statistical data treatment to be applied to determine if cleanup goals were achieved by the remediation efforts.

During June 1998, an initial sample set was collected, analyzed and evaluated as described in a companion report [2]. In both that report [2] and the VSAP [1], it was noted there were two types of samples specified for collection and analysis: one sample group consisted of 9 samples (3 sample locations at 3 sample depths for each location) collected from the area immediately surrounding the former U-tube location in Building 59, and the other sample group consisted of 5 samples collected from the perimeter and central area immediately beneath the excavation of the former U-tube location. (Sampling practices also specify that additional laboratory and field replicate samples be analyzed to provide quality assurance/quality control data.)

The companion report concluded that, based on the initial sample set, cleanup goals **were achieved** per the specified process in the VSAP for one target radionuclide, specifically Pu^{238}, but cleanup goals **were not achieved** for the other two remaining target radionuclides, Eu^{152} and Co^{60}. A sensitivity analysis of the initial data results indicated that the result from only one sample location from beneath the former location of the U-tube was sufficient to cause these cleanup goals to not be met. The report further noted that the target radionuclides failing the cleanup goals were mostly non-detectable in the sample group surrounding the U-tube position and mostly present in the sample group from beneath the U-tube position. This seemed to imply excessive residual contamination remained beneath the initial excavation and the central sampling locations but that the contamination did not spread outward beyond the excavation area.

Based on the failure to achieve the cleanup goals, the consensus course of action to be taken was to excavate deeper beneath the U-tube and to collect new samples to replace the original sample group from beneath U-tube position. Results from the new samples combined with original results from the 9 samples from the surrounding locations which were not further excavated would be assessed as specified in the VSAP. This combination of new and original data would be used to determine if the Eu^{152} and Co^{60} cleanup goals

were met after the additional excavation. The Pu^{238} cleanup goal was considered met using the only initial data set with no additional assessment being necessary after further excavation. Consensus discussions indicated that a statistically sound defensible assessments would be made using the sample results organized in this manner.

This report provides the data validation on the newly collected samples and assesses the final data sets for attainment of the cleanup goals. The earlier report must be referred to for validation of the original data, however, the entire data set utilized in the cleanup assessment is provided in Appendix A for the reader's convenience.

This report indicates all cleanup goals are now satisfied per the process specified in the VSAP. The results of this assessment are presented.

DATA DESCRIPTION

The initial data were described in the companion data assessment report [2]. The newly collected samples are described as follows. Five samples from beneath the re-excavation (to replace the five earlier samples), one field replicate sample and one equipment rinsate sample were collected on 07/28/98 and sent to Quanterra Environmental Services in Earth City, MO. The samples were analyzed by gamma scan only during 08/10-13/98 as LSDG 18528 on project contract 145.04. The original samples were also analyzed using plutonium isotopic alpha spectrometry, but this was not necessary for these samples as the Pu^{238} cleanup goals were met. (Two additional samples were collected for Pb^{210} alpha spectrometry analysis and forwarded to the Quanterra-Richland, WA laboratory. Results from those two samples for Pb^{210} analysis are not yet available and are beyond the scope of this report.)

DATA VALIDATION

The six new "S2" samples replace the six original samples which were rendered unusable for assessing the cleanup for two of the target radionuclides by the additional excavation that was conducted. The analytical results for the initial samples were validated in the companion report [2] and are utilized in this report without further review.

The analytical results for the new samples were validated by the following reviews.

Satisfactory results were reported for the QA blank and QA laboratory control samples associated with this LSDG. One sample was analyzed as a laboratory replicate. The results exhibit satisfactory agreement. The field replicate results also exhibit satisfactory agreement. No relative percent differences can be cited as most of the results were determined to be below minimum detection levels.

The radionuclide identification from the gamma scan spectra was reviewed and is validated and accepted as reported.

The Minimum Detectable Activity (MDA) values met the desired (requested) sensitivities. Table 1 lists the MDA values for each target analyte determined when the analyte was not detectable or was at low abundance (<3 times the MDA).

