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Revision 1

207-A South Retention Basin Closure Plan

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy
under Contract DE-AC06-08RL14788

P.O. Box 1600
Richland, Washington 99352

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By Ashley R Jenkins at 1:08 pm, Jun 16, 2015

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Contents

Appendix

Figures

Tables

Terms

ASTM	American Society for Testing and Materials
CAS	Chemical Abstracts Service
DOE	U.S. Department of Energy
DST	double-shell tank
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
GPS	global positioning system
HASQARD	*Hanford Analytical Services Quality Assurance Requirements Document* (DOE/RL-96-68)
HEIS	Hanford Environmental Information System
HHE	human health and the environment
IQRPE	Independent Qualified Registered Professional Engineer
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MTCA	"Model Toxics Control Act—Cleanup" (WAC 173-340)
N/A	not applicable
OU	operable unit
PQL	practical quantitation limit
QA	quality assurance
QC	quality control
RCRA	*Resource Conservation and Recovery Act of 1976*
RI	remedial investigation
SAF	Sampling Authorization Form
SAP	sampling and analysis plan
SEPA	State Environmental Policy Act
TPA	Tri-Party Agreement
TSD	treatment, storage, and/or disposal
VSP	Visual Sample Plan

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1 Introduction

The purpose of this plan is to describe the *Resource Conservation Recovery Act of 1976* (RCRA) closure process for the 207-A South Retention Basin treatment, storage, and/or disposal (TSD) unit, hereinafter called 207-A South Retention Basin. This closure process will include the demolition and removal of the basin and soil sampling to verify soils clean closure standards. This closure plan complies with WAC 173-303-610(2) through (6), "Dangerous Waste Regulations," "Closure and Post-Closure," and represents the baseline for closure and the enforceable compliance requirements for conducting closure. Amendments to this closure plan will be submitted as a permit modification in accordance with WAC 173-303-610(3)(b).

The 207-A South Retention Basin, is an inactive, interim status surface impoundment that was used for storage of 242-A Evaporator process condensate for sampling and analysis before the condensate was discharged to the 216-A-37-1 Crib for disposal to the soil column. The basin began storage operations in 1977. 242-A Evaporator discharge to the basin was terminated on April 12, 1989, and the basin has been inactive since that date. Because the 242-A Evaporator process condensate was designated as dangerous waste under WAC 173-303, a *Dangerous Waste Permit Application Part A Form*, for the 207-A South Retention Basin (WA7 89000 8967, Part V, Closure Unit 9), hereinafter called the Part A Form, was submitted to the Washington State Department of Ecology (Ecology) in 1986 with the latest revision on October 1, 2008. Figure 1 provides a timeline that summarizes the operations and regulatory milestone associated with the 207-A South Retention Basin. Operations milestones are shown below the timeline, and regulatory milestones are shown above the timeline (Figure 1).

The dangerous chemicals in the 242-A Evaporator Process Condensate are regulated under the *Resource Conservation and Recovery Act of 1976* (RCRA), as modified in 40 CFR 265 ("Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities") and RCW 70.105 ("Public Health and Safety," "Hazardous Waste Management") and its implementing requirements in Washington State's dangerous waste regulations (WAC 173-303-400, "Dangerous Waste Regulations," "Interim Status Facility Standards"). The radionuclides in the mixed waste may include "source, special nuclear, and byproduct materials" as defined in the *Atomic Energy Act of 1954* (AEA). Both RCRA and AEA state that these radionuclide materials are regulated at U.S. Department of Energy (DOE) facilities exclusively by the DOE, acting pursuant to its AEA authority. These radionuclide materials are not hazardous/dangerous wastes and, therefore, are not subject to regulation by the State of Washington under RCRA and HWMA."

1.1 Physical Description

The 207-A South Retention Basin is located in the 200 East Area (Figure 2) directly east of the 242-A Evaporator. The 207-A South Retention Basin, also known as Process Condensate Basins 1, 2, and 3 (i.e., PC-1, PC-2, and PC-3), began operations in March 1977. The 207-A South Retention Basin consists of three separate open liquid effluent storage cells constructed of concrete that operated as a surface impoundment. Figure 3 provides a simplified diagram of the 207-A South Retention Basin. Each of the three cells had a 264,979 L (70,000 gal) design capacity for a total capacity of 794,937 L (210,000 gal). Each cell is 16.8 m (55 ft) long, 3.0 m (10 ft) wide at the bottom, and 2.1 m (7 ft) deep. The bottom of each basin cell slopes toward a drain located at the south end of the cell.
During construction of the basin, a Hypalon® liner was installed first, and then the basin itself. In 1982, all three concrete cells were coated with an elastomeric coating to prevent waste contaminants from penetrating the concrete. These concrete structures have remained intact since operations ceased and no

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leaks have been reported from the basin during inspections. The TSD unit boundary, as shown on the Part A Form, was established as the exterior wall of the concrete basin structure.

