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G-000-705.142

**CLOSURE CERTIFICATION REPORT FOR HAZARDOUS WASTE
MANAGEMENT UNIT NUMBER 3 - WASTE OIL STORAGE AREA IN
GARAGE**

04/10/96

DOE-0764-96
DOE-FN OEPA
35
CLOSURE CERT



Department of Energy

**Ohio Field Office
Fernald Area Office**

P. O. Box 538705
Cincinnati, Ohio 45253-8705
(513) 648-3155



APR 10 1995

DOE-0764-96

Mr. Donald Schregardus, Director
Ohio Environmental Protection Agency
P. O. Box 1049
1800 Watermark Drive
Columbus, Ohio 43266-1049

Dear Mr. Schregardus:

**CLOSURE CERTIFICATION REPORT FOR HAZARDOUS WASTE MANAGEMENT UNIT
NUMBER 3 - WASTE OIL STORAGE AREA IN GARAGE**

Enclosed is the Closure Certification Report for Hazardous Waste Management Unit (HWMU) Number 3 - Waste Oil Storage Area in Garage. This Certification Report is submitted as the final requirement of the December 28, 1995, Ohio Environmental Protection Agency (OEPA) approved Closure Plan Information and Data (CPID) package.

Certification is being provided that the approved CPID was completed as approved and that the Waste Oil Storage Area in the Garage meets closure standards. Please note that the area will be resurfaced after concurrence is received from the OEPA that the HWMU area was successfully decontaminated. The Department of Energy, Fernald Area Office (DOE-FN) will discontinue HWMU inspections 15 days after receipt of closure approval.

If you have any questions, please contact Mr. Robert Danner (513) 648-3167.

Sincerely,

Glenn Buzette

for Jack R. Craig
Director

FN:Danner

Enclosure: As Stated

000001

cc w/enc:

J. Saric, USEPA-V, SRF-5J
T. Crepeau, OEPA-Columbus
P. Pardi, OEPA-Dayton
T. Schneider, OEPA-Dayton
T. Hagen, FERMCO/65-2
S. Houser, FERMCO/52-3
M. West, FERMCO/35-1
AR Coordinator, FERMCO/78



Restoration Management Corporation

P. O. Box 538704 Cincinnati, Ohio 45253-8704 (513) 648-3000

7598

April 4, 1996

Fernald Environmental Management Project
Letter No. C:OP:96-0223

Mr. Jack R. Craig, Director
Department of Energy
Fernald Area Office
P. O. Box 538705
Cincinnati, Ohio 45253-8705

Dear Mr. Craig:

CONTRACT DE-AC24-92OR21972, CLOSURE CERTIFICATION REPORT FOR HAZARDOUS WASTE MANAGEMENT UNIT NO. 3 - WASTE OIL STORAGE AREA IN GARAGE

- Reference:
1. Ohio Administrative Code 3745-66-15 and 40 Code of Federal Regulations Part 265.115
 2. Letter, Donald R. Schregardus, OEPA, to Jack R. Craig, U.S. DOE-FEMP, "Closure Plan Approval," December 28, 1995

Attached is the Closure Certification Report for Hazardous Waste Management Unit (HWMU) No. 3 - Waste Oil Storage Area in Garage. This report is submitted in accordance with the referenced regulatory citations (Reference 1) and is the final requirement of the approved Closure Plan Information and Data (CPID) package (Reference 2).

Certification is being provided that the approved CPID was completed as approved and that Waste Oil Storage Area in the Garage meets closure standards. Attached is a recommended letter to the Ohio Environmental Protection Agency (OEPA). If you have any questions, please contact Ken Kolthoff at 648-4051.

Sincerely,

A handwritten signature in black ink, appearing to read "John Bradburne".

John Bradburne *for*
President

JCB:MJH:dIm
Attachments

000003



Mr. Jack R. Craig
Letter No. C:OP:96-0223
Page 2

c: With Attachment

D. J. Carr, FERMCO/52-5
T. R. Clark, FERMCO/52-3
R. Danner, DOE-FN/45
L. C. Goidell, FERMCO/52-3
T. D. Hagen, FERMCO/65-2
R. V. Holmes, FERMCO/3
S. K. Kaster, DOE-FN/45
D. Klein, FERMCO/52-9
K. R. Kolthoff, FERMCO/52-3
L. E. Parsons, DOE Contract Specialist/45
E. M. Dupuis-Nouille, FERMCO/52-5
R. J. Steel, MTC/45
K. N. Wintz, FERMCO/52-3

Without Attachment

S. D. Hauck, FERMCO/3
R. P. Heck, FERMCO/52-5
S. M. Houser, FERMCO/52-3
J. L. Oxendine, FERMCO/52-3
B. S. Perkins, FERMCO/67
D. A. Pfister, DOE-FN/45
J. M. Sattler, DOE-FN/45
T. J. Walsh, FERMCO/65-2
M. K. Yates, FERMCO/9

Administrative Record
RCRA Operating Record
Engineering Document Control (113.26.3.1.1)
File Record Storage Copy 102.1

ATTACHMENT: RECOMMENDED LETTER FOR TRANSMITTAL TO OHIO EPA

**Mr. Donald Schregardus, Director
Ohio Environmental Protection Agency
P. O. Box 1049
1800 Watermark Drive
Columbus, Ohio 43266-1049**

Dear Mr. Schregardus:

**CLOSURE CERTIFICATION REPORT FOR HAZARDOUS WASTE MANAGEMENT UNIT (HWMU)
NO. 3 - WASTE OIL STORAGE AREA IN GARAGE**

Attached is the Closure Certification Report for Hazardous Waste Management (HWMU) No. 3 - Waste Oil Storage Area in Garage. This Certification Report is submitted as the final requirement of the December 28, 1995, OEPA approved Closure Plan Information and Data (CPID) package.