The equipment rinsate sample collected at the onset of sample collection indicates contamination with one analyte of interest (but not the other analyte of interest). Since the rinsate result exceeds all other sample results, the rinsate results are discounted and cross contamination is assumed to be not significant.

Table 1. Listing of MDAs Achieved For Target Analytes At Low Abundances.

Analyte[2]	Number Of Results Included in Mean MDA	Mean MDA (pCi/g)	Std. Dev. Of MDA (pCi/g)	Requested MDA[1] (pCi/g)
Cobalt-60	7	0.045	0.004	0.10
Europium-152	7	0.21	0.02	0.24

1. Requested MDAs from reference [1], which is set at 10% of the cleanup goal level.
2. The MDA achieved for the target analyte Pu^{238} was acceptable and was provided in the companion report.

CLEANUP GOAL ASSESSMENT

The data were validated as reported and were used to assess whether the cleanup goals were achieved. To reiterate, the data sets used for the cleanup assessment consisted of all the original sample results for Pu^{238}, and the newly collected "S2" results combined with the original "S1" results for Co^{60} and Eu^{152}. The original "S2" results for the latter two target radionuclides were rendered invalid because the cleanup goals were not realized and additional soil excavation was necessary. The new "S2" samples were collected after the additional excavation and replace the original results in the cleanup assessment for the latter two target radionuclides.

The cleanup assessment methodology was conducted as described in the VSAP. Briefly, this process was conducted as follows.

First, all relevant data were utilized on an equal weighting basis. Where replicate laboratory results and field replicate results were available for a single sample location, the mean result was computed and used to represent the value for that location in all subsequent calculations. This ensures each location is equally weighted in the cleanup assessment. Also, every sample location is equally weighted, so no allowances were applied for different numbers of samples for "S1" or "S2" locations.

Second, where reported results were less than the reported MDA, the value used in subsequent calculations was the reported MDA itself. This is a conservative approach to determining mean concentrations when non-detectable results are reported. This approach can yield a lower variance since non-detectable events are assigned nearly equal values.

The lower variance can shift the upper confidence level to a lower value, but any reduction would be offset somewhat by the higher mean obtained by substitution of MDA values for non-detectable results. This situation exists in this application since the majority of results are less than the reported MDAs. Since the MDAs are sufficiently below the established cleanup goals, any reduction in variance by MDA substitution was determined to be insignificant and does not impact calculation of the upper confidence limits levels sufficiently to alter the cleanup goal assessment conclusions.

Third, statistical confidence limits of the mean concentration of each target analyte was determined using the prescribed methodology given in the VSAP. Table 2 lists the computed statistical measures. The column "Upper 95% Confidence Limit for the Mean" is computed as:

$$UCLM_{95} = Mean + t(95,df_i) * s_i / SQRT(N_i),$$

where

$$Mean = \Sigma_i (Result_i) / N_i,$$

and where

$\Sigma_i (Result_i)$ = sum of all measured activities for target radionuclide I,

N_i = number of activity measurements for target radionuclide I,

$t(95,df_i)$ = Student's t-statistic at the 95% cumulative distribution point at the appropriate number of degrees of freedom for target radionuclide I, and

s_i = standard deviation of the measured activity values for target radionuclide I.

This calculated quantity is compared individually with the cleanup goal specified for each target radionuclide. Cleanup goals for individual target radionuclides are satisfactorily met if this quantity is less than the risk based cleanup goal. The established cleanup goal for each target radionuclide is provided in Table 3.

Table 2. Listing Of Statistical Measures Calculated From The Cleanup Assessment Samples.

Target Analyte	**Number Of Values[1]**	**Mean Result[2] (pCi/g)**	**Standard Deviation (pCi/g)**	**Upper 95% Confidence Limit Of Mean (pCi/g)**	**Cleanup Goal Achieved ?**
Pu-238	14	1.02	0.55	1.33	Yes
Co-60	14	0.046	0.003	0.048	Yes

Eu-152	14	0.217	.023	0.230	Yes
Aggregate Risk[3]				0.168	Yes

1 - Number of sample locations entering calculations.