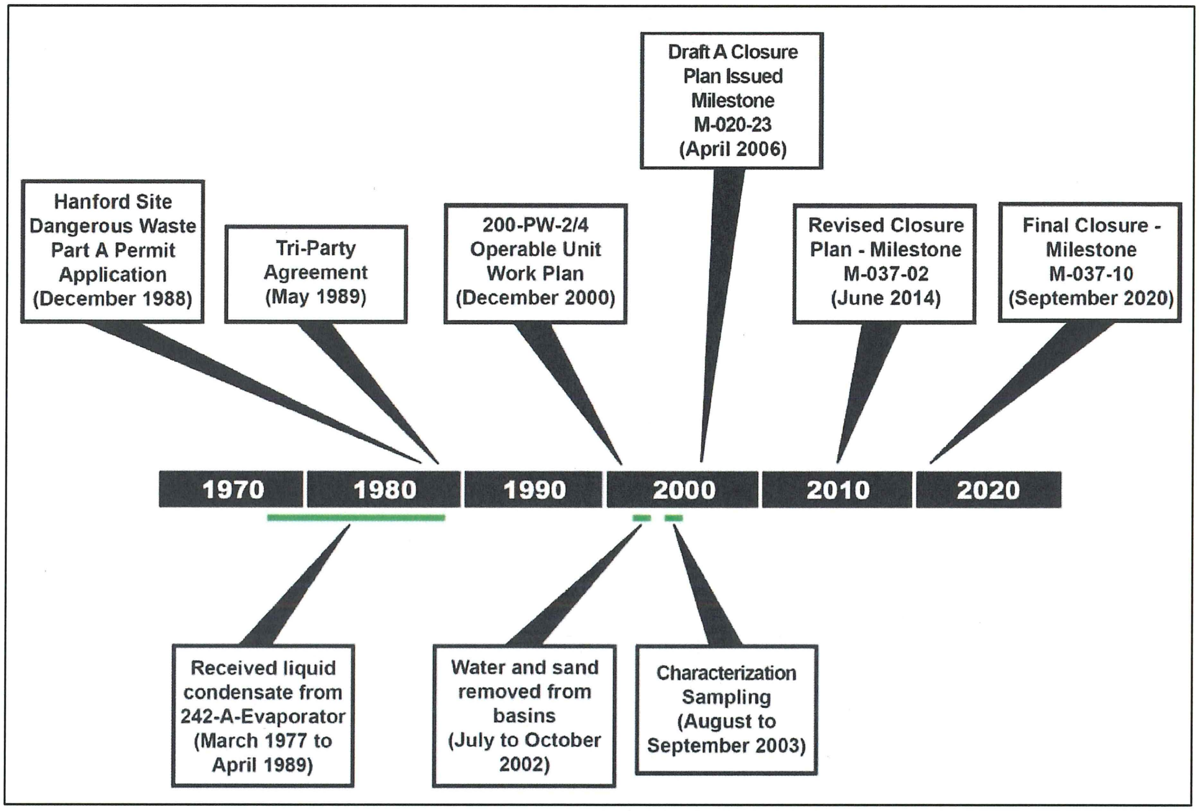

Figure 1. Timeline for the 207-A South Retention Basin

1.2 Process Information

This unit operated as a surface impoundment for interim storage of 242-A Evaporator process condensate, while the condensate awaited sampling and analysis. Waste was pumped from the 242-A Evaporator through waste transfer piping to the basin. Waste generally was stored in the basin only long enough to obtain sample results for process control. The pumps located at a pumping station between the 207-A North Retention Basin and the 207-A South Retention Basin were used to transfer the stored effluent to the 216-A-37-1 Crib for disposal to the soil column. No waste treatment or disposal occurred at the 207-A South Retention Basin.

Waste processed by the 242-A Evaporator is received from the double-shell tank (DST) system as an aqueous, mixed waste solution containing dissolved cations and anions, such as sodium, potassium, aluminum, hydroxides, nitrates, and nitrites. Slurry and process condensate are the two mixed waste streams generated at the 242-A Evaporator. The slurry is returned to the DST system. The process condensate is condensed vapor from the evaporation process. During this period of operations, process condensate was transferred to the 207-A South Retention Basin for interim storage before it was disposed to the 216-A-37-1 Crib.