Certification is being provided that the approved CPID was completed as approved and that the Waste Oil Storage Area in the Garage meets closure standards. Please note that the area will be resurface after concurrence is received from OEPA that the HWMU area was successfully decontaminated.

If you have any questions, please contact Mr. Robert Danner (513) 648-3167.

Sincerely,

FN:Danner

**Jack. R. Craig, Director
Department of Energy
Fernald Area Office**

Enclosures: As Stated

**c: Mr. James A. Saric, U. S. EPA
File Record Storage Copy 102.1**

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT

**Hazardous Waste Management Unit No. 3
Waste Oil Storage Area in the Garage
Closure Certification Report**

April 1996

U.S. DEPARTMENT OF ENERGY

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- Photograph 2 - Scabbled concrete area

ATTACHMENT 1 EPA CORRESPONDENCE

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ACRONYMS AND ABBREVIATIONS

CFR	Code of Federal Regulations
CPID	Closure Plan Information and Data
CM	centimeters
FEMP	Fernald Environmental Management Project
HWMU	Hazardous Waste Management Unit
OAC	Ohio Administrative Code
OEPA	Ohio Environmental Protection Agency
PPE	Personal Protective Equipment
WWTS	Wastewater Treatment System

HWMU No. 3
Waste Oil Storage Area in the Garage
Closure Certification Report

1.0 INTRODUCTION

1.1 Purpose

This Certification Report documents the actions taken to clean close the Waste Oil Storage Area in the Garage Hazardous Waste Management Unit (HWMU) No. 3, in accordance with the approved Closure Plan Information and Data (CPID) package. The CPID was approved by the Ohio Environmental Protection Agency (OEPA) on December 28, 1995.

This Certification Report contains a closure certification statement and a Professional Engineer's certification statement to document that closure of the Waste Oil Storage Area in the Garage was accomplished in accordance with the approved CPID, as required under OAC 3745-66-15. A minor deviation to the CPID is that the scabbled flooring will be resurfaced to the level of the surrounding floor before a clear sealant is applied. This deviation is to improve worker safety. This certification report was prepared in accordance with the September 1993, Interim Final, Closure Plan Review Guidance for RCRA Facilities (OEPA Guidance).

Closure activities completed for the Waste Oil Storage Area in the Garage met the performance standards (OAC 3745-66-11 and 40 Code of Federal Regulations [CFR] 265.11) presented in the CPID. This Certification Report explains field changes to the CPID required to meet the above standards.

1.2 Background

The original CPID for the Waste Oil Storage Area in the Garage was submitted to OEPA on July 7, 1992. The CPID was resubmitted to the OEPA on February 16, 1995. This CPID stated that 1) a new decontamination process (e.g., scabbling) would be used to clean the concrete and 2) soil borings from beneath the concrete pad would not be taken. The soil borings would not be taken because the concrete pad surface had only shallow surface cracks and there were no reports of spills or releases of wastes from the area. As noted previously, the CPID was approved by OEPA on December 28, 1995.

HWMU No. 3
Waste Oil Storage Area in the Garage
Closure Certification Report

1.3 Unit Description

The Waste Oil Storage Area in the Garage, HWMU No. 3, consisted of a 10' x 10' concrete container storage area along the west wall of Building 31. The maximum storage capacity of this unit is approximately twenty-five, 55-gallon drums. There is no documentation of the actual number of drums of waste that were stored or removed from this unit. Building 31, constructed of concrete block walls and five inch deep poured concrete floor, is used to maintain vehicles and equipment used at the FEMP.

The HWMU area was used to store waste oils, for greater than 90 days, generated from vehicle maintenance from 1952 through 1988. The waste oil generated in the Garage was deemed hazardous because of the presence of 1,1,1-trichloroethane spent solvent (F002). It is believed that spent solvents and oil were mixed together. Currently, a biodegradable degreasing agent is used in the Garage.

Within the HWMU, near the northwest corner of the unit, two abandoned pipes (former air and hydraulic fluid supply for the removed vehicle lift) extend two inches above the floor. Within the unit, near the southwest corner of the unit, an abandoned electrical conduit is cut off approximately 18 inches above the floor.

Previous facility upgrades have altered parts of the HWMU and surrounding areas. In 1983, the vehicle lift on the south boundary of the HWMU was removed and replaced with a new lift. When the old lift was removed, a section of the floor (approximately 3' x 10') along the southern boundary of this unit was removed and replaced with new concrete.

The entire Garage contains six floor drains and a catch basin. Prior to 1990, the six floor drains flowed to a oil/water separator. The oil from the separator was piped to an underground storage tank and the water flowed to the FEMP Wastewater Treatment System (WWTS). The floor drain has been capped and the oil/water separator and the underground tank have been removed.

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Waste Oil Storage Area in the Garage
Closure Certification Report

The catch basin collects wastewater from cleaning the floor in the Garage and flows to a sump. Liquids are pumped from the sump and stored in an aboveground 500 gallon tank pending laboratory analysis prior to treatment in the FEMP WWTS.

Due to frequent oil changes, floor staining in the Garage is ubiquitous. Therefore, removal of contiguous floor staining outside the HWMU boundaries was not required to achieve clean closure of the HWMU.

HWMU No. 3
Waste Oil Storage Area in the Garage
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Photograph 1 - Walk-behind scabbling device in enclosure.



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Waste Oil Storage Area in the Garage
Closure Certification Report

2.0 SUMMARY OF CLOSURE ACTIONS

The closure activities completed for the Waste Oil Storage Area in the Garage met the following performance standards (OAC 3745-66-11 and 40 CFR 265.111) as presented in the CPID.

