

FINAL

**EXPLANATION OF SIGNIFICANT DIFFERENCES
FOR
OPERABLE UNIT 4 SILOS 1 AND 2 REMEDIAL ACTIONS**

**UNITED STATES DEPARTMENT OF ENERGY
FERNALD CLOSURE PROJECT
FERNALD, OHIO**

October 2003

40750-RP-0038

Robert Warther, Manager
United States Department of Energy – Ohio Field Office

Date

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Superfund Division
United States Environmental Protection Agency – Region 5

Date

1 **1.0 INTRODUCTION TO THE SITE AND STATEMENT OF PURPOSE**

2 1.1 BACKGROUND

3 The Fernald Closure Project (FCP) is a former uranium processing facility located in Hamilton and Butler
4 Counties, Ohio approximately 18 miles northwest of Cincinnati, Ohio. The FCP is owned by the United
5 States Department of Energy (DOE). In November 1989, the FCP site (formerly the Feed Materials
6 Production Center [FMPC] and then the Fernald Environmental Management Project [FEMP]) was
7 included on the National Priorities List of the United States Environmental Protection Agency
8 (U.S. EPA). As the owner, DOE is the lead agency for remediation of the FCP pursuant to the Amended
9 Consent Agreement under Comprehensive Environmental Response, Compensation, and Liability Act
10 (CERCLA) as amended Sections 120 and 106(a) signed with U.S. EPA in September 1991. The Ohio
11 Environmental Protection Agency (OEPA) is also participating in the cleanup process at the site.

12

13 Operable Unit 4 is one of the five operable units identified in the Amended Consent Agreement and
14 consists of Silos 1, 2, and 3 and their contents, the empty Silo 4, and associated facilities. A Record of
15 Decision (ROD) for Operable Unit 4 was signed on December 7, 1994 and an Operable Unit 4
16 Silos 1 and 2 ROD Amendment was signed on July 13, 2000. The 1994 ROD documented vitrification
17 and off-site disposal at the Nevada Test Site (NTS) as the selected remedy for both Silos 1 and 2 and
18 Silo 3. The 2000 Silos 1 and 2 ROD Amendment modified the selected remedy to chemical stabilization
19 of the Silos 1 and 2 material and off-site disposal at NTS.

20

21 1.2 CIRCUMSTANCES GIVING RISE TO PREPARATION OF AN EXPLANATION OF
22 SIGNIFICANT DIFFERENCES (ESD) FOR OPERABLE UNIT 4 SILOS 1 AND 2

23 Since the Operable Unit 4 Silos 1 and 2 ROD Amendment was issued, DOE and U.S. EPA have received
24 new information concerning (1) the waste acceptance criteria for the NTS disposal facility, and (2) the
25 potential availability of other commercial facilities that can accept the Silos 1 and 2 residues for disposal
26 as byproduct materials.

27

28 The changes addressed under this ESD align the quantitative performance standards for treating the
29 Silos 1 and 2 material stipulated in Section 2.1.3 of the Operable Unit 4 ROD Amendment with the
30 recently revised NTS waste acceptance criteria (February 2002) and also allow the option of disposal at
31 an appropriately permitted commercial disposal facility.

32

1 1.3 REGULATORY BASIS

2 Pursuant to Section 117 of CERCLA as amended and the National Contingency Plan at
3 40 CFR 300.435(c)(2)(i), an ESD document should be published when “differences in the remedial or
4 enforcement action, settlement, or consent decree significantly change but do not fundamentally alter the
5 remedy selected in the ROD with respect to scope, performance, and cost.” After a review of the
6 proposed changes to the remedy, DOE and U.S. EPA have determined that since the revised remedy will
7 still include retrieval, chemical stabilization, and protective off-site disposal of Silos 1 and 2 material, the
8 adjustments to the ROD provided in this ESD are significant but do not fundamentally alter the overall
9 Silos 1 and 2 remedy with respect to scope, performance, or cost.

10

11 1.4 ADMINISTRATIVE RECORD

12 This ESD will become part of the Administrative Record pursuant to 40 CFR 300.825(a)(2) and will be
13 available at the Public Environmental Information Center (PEIC), 7400 Willey Road, Hamilton, Ohio.
14 The PEIC is open from 7:30 a.m. to 5:00 p.m. on Tuesday and Thursday and may be contacted at
15 (513) 648-5051.