2 - The reported MDA was inserted in the mean calculation whenever the measured result was less than the reported MDA. This mean represents the mean result of all sample locations appropriate for the assessment.

3 - Aggregate risk is the cumulative risk of all target radionuclides. This is computed as the sum-of-fractions of the ratios of the upper confidence interval for each mean to its respective cleanup goal value. If this value is less than one, the aggregate risk lies within an acceptable risk level.

The cleanup goal for each target radionuclide is set to provide an equal risk (10^{-5}) from exposure to that target radionuclide. A final cleanup assessment step is to determine if the cumulative risk from all target radionuclides also lies within this working risk level. This is determined by using a sum-of-fractions methodology to combine the risks from each individual target radionuclide into one overall quantity. If this sum-of-fractions quantity is less than unity, the cumulative risk from all target radionuclides at the cleanup condition is also satisfactory.

Table 3. List of Cleanup Goals Established For Each Target Radionuclide.

Target Radionuclide	Established Cleanup Goal For 10^{-5} Risk (pCi/g)
Pu-238	55.
Co-60	1.0
Eu-152	2.4

CONCLUSIONS

The radioactivity remediation efforts of building removal and soil excavation at Building 59 were determined to be satisfactorily completed. The level of cleanup achieved was demonstrated to meet all pre-established radionuclide cleanup goals for this project.

The assessment of the level of cleanup was based on verification sampling and analysis, and a statistical treatment of the analytical results. The residual levels of the target radionuclides known to be present at time of remediation (Pu^{238}, Co^{60} and Eu^{152}) do not present any residual risk exceeding the selected 10^{-5} risk level. The residual risk was determined to be within the selected risk level for individual target radionuclides as well as all target radionuclides collectively.

REFERENCES

[1] "VERIFICATION PLAN BUILDING 59 SOILS", Revision 2 (July 15, 1998)

[2] "BUILDING 59 SOILS CLEANUP VERIFICATION SAMPLE RESULTS: DATA VALIDATION AND DATA ASSESSMENT (PART 1)", J. C. Miles (August 27, 1998)

APPENDIX A.

Table A. Listing Of All Analytical Results For All Target Radionuclides That Were Used In Cleanup Assessment.

Sample ID	Co-60 Result (pCi/g)	Co-60 MDA (pCi/g)	Eu-152 Result (pCi/g)	Eu-152 MDA (pCi/g)	Pu-238 Result (pCi/g)	Pu-238 MDA (pCi/g)
New Samples:	"S2" Series					
B59-S2F	ND	0.052	ND	0.21		
B59-S2G	ND	0.046	ND	0.25		
B59-S2G Dup	ND	0.046	0.28	0.22		
B59-S2H	ND	0.042	ND	0.20		
B59-S2I	ND	0.046	ND	0.20		
B59-S2J	ND	0.045	ND	0.21		
B59-S2K (Field Replicate of B59-S2H)	ND	0.041	ND	0.21		
Initial Samples[1]:	"S2" Series					
B59-S2A					-0.27*	1.16
B59-S2B					0.36*	0.78
B59-S2C					0.04*	0.60
B59-S2D					0.15*	0.79
B59-S2E					0.24*	0.78
B59-FD					-0.06*	0.99
Initial Samples[1]:	"S1" Series					
B59-S1A0	ND	0.049	0.25	0.19	1.85*	2.74
B59-S1A7	ND	0.033	ND	0.18	0.29*	0.68
B59-S1A7 Dup	ND	0.050	ND	0.24	0.09*	0.72
B59-S1A14	ND	0.043	ND	0.19	-0.04*	1.26
B59-S1B0	ND	0.047	ND	0.23	-0.11*	0.75
B59-S1B7	ND	0.048	ND	0.23	0.02*	0.53
B59-S1B14	ND	0.048	ND	0.20	0.29*	0.82
B59-S1C0	ND	0.039	ND	0.21	-0.13*	1.28
B59-S1C0 Dup	ND	0.049	ND	0.25	0.04*	1.16
B59-S1C7	ND	0.041	ND	0.26	0.35*	1.20
B59-S1C14	ND	0.049	ND	0.21	0.17*	0.84