The FEMP used performance-based physical extraction methods to demonstrate that the Waste Oil Storage Area in the Garage HWMU had been properly decontaminated. Physical extraction methods include abrasive blasting, scarification, grinding and planing, spalling, vibratory finishing, and high pressure steam and water sprays. This decontamination standard requires: 1) removal of at least 0.6 centimeters of surface layer of porous materials (e.g., concrete asphalt pavement), and 2) treatment to a "clean debris surface." Achievement of the 0.6 centimeter standard should be verified by reference to machinery design specifications and level of effort.

A "clean debris surface" is a surface that, when viewed without magnification, shall be free of all visible contaminated soil and hazardous waste, except that residual staining caused by waste consisting of light shadows, slight streaks, or minor discolorations, and waste in cracks, crevices, and pits may be present provided that such staining and waste in cracks, crevices, and pits shall be limited to no more than 5% of the total surface area.

This Certification Report documents that the closure activities performed on HWMU No. 3 to meet the RCRA requirements as stated in the CPID. A chronology of the closure activities performed is listed below:

- September 14, 1995
- ▶ EPA was given notice of initiation of field activities.
 - ▶ Surveyors took initial depth measurements using a Geodimeter surveying instrument. This was to establish a baseline to compare with the verification survey taken after scabbling was complete to verify 0.6 cm.

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Waste Oil Storage Area in the Garage
Closure Certification Report

- September 15, 1995 ▶ An enclosure was constructed (Photo 1) around the 10' x 10' area constructed with a wooden frame wrapped in Herculite™ plastic sheeting. Duct tape was used to seal the edges. A High Efficiency Particulate Air (HEPA) unit was attached at one end of the enclosure to create a negative air pressure environment and prevent any silica dust from escaping the project area. Plexiglass windows were taped into the sides of the enclosure to facilitate inspection of the area while work was in process. The concrete floor in the HWMU area was vacuumed of debris.
- September 20, 1995 ▶ Scabbling was started using a BOSCH Rotary Hammer with a hammer and chisel bit. Water spray was used to control silica dust in the enclosed work area and a HEPA vacuum was used to clear the scabbled concrete. Scabbling continued with the rotary hammer until October 4, 1995. Upon inspection, the area showed no evidence of staining and the required removal of 0.6 cm of concrete had been accomplished.
- October 12, 1995 ▶ The front of the enclosure was removed in order for the surveyors to take their verification measurements. The rotary hammer bits, vacuum hoses and vacuum drum lid were pressure washed and triple rinsed over a 55-gallon drum at Building 69 pad. Rinse water was then stored pending waste characterization. The field survey indicated that only an average of 0.3 cm of concrete had been removed from the surface.
- October 17, 1995 ▶ To facilitate the timely removal of the remaining 0.3 cm of concrete, a large, air-driven, walk-behind scabbling device (Photo 2) was used. This method proved to be less strenuous on the worker and more efficient in removing the required amount of concrete. The rotary hammer was

HWMU No. 3
Waste Oil Storage Area in the Garage
Closure Certification Report

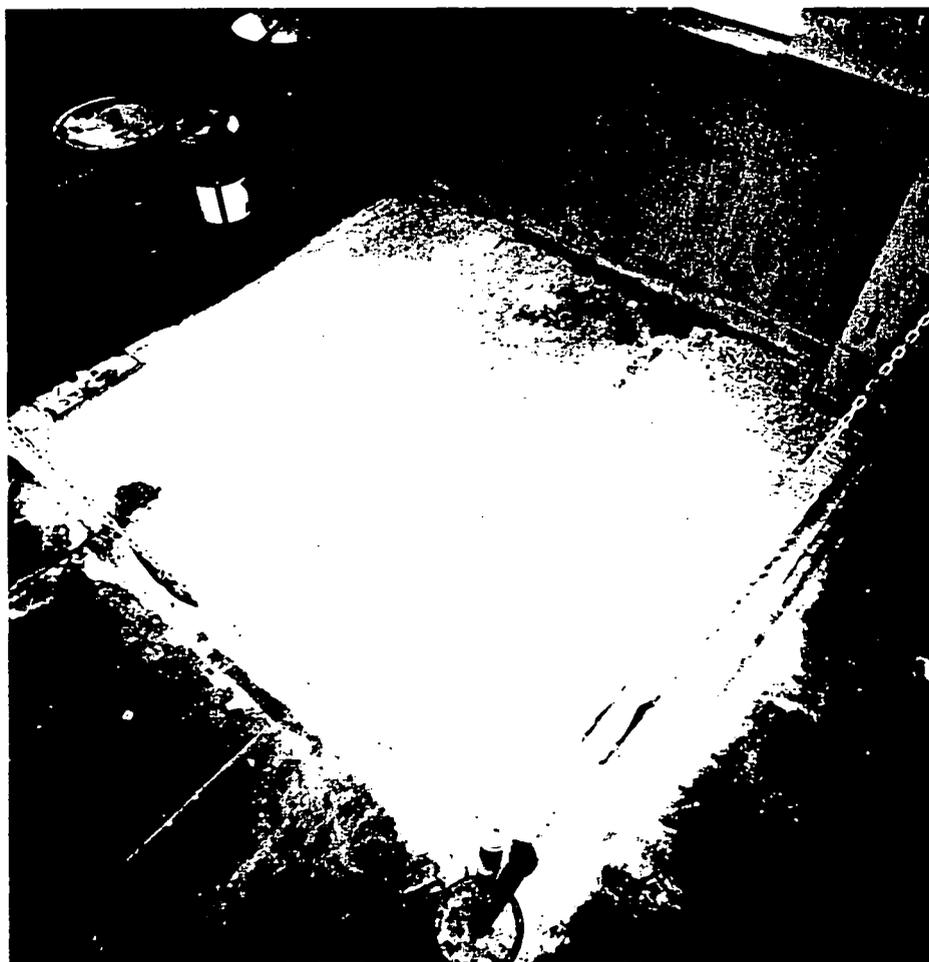
still used in areas inaccessible to the larger scabblers. The rotary hammer was also used to remove any deeply stained areas of concrete. At this time, the water spray was reduced to better facilitate the removal of the stained areas because wet concrete resembled stained concrete.