16

17 **2.0 SITE HISTORY, CONTAMINATION, AND SELECTED REMEDY**

18 2.1 SUMMARY OF SITE OPERATING HISTORY

19 Operating as the FMPC between 1951 and 1989, the site produced high purity uranium metal products in
20 support of national defense programs. The site consists of approximately 1,050 acres encompassing three
21 primary areas: the former production area, the waste storage area, and adjacent forest/pasture land. The
22 former production area is a 136-acre tract at the center of the site. The waste storage area, which includes
23 Silos 1 and 2, is located west of the former production area. In 1989, operations ceased and efforts were
24 focused on environmental restoration and waste management activities. In 1991, the site name changed
25 to the FEMP to recognize this new emphasis. In 2003, the site name changed again to the FCP to reflect
26 the increased focus on final site closure.

27 Through the Amended Consent Agreement, the cleanup activities for the site were organized into five
28 operable units. Operable Units 1 through 4 are considered source operable units while Operable Unit 5
29 encompasses all environmental media, both on and off FCP property. The final remedial actions include:
30 facility decontamination and dismantlement; on-site disposal of the majority of contaminated soil and
31 debris; off-site disposal of the contents of Silos 1 and 2, Silo 3, waste pit material, nuclear product
32 inventory, low-level waste, mixed waste, and limited quantities of soil and debris not meeting on-site
33 waste acceptance criteria; and treatment of contaminated groundwater to restore the Great Miami Aquifer.

34

1 2.2 CONTENTS OF SILOS 1 AND 2

2 Silos 1 and 2 contain a total of 8,012 cubic yards of 11e.(2) byproduct material and a total of 878 cubic
3 yards of BentoGrout clay for a total volume of 8,890 cubic yards. The BentoGrout clay layer was added
4 in 1991 to the Silos 1 and 2 material in order to reduce the radon emanation. Radionuclides at significant
5 activity levels within these silos are actinium-227, radium-226, thorium-230, polonium-210, and
6 lead-210. These radionuclides are naturally occurring elements found in the original ores. Non-
7 radiological constituents detected in significant concentrations in Silos 1 and 2 material include sodium,
8 magnesium, nickel, barium, lead, calcium, iron, and tributyl phosphate (a solvent used in the former
9 uranium extraction process at the FCP). Tests performed on samples of stored material identified that
10 lead can leach from the untreated material in concentrations that exceed federal guidelines for hazardous
11 wastes.

12
13 As mentioned above, the residues contained in Silos 1 and 2 are designated by DOE as Section 11e.(2)
14 byproduct materials under the Atomic Energy Act of 1954 as amended (AEA), which is a regulatory
15 classification that acknowledges the origin of the materials and identifies that they consist of tailings and
16 wastes that were produced by the extraction and concentration of uranium from ores that were processed
17 primarily for their source material content. As 11e.(2) byproduct materials, the residues are statutorily
18 excluded from the definition of solid and hazardous waste under the Resource Conservation and Recovery
19 Act (RCRA) of 1976; this statutory exclusion is described in the RCRA regulations under
20 40 CFR 261.4(a)(4). Specific regulatory requirements for management of the byproduct materials are
21 defined through the AEA regulations and accompanying policies and directives.

22
23 As a point of reference, although they are statutorily excluded from formal RCRA hazardous waste
24 definitions and administrative requirements, the Silos 1 and 2 residues do contain sufficient quantities of
25 lead, a RCRA regulated metal, such that they can exceed RCRA thresholds for leachability as measured
26 through the RCRA toxicity characteristic leaching procedure (TCLP) laboratory test. As explained
27 further below, this condition was a consideration in establishing remedy-specific quantitative performance
28 levels in the 1994 Operable Unit 4 ROD and the 2000 Operable Unit 4 Silos 1 and 2 ROD Amendment
29 for rendering the Silos 1 and 2 residues suitable for off-site disposal through treatment, in accordance
30 with NTS waste acceptance criteria requirements at that time.

31

1 2.3 OPERABLE UNIT 4 SILOS 1 AND 2 SELECTED REMEDY

2 The Operable Unit 4 ROD was signed and effective on December 7, 1994 and the Operable Unit 4
3 Silos 1 and 2 ROD Amendment was signed and effective on July 13, 2000. The current selected remedy
4 defined in the ROD and ROD Amendment provide for:

- 5 • Complete removal of contents of Silos 1 and 2 and the Decant Sump Tank System sludge from
6 the Transfer Tank Area followed by treatment using chemical stabilization to stabilize
7 characteristic metals to meet RCRA toxicity characteristic limits and attain the NTS waste
8 acceptance criteria;
- 9 • Off-site shipment and disposal of the chemically stabilized waste at the NTS;
- 10 • Decontamination and dismantlement of all structures and remediation facilities in accordance
11 with the Operable Unit 3 ROD;
- 12 • Gross decontamination, demolition, size reduction, and packaging of concrete from Silos 1 and 2
13 structures followed by shipment for off-site disposal at the NTS or an appropriately permitted
14 commercial disposal facility;
- 15 • Disposal of contaminated soil and debris, excluding concrete from Silos 1 and 2 structures, in
16 accordance with the FCP On-Site Disposal Facility waste acceptance criteria or an appropriate
17 off-site disposal facility, such as the NTS or a permitted commercial disposal facility;
- 18 • Removal of the earthen berms and excavation of the contaminated soils within the Operable
19 Unit 4 boundary to achieve the remediation levels outlined in the Operable Unit 5 ROD;
- 20 • Appropriate treatment and disposal of all secondary wastes at either the NTS or an appropriate
21 permitted commercial disposal facility;
- 22 • Collection of perched water encountered during remedial activities for treatment at Operable
23 Unit 5 water treatment facilities;
- 24 • Continued access controls and maintenance and monitoring of the stored waste inventories; and
25 • Institutional controls of the Operable Unit 4 area such as deed and land-use restrictions.
26

27 **3.0 DESCRIPTION OF SIGNIFICANT DIFFERENCES AND THE BASIS FOR THE**
28 **CHANGE**

29 3.1 SUMMARY OF DIFFERENCES

30 The selected remedy will maintain the requirement to treat the Silos 1 and 2 materials using chemical
31 stabilization. Therefore, there will be no decrease in the benefits currently provided by the treated waste
32 form, including a reduction in the mobility of contaminants, decreased transportation risks, and a safe,
33 permanent disposal method. However, to cost-effectively align the remedy with the waste acceptance
34 criteria of the disposal facilities, this ESD removes the quantitative TCLP performance standard as a
35 relevant and appropriate regulatory requirement for execution of the Silos 1 and 2 remedy. It also allows
36 the option of disposal of the chemically stabilized Silos 1 and 2 waste at an appropriately permitted
37 commercial disposal facility in addition to, or instead of, the NTS. Only the first two bullets from the list
38 above in Section 2.3 require revision. They are modified as follows:

- 1 • Complete removal of contents of Silos 1 and 2 and the Decant Sump Tank System sludge from
2 the Transfer Tank Area followed by treatment using chemical stabilization;
- 3 • Off-site shipment and disposal of the chemically stabilized waste at the NTS or an appropriately
4 permitted commercial disposal facility.
5

6 Material from Silos 1 and 2 and from the Decant Sump Tank will be removed by a hydraulic slurry
7 retrieval process that will transfer the bulk of the waste. It is anticipated that there will be some “heel”
8 material in the bottoms of the silos and sump tank that will be resistant to removal by the hydraulic slurry
9 retrieval process. A variety of techniques are available to remove this material and are currently being
10 evaluated. The selected method(s) for heel removal will be documented in the Remedial Action Work
11 Plan for Waste Retrieval. Following heel removal, a small amount of residual material may remain in the
12 silos, the decant sump, or in the soil underneath the silos. For these small quantities of residues, the DOE
13 will employ a cost effective and protective approach that may differ from the chemical stabilization
14 treatment process. This approach will be developed in conjunction with the U.S. EPA and the Ohio EPA
15 based on the volume and characteristics of the residues that remain. Whatever process is employed, the
16 residual will be converted into a form that complies with the waste acceptance criteria for NTS or an
17 appropriately permitted commercial disposal facility and with applicable transportation regulations prior
18 to shipment and off-site disposal.
19

20 3.2 BASIS FOR CHANGE

21 In the 1994 Operable Unit 4 ROD, on-site vitrification and off-site disposal at the NTS of both the
22 Silos 1 and 2 and the Silo 3 materials was selected as the preferred remedy for the Operable Unit 4
23 materials as a whole. Vitrification is a treatment process that heats the materials to such temperatures that
24 the materials fuse to a glass-like state, which in turn binds up the radioactive and non-radioactive metals
25 in the waste to a low leachability condition. At the time of the 1994 ROD, the NTS was the only
26 available disposal location that could accept the vitrified silo materials for permanent disposal. As part of
27 its waste acceptance criteria, the NTS required in 1994 that all treated or untreated waste accepted for
28 disposal at the facility – regardless of its RCRA statutory exempt or non-exempt status – meet TCLP
29 limits for toxicity characteristic constituents otherwise regulated under RCRA. Based on this disposal-
30 facility-specific requirement, the 1994 Operable Unit 4 ROD adopted the TCLP limits as *relevant and*
31 *appropriate* regulatory performance requirements for waste treatment (versus broader adoption as
32 *applicable* requirements, since the materials continued to retain their statutorily exempt legal status). The
33 NTS TCLP limits therefore became the relevant and appropriate quantitative performance standard in the
34 1994 ROD for treating the Silos 1 and 2 wastes to meet the existing waste acceptance criteria for the
35 RCRA metal of concern (lead) contained within the Silos 1 and 2 waste.