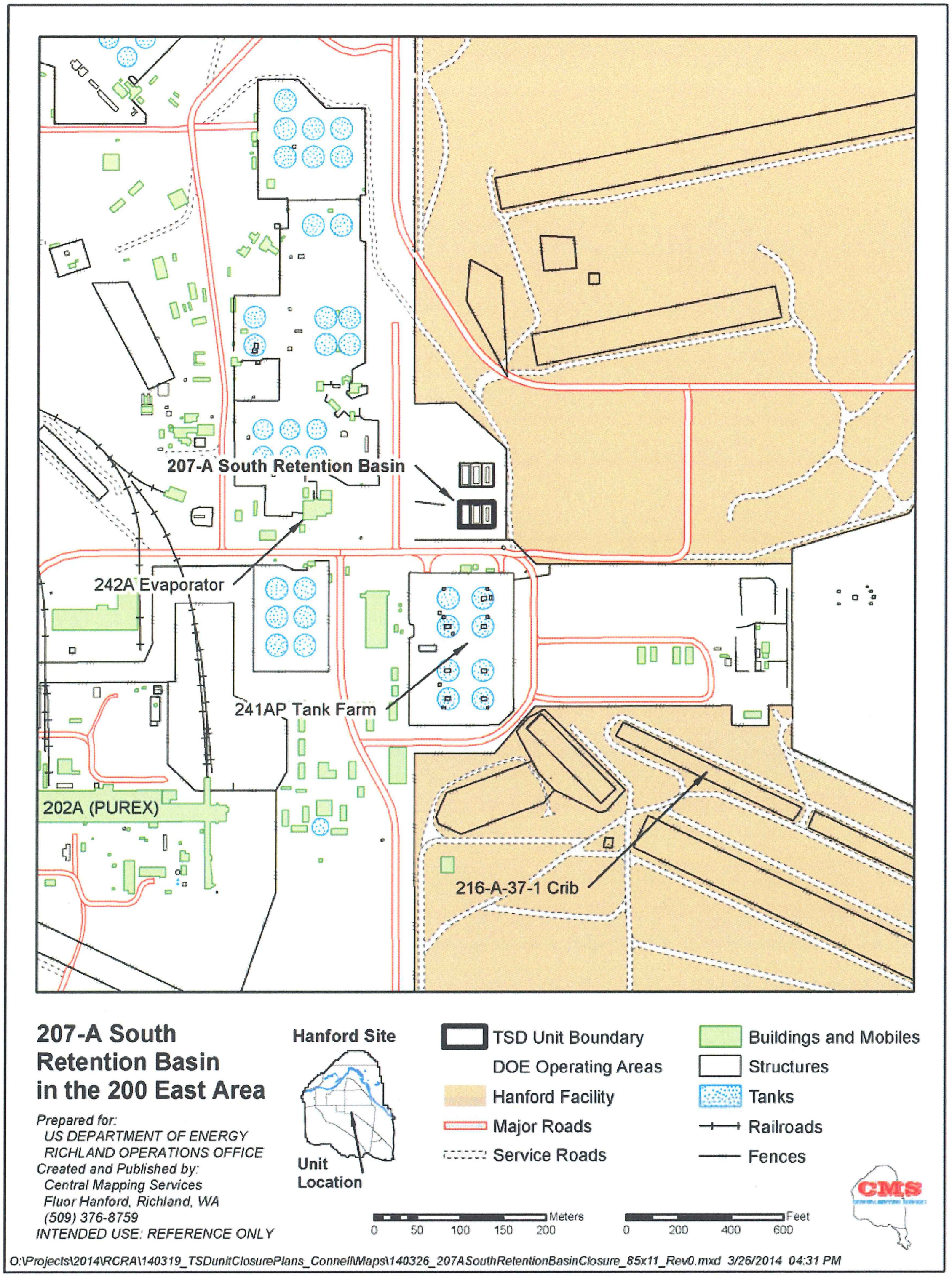

Figure 2. 207-A South Retention Basin in the 200 East Area

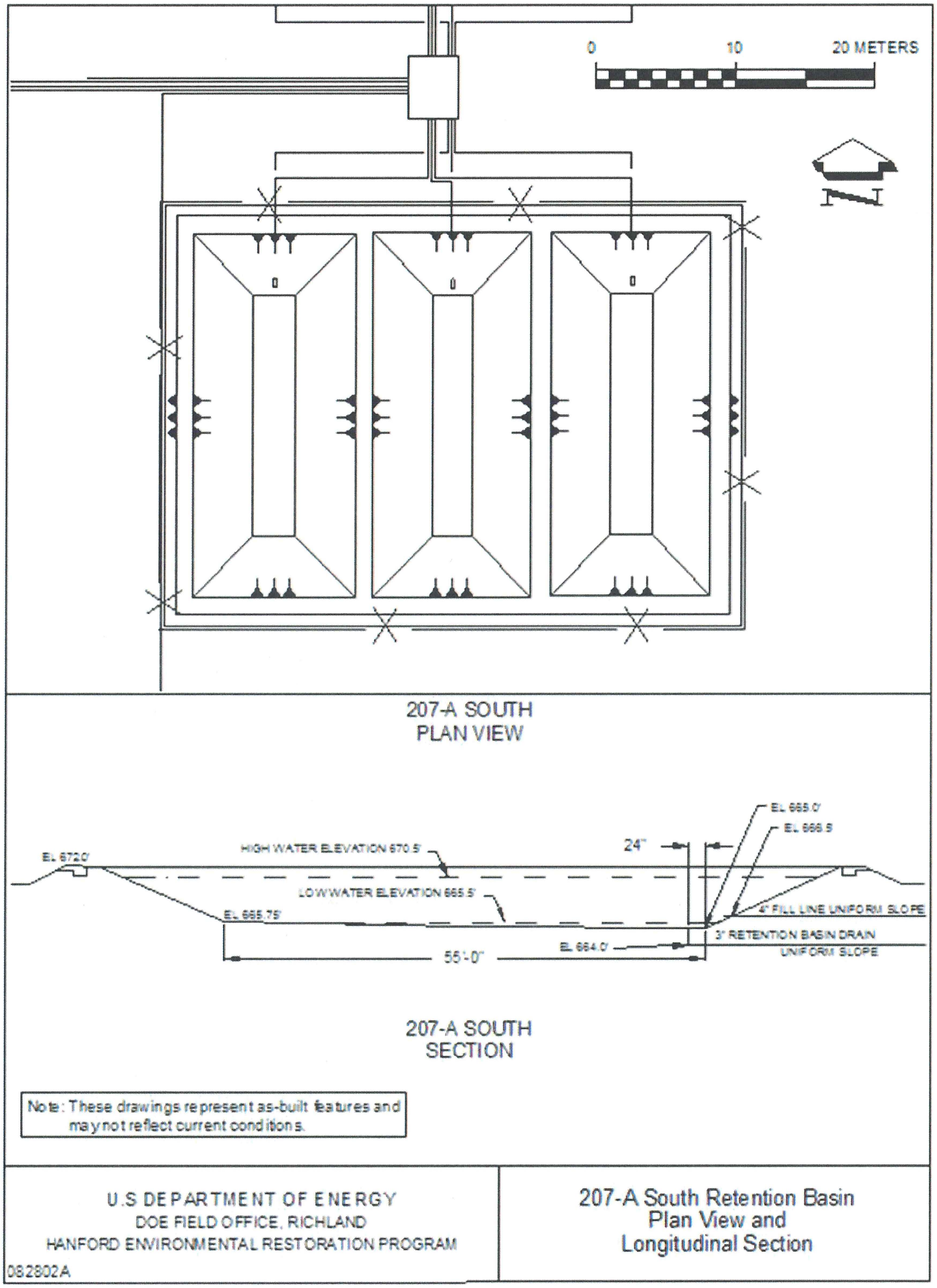

Figure 3. Simplified Diagram of the 207-A South Retention Basin

1.3 Waste Inventory and Characteristics

The 207-A South Retention Basin operated from 1977 to 1989. The total quantity of process condensate waste onsite at any one time was limited to the combined design capacity of the storage cells of approximately 794,937 L (210,000 gal). The total volume of liquid effluent the TSD unit received for intermediate storage was 377,000,000 L (99,590,000 gal) of evaporator condensate (DOE/RL-98-28, *200 Areas Remedial Investigation/Feasibility Study Implementation Plan – Environmental Restoration Program*).

The process condensate is an aqueous, mixed waste solution containing trace amounts of dissolved cations and anions, such as sodium, potassium, aluminum, hydroxides, nitrates, and nitrites with radionuclides (WHC-EP-0342, Addendum 15, *242-A Evaporator Process Condensate Stream-Specific Report*). The 242-A Evaporator process condensate was designated as mixed waste (WAC 173-303-040, "Definitions") because the waste was derived from a waste containing spent halogenated and nonhalogenated solvents (WAC 173-303, dangerous waste codes F001, F002, F003, F004, and F005) and because of the toxicity of ammonia (WT02, state-only, toxic, dangerous waste). The TSD unit's constituents associated with these dangerous waste codes include ammonia, acetone, *m*-cresol, *o*-cresol, *p*-cresol, and methylene chloride.

1.4 Security Information

The 207-A South Retention Basin is located in the 200 East Area and, therefore, security information pertaining to the 200 Areas applies to this TSD unit. A single-link chain fence surrounds the 207-A South Retention Basin. Changes to security are expected to occur during the course of 200 East Area deactivation and decommissioning activities. Security measures will remain in place that limit unit entry to authorized personnel and that preclude unknowing access by unauthorized individuals until closure of the TSD unit.

2 Groundwater Monitoring

Normally, a surface impoundment and regulated unit under the definitions of WAC 173-303-040, if it were still operating, would require RCRA groundwater monitoring under the current interim status groundwater requirements of WAC 173-303-400(3)(a) through (3)(c), "Interim Status Facility Standards," "Standards." However, a certified waiver of groundwater monitoring requirements in accordance with 40 CFR 265, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," Subpart F, "Ground-Water Monitoring," as referenced by WAC 173-303-400(3)(a), was developed and documented, demonstrating a low potential for migration of hazardous contaminants from this unit to groundwater (PNNL, 2005, *Basis for Waiver of Groundwater Monitoring Requirements for 207-A South Retention Basin*). This waiver and demonstration are consistent with the basin having remained intact during operations, thereby preventing liquid from entering the soil, and with soil sample results indicating that vadose zone contamination does not exist above levels protective of groundwater.

If clean closure is not achieved, then a post-closure groundwater monitoring plan will be prepared and submitted as a section of the post-closure plan. The post-closure groundwater monitoring plan will be submitted, as required, by a permit condition in the Hanford Facility RCRA Permit, Part V, Closure Units for this TSD unit.

