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Richland Operations Office
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JAN 03 1996

Mr. Douglas R. Sherwood
Hanford Project Manager
U.S. Environmental Protection Agency
712 Swift Blvd., Suite 5
Richland, Washington 99352

Mr. Joe Stohr
Section Manager
Nuclear Waste Program
State of Washington
Department of Ecology
P.O. Box 47600
Olympia, Washington 98504-7600

Dear Messrs. Sherwood and Stohr:

REVIEW OF DRAFT ENGINEERING EVALUATION/COST ANALYSIS (EE/CA) FOR DISPOSAL OF 183-H SOLAR EVAPORATION BASIN WASTE

Attached is a draft copy of the EE/CA for Disposal of Structural Concrete and Soil from the 183-H Solar Evaporation Basin Closure developed by the U.S. Department of Energy (DOE), Richland Operations Office (RL). RL is requesting your preliminary review and comment of this EE/CA by January 25, 1995.

The 183-H Solar Evaporation Basins (183-H) constitute a final status storage and treatment unit under the Resource Conservation and Recovery Act (RCRA) currently undergoing closure in accordance with Washington Administrative Code 173-303. Closure and postclosure activities at 183-H will continue under RCRA authority. The attached EE/CA will have no impact on these activities. Its only function is to allow a decision on a disposal alternative for structural concrete and soils generated during closure activities.

Upon review and resolution of any preliminary regulatory agency comments, RL intends to make the EE/CA available for public review and comment. Upon completion of the public participation process, RL will develop and sign an Action Memorandum recording the selection of a disposal alternative. Authority for this action is described in section 7.2.4 of the Tri-Party Agreement which recognizes DOE's authority under Section 2 of Executive Order 12580 to implement non-emergency removal actions. CERCLA Section 101(23) defines removal actions as including disposal of removed material.

Should you have any questions regarding this request, please contact me on (509) 376-7121.

Sincerely,

Jeffrey M. Bruggeman, Project Manager
Decontamination and Decommissioning Project

DDP:JMB

Attachment

cc w/attach:
R. Cordts, Ecology
P. Innis, EPA
M. Janaskie, EM-442
L. Miller, BHI

DRAFT

Engineering Evaluation/Cost Analysis for Disposal of Structural Concrete and Soil from 183-H Solar Evaporation Basin Closure

December 1995

CONTENTS

1.0 INTRODUCTION

This Engineering Evaluation/Cost Analysis (EE/CA) presents an engineering evaluation and cost analysis for determination of alternatives for disposal of structural concrete and soils generated from the Resource Conservation and Recovery Act (RCRA) closure of the 183-H Solar Evaporation Basins (183-H). The EE/CA was prepared pursuant to the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). This EE/CA is intended to aid the U.S. Department of Energy (DOE), Richland Operations Office (RL) in selecting a preferred disposal alternative for these wastes. A RCRA closure plan (*183-H Solar Evaporation Basins Closure/Post-Closure Plan*, DOE-RL 1991) has been submitted to the State of Washington Department of Ecology (Ecology) and is included in the Hanford Facility RCRA Permit. The Hanford Facility RCRA Permit requires that final closure be completed within 18 months of the Permit's effective date, September 28, 1994. The RCRA closure plan contains information regarding remediation activities at 183-H. It does not identify a disposal site for removed structural concrete or soils.

The 183-H are a series of four basins that were used from 1974 to 1985 for the treatment of liquid chemical wastes resulting from the 300 Area fuel fabrication facilities. The 183-H is a final status treatment unit under RCRA, currently undergoing closure in accordance with Washington Administrative Code (WAC) 173-303. It is also within the geographical area encompassed by the 100-HR-1 Operable Unit (OU), an area designated for remedial investigation under CERCLA. Groundwater contamination resulting from basin leakage will be remediated through actions associated with the 100-HR-3 groundwater OU.

183-H closure is proposed to meet the requirements for modified closure in accordance with the Hanford Facility RCRA Permit condition II.K.3. In order to meet these requirements, structures and soils must be removed where contaminated above action levels established under the Model Toxics Control Act (MTCA) Method C pursuant to WAC 173-340. These action levels have been previously agreed to by RL and Ecology.