1 - Initial samples refers to the samples collected after the initial excavation. New samples refers to the newly collected samples following the additional excavation necessary to achieve all cleanup goals.

* - Note that the reported result is below the MDA.

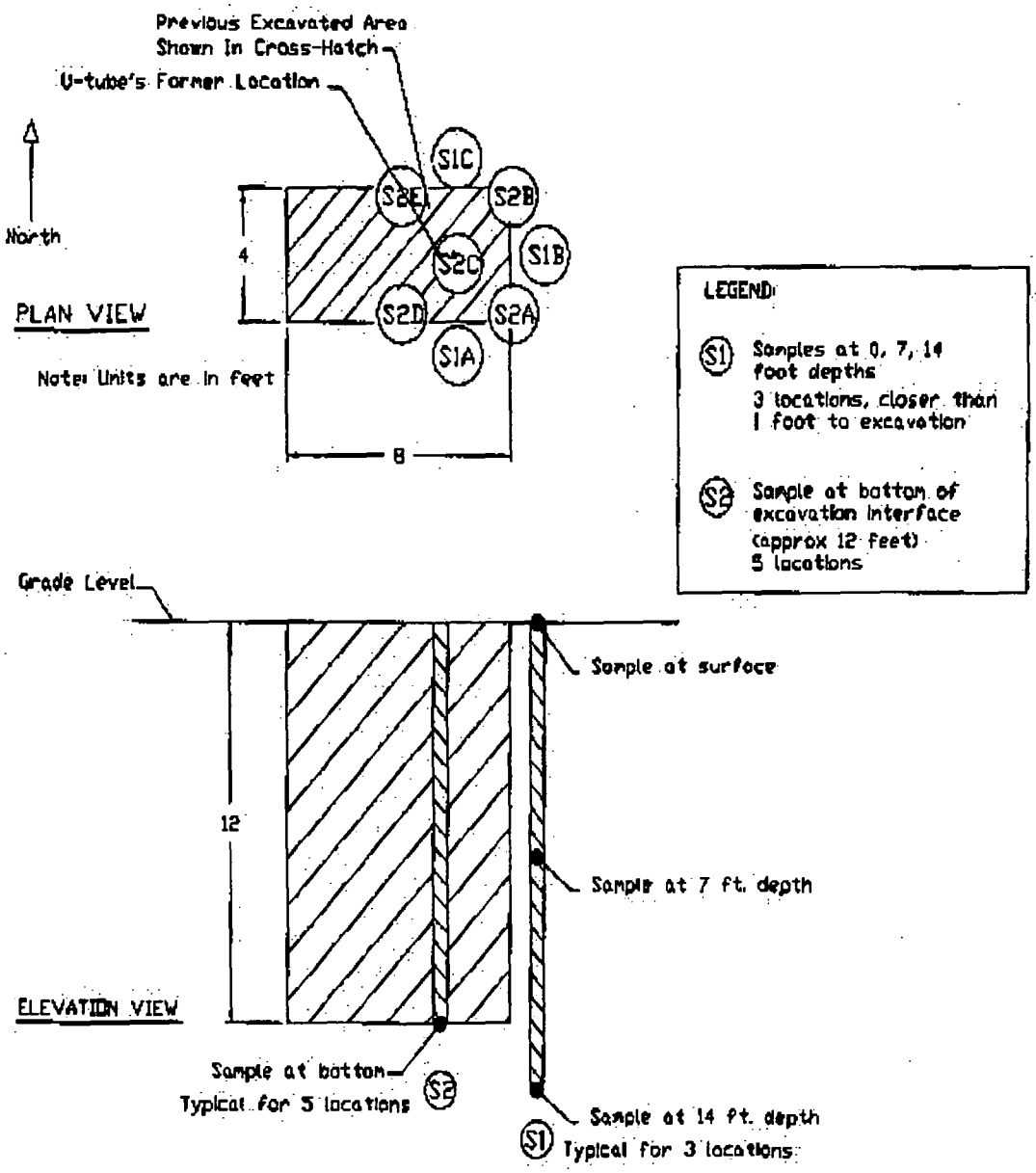
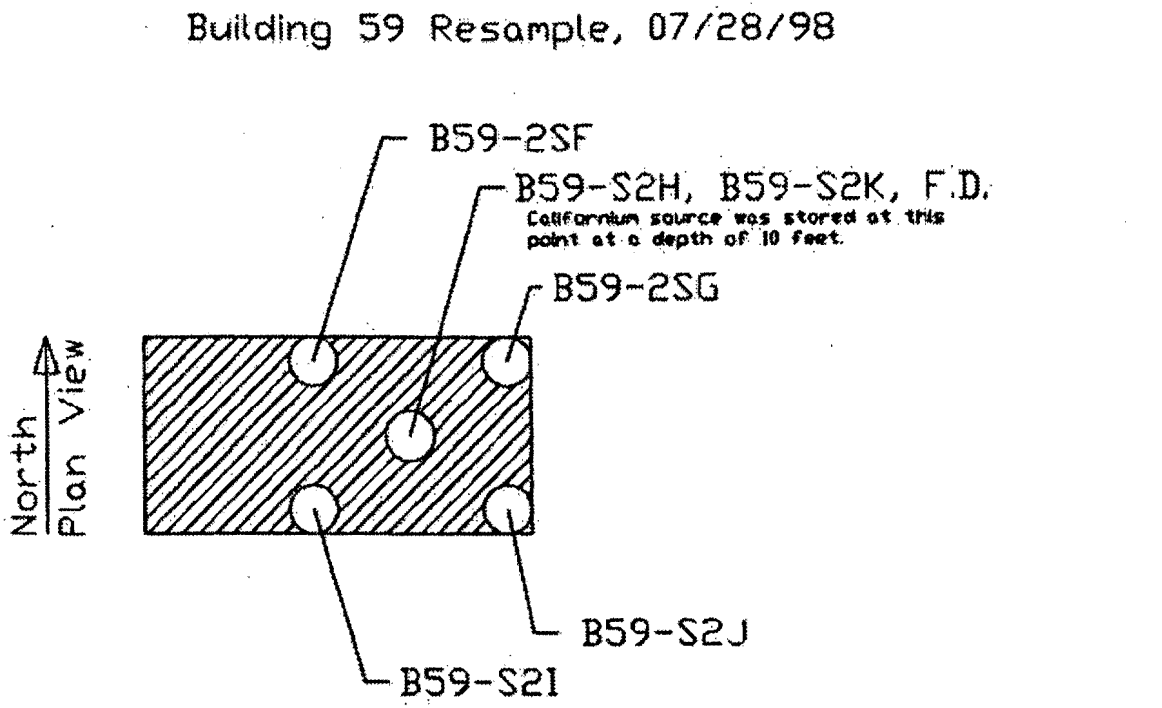


Figure C-1. Sample Grid Locations for Building 59



B59-S2L - Taken at old S2A position and depth (12 Ft) for Pb-210 only.

B59-S2M - Taken at old S2A position, bottom of remediation (16 Ft depth) for Pb-210 only.

B59-ER3 - Equipment Rinsate

All other samples collected at bottom of remediation (16 Ft depth).