1 Although the treatment component of the selected remedy was re-evaluated and modified from
2 vitrification to chemical stabilization in the 2000 Operable Unit 4 Silos 1 and 2 ROD Amendment, the
3 NTS TCLP limits remained the relevant and appropriate quantitative performance standards for
4 chemically stabilizing the Silos 1 and 2 wastes.

5
6 Since the issuance of the Operable Unit 4 Silos 1 and 2 ROD Amendment, DOE and U.S. EPA received
7 new information concerning (1) revisions to the waste acceptance criteria for the NTS disposal facility,
8 and (2) the availability of other commercial facilities that can accept the Silos 1 and 2 residues for
9 disposal as byproduct materials.

10

11 3.2.1 Waste Acceptance Criteria for the NTS

12 In February 2002, the NTS, in conjunction with the state and federal regulatory agencies that oversee the
13 facility's waste disposal operations, updated the waste acceptance criteria for the facility. Prior to the
14 update, the waste acceptance criteria required that "low-level waste offered for disposal *must not* exhibit
15 characteristics of, or be listed as, hazardous waste...." This language was modified in February 2002 and
16 now states that "waste regulated under Title 40 CFR 261-268 [the RCRA hazardous waste regulations]
17 and state of Nevada hazardous waste regulations *shall not* be accepted for disposal." Therefore, materials
18 that are not regulated under Title 40 CFR 261-268 or State of Nevada hazardous waste regulations, such
19 as 11e.(2) materials or waste from the beneficiation of ores, no longer need to meet TCLP-based
20 acceptance criteria, provided the waste is otherwise disposed of in a manner that is protective of human
21 health and environment. As part of an eligibility evaluation, a waste profile for each waste must be
22 reviewed individually to ensure that: (1) the waste is exempt from Federal and State of Nevada hazardous
23 waste regulations and (2) protective requirements are met for the constituents that would otherwise be
24 regulated under RCRA. NTS personnel have already completed an eligibility review and have
25 determined that this material is both exempt from Federal and State of Nevada hazardous waste
26 regulations and acceptable for disposal at NTS as 11e.(2) material (see Attachment 1).

27

28 3.2.2 Emergence of a Commercial Disposal Facility to Potentially Accept DOE 11e.(2) Materials

29 Also since the time that the 2000 Operable Unit 4 Silos 1 and 2 ROD Amendment was prepared, potential
30 commercial disposal options have been identified for disposal of Silos 1 and 2 material. Similar to the
31 revised waste acceptance criteria requirements at the NTS, a commercial facility would be able to accept
32 treated Silos 1 and 2 materials without applying the TCLP limits as quantitative performance standards
33 provided the material is deemed eligible for disposal by the regulatory agency, a waste-specific profile
34 review is conducted, and all other waste acceptance criteria requirements that are applicable to the waste

1 are met. For purposes of this ESD, the Envirocare facility, in Clive, Utah is identified as a representative
2 permitted commercial disposal facility that may be eligible to accept the Silos 1 and 2 material. The
3 Envirocare facility is currently in the process of working with the State of Utah to modify their Nuclear
4 Regulatory Commission license to allow them to accept the Silos 1 and 2 materials into their 11e.(2)
5 disposal cell.

6
7 This new development may result in additional off-site disposal site options for DOE and U.S. EPA to
8 consider in addition to the NTS and may result in reduced schedule and accompanying cost risks. A cost
9 estimate shows that up to \$30 million may be saved by shipping the waste to a permitted commercial
10 disposal facility. The actual disposal facility will be selected as part of the design process and may
11 include the NTS, an appropriately permitted commercial disposal facility that can accept the materials, or
12 a combination of both. NTS will continue as the baseline Silos 1 and 2 waste disposal location for
13 ongoing planning and budgeting purposes until such time that the final disposal facility selection is made.