2.0 SITE CHARACTERIZATION

2.1 Site description and background

The following information is presented to gain historical perspective on 183-H closure actions. The purpose of this EE/CA is to determine the appropriate disposal alternative for structural concrete and soils generated from these closure actions. Decisions regarding the closure actions that have occurred and will occur in the future at 183-H are and will be made under the authority of Ecology. These decisions are outside the scope of this EE/CA.

The 183-H is part of the 100-H Area, located in the northern part of the Hanford Site along the Columbia River (Figure 1). The 100-H Area contained a nuclear-defense, production-reactor facility that operated from October 1949 to April 1965. The 183-H structure consists of four basins (aboveground concrete structures) which remain from operation of the 183-H Water Treatment Facility. The 183-H Water Treatment Facility provided water treatment and reservoir capacity for the reactor process water system. This filter plant operated concurrently with the start-up and shutdown of the 105-H Reactor.

The 183-H Water Treatment Facility consisted of a head house and chemical building, a filter building and clean water storage vaults (clear wells), a pump room, and sixteen basins. Each of these basins is made up of a shallow flocculation basin and a deeper sedimentation basin. Most of the facility was demolished in 1974. Demolition rubble was used as backfill in the nearby clear wells. Four basins were left intact and designated for use as a solar evaporation facility for chemical waste. The adjacent clear wells were also left intact for future use as a clean-debris disposal site.

Each of the four intact basins consists of a flocculation and a sedimentation reservoir. The width of the concrete basin walls is uniformly 15 centimeters (6 inches) and the basin floor is 13 centimeters (5 inches) in minimum thickness.

Beginning in 1973, Basin 1 (basins are numbered 1 through 4 from east to west) was used for disposal of neutralized acid-etching solutions from N Reactor fuel fabrication facilities in the 300 Area of the Hanford Site, as well as for miscellaneous used and unused chemicals. A total of 9,462 kiloliters (2.5 million gallons) of caustic solution was discharged to the basins during the period of waste operations. The solution consisted primarily of sodium nitrate with trace amounts of miscellaneous chemicals, including uranium and technetium-99. The waste stream included small amounts of listed waste constituents, as defined by WAC 173-303-080, including formic acid (U123), vanadium pentoxide (P120), and cyanide salts (P029, P030, P098, P106). The solution was designated mixed waste.

Waste deposited in the basins underwent volume reduction through evaporation. The use of Basin 1 to treat spent fuel fabrication waste continued until the detection of nitrates when well 199-H4-3 was monitored, and there was an indication that possible spill or leak material was reaching the groundwater. Use of Basin 1 was discontinued in 1978. Spray-on polyurethane liners had been installed in Basins 2 and 3, then the liquid waste from Basin 1 was transferred into Basin 3 in 1978. (Basin 1 solids and sludges were removed in 1985.) Basin 2 first managed waste in 1979. Shortly before its use in 1982, Basin 4 was lined with a spray-on white butyl/hypalon[1] liner after it was observed that the spray-on polyurethane coating in Basins 2 and 3 showed degradation from sunlight. The last shipment of waste to the basins occurred in November 1985. The liquid content of Basin 2 was transferred to Basins 3 and 4; Basin 2 solids and sludges were removed in 1986. Also in 1986 a high-density polyethylene liner was installed in Basin 2. The liner was field seamed and 100-percent vacuum tested to ensure a leak-tight installation, then the accessible liquid waste from Basins 3 and 4 was transferred into Basin 2.

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[1]Hypalon is a trademark of E.I. Du Pont de Nemours and Company.

2.2 Previous removal actions

Before the implementation of initial RCRA closure activities in 1986, Basins 2, 3, and 4 held waste consisting of three distinct layers: a basal crystalline layer, a sludge layer, and a liquid layer on the top. Using Sorbond LPC-II[2] colloidal cement, the liquid waste was solidified inside lined U.S. Department of Transportation (DOT)-approved 17-H, 55-gallon drums. The sludge and crystalline layers were removed from the basins by manually shovelling and/or scooping the material into lined DOT-approved 17-H, 55-gallon drums.