Figure C-2. Sample Locations for Building 59 Resample Event

APPENDIX D

LEAD-210 MEASUREMENT RESULTS OBSERVED FROM BUILDING 59 CLEANUP VERIFICATION SAMPLING

LEAD-210 MEASUREMENT RESULTS OBSERVED FROM BUILDING 59 CLEANUP VERIFICATION SAMPLING

J. C. Miles

November 10, 1998

INTRODUCTION

During June 1998, an initial set of cleanup verification samples was collected to determine if site remediation where Building 59 (also referred to as the CFX Facility) formerly stood met predetermined site cleanup goals. The radionuclides of interest at this site were determined to be Pu-238, Co-60 and Eu-152, based on radionuclide identification during building demolition and site excavation.

Based on analytical results from the initial samples, it was determined that site cleanup did not achieve all predetermined cleanup goals. After additional excavation where the target analytes exceeded goals, a second set of follow-up verification samples was collected in July 1998. This second set of follow-up samples was only a partial sample set collected from the depth (base) of the final excavation. The perimeter samples initially collected met the cleanup goals, thus additional perimeter sampling was not deemed necessary. Using the initial perimeter results in combination with the follow-up sample results from the excavation base, all cleanup goals were met after the final excavation. Earlier reports [1,2] described the data collection, analysis results, and cleanup assessment methodology.

In those reports, it was also noted that an elevated level of Pb-210 (lead isotope 210) was present based on gamma scan assay of the verification soil samples. No further evaluation of the Pb-210 results was made because Pb-210 was not a target analyte of interest, so an assessment of those results would lie outside the scope of this assessment. It was decided the Pb-210 presence should be addressed later in an assessment of PRS 72.

Pb-210 is a potential contaminant in PRS 72 that lies adjacent to the Building 59 site. PRS 72 refers to a disposal location of debris potentially containing Pb-210 that resulted from prior activities not associated with Building 59 operations. Therefore, a separate report presenting and describing the Pb-210 results is needed for future consideration in developing any remediation plans for PRS 72. This report presents and discusses these Pb-210 results.

SAMPLING DISCUSSION

The planar dimensions of the excavation at the former U-tube location are not large—a few feet by a few feet. Thus, it should be realized that all samples were collected within a

small area. Because of the limited area and since the contamination appeared to be localized within this limited area, subsequent sampling to verify previous results might not be reproducible.

Two general sampling schemes were utilized. Some samples were collected at various depths (0, 7 and 14 ft) outside the excavation to observe any spatial dispersion or outward migration of the target analytes. The remaining samples were collected from beneath the U-tube location (12-ft depth) to observe whether the target analytes permeated beneath the remediation site. The Building 59 cleanup goals were not meet with the initial sample collection solely due to results from the second sampling area, i.e., the samples beneath the U-tube location. The follow-up samples were collected after additional excavation beneath the U-tube location. At this point, the base of the excavation was ~16 ft.

The elevated levels (above background) of Pb-210 from the initial samples were associated solely with the region beneath the U-tube location (see data listing in Table 1) and not with the perimeter region. The ambient background level of Pb-210 is ~1 pCi/g resulting from the natural abundance of U-238 and its decay series. Because of wide variability in the Pb-210 results, there was uncertainty whether the reported Pb-210 results indicated an actual presence of Pb-210. It was conceivable that the Pb-210 was reported because of analytical difficulty, such as spectral interference or spectral assignment to radionuclides, since the Pb-210 results were highly correlated with the Eu-152 levels.

In order to determine whether Pb-210 was present, it was decided that two special samples would be collected for Pb-210 analysis by an independent method. These two samples would be collected at the start of the final excavation from the base of the original excavation. In other words, the special samples would attempt to reproduce the initial sample results and confirm the Pb-210 presence by utilizing an independent analysis method. Gamma scan assay would still be performed on the follow-up samples collected from the new base of the final excavation. Since the original excavation had been already filled in, the backfill overburden had to be removed to reach the base of the original excavation to collect these special samples.