- October 24, 1995 ▶ The front of the enclosure was again removed to allow the surveyors to verify the removal of 0.6 cm of concrete.
- October 26, 1995 ▶ Survey results indicated that 0.6 cm of concrete (Photo 3) had been removed from the HWMU area (Attachment 2) and a "clean debris surface" was established. The scabbling equipment, vacuum hoses, and vacuum drum lid were pressure washed and triple rinsed over another 55-gallon drum at Building 69 pad. Rinse water was stored pending waste characterization.

As a safety best management practice, the sealant was not applied immediately to the HWMU area. This is a deviation from the CPID. After concurrence from OEPA that the HWMU area was successfully decontaminated, the area will be resurfaced with concrete to provide a smooth and level surface to reduce the potential for worker tripping incidents.

HWMU No. 3
Waste Oil Storage Area in the Garage
Closure Certification Report

Photograph 2 - Scabbled concrete area



HWMU No. 3
Waste Oil Storage Area in the Garage
Closure Certification Report

**3.0 MATERIALS AND WASTES GENERATED DURING CLOSURE ACTIVITIES AND
DISPOSITION OF WASTE STREAMS**

Two 55-gallon drums of scabbled concrete and two 55-gallon drums of decontamination rinse water were generated as the result of closure activities. The wastes will be sampled for waste characterization and stored in an appropriate storage area pending disposition.

The personal protective equipment (PPE) was characterized as low-level waste and sent to the compactible trash bailer. The Waste Oil Storage Area in the Garage was successfully decontaminated according to the requirements of the CPID.

HWMU No. 3
Waste Oil Storage Area in the Garage
Closure Certification Report

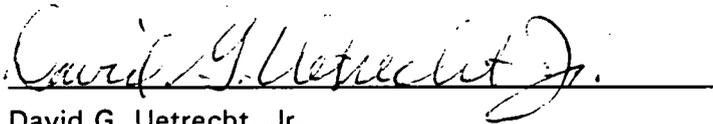
CERTIFICATION STATEMENTS

The following pages are the DOE closure certification statements (following the format in OAC 3745-50-42(D)) and a Professional Engineer's certification statement documenting that HWMU No. 3, Waste Oil Storage Area in the Garage, was closed in accordance with the approved CPID as required under OAC 3745-66-15.

HWMU No. 3
Waste Oil Storage Area in the Garage
Closure Certification Report

INDEPENDENT ENGINEER'S CERTIFICATION STATEMENT

Based on observations in the field and information provided to me, I hereby certify that the Waste Oil Storage Area in the Garage, Hazardous Waste Management Unit No. 3, at the Department of Energy (DOE) Fernald Environmental Management Project (FEMP) has been closed in accordance with the specifications in the December 28, 1995, OEPA approved CPID. Deviations are documented and discussed in the Certification Report. Closure activities were initiated and completed based on the CPID, as modified. Copies of the correspondence concerning this matter are included in Attachment 1.



David G. Uetrecht, Jr.

Ohio Registration No. E-47837

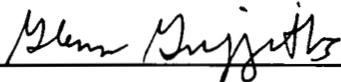
ADENA Utilities Engineering, Inc.



HWMU No. 3
Waste Oil Storage Area in the Garage
Closure Certification Report

CERTIFICATION OF OWNER AND OPERATOR

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."


for _____
U. S. Department of Energy, Fernald Office
Owner and Operator

4-10-96

Date Signed

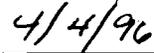
HWMU No. 3
Waste Oil Storage Area in the Garage
Closure Certification Report

CERTIFICATION OF CO-OPERATOR

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."



Fernald Environmental Restoration
Management Corporation, Co-Operator



Date Signed

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HWMU No. 3
Waste Oil Storage Area in the Garage
Closure Certification Report

ATTACHMENT 1 - EPA CORRESPONDENCE

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State of Ohio Environmental Protection Agency

STREET ADDRESS:

1800 WaterMark Drive
Columbus, OH 43215-1099

TELE: (614) 644-3020 FAX: (614) 244-2329

MAILING ADDRESS:

P.O. Box 1049
Columbus, OH 43216-1049

LOC J-0767

JAN 3 10 30 AM '95

CLOSURE PLAN APPROVAL

LIBRARY: _____

CERTIFIED MAIL

December 28, 1995

Re: CLOSURE PLAN APPROVAL
U.S. DOE-FEMP
OH6890008976

Mr. Jack R. Craig
Site Manager
U.S. DOE-FEMP
P.O. Box 398705
Cincinnati, Ohio 45239-8705

Dear Mr. Craig:

On July 7, 1992, U.S. Department of Energy - Fernald Environmental Management Project (DOE-FEMP) submitted to Ohio EPA a closure plan for Hazardous Waste Management Unit #3 (Waste Oil Storage in Garage), an unpermitted storage unit located at 7400 Willey Road, Fernald, Ohio. Revisions to the closure plan were submitted on February 16, 1995. The closure plan was submitted pursuant to Rule 3745-66-12 of the Ohio Administrative Code (OAC) in order to demonstrate that DOE-FEMP's proposal for closure complies with the requirements of OAC Rules 3745-66-11 and 3745-66-12.