Basins 1 and 4 were subsequently cleaned by wet sandblasting. Waste generated during sandblasting was packaged as were the solids and sludges described previously. The drums containing the liquids, solids, sludges, and sandblast waste were sealed and taken to the Hanford Site Central Waste Complex Retrievable Waste Storage Unit (CWC). By the end of 1990, all bulk waste had been removed from the 183-H.

Berm soils (920 cubic meters or 200 cubic yards) along the east and west sides of the basins were sampled, removed, placed on plastic just south of the 183-H, and sprayed with Arrospray 70[3] (a clear soil binder) to minimize wind dispersal and erosion.

The 183-H structural concrete has been decontaminated through a scabbling technology to remove the top 6 mm of contaminated surface. The contaminated residual has been drummed and will be shipped to the CWC.

2.3 Source, nature, and extent of contamination

Following removal of the process waste managed at the 183-H, concrete and soil sampling was performed in 1989 and 1991 to evaluate the possibility of residual contamination at the site. Laboratory chemical and radiological analyses of the 183-H concrete, shallow soils beneath and adjacent to the basins, and the deeper soils of the vadose zone beneath and surrounding the basins, were conducted using standard methods. Chemical analyses were conducted in accordance with *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods* (SW-846; EPA 1986) at offsite laboratories. Data, sampling, and analytical methods, sample number and locations, and quality assurance/quality control (QA/QC) measures are reported in the *RCRA Closure Data Evaluation Report: 183-H Solar Evaporation Basins Soil and Concrete*.

As part of a Data Quality Objectives process carried out between RL and Ecology (August 1995), constituents of concern and their associated action levels were determined. Constituents of concern that will be removed to levels below action levels in soils include arsenic, chromium, copper, fluoride, nickel, and nitrate. Surface soil contamination above action levels is largely contained in plumes attributable to fluoride and nitrate contamination. Fluoride contamination extends down to an estimated eleven foot depth under Basins 1 and 2.

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[2]Sorbond LPC-II is a trademark of the American Colloid Company.

[3]Arrospray 70 is a trademark of the American Cyanamid Company.

The extent of chromium contamination is currently unknown relative to its valence states of hexavalent and trivalent chromium. Chromium samples taken during the 1989 and 1991 sampling efforts only delineated total chromium. Because hexavalent chromium action levels are more stringent than those established for trivalent chromium, the extent of contamination of hexavalent chromium at 183-H requires determination. An effort has been initiated to characterize soil contamination for hexavalent chromium. Should this effort determine that hexavalent chromium is present in the soil column to depths that would preclude soil removal, the unit may require closure as a RCRA landfill. Should landfill closure be required, no soil removal would occur. Further assessment of remediation needs would be undertaken during the 100-HR-1 OU analysis under this scenario. Should hexavalent chromium be below action levels or if portions above action levels could be removed cost-effectively, then soil removal will continue until the soil column is appropriately remediated. Decisions regarding hexavalent chromium will be made prior to a closure determination at 183-H.

Both soils and structures removed from 183-H will be defined as low-level radioactive waste.

2.4 Analytical data

Analytical data for contaminated structural concrete and for soils are incorporated by reference in the *RCRA Closure Data Evaluation Report: 183-H Solar Evaporation Basins Soil and Concrete*. Removed soils will be contaminated with constituents of concern at levels below dangerous waste designation limits and above MTCA Method C residential action levels. Constituents of concern are anticipated to include arsenic, cadmium, chromium, copper, fluoride, mercury, nickel, nitrate. Removed structural concrete from 183-H is expected to contain little chemical contamination attributable to waste operations. The extraction technology utilized to clean the concrete is highly effective in the removal of both chemical and radiological constituents.