14 15 3.2.3 Statement of Significant Difference

16 The new information summarized above demonstrates that it is now permissible to permanently dispose
17 of the treated Silos 1 and 2 residues at the NTS without applying the TCLP limits as quantitative
18 performance standards, and that a commercial facility may also be able to accept the Silos 1 and 2
19 materials in the near future. Based on this new information, DOE and U.S. EPA conclude that the TCLP-
20 based waste treatment performance standard, adopted in both the 1994 ROD and the 2000 Operable
21 Unit 4 Silos 1 and 2 ROD Amendment as a facility-specific relevant and appropriate requirement for
22 treatment, is no longer necessary to maintain compliance with disposal facility waste acceptance
23 requirements, either at NTS or an appropriately permitted commercial disposal facility. DOE and
24 U.S. EPA are therefore removing the quantitative TCLP performance standard as a relevant and
25 appropriate regulatory requirement for execution of the Silos 1 and 2 selected remedy. In addition, DOE
26 will have the option of disposal of the treated Silos 1 and 2 material at an appropriately permitted
27 commercial disposal facility.

28 29 3.2.4 Impact on Silos 1 and 2 Treatment and Disposal Process

30 Regardless of the modification to quantitative performance standards or off-site disposal options, the
31 Silos 1 and 2 material will continue to be treated by chemical stabilization with no changes to the physical
32 characteristics of the final waste form, the associated transportation risks, or the disposal method.
33 Reducing the leachability of metals will continue to be a goal of the treatment process with the primary
34 focus still being the reduction of the direct radiation levels and moisture content of the material to

1 facilitate safe and efficient transportation and disposal. The treatability study data collected from past and
2 future studies will be used both to optimize the chemical stabilization process requirements and to obtain
3 the maximum reasonably obtainable reduction in leachability. Based on this, the only procedural
4 modification arising from this ESD will be to eliminate sampling and TCLP testing of the treated waste
5 since it is no longer necessary for WAC demonstration purposes. The removal of that sampling step will
6 protect employees from having to work near the open containers to obtain samples and from being
7 exposed to radiation from the waste material during the sampling and laboratory analysis activities. Over
8 the life of Silos 1 and 2 treatment operations and the number of repetitive sampling activities that would
9 have been necessary, this change should reduce potential worker exposure by more than 500 millirem
10 (mrem) over the life of the project and is consistent with DOE's As Low As Reasonably Achievable
11 (ALARA) principles and practices. In addition, elimination of TCLP testing of the treated waste will
12 result in a cost savings of approximately \$400,000.

13

14 **4.0 AFFIRMATION OF THE STATUTORY DETERMINATIONS**

15 Considering the new information that has become available and the changes that have been made to the
16 selected remedy, DOE and U.S. EPA believe that the revised remedy meets all of the statutory
17 requirements of Section 121 of CERCLA as amended. The revised remedy 1) is protective of human
18 health and the environment, 2) complies with Federal and State requirements that are legally applicable or
19 relevant and appropriate to the remedial action, and 3) is cost effective. In addition, the revised remedy
20 utilizes permanent solutions and treatment technologies to the maximum extent practicable.

21 **5.0 PUBLIC PARTICIPATION**

22 The draft final ESD was made available for formal public comment from August 27 through September
23 26, 2003. A public hearing was held in the vicinity of the FCP on September 9, 2003 to provide the
24 public with a forum to submit oral comments on the proposed revised remedy. No written or oral
25 comments were received by DOE at the Public Hearing. The availability of the Draft Final ESD and
26 supporting documentation, the schedule for the comment period, and the location and schedule for the
27 public hearing, were announced in local newspapers. In addition, this information was announced on the
28 Fernald Closure Project web site (www.fernald.gov) and communicated by direct mail to stakeholders on
29 the FCP Public Affairs mailing list.

30 Comments were received from only two stakeholders during the public comment period. The comments
31 from these two stakeholders, DOE's response to each comment, and a transcript of the public hearing, are
32 presented in the Responsiveness summary contained in Attachment 2 of this ESD.

ATTACHMENT 1

**DOE-NEVADA LETTER DOCUMENTING
ACCEPTABILITY OF SILOS MATERIAL
AT THE NEVADA TEST SITE**



Department of Energy
National Nuclear Security Administration
Nevada Operations Office
P.O. Box 98518
Las Vegas, NV 89193-8518

FERNALD _____

LOG C-1436

2002 JUN 25 A 10:00

FILE: 9530

JUN 20 2002

Stephen H. McCracken, Director, FEMP, Cincinnati, OH

**DISPOSAL OF FERNALD SILOS WASTE MATERIALS AT THE NEVADA TEST SITE
(NTS)**

This is to inform you that Fernald Silos materials, including the Silo 3 untreated material (all of which is statutorily exempt from the Resource Conservation and Recovery Act), may be accepted for disposal at the NTS as 11(e)(2) byproduct material following the successful completion of the NTS waste approval process.

If you have any questions regarding this letter, please feel free to contact Jhon T Carilli, of my staff, at (702) 295-0672.

Carl E. Gertz
Assistant Manager
for Environmental Management

WMD:JTC-240

cc:

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