The public was given the opportunity to submit written comments regarding the closure plan of DOE-FEMP in accordance with OAC Rule 3745-66-12. No comments were received by Ohio EPA in this matter.

Based upon review of DOE-FEMP's submittal and subsequent revisions, I conclude that the closure plan for the hazardous waste facility at 7400 Willey Road, Fernald, Ohio meets the performance standard contained in OAC 3745-66-11 and complies with the pertinent parts of OAC Rule 3745-66-12. The revised closure plan submitted to Ohio EPA on February 16, 1995 by DOE-FEMP is hereby approved.

I certify this to be a true and accurate copy of the official document as filed in the records of the Ohio Environmental Protection Agency.

OHIO E.P.A.

DEC 28 95

By: Kauffman Date 12/28/95

ENTERED DIRECTOR'S JOURNAL

George V. Voinovich, Governor
Nancy P. Hollister, Lt. Governor
Donald R. Schregardus, Director

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Closure Plan Approval
 U.S. DOE-FEMP
 Page 2

Please be advised that approval of this closure plan does not release DOE-FEMP from any responsibilities as required under the Hazardous and Solid Waste Amendments of 1984 regarding corrective actions for all releases of hazardous waste or constituents from any solid waste management unit, regardless of the time at which waste was placed in the unit.

Notwithstanding compliance with the terms of the closure plan, the Director may, on the basis of any information that there is or has been a release of hazardous waste, hazardous constituents, or hazardous substances into the environment, issue an order pursuant to Section 3734.20 et seq of the Revised Code or Chapters 3734 or 6111 of the Revised Code requiring corrective action or such other response as deemed necessary; or initiate appropriate action; or seek any appropriate legal or equitable remedies to abate pollution or contamination or to protect public health or safety or the environment.

Nothing here shall waive the right of the Director to take action beyond the terms of the closure plan pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980, 42 U.S.C. § 9601 et seq., as amended by the Superfund Amendments and Reauthorization Act of 1986, Pub. L. 99-499 ("CERCLA") or to take any other action pursuant to applicable Federal or State law, including but not limited to the right to issue a permit with terms and conditions requiring corrective action pursuant to Chapters 3734 or 6111 of the Revised Code; the right to seek injunctive relief, monetary penalties and punitive damages; to undertake any removal, remedial, and/or response action relating to the facility; and to seek recovery for any costs incurred by the Director in undertaking such actions.

You are notified that this action of the Director is final and may be appealed to the Environmental Board of Review pursuant to Section 3745.04 of the Ohio Revised Code. The appeal must be in writing and set forth the action complained of and the grounds upon which the appeal is based. It must be filed with the Environmental Board of Review within thirty (30) days after notice of the Director's action. A copy of the appeal must be served on the Director of the Ohio Environmental Protection Agency within three (3) days of filing with the Board. An appeal may be filed with the Environmental Board of Review at the following address: Environmental Board of Review, 236 East Town Street, Room 300, Columbus, Ohio 43266-0557.

When closure is completed, the Ohio Administrative Code Rule 3745-66-15 requires the owner or operator of a facility to submit to the Director of the Ohio EPA certification by the owner or operator and an independent, registered professional engineer that the facility has been closed in accordance with the specifications in the approved closure plan. These

I certify this to be a true and accurate copy of the official document as filed in the records of the Ohio Environmental Protection Agency.

OHIO E.P.A.

DEC 28 95

By: Kara Yoder Date 12/28/95

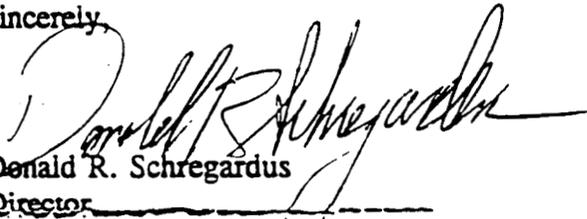
ENTERED DIRECTOR'S JOURNAL

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Closure Plan Approval
U.S. DOE-FEMP
Page 3

certifications shall follow the format specified in OAC 3745-50-42(D), and should be submitted to: Ohio Environmental Protection Agency, Division of Hazardous Waste Management, Attention: Tom Crepeau, Data Management Section, P.O. Box 1049, Columbus, Ohio 43266-0149.

Sincerely,


Donald R. Schregardus
Director

- cc: Tom Crepeau, DMS, DHWM
- Montee Suleiman, DHWM, RES, CO
- Harriet Croke, USEPA, Region V
- Harold O'Connell, DHWM, SWDO
- Bob Danner, DOE-FEMP

OHIO E.P.A.

DEC 28 95

ENTERED DIRECTOR'S JOURNAL

I certify this to be a true and accurate copy of the official document as filed in the records of the Ohio Environmental Protection Agency.

By: Kara York Date 12/28/95

7598

HWMU No. 3
Waste Oil Storage Area in the Garage
Closure Certification Report

ATTACHMENT 2 - SCABBLING RESULTS

000026

* Time=12.3603

Date: 10-26-1995

Page: 1

GEODIMETER SURVEYING SOFTWARE - V4.5E
 RADIAL SURVEY COMPUTATION

Computed from Observational File 310.OBS

Control Coordinates from File 310.XYZ

Length and coordinate units: feet, combined scale factor: 1.00000000

project:

job no: 310

date: 1995.1025

crew id:

angles:

s/n :