DATA DISCUSSION

The initial and follow-up samples were analyzed by Quanterra Environmental Services in

St. Louis. The initial sample set was analyzed as SDGs (Sample Data Group) 18115 and 18128. The follow-up sample set was analyzed as SDG 18528. The referenced reports [1,2] describe the data and sampling in more detail.

The special samples were analyzed by Quanterra's Richland laboratory. The special samples were in SDG 18528 but are identified as SDG 10593 at Richland.

A listing of the Pb-210 data is provided in Table 1. For comparison, the Pb-214 and Eu-152 results are also shown in Table 1. The Pb-210 content in the initial and follow-up samples was determined using gamma ray spectral analysis. The Pb-210 content in the special samples was determined using low energy photon spectral analysis.

The referenced reports [1,2] note that, like the target analyte Eu-152, an elevated level of Pb-210 was evident only in the samples collected from beneath the former location of the U-tube. A regression analysis of the Pb-210 results with the Eu-152 results showed a high degree of correlation (correlation coefficient R^2 of 0.99) between the two radionuclides. (It should be noted that a high correlation would appear when one data pair is widely separated from the remaining data pairs, as in this case.)

Table 1. Listing of Pb-210, Pb-214 and Eu-152 results from the Building 59 sampling.

Sample ID	Pb-210 Result (pCi/g)	Pb-210 MDA (pCi/g)	Pb-214 Result (pCi/g)	Pb-214 MDA (pCi/g)	Eu-152 Result (pCi/g)	Eu-152 MDA (pCi/g)
Initial Samples:[1] "S1" Series						
B59-S1A0	0.53	0.41	0.64	0.054	0.25	0.19
B59-S1A7	1.13	0.29	0.64	0.050	ND	0.18
B59-S1A7 Dup[2]	1.50	0.31	0.71	0.059	ND	0.24
B59-S1A14	0.78	0.40	0.68	0.050	ND	0.19
B59-S1B0	1.21	0.34	0.71	0.061	ND	0.23
B59-S1B7	1.42	0.30	0.71	0.059	ND	0.23
B59-S1B14	0.98	0.43	0.85	0.053	ND	0.20
B59-S1C0	0.55	0.30	0.52	0.047	ND	0.21
B59-S1C0 Dup[2]	0.85	0.31	0.53	0.053	ND	0.25
B59-S1C7	0.50	0.37	0.57	0.053	ND	0.16
B59-S1C14	1.00	0.33	0.76	0.056	ND	0.21
Initial Samples: [1] "S2" Series						
B59-S2A	20.20	0.86	0.73	0.130	31.50	0.27
B59-S2B	1.67	0.41	0.75	0.064	1.31	0.21
B59-S2C	3.13	0.41	0.54	0.070	4.01	0.21
B59-S2D	1.38	0.60	0.75	0.062	0.73	0.17
B59-S2E	1.56	0.70	0.63	0.060	1.86	0.17
B59-S2FD (FD[3] of S2E)	1.86	0.36	0.55	0.058	2.07	0.18
New Samples: [1] "S2" Series						
B59-S2F	1.18	0.63	0.86	0.073	ND	0.21
B59-S2G	0.92	0.34	ND	NA	ND	0.25
B59-S2G Dup[2]	0.77	0.35	0.78	0.054	0.28	0.22
B59-S2H	0.99	0.35	0.85	0.052	ND	0.20
B59-S2I	0.95	0.57	0.88	0.066	ND	0.20
B59-S2J	0.93	0.34	0.71	0.055	ND	0.21

B59-S2K (FD of S2H)[3]	1.27	0.35	0.80	0.056	ND	0.21
Special Samples:[1]	"S2"	Series				
B59-S2L	28.30	NA				
B59-S2M	0.855	NA				
B59-S2M Dup[2]	0.869	NA				

Table 1 Footnotes:

'Initial Samples' are samples collected after the initial excavation. 'New Samples' are follow-up samples collected after the additional excavation that achieved the cleanup goals. 'Special Samples' are those samples collected at the initial excavation interface for Pb-210 analysis to confirm the earlier results.