3 Closure Performance Standards

The standards for closure of this TSD unit are in accordance with the requirements of the Tri-Party Agreement (TPA) Action Plan (Ecology et al. 1989b, *Hanford Federal Facility Agreement and Consent*

Order Action Plan), Section 5.3, directing that Hanford Site interim status TSD unit closures meet cleanup requirements established in accordance with WAC 173-303-610. As required by the TPA Action Plan (Ecology et al. 1989b), Section 6.3.1, clean closure must demonstrate that TSD unit operations did not adversely affect soil. The closure performance standards of' WAC 173-303-610(2)(a)(i) through (iii) require the owner or operator of a TSD facility to close the facility in a manner that will accomplish the following objectives:

1. Minimize the need for further maintenance.
2. Control, minimize, or eliminate post-closure escape of dangerous waste, dangerous waste constituents, leachate, contaminated runoff, or dangerous waste decomposition products to the ground, surface water, groundwater, or atmosphere to the extent necessary to protect human health and the environment (HHE).
3. Return the land to the appearance and use of surrounding land areas.

WAC 173-303-610(2)(b)(i) requires that for clean closure of soil, that" the numeric cleanup levels calculated using the unrestricted use exposure assumptions according to WAC 173-340, "Model Toxics Control Act—Cleanup," hereinafter called MTCA, cleanup regulations. For this closure, the numerical cleanup levels for soil concentrations protective of human health, WAC 173-340-740, the associated requirements for soil concentration protective of groundwater, WAC 173-340-747, and for soil concentration protective of ecology, WAC 173-340-7490 will be used. These cleanup levels are contained in Table 4 in the shaded column (Closure Performance Standards).

According to WAC 173-303-610(2)(b)(ii), all structures, equipment, basins, and lines clean closure standards will be determined by the department on a case-by-case basis in accordance with the closure performance standards of WAC 173-303-610(2)(a)(ii) and in a manner that minimizes or eliminates post-closure escape of dangerous water.

Clean closure will eliminate the need for future post-closure inspections, monitoring, and maintenance resulting from contamination from TSD unit constituents. After clean closure, appearance of the land will be consistent with future land-use determinations for adjacent portions of the 200 Areas as an industrial-exclusive portion of the Hanford Site. This land use is consistent with the formal determination made for this portion of the 200 Area as described in 64 FR 61615, "Record of Decision: Hanford Comprehensive Land-Use Plan Environmental Impact Statement (HCP EIS)."

4 Closure Strategy

The proposed clean closure determination for 207-A South Retention Basin is partially based on review of the operational history, operating records, waste management records, and a visual inspection of the basin area. The basins have not been operated since 1989. Since that time routine surveillance inspections have been performed. Wind-blown debris, such as tumbleweeds, is removed on a periodic basis from the basin storage cells. Rainfall and snowmelt accumulate in the basin storage cells and evaporate. After nearly 40 years since construction, signs of unused, small portions of the Hypalon® liner have been exposed and the small areas of the elastomeric coating have degraded.

Based on these reviews, 207-A South Retention Basin is a candidate for clean closure under WAC 173-303, and verification sampling will be performed. Sampling and analysis activities were developed using the results of the records review and visual inspection (EPA/240/R-02/005, *Guidance on Choosing a Sampling Design for Environmental Data Collection* [EPA QA/G-5S];

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Ecology Publication 94-111, *Guidance for Clean Closure of Dangerous Waste Units and Facilities*) and will be conducted via a sampling and analysis plan (SAP) (Section 6.1). The objective of the sampling described in this document is to determine if MTCA unrestricted use standards for soil will be met after basin removal demonstrating clean closure of the soil underneath the basins.

4.1 Previous Closure Activities

To preclude any further influent to the unit, and in support of TSD unit closure, the basin was physically isolated from receipt of 242-A Evaporator process condensate effluent in 1989. Operations at the 242-A Evaporator were halted in 1989 to begin facility upgrades to allow waste to be transferred to the Liquid Effluent Retention Facility basins for storage and treatment at the 200 Areas Effluent Treatment Facility

The 207-A South Retention Basin TSD unit, as well as other waste sites and TSD units, were included as part of the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* remedial investigation (RI) for 200-PW-2/4 Operable Unit (OU). Characterization activities comprising borehole drilling, geophysical logging, field screening, and sampling and analysis of concrete cores and borehole soils were performed in 2003 and 2004. In total, 29 soil samples and 9 concrete samples were collected for analysis from the 3 concrete basin storage cells. These activities were performed to identify the nature and extent of any chemical and radiological contamination in vadose zone soil underlying the basin, in support of OU remedial decision making and RCRA TSD unit closure. The RI was conducted in accordance with the SAP (Appendix B of DOE/RL-2000-60, *Uranium-Rich/General Process Condensate and Process Waste Group Operable Units RI/FS Work Plan and RCRA TSD Unit Sampling Plan Includes: 200-PW-2 and 200-PW-4 Operable Units*). Data collected from the basin storage cells are presented in the RI report (DOE/RL-2004-25, *Remedial Investigation Report for the 200-PW-2 Uranium-Rich Process Waste Group and the 200-PW-4 General Process Condensate Group Operable Units*, Appendix B and Section 7.2.2.2). Work plan sampling and analysis requirements for TSD unit characterization were determined through a data quality objectives process documented in CP-14176, *Remedial Investigation Data Quality Objectives Summary Report for the 200-PW-4 Operable Unit.* A data review supports the decision to clean close the TSD unit by removal of the basin storage cells.

4.2 Clean Closure Strategy

207-A South Retention Basin will be clean closed by removing the basin storage cells and up to 1 m (3 ft) of soil, which will meet the requirements of WAC 173-303-610(2)(b)(ii). In accordance with WAC 173-303-610(2)(b)(i), the clean closure levels for soil will be the numeric cleanup levels calculated using unrestricted use exposure assumptions according to MTCA. These numeric cleanup levels will be developed using the MTCA Method B unrestricted use standards current at the time of closure as of the effective date of the closure plan approval. These cleanup levels consider carcinogens, noncarcinogens, groundwater protection, and ecological indicator values and are contained in Table 4.

Sampling and analysis will be performed to verify clean closure for the soil (Chapter 6, "Soil Verification Sampling and Analysis"). Both random and focused sampling strategy will be used. Focused sampling will entail choosing sampling location based where concrete joints are located and where cracks in the coating warrant sampling. Should sampling and analysis of the 207-A South Retention Basin indicate contamination above the MTCA Method B unrestricted use standards, a post-closure plan will be submitted, as required by a permit condition to be included in the Hanford Facility RCRA Permit.

For closure strategy purposes, the null hypothesis will be used to support the basis for clean closure. A null hypothesis is generally assumed true until evidence indicates otherwise. The null hypothesis, as defined in MTCA (WAC 173-340-200, "Definitions) for the TSD unit, is that the soil is assumed to be above unrestricted use cleanup levels, commonly called MTCA Method B cleanup levels. Therefore, the closure site is presumed to be contaminated (i.e., there has been release from the unit). Rejection of the null hypothesis means sampling and analysis results of the closure site indicated the soil contains contamination levels below the MTCA Method B cleanup levels. Sampling and analysis will be used to determine whether the null hypothesis can be rejected, thereby confirming the underlying soil meets the closure performance standards.