Station/ Point	Bearing (N).Azimuth	Slope Dist Northing	Horz Dist Easting	Elev Diff Elevation	Point Description
010		0.000	0.000	0.000	Instrument Station
ELE CONTROL	S00 11 22W 180 11 22	-15.125	-0.050	-0.015	Backsight Station
ELE	S00 15 38W 180 15 38	5.430 -5.430	5.430 -0.025	-0.173 -0.173	New Point Code
00	S00 15 38W 180 15 38	15.180 -15.179	15.179 -0.069	-0.053 -0.053	New Point Code
01	S00 23 28W 180 23 28	14.120 -14.118	14.119 -0.096	-0.049 -0.049	New Point Code
02	S00 27 38W 180 27 38	13.110 -13.108	13.108 -0.105	-0.040 -0.040	New Point Code
03	S00 35 48W 180 35 48	12.170 -12.168	12.169 -0.127	-0.049 -0.049	New Point Code
04	S00 33 48W 180 33 48	11.140 -11.138	11.138 -0.110	-0.056 -0.056	New Point Code
05	S00 35 10W 180 35 10	10.110 -10.108	10.108 -0.103	-0.046 -0.046	New Point Code
06	S00 23 48W 180 23 48	9.140 -9.137	9.138 -0.063	-0.035 -0.035	New Point Code
07	S01 37 48W 181 37 48	8.130 -8.125	8.128 -0.231	-0.067 -0.067	New Point Code
08	S01 59 24W 181 59 24	7.120 -7.114	7.118 -0.247	-0.094 -0.094	New Point Code
09	S00 21 18W 180 21 18	6.320 -6.317	6.317 -0.039	-0.043 -0.043	New Point Code

000027

GEODIMETER SURVEYING SOFTWARE - V4.5E
RADIAL SURVEY COMPUTATION

Station/ Point	Bearing (N).Azimuth	Slope Dist Northing	Horz Dist Easting	Elev Diff Elevation	Point Description
19	S09 30 56W 189 30 56	6.390 -6.299	6.387 -1.056	-0.053 -0.053	New Point Code
18	S08 39 16W 188 39 16	7.220 -7.135	7.218 -1.086	-0.056 -0.056	New Point Code
17	S07 40 42W 187 40 42	8.170 -8.095	8.168 -1.091	-0.059 -0.059	New Point Code
16	S06 43 40W 186 43 40	9.240 -9.175	9.238 -1.082	-0.058 -0.058	New Point Code
15	S06 15 56W 186 15 56	10.210 -10.147	10.208 -1.114	-0.051 -0.051	New Point Code
14	S05 35 04W 185 35 04	11.180 -11.125	11.179 -1.088	-0.057 -0.057	New Point Code
13	S05 14 12W 185 14 12	12.190 -12.138	12.189 -1.112	-0.064 -0.064	New Point Code
12	S04 47 10W 184 47 10	13.140 -13.093	13.139 -1.096	-0.065 -0.065	New Point Code
11	S04 27 18W 184 27 18	14.130 -14.086	14.129 -1.097	-0.076 -0.076	New Point Code
10	S04 08 26W 184 08 26	15.120 -15.080	15.119 -1.092	-0.092 -0.092	New Point Code
20	S08 03 40W 188 03 40	15.260 -15.108	15.259 -2.140	-0.089 -0.089	New Point Code
21	S08 23 50W 188 23 50	14.320 -14.166	14.319 -2.091	-0.088 -0.088	New Point Code
22	S08 56 16W 188 56 16	13.270 -13.108	13.269 -2.061	-0.083 -0.083	New Point Code
23	S09 56 12W 189 56 12	12.270 -12.085	12.269 -2.117	-0.091 -0.091	New Point Code
24	S10 49 38W 190 49 38	11.320 -11.117	11.319 -2.126	-0.077 -0.077	New Point Code

GEODIMETER SURVEYING SOFTWARE - V4.5E
RADIAL SURVEY COMPUTATION

Station/ Point	Bearing (N).Azimuth	Slope Dist Northing	Horz Dist Easting	Elev Diff Elevation	Point Description
25	S11 36 22W 191 36 22	10.330 -10.117	10.329 -2.078	-0.065 -0.065	New Point Code
26	S12 35 30W 192 35 30	9.340 -9.114	9.338 -2.036	-0.070 -0.070	New Point Code
27	S14 25 46W 194 25 46	8.350 -8.085	8.348 -2.080	-0.076 -0.076	New Point Code
28	S16 21 20W 196 21 20	7.420 -7.118	7.418 -2.089	-0.068 -0.068	New Point Code
29	S18 15 14W 198 15 14	6.580 -6.246	6.577 -2.060	-0.053 -0.053	New Point Code
39	S26 04 06W 206 04 06	6.980 -6.268	6.978 -3.066	-0.063 -0.063	New Point Code
38	S23 24 28W 203 24 28	7.750 -7.110	7.748 -3.078	-0.066 -0.066	New Point Code
37	S21 05 08W 201 05 08	8.720 -8.134	8.718 -3.136	-0.059 -0.059	New Point Code
36	S18 56 34W 198 56 34	9.630 -9.107	9.628 -3.126	-0.058 -0.058	New Point Code
35	S16 55 36W 196 55 36	10.550 -10.092	10.549 -3.071	-0.064 -0.064	New Point Code
34	S15 23 00W 195 23 00	11.520 -11.106	11.519 -3.056	-0.068 -0.068	New Point Code
33	S14 19 14W 194 19 14	12.470 -12.081	12.469 -3.084	-0.056 -0.056	New Point Code
32	S13 28 34W 193 28 34	13.490 -13.117	13.489 -3.143	-0.061 -0.061	New Point Code
31	S12 29 50W 192 29 50	14.440 -14.097	14.439 -3.125	-0.079 -0.079	New Point Code
30	S11 38 06W 191 38 06	15.420 -15.102	15.419 -3.110	-0.070 -0.070	New Point Code