3.0 IDENTIFICATION OF REMOVAL ACTION OBJECTIVES

3.1 Determination of removal scope

Remediation of 183-H is estimated to result in the generation of 100 cu.yd. of structural concrete and 3200 cu. yd. of soils. These materials will require disposal at a landfill designed to manage low levels of radiologically and chemically contaminated debris and soils. Depending upon the availability of the disposal site at the time of waste generation, interim storage may be required at the 183-H site. Structural concrete will contain minimal chemical or radiological contamination and will not be designated as dangerous waste. It will be stored in piles adjacent to 183-H. Soils removed from the unit will be containerized and also stored in an area adjacent to 183-H.

3.2 Determination of removal schedule

A general schedule for structure and soil removal is provided in Figure 2.

4.0 IDENTIFICATION OF REMOVAL ACTION ALTERNATIVES

Alternatives under consideration for the disposal of structures and soils from 183-H closure are as follows:

- No action
- Adjacent clear well disposal
- Central Landfill disposal
- Low-Level Burial Grounds (LLBG) disposal
- W-025 Mixed Waste Trench (W025) disposal
- Environmental Remediation Disposal Facility (ERDF) disposal

Because wastes will require removal in order to comply with RCRA closure actions, the no action alternative for this alternative analysis would consist of long-term storage of the concrete and soils adjacent to the unit.

Due to detectable levels of radiological contamination of the soils as well as some or all of the concrete, the clear well and Central Landfill are removed from further consideration because they are not approved for disposal of radiological waste.

5.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

This section provides an analysis of remedial alternatives evaluated against the following criteria: (1) overall protection of human health and the environment; (2) compliance with federal and state regulations; (3) long-term effectiveness; (4) reduction of toxicity, mobility, or volume through treatment; (5) short-term effectiveness; (6) implementability; (7) cost, and; (8) state and community acceptance.

5.1 Overall protection

The overall protection of human health and the environment criterion determines whether each alternative provides adequate protection of human health and the environment. Protection includes reduction of risk to acceptable levels (either by reduction of concentrations or the elimination of potential routes for exposure) and minimization of exposure threats (introduced by actions during remediation.) This first criterion is a threshold requirement and the primary objective of the remedial program. The no action alternative (long-term storage adjacent to the unit) would not be considered protective of human health and the environment. The ERDF and W025 both provide for disposal in a unit that meets landfill requirements under RCRA. These units will be double-lined and will include leak detection and leachate collection systems. The LLBG are unlined trenches and would be considered the less protective alternative.

The LLBG are available for disposal immediately and therefore would not require interim storage onsite. The W025 currently has no funding for operation through the year 2002 thus interim storage would be required for an extended period. Interim storage prior to disposal at ERDF would be a much shorter period of time. The ERDF is anticipated to be operational in March 1996. Structural concrete will begin to be generated October 1995. Soil removal is scheduled to begin November 1995. The no action alternative fails to protect human health and the environment, while ERDF and W025 storage of the wastes are equally protective.

5.2 Compliance with regulations

Applicable or relevant and appropriate requirements (ARARs) in federal and state law must be met or waived for CERCLA response actions. The no action alternative would have the potential to create a new chemically contaminated area adjacent to 183-H given levels of these constituents relative to MTCA B groundwater protection standards. This scenario would not provide compliance with RCRA closure requirements contained in WAC 173-303.

Structural concrete and soils will be identified as low-level wastes. Structural concrete and sols do not contain listed waste (due to the granting of contained-in determinations for these wastes) and do not exhibit a dangerous waste characteristic, therefore they are not subject to WAC 173-303 requirements for disposal. Substantive requirements associated with radiation standards within Part 10 CFR are considered ARARs for disposal of these wastes. All three alternatives under analysis, ERDF, LLBG, and W025 would comply with these ARARs.

Clean Air Act evaluation of potential airborne emission of particulates, radionuclides, and constituents of concern must be addressed as ARARs for the ERDF and W025 alternatives due to the interim storage need. It is not anticipated that interim storage will generate significant amounts of air pollutants.