5 Closure Activities

Clean closure of the 207-A South Retention Basin will include the following activities:

- Basin demolition and disposal (Section 5.1)
- Waste management (Section 5.2)
- Air emission controls (Section 5.3)
- Health and safety (Section 5.4)
- Cultural and ecological (Section 5.5)
- Soil verification sampling and analysis (Chapter 6)

5.1 Basin Demolition and Disposal

Demolition of the 207-A South Retention Basin will include removal of the basin storage cells. The majority of the demolition will require the use of heavy equipment (e.g., excavator with various attachments) to demolish the structure. Other standard industry or conventional demolition practices also may be used (e.g., hydraulic shears with steel shear jaws, concrete pulverizer jaws, or breaker jaws). Selection of demolition methods will be based on the structural elements to be demolished, remaining contamination, location, and integrity of the structure. Water may be used to control dust generated from demolition activities. The amount of water used will be minimized to prevent ponding and runoff. While unlikely, other controls such as portable ventilation filter units, HEPA-filtered vacuum cleaners, greenhouses, and/or fogging agents may be used. Additional storm water run-on and run-off controls may be implemented, as needed. The following demolition activities presume that the waste will be disposed in the Hanford Environmental Restoration Disposal Facility (ERDF), as discussed in Section 5.2. If for some reason the waste is not disposed of at ERDF, then waste will disposed of at a RCRA TSD unit authorized for disposal such as Trenches 31 and 34 in the 218-W-5 Burial Grounds.

5.1.1 Mobilization and Site Preparation

Demolition mobilization and site preparation include the activities necessary for field setup and closure action implementation. This includes obtaining field crew resources, equipment, materials, and performing field job site activities (e.g., site assessments and map development, providing worker support infrastructure, waste management areas, and other site preparation as required). Global positioning system (GPS) coordinates will be taken to ensure that after removal of the basin storage cells, the grid for the verification sampling may be laid out (Chapter 6). Other prework tasks may include installing barriers and postings, site walk downs, completion of pre-demolition reviews, and equipment testing.

5.1.2 Basin Walls Demolition

The basin walls will be rubblized. The demolition will occur most likely from north to south, removing concrete debris accordingly with no set pattern or amount removed. The rubblized debris from the walls, debris boxes, and engineered fill material from the basin will be loaded into ERDF cans (roll-on/roll-off containers) for disposal at ERDF. While no liquid is expected to be in the basin prior to demolition, if present the liquid will be removed, containerized, and shipped for disposal to a permitted unit.

5.1.2.1 Miscellaneous Piping and Soil

Piping runs that supported operations in the basin storage cells will be removed as necessary to access the basin walls and provide side sloping. The soil around the basin storage cells will be placed in ERDF containers and staged at <90-day accumulation areas. If soil is placed outside prior to loading, the soil will be sprayed with fixatives to eliminate wind blowing the soil. Any contaminated piping will have a fixative applied inside, as needed, prior to closure or demolition.

5.1.3 Basin Floors

The basin floors will be rubblized. Front-end loaders and excavators will load the rubble and remaining engineered fill material into ERDF cans. Based on the basin footprint of 40 m (130 ft) long, 27.7 m (91 ft) wide, and 2.1 m (7 ft) deep, the final excavation footprint will be approximately 42.6 m (140 ft) long, 30.8 m (101 ft) wide, and 3 m (10 ft) deep. Additional soil removal may be performed underneath the basin floors if deemed necessary to meet clean closure standards.

5.1.4 Decontamination

Decontamination of the basin storage cells is not planned based on previous operational history and concrete sampling results.

5.1.5 Stabilization

Upon completion of closure activities at the 207-A South Retention Basin, the site will be stabilized in a manner that will mitigate potential industrial safety hazards and not unduly hinder future remediation in the immediate vicinity, should it be necessary.

5.1.6 Completion Criteria

The demolition is considered complete after all waste debris has been removed to a nominal 1 m (3 ft) below the basin floor, piping in the excavation footprint has been removed, all waste generated during demolition is dispositioned, the bottom of the excavation is sampled, and results documented. When the sample results verify the soil meets the cleanup criteria, the basin will be backfilled and revegetated.

5.2 Waste Management

A variety of waste streams may be generated under this closure action and will be in solid form. Some of the waste may be determined to be potentially dangerous or mixed waste. The generator and storage requirements of WAC 173-303-200, "Accumulating Dangerous Waste On-Site," will be followed.

Wastes generated through implementation of this closure action will be disposed at ERDF or an approved RCRA TSD unit. ERDF is the preferred waste disposal facility. Waste is expected to meet the waste acceptance criteria (WCH-191, *Environmental Restoration Disposal Facility Waste Acceptance Criteria*) as is. Waste volume reduction practices, such as minimizing cross-contamination during the remedial action or segregation of clean materials from contaminated materials, will be implemented where feasible.

Waste management activities include waste characterization, designation, staging, packaging, handling, marking, labeling, segregation, storage, transportation, treatment, and disposal and are briefly described in the following subsections.

5.2.1 Projected Waste Streams

One or all of the following solid waste streams are anticipated to be generated during the closure and may fall into any combination of these categories: nondangerous/nonradioactive, radioactive, mixed, hazardous, dangerous, suspect radioactive, suspect dangerous, and suspect mixed:

- Concrete and associated debris
- Soils
- Miscellaneous waste (e.g., rubber, glass, paper, personal protective equipment, cloth, plastic, and metal)
- Equipment and construction materials

5.2.1.1 Hazardous/Dangerous Waste, Low-Level Waste, and Mixed Waste Management

These wastes will be packaged, stored, and transported to prevent dispersion and public exposure. Waste specific storage and packaging requirements will comply with WAC 173-303 requirements, as applicable.

5.2.1.2 Solid Waste Management

Solid waste, such as personal protection equipment, step-off pad waste, will be managed as appropriate for the nonradiological and radiological contaminants present or suspected to be present, if any. Miscellaneous solid waste that has contacted suspect dangerous or suspect mixed waste will be treated as such. Field screening will be used to segregate radioactive waste from no radiation added (nonradioactive) waste. Container(s) will be properly marked and labeled. The containers will be segregated as appropriate, and then staged at the U.S. Department of Energy (DOE) designated waste container storage area. Miscellaneous solid waste will be dispositioned based on waste characterization information.

5.2.2 Waste Management and Characterization

Dangerous and mixed wastes will be packaged, stored, and transported to prevent dispersion and public exposure. Waste specific storage and packaging requirements will comply with WAC 173-303 requirements, as applicable. Miscellaneous solid waste will be managed as appropriate for the nonradiological and radiological contaminants present or suspected to be present, if any. Miscellaneous solid waste that has contacted suspect dangerous or suspect mixed waste will be treated as such. Field screening will be used to segregate radioactive waste from no radiation added (nonradioactive) waste. Container(s) will be properly marked and labeled. The containers will be segregated, as appropriate, and then staged at the DOE-designated waste container storage area. Miscellaneous solid waste will be dispositioned based on waste characterization information.