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GEODIMETER SURVEYING SOFTWARE - V4.5E
RADIAL SURVEY COMPUTATION

Station/ Point	Bearing (N).Azimuth	Slope Dist Northing	Horz Dist Easting	Elev Diff Elevation	Point Description
	S15 12 54W 195 12 54	15.670 -15.120	15.669 -4.112	-0.080 -0.080	New Point Code
	S16 11 46W 196 11 46	14.660 -14.077	14.659 -4.089	-0.065 -0.065	New Point Code
	S17 16 46W 197 16 46	13.710 -13.090	13.709 -4.072	-0.062 -0.062	New Point Code
	S18 48 22W 198 48 22	12.790 -12.106	12.789 -4.123	-0.053 -0.053	New Point Code
	S20 13 48W 200 13 48	11.820 -11.090	11.819 -4.087	-0.074 -0.074	New Point Code
	S22 02 22W 202 02 22	10.890 -10.093	10.889 -4.086	-0.078 -0.078	New Point Code
	S24 00 12W 204 00 12	9.970 -9.107	9.969 -4.055	-0.073 -0.073	New Point Code
	S26 45 52W 206 45 52	9.080 -8.106	9.078 -4.088	-0.066 -0.066	New Point Code
	S29 50 28W 209 50 28	8.220 -7.128	8.218 -4.089	-0.057 -0.057	New Point Code
	S32 32 52W 212 32 52	7.480 -6.304	7.478 -4.023	-0.080 -0.080	New Point Code
	S38 52 48W 218 52 48	8.110 -6.312	8.108 -5.089	-0.058 -0.058	New Point Code
	S35 31 28W 215 31 28	8.740 -7.112	8.738 -5.077	-0.069 -0.069	New Point Code
	S32 17 56W 212 17 56	9.570 -8.088	9.569 -5.113	-0.078 -0.078	New Point Code
	S29 19 30W 209 19 30	10.360 -9.031	10.359 -5.073	-0.074 -0.074	New Point Code
	S26 49 08W 206 49 08	11.360 -10.137	11.359 -5.125	-0.078 -0.078	New Point Code

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GEODIMETER SURVEYING SOFTWARE - V4.5E
RADIAL SURVEY COMPUTATION

Station/ Point	Bearing (N).Azimuth	Slope Dist Northing	Horz Dist Easting	Elev Diff Elevation	Point Description
54	824 41 36W 204 41 36	12.190 -11.074	12.189 -5.092	-0.071 -0.071	New Point Code
53	822 54 22W 202 54 22	13.100 -12.066	13.099 -5.098	-0.058 -0.058	New Point Code
52	821 30 22W 201 30 22	14.100 -13.118	14.099 -5.169	-0.120 -0.120	New Point Code
51	819 58 02W 199 58 02	14.910 -14.013	14.910 -5.091	-0.128 -0.128	New Point Code
50	818 34 28W 198 34 28	15.960 -15.128	15.959 -5.084	-0.111 -0.111	New Point Code
60	821 59 24W 201 59 24	16.310 -15.123	16.310 -6.107	-0.144 -0.144	New Point Code
61	823 32 02W 203 32 02	15.320 -14.046	15.320 -6.117	-0.168 -0.168	New Point Code
62	825 02 46W 205 02 46	14.470 -13.109	14.470 -6.126	-0.160 -0.160	New Point Code
63	826 48 00W 206 48 00	13.490 -12.040	13.489 -6.082	-0.076 -0.076	New Point Code
64	828 49 00W 208 49 00	12.700 -11.127	12.699 -6.121	-0.096 -0.096	New Point Code
65	831 08 50W 211 08 50	11.790 -10.089	11.789 -6.098	-0.082 -0.082	New Point Code
66	833 52 28W 213 52 28	10.950 -9.090	10.949 -6.103	-0.070 -0.070	New Point Code
67	837 10 58W 217 10 58	10.090 -8.038	10.089 -6.097	-0.069 -0.069	New Point Code
68	840 45 06W 220 45 06	9.310 -7.051	9.308 -6.076	-0.048 -0.048	New Point Code
69	844 22 26W 224 22 26	8.690 -6.210	8.688 -6.076	-0.066 -0.066	New Point Code

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GEODIMETER SURVEYING SOFTWARE - V4.5E
RADIAL SURVEY COMPUTATION

Station/ Point	Bearing (N).Azimuth	Slope Dist Northing	Horz Dist Easting	Elev Diff Elevation	Point Description
79	S48 28 40W 228 28 40	9.490 -6.290	9.488 -7.104	-0.044 -0.044	New Point Code
78	S45 13 34W 225 13 34	10.050 -7.077	10.048 -7.133	-0.034 -0.034	New Point Code
77	S41 26 32W 221 26 32	10.790 -8.087	10.789 -7.141	-0.062 -0.062	New Point Code
76	S38 00 00W 218 00 00	11.510 -9.069	11.509 -7.085	-0.059 -0.059	New Point Code
75	S35 13 18W 215 13 18	12.290 -10.039	12.289 -7.088	-0.079 -0.079	New Point Code
74	S32 39 52W 212 39 52	13.180 -11.095	13.179 -7.113	-0.085 -0.085	New Point Code
73	S30 22 06W 210 22 06	14.010 -12.087	14.009 -7.082	-0.075 -0.075	New Point Code
72	S28 35 12W 208 35 12	14.910 -13.092	14.909 -7.134	-0.083 -0.083	New Point Code
71	S26 48 30W 206 48 30	15.830 -14.128	15.829 -7.139	-0.071 -0.071	New Point Code
70	S25 16 20W 205 16 20	16.710 -15.110	16.709 -7.133	-0.062 -0.062	New Point Code
60	S28 14 20W 208 14 20	17.130 -15.091	17.129 -8.105	-0.073 -0.073	New Point Code
1	S30 03 20W 210 03 20	16.290 -14.099	16.289 -8.158	-0.092 -0.092	New Point Code
2	S31 45 48W 211 45 48	15.390 -13.084	15.389 -8.101	-0.093 -0.093	New Point Code
3	S33 41 22W 213 41 22	14.550 -12.106	14.549 -8.070	-0.088 -0.088	New Point Code
4	S36 05 30W 216 05 30	13.750 -11.110	13.749 -8.099	-0.086 -0.086	New Point Code