Dup refers to sample split by the analytical laboratory for replicate analysis.

FD refers to a field duplicate sample collected for replicate analysis.

The referenced reports [1,2] also noted that the Pb-210 levels exceeded the levels for Pb-214, which is a precursor radionuclide in the naturally occurring uranium decay series. Because of the correlation with Eu-152, because of the elevated levels above those of a precursor radionuclide, and because of the variability between closely spaced samples, there was doubt that the results indicated elevated levels of Pb-210. However, since Pb-210 is identified as a potential contaminant in PRS 72 resulting from disposal of waste debris from prior operations involving Po-210 processing, the Pb-210 results could not be discounted, especially with respect to assessments of PRS72. Two follow-up samples for assay using an independent method were performed to clarify this issue.

In addition, a request was made for the laboratory analytical manager to review the initial sample reported results. Their review indicated that the laboratory believed the initial Pb-210 results were accurate and represented presence of Pb-210.

From the tabulated results, it is noted that the maximum Pb-210 reported from the special samples is approximately the same magnitude as the maximum in the original samples. The original samples exhibited a maximum result of 20.2 pCi/g and one of the special samples has 28.3 pCi/g Pb-210.

Although analysis of the special samples for Eu-152 was not requested, the low energy photon spectra provided in the data package have spectral peaks annotated that represent

a presence of Eu-152. So again, there appears to be a mutual association between the Pb-210 and the Eu-152 that should be considered in the final discussions on this matter.

Again, the variability between results of samples collected over a small spatial region is observed. As noted, just one initial sample and just one special sample indicate considerably elevated levels of Pb-210. Only one other sample exceeds 2 pCi/g (a result of 3.13 pCi/g). All other results (including one of the special samples) show just the natural background levels of Pb-210 (~1 pCi/g) or just slightly elevated levels above background (1-2 pCi/g).

Given the small physical area involved, given that additional excavation appears to have removed the excessive levels of contamination, and given that just two results ever showed excessive Pb-210 levels prior to final excavation, any further remediation in the Building 59 area would appear unnecessary. It is not clear that these results will be useful in assessing PRS 72 disposition due to the limited extent of sampling and limited extent of positive results. Any assessment that assigns a contaminating source for the presence of Pb-210 would have to be consistent with the observed correlation between Pb-210 and Eu-152.

CONCLUSIONS

Some of the Building 59 Cleanup Verification Samples indicated elevated levels of Pb-210 in the soil following initial excavation. Since the precursor radionuclides in the uranium decay series were evident only at naturally occurring concentrations, questions were raised whether elevated levels of Pb-210 actually existed. In addition, elevated levels of Pb-210 only were noted in mutual association with Eu-152. Thus, there appeared to be a possibility that the Pb-210 results were artifacts of the analysis attributable to spectral interference or to erroneous assignment of spectral peaks to source nuclides.

Since additional excavation was required to achieve the Building 59 cleanup goals, it was decided that additional sampling with analysis by an independent method would be conducted to confirm the presence of Pb-210 as reported earlier. Of the two additional samples collected and analyzed by an independent method, one sample concurred in the presence of Pb-210 at the same nominal concentration while the other sample had just the natural background concentration. Thus, it appears that the presence and magnitude of

the Pb-210 concentration is confirmed. However, since the area involved was small and the samples collected after the final excavation do not exhibit elevated levels of Pb-210, there seems to be no need for further remediation at this site.

REFERENCES

"Building 59 Soils Cleanup Verification Sample Results: Data Validation and Data Assessment (Part 1), J. C. Miles, Babcock & Wilcox of Ohio internal memorandum (August 27, 1998).

"Building 59 Soils Cleanup Verification Sample Results: Data Validation and Data Assessment (Part 2), J. C. Miles, Babcock & Wilcox of Ohio internal memorandum (August 26, 1998).