Waste generated through implementation of this closure action will be characterized in accordance with the waste acceptance criteria of the receiving facility. Characterization is performed using a variety of information that includes, but is not limited to, process knowledge, historical analytical data, sampling and analysis, and radiological and chemical screening.

Waste characterization information for managing the demolition waste as dangerous/mixed waste based on the historical information on basin operations, the Part A form, and previous characterization information.

5.2.3 Waste Handling, Storage, and Packaging

Marking, labeling, segregating, and staging of waste containers will be performed or directed by the waste specialist. If waste containers cannot be shipped directly to the disposal site, wastes may be stored at Hanford TSD units that are permitted to operate as container storage areas until disposal. Dangerous/mixed waste may also be accumulated in accordance with the generator requirements of WAC 173-303-200.

5.2.3.1 Management of Bulk Waste

The preferred management of the basin storage cells is a bulk form. Bulk waste will be placed ERDF cans for eventual disposal at ERDF or other approved RCRA TSD units. These bulk containers will be stored/staged in a suitable area adjacent to the 207-A South Retention Basin or may be staged for up to

90 days in another suitable location. Bulk containers will be covered when waste is not being added or removed. Lightweight material (e.g., plastic and paper) will be bagged, if appropriate, prior to placement in the bulk container, to eliminate the potential for materials blowing out of the bulk container or truck. Applicable packaging and pre-transportation requirements for dangerous or mixed waste generated by the closure action will be identified and implemented before movement of waste.

Additionally, a fixative will be applied to the demolition site and any loose soil as needed, to help control dust and radiological and nonradiological contaminants.

5.2.3.2 Management of Waste Containers

While not expected, nonbulk waste may be generated and placed in a container, usually a 55 gal drum. Nonbulk containers or packages of waste requiring tracking (e.g., hazardous and mixed) will be assigned a unique tracking number by a waste specialist. If a container is in poor condition, the contents will be transferred to a container in good condition.

Waste containers are inspected before use to ensure container integrity. The containers will be stored/ staged in a suitable area adjacent to the 207-A South Retention Basin or may be staged for up to 90 days another suitable Hanford site location. Containers awaiting analytical results will be marked and labeled, as appropriate. Weekly inspections of the containers will be performed to document the integrity, container marking/ labeling, physical container placement, storage area boundaries/ identification/ warning signs, and signs of any potential leakage. Containers showing signs of deterioration will be identified during container inspection and overpacked or repackaged, as necessary.

Waste packages will remain closed, except during packaging and waste inspection activities, once they are staged.

5.2.3.3 Waste Profile

Waste profiling for establishing values for the waste-tracking form may take place concurrently with closure action activities. Field-screening measurements may be used to obtain data to adjust the waste-tracking form. The waste profile may be adjusted (as necessary) through a combination of in-process field-screening methods and analytical laboratory analysis.

5.2.3.4 Final Waste Disposal

Dangerous, mixed, and radioactive waste generated through implementation of the closure action will be dispositioned at the Hanford Site ERDF. ERDF is the preferred disposal location for waste meeting ERDF waste acceptance criteria, as it is engineered to meet appropriate RCRA technological requirements for landfills as described in the ERDF record of decision (EPA, 1995, *Record of Decision, U.S. DOE Hanford Environmental Restoration Disposal Facility, Hanford Site, Benton County, Washington*).

5.2.3.5 Waste Disposal Records

Original Onsite Waste Tracking Forms will be sent to ERDF with each container shipped. Original sample reports and a copy of the Original Onsite Waste Tracking Form for each ERDF container will be retained and forwarded to the assigned waste specialist for inclusion in the project file following final waste disposition.

5.2.4 Waste Treatment

Typical treatment of waste from demolition activities (e.g., grouting, macroencapsulation, solidification, separation, size reduction, and/or repackaging) is not expected to be needed, based on available information. If treatment is deemed necessary to provide safe transport, meet waste disposal facility waste acceptance criteria, and/or address land disposal restriction requirements, such treatment may be conducted at the generating site, ERDF Residuals from treatment of waste originating from activities addressed in this closure plan can be disposed at ERDF, providing the treatment residuals meet ERDF waste acceptance criteria.

5.2.5 Waste Minimization and Recycling

Waste minimization practices will be followed to the extent technically and economically feasible during waste management. Introduction of clean materials into a contamination area, as well as contamination of clean materials, will be minimized to the extent practicable. Emphasis will be placed on source reduction to eliminate or minimize the volume of waste generated. Materials released offsite for disposal/recycle must be certified.

5.3 Air Emissions

There is no expectation that substantial emissions of criteria and toxic air pollutants will result from demolition activities. No bulk processing chemicals are known to be present in the facility. Relatively small amounts of radiological contaminant fixing agents could be introduced into the facility to support deactivation. These are commercially available products that are used throughout the Hanford Site on a daily basis.

Reasonable precautions will be taken to minimize visible dust emissions from active structural demolition with standard emission control techniques. Active excavations shall use water or crusting agents (e.g., Soil-Sement®) as approved for dust control. Water usage for dust control will be minimized to protect against contaminant migration. Crusting agents or fixatives will be applied to any disturbed portion of the contamination area that will be inactive for more than 24 hours. Material to be disposed at ERDF will also comply with the moisture content and other applicable requirements of the ERDF waste acceptance criteria (WCH-191). Dust fixative is applied to the demolition and excavation site when potential concerns arise about health issues or the spread of contamination.

Airborne emissions associated with these closure activities will be minimized by the use of appropriate work controls. Airborne releases of contaminants during these closure activities will be controlled in accordance with DOE radiation control and substantive air pollution control standards in order to maintain emissions of air pollutants at the Hanford Site to as low as reasonably achievable levels.

Minimal operations associated with greater than 100°C (212°F) deactivation methods (e.g., welding, laser cutting) will be expected. The applicability of WAC 173-400-110 ("General Regulations for Air Pollution Sources," "New Source Review (NSR) for Sources and Portable Sources") and WAC 173-460 ("Controls for New Sources of Toxic Air Pollutants") was evaluated. The proposed activity does not meet the definitions of establishment of a new source (under WAC 173-400-030, "Definitions") or modification (WAC 173-400-030(44)); therefore, the new source review requirements of WAC 173-400-100 are not applicable. WAC 173-460 is not an applicable chapter because these activities do not meet definitions of new toxic air pollutant source.