00003

GEODIMETER SURVEYING SOFTWARE - V4.5E
RADIAL SURVEY COMPUTATION

Station/ Point	Bearing (N).Azimuth	Slope Dist Northing	Horz Dist Easting	Elev Diff Elevation	Point Description
85	838 55 24W 218 55 24	12.950 -10.074	12.949 -8.136	-0.093 -0.093	New Point Code
86	841 47 08W 221 47 08	12.180 -9.081	12.179 -8.115	-0.077 -0.077	New Point Code
87	844 53 38W 224 53 38	11.460 -8.118	11.459 -8.088	-0.075 -0.075	New Point Code
88	848 38 20W 228 38 20	10.740 -7.096	10.739 -8.060	-0.061 -0.061	New Point Code
89	852 14 22W 232 14 22	10.150 -6.214	10.148 -8.023	-0.040 -0.040	New Point Code
99	855 30 12W 235 30 12	11.080 -6.274	11.078 -9.130	-0.051 -0.051	New Point Code
98	851 57 56W 231 57 56	11.530 -7.103	11.529 -9.081	-0.080 -0.080	New Point Code
97	848 23 38W 228 23 38	12.190 -8.094	12.189 -9.114	-0.081 -0.081	New Point Code
96	845 03 42W 225 03 42	12.870 -9.090	12.869 -9.110	-0.078 -0.078	New Point Code
95	842 09 42W 222 09 42	13.540 -10.036	13.539 -9.088	-0.083 -0.083	New Point Code
94	839 31 06W 219 31 06	14.320 -11.046	14.319 -9.112	-0.085 -0.085	New Point Code
93	837 03 40W 217 03 40	15.180 -12.113	15.179 -9.148	-0.082 -0.082	New Point Code
92	834 48 44W 214 48 44	16.000 -13.136	15.999 -9.134	-0.092 -0.092	New Point Code
91	832 57 36W 212 57 36	16.810 -14.104	16.809 -9.145	-0.090 -0.090	New Point Code
90	831 21 00W 211 21 00	17.630 -15.055	17.629 -9.172	-0.060 -0.060	New Point Code

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GEODIMETER SURVEYING SOFTWARE - V4.5E
RADIAL SURVEY COMPUTATION

Station/ Point	Bearing (N).Azimuth	Slope Dist Northing	Horz Dist Easting	Elev Diff Elevation	Point Description
100	S35 19 30W 215 19 30	17.910 -14.612	17.909 -10.355	-0.056 -0.056	New Point Code
101	S35 25 16W 215 25 16	17.320 -14.114	17.319 -10.038	-0.070 -0.070	New Point Code
102	S38 03 06W 218 03 06	16.520 -13.008	16.519 -10.182	-0.076 -0.076	New Point Code
103	S39 48 24W 219 48 24	15.680 -12.045	15.679 -10.038	-0.067 -0.067	New Point Code
104	S42 23 44W 222 23 44	14.970 -11.055	14.969 -10.093	-0.070 -0.070	New Point Code
105	S44 54 40W 224 54 40	14.210 -10.063	14.209 -10.032	-0.073 -0.073	New Point Code
106	S48 13 06W 228 13 06	13.580 -9.048	13.579 -10.126	-0.065 -0.065	New Point Code
107	S51 32 14W 231 32 14	12.880 -8.011	12.879 -10.084	-0.069 -0.069	New Point Code
108	S54 51 56W 234 51 56	12.340 -7.101	12.339 -10.091	-0.063 -0.063	New Point Code
109	S57 47 20W 237 47 20	11.920 -6.353	11.919 -10.084	-0.061 -0.061	New Point Code

000034

BACK WALL

	00	10	20	30	40	50	60	70	80	90	100
(00) POINT NUMBER	(.444)	(.912)	(.816)	(.66)	(.804)	(1.332)	(1.536)	(.528)	(.672)	(.540)	(.672) APPROX
(.444) FINAL DEPTH OF MATERIAL REMOVED IN INCHES	(.348)	(.732)	(.816)	(.696)	(.564)	(1.627)	(1.992)	(.540)	(.780)	(.78)	(.504)
NOTE: GIRD SIZE USED 12" X 12"	(.300)	(.648)	(.852)	(.504)	(.540)	(1.32)	(1.764)	(.540)	(.756)	(.744)	(.492)
X AMOUNT OF MATERIAL REMOVED IN INCHES	(.576)	(.780)	(1.056)	(.468)	(.408)	(.504)	(.696)	(.504)	(.696)	(1.32)	(.432)
X̄ = .658	(.648)	(.648)	(.78)	(.564)	(.636)	(.600)	(.912)	(.720)	(.624)	(.66)	(.480)
	(.504)	(.588)	(.648)	(.492)	(.672)	(.624)	(.756)	(.420)	(.864)	(.612)	(.504)
	(.348)	(.54)	(.600)	(.432)	(.612)	(.648)	(.636)	(.540)	(.504)	(.576)	(.360)
	(.648)	(.492)	(.672)	(.420)	(.528)	(.696)	(.732)	(.636)	(.72)	(.636)	(.492)
	(.852)	(.480)	(.636)	(.504)	(.372)	(.696)	(.504)	(.336)	(.540)	(.696)	(.420)
	(.948)	(.504)	(.432)	(.456)	(.696)	(.504)	(.708)	(.408)	(.360)	(.312)	(.360)