5.3 Long-term effectiveness

The long-term effectiveness and permanence criterion assesses whether the alternatives leave a risk after the conclusion of remedial activities. The no-action alternative would not provide long-term protection to human health and the environment. Given the more protective nature of the design of a RCRA landfills relative to an unlined trench, it is concluded that ERDF and W025 would provide for a more long-term effectiveness than would the LLBG.

5.4 Reduction of toxicity, mobility, or volume

The reduction of toxicity, mobility, or volume through treatment criterion assesses whether the alternatives permanently and significantly reduce the hazard posed by the site by destroying contaminants, reducing the quantity of contaminants, or irreversibly reducing the mobility of the contaminants. The no-action alternative provides no reduction in toxicity, mobility, or volume. Contamination resulting from 183-H process waste in contact with structural concrete will be treated through extraction under RCRA closure action authority. Levels of radiological and chemical constituents remaining in structural concrete and in soils is anticipated to be very low and therefore would not benefit from further treatment actions.

5.5 Short-term effectiveness

The short-term effectiveness criterion assesses whether the alternative provides adequate protection to human health and the environment during the remedial action, and how long it will take for the action to achieve the established objectives. The no action alternative will not have any short-term impacts. The W025 and ERDF alternatives will require interim storage until the disposal units become operational. However, because the W025 option requires a longer term interim storage, the ERDF would be considered the more effective option for short-term protection. Interim storage will require double handling of wastes (once to store and then again to dispose) using the W025 or ERDF option. Worker safety aspects of interim storage are considered acceptable for either option. Standard construction activities such as container management and transport can be managed safely.

5.6 Implementability

The Implementability criteria assesses whether the alternatives are technically and administratively feasible. The no action alternative is implementable. All three disposal site alternatives under consideration are similar in technical and administrative implementability relative to disposal aspects. The LLBG option would have no implementability criterion issues relative to interim storage. The ERDF will require short-term interim storage requiring more preplanning and administrative action. These implementation actions are considered minor. The W025 option would require longer term interim storage which would require greater technical and administrative actions in order to maintain the storage area in an environmentally and worker protective manner through the years.

5.7 Cost

The cost criteria evaluates whether the alternatives are cost effective. The no action alternative would involve no incremental increase in cost. The total estimated disposal costs shown below do not include additional costs which would be incurred for interim storage prior to acceptance at the final disposal site for W025 (5 years) and for ERDF (approximately 6 months). Cost for disposal of 3300 cubic yards of structural concrete and soils is based on the estimated base cost as follows:

DISPOSAL UNIT	COST	ESTIMATED DISPOSAL COST
W025	$120 per cu. ft.	$10,692,000
LLBG	$36 per cu. ft.	$3,207,600
ERDF	$50 per cu. yd.	$165,000

5.8 State and community acceptance

The state acceptance criterion evaluates whether the technical and administrative concerns of the state have been addressed. The community acceptance criteria evaluates whether the alternatives address the concerns of the local community. The state and community have not had an opportunity to comment on disposal alternatives. The criterion will be evaluated following completion of the public comment period and will be factored into final disposal decisionmaking.

6.0 RECOMMENDED REMOVAL ACTION ALTERNATIVE

Based on overall effectiveness, long- and short-term effectiveness, implementability, and cost, the ERDF is determined to be the preferred disposal alternative for disposition of 183-H structural concrete and soils. The ERDF alternative will provide a significant cost savings to the cleanup action while providing a higher degree of protectiveness and effectiveness than would be provided through implementation of the LLBG or W025 alternatives.

7.0 REFERENCES

DOE-RL, 1991, *183-H Solar Evaporation Basins Closure/Post-Closure Plan*, DOE/RL 88-04, U.S. Department of Energy, Richland Field Office, Richland, Washington

DOE-RL, 1994, *Hanford Facility Resource Conservation and Recovery Act Permit for the Treatment, Storage, and Disposal of Dangerous Waste*, U.S. Department of Energy, Richland Operations Office, Richland, Washington

WHC, 1994, *RCRA Closure Data Evaluation Report: 183-H Solar Evaporation Basins Soil and Concrete*, WHC-SD-DO-TO-075, Westinghouse Hanford Company, Richland, Washington