5.4 Health and Safety Requirements

Closure will be performed in a manner to ensure the safety of personnel and the surrounding environment. Qualified personnel will perform any necessary closure activities in compliance with established safety and environmental procedures. Personnel will be equipped with appropriate personal protective equipment. Qualified personnel will be trained in applicable safety and environmental procedures and

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have appropriate training and experience in sampling activities. Field operations will be performed in accordance with applicable health and safety requirements. If an emergency would occur, the on-call Building Emergency Director will be notified, and the requirements associated with DOE/RL-94-02, *Hanford Emergency Response Plan*, will be implemented.

The Permittees have instituted training or qualification programs to meet training requirements imposed by regulations, DOE orders, and national standards such as those published by the American National Standards Institute/American Society of Mechanical Engineers. For example, the environmental, safety, and health training program provides workers with the knowledge and skills necessary to execute assigned duties safely. Field personnel typically have completed the following training before starting work:

- Occupational Safety and Health Administration 40-Hour Hazardous Waste Worker Training
- 8-Hour Hazardous Waste Worker Refresher Training (as required)
- Hanford General Employee Training

Project-specific safety training addressed explicitly to the project and the day's activity will include the following:

- Training will provide the knowledge and skills needed for sampling personnel to perform work safely and in accordance with quality assurance (QA) requirements.
- Samplers are required to be qualified in the type of sampling being performed in the field.

Pre-job briefings will be performed to evaluate activities and associated hazards by considering the following factors:

- Objective of the activities
- Individual tasks to be performed
- Hazards associated with the planned tasks
- Environment in which the job will be performed
- Facility where the job will be performed
- Equipment and material required
- Safety protocols applicable to the job
- Training requirements for individuals assigned to perform the work
- Level of management control
- Proximity of emergency contacts

Training records are maintained for each employee in an electronic training record database. The Permittees training organization maintains the training records system.

5.5 Cultural and Ecological Resources

Cultural and ecological resource reviews are performed in support of the closure action activities to identify any potential impacts. The cultural and ecological resource reviews are conducted in accordance with DOE requirements. If potential impacts are discovered by these reviews, an appropriate mitigation action plan will be developed and implemented.

A State Environmental Policy Act (SEPA) (RCW 43.21C, "State Environmental Policy") checklist will be prepared. SEPA (RCW 43.21C) requires the environmental effects of a proposal before decisions are made by Ecology. The purpose of this checklist is to provide information to help identify impacts for the action, in this case closure of the basin, and to reduce or avoid impacts from this action.

6 Soil Verification Sampling and Analysis

Sampling and analysis of the soil will be conducted to confirm that clean closure levels in the soil have been achieved. The SAP summarizes the sampling design used and associated assumptions based on the knowledge of the 207-A South Retention Basin. The sampling design includes input parameters used to determine the number and location of samples.

6.1 Closure Sampling and Analysis Plan

All sampling and analysis will be performed in accordance with the sampling and quality standards established in this closure SAP. The closure SAP details sampling and analysis procedures in accordance with SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update IV-B*; the American Society for Testing and Materials (ASTM) *Annual Book of ASTM Standards*; and applicable U.S. Environmental Protection Agency (EPA) guidance. Sampling and analysis activities will meet applicable requirements of SW-846, ASTM standards, EPA-approved methods, and DOE/RL-96-68, *Hanford Analytical Services Quality Assurance Requirements Document* (HASQARD). This SAP was also developed using Ecology Publication 94-111, Section 7.0, "Sampling and Analysis for Clean Closure," and EPA/240/R-02/005 (EPA QA/G-5S).

6.1.1 Target Analytes

The Part A Form and effluent records for discharges to the basin storage cells were reviewed. This information identified the federal and state waste codes of the liquid effluent discharged to the basin storage cells. The identified waste codes were the basis for the list of target analytes for analysis in this SAP. Table 1 details the waste codes listed for the basin storage cells and the target analyte associated with that waste code.

6.1.2 Verification Sampling Schedule

Verification closure sampling and analysis will be performed in accordance with the closure plan schedule in Chapter 8, "Schedule for Closure."

6.1.3 Project Management

The Permittees are responsible for planning, coordinating, sampling, preparing, packaging, and shipping samples to the laboratory

6.2 Sampling Design

The objective of sampling the soil underneath the basin storage cells is to obtain analytical data to confirm that the soil does not have contaminants that exceed the MTCA Method B clean closure performance standards.

This SAP used Ecology Publication 94-111, Section 7.0, "Sampling and Analysis for Clean Closure," to determine the type of sampling design that will be used to demonstrate clean closure. When designing the sampling plan, both focused and area-wide (grid) sampling methods were considered. Ecology Publication 94-111, Section 7.2.1, identifies area-wide sampling as appropriate when the spatial distribution of contamination at or from the closure unit is uncertain. Ecology Publication 94-111, Section 7.3, "Sampling to Determine or Confirm Clean Closure," identifies the area-wide sampling approach as generally appropriate for sampling to determine or confirm that clean closure levels are achieved. Focused sampling, as identified in Section 7.2.2 of Ecology Publication 94-111, is selective sampling of areas where contamination is expected or releases have been documented. Based on the records review and visual inspection performed for the basin storage cells, both the area-wide sampling approach and focused sampling of concrete seams at the wall and floor joints were determined appropriate for verification of clean closure.

Table 1. Target Analyte List

Target Analyte (Waste Code)	CAS Number
m-Cresol (F004)	108-39-4
p-Cresol (F004)	106-44-5
o-Cresol (F004)	95-48-7
Acetone (F003) (U002)	67-64-1
Methylene Chloride (F001) (F002)	75-09-2

CAS = Chemical Abstracts Service

Area-Wide (Grid) Sampling. In grid sampling, samples are collected at regularly spaced intervals over space or time. An initial location or time is chosen at random, and the remaining sampling locations are defined so that locations are at regular intervals over an area (grid). Grid sampling is used to search for hot spots and to infer means, percentiles, or other parameters. It is useful for estimating spatial patterns or trends over time. This design provides a practical method for designating sample locations and ensures uniform coverage of a site, unit, or process.

Focused Sampling. Focused sampling involves selective sampling of areas where contamination is expected or releases have been documented. Focused sampling should be conducted in addition to grid sampling where there is evidence of leaks or spins or potential for a dangerous waste constituent to migrate. Focused sampling could involve linear sampling along a drainage way, boundary, or other linear dimension.

The quantity and location of the area-wide samples was determined using the Visual Sample Plan (VSP) software. VSP, a tool used throughout Washington State and nationally, statistically determines the quantity of samples required to accept or reject the null hypothesis based on input parameters specific to the 207-A South Retention Basin.

Both parametric and nonparametric equations rely on assumptions about the data population. Typically, however, nonparametric equations require fewer assumptions and allow for more uncertainty about the distribution of data. Alternatively, if the parametric assumptions are valid, the required number of samples is usually less than if a nonparametric equation were used. For soils underneath the basin cells, the data assumptions were largely based on information obtained from a grouping of similar waste sites with the same type of constituents. The parameters from the 200-MG-1 waste sites were approved by Ecology in the SAP (DOE/RL-2009-60, *Sampling and Analysis Plan for Selected 200-MG-1 Operable Unit Waste Sites*), evaluated, deemed appropriate, and used for the input parameters for soil. The VSP parameter inputs and the basis for those inputs are detailed in Table 2.

The decision rule for demonstrating compliance with the MTCA Method B clean closure level has three parts:

- The upper percent confidence limit on the true data mean must be less than the MTCA Method B clean closure level
- No sample concentration can be more than twice the cleanup level

- Less than 10 percent of the samples can exceed the cleanup level

Using a nonparametric test and the input parameters identified in Table 2, VSP calculated a minimum of 20 samples is required to reject the null hypotheses with 95 percent confidence and ensure that soil would not be mistakenly released as clean. For using the VSP software, the null hypothesis is to compare a site mean to a fixed threshold. Data will be evaluated to ensure that less than 10 percent of the individual values do not exceed the MTCA Method B clean closure performance standards and that no values are more than twice the cleanup level.

Sample locations were determined using the area-wide grid with a random start sampling method run in the VSP software. Statistical analyses of systematically collected data are valid if a random start to the grid is used. The 207-A South Retention Basin anticipated sampling area dimensions were entered into VSP to determine the locations of samples. The triangular grid sampling layout was determined to have an even distribution over the entire soil sampling area, providing the most representative data set. The choice of a triangular grid sampling layout required one additional sample location in order to complete the grid over the sample area, resulting in 20 samples. The 20 samples will be taken from the node locations indicated by the VSP software (Appendix A) and will be assigned sample location identifications and sample numbers using the Hanford Environmental Information System (HEIS). The southeast corner of the basin excavation is considered the (0,0) point of the sampling location map in Appendix A.

The first node location was chosen at random by the VSP software, and the subsequent 19 sample locations were assigned by the VSP software using a triangular grid sampling layout. Supporting documentation and the sampling grid map automatically generated by the VSP software are provided in Appendix A.

For focused sampling at the concrete expansion joints in the basin floors, professional judgment was used to determine the number of sample locations. VSP did not include the focus sampling locations because they are biased and would skew the randomness of the VSP locations. Three sample locations for each basin storage cell floor were determined to be sufficient to support the overall sampling approach. In addition, any discoloration or staining of concrete will be examined to determine if a focused sampling location is warranted. GPS coordinates will be taken to determine the locations of these sample sites in the expansion joints. Once the basins are removed, these locations will be sampled in conjunction with the VSP sample locations.

6.2.1 Sampling Methods and Handling

The grab sample matrix will consist of soil collected in pre-cleaned sample containers taken at a depth of 0 to 15.24 cm (0 to 6 in.) below ground surface. Subsurface sampling (sampling up to 4.6 m [15 ft] below surface) was evaluated. However, based on the results of the records review and no identified dangerous waste releases, subsurface sampling is deemed unnecessary. For the purpose of this SAP, soil surface is defined as the exposed surface layer once the basin storage cells have been removed.

Once the soil is sampled, the sampled media will be screened to remove material larger than approximately 2 mm (0.08 in.) in diameter. Removal of material larger than approximately 2 mm (0.08 in.) in diameter will allow for a larger surface area to volume ratio and be more likely to identify any potential contamination in the sample. Grab samples will be collected into containers at the chosen node sample locations. To ensure sample and data usability, sampling will be performed in accordance with established sampling practices, procedures, and requirements pertaining to sample collection, collection equipment, and sample handling.

Table 2. Visual Sample Plan Parameter Inputs

Parameter	Value	Basis
Primary Objective of the Sampling Design	Compare a site mean or median to a fixed threshold	Reject the null hypothesis.
Type of Sampling Design	Nonparametric	Data are not assumed to be normally distributed.
Working Null Hypothesis	The mean value at the site exceeds the threshold (MTCA Method B closure performance standards).	The null hypothesis assumes that the site is contaminated, requiring the sampling and analysis to demonstrate through statistical analysis that the site is clean.
Area-Wide Grid Sampling Pattern	Triangular	A triangular pattern provided an even distribution of sample locations over the basin storage cells.
Standard deviation (S)	0.45	This is the assumed standard deviation value relative to a unit action level for the sampling area. The value of 0.45 is conservative, based on consideration of past verification sampling. MARSSIM suggests 0.30 as a starting point; however, 0.45 has been selected to be more conservative. (Number of samples calculated increases with higher standard deviation values relative to a unit action level.)
Delta (Δ)	0.40	This is the width of the gray region. It is a user-defined value relative to a unit action level. The value of 0.40 is a value that balances unnecessary remediation cost with sampling cost.
Alpha (α)	5%	This is the acceptable error of deciding a dirty site is clean when the true mean is equal to the Action Level. It is a maximum error rate since dirty sites with a true mean above the Action Level will be easier to detect. A value of 5% was chosen as a practical balance between health risks and sampling cost.
Beta (β)	20%	This is the acceptable error of deciding a clean site is dirty when the true mean is at the lower bound of the gray region. A value of 20% was chosen during the data quality objectives process as a practical balance between unnecessary remediation cost and sampling cost.
MARSSIM sampling overage	20%	MARSSIM suggests that the number of samples should be increased by at least 20% to account for missing or unusable data and uncertainty in the calculated value of *n*.

Reference: EPA 402-R-97-016, *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM).*

MTCA = "Model Toxics Control Act—Cleanup" (WAC 173-340)

Sample container, preservation, and holding time requirements are specified in Table 3 for soil samples. These requirements are in accordance with the analytical method specified. The final container type and volumes will be identified on the Sampling Authorization Form (SAF) and the chain-of-custody form.

Table 3. Sample Preservation, Container, and Holding Time for Soil Samples

Method	Analysis/Analytes	Preservation Requirement	Holding Time	Bottle Type	Minimum Sample Size
EPA 8260	Volatile Organic Analytes	Cool ~4°C	14 days	Glass	5 × 40 g
EPA 8270	Semivolatile Organic Compound	Cool ~4°C	14/40 days	Amber Glass	250 g
EPA 300.0	Anions	Cool ~4°C	48 hours/28 days	Glass/Plastic	120 g
EPA 9056A	Anions	None	48 hours/28 days	Glass/Plastic	250 g

Notes: For EPA Method 300.0, see EPA-600/4-79-020, *Methods for Chemical Analysis of Water and Wastes.*

For the four-digit EPA methods, see SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update IV-B.*

48 hours/28 days = 48 hours for nitrate, nitrite, and phosphate; others, 28 days

EPA = U.S. Environmental Protection Agency

To prevent potential contamination of the samples, care will be taken to use decontaminated equipment for each sampling activity.

Level I EPA pre-cleaned sample containers will be used for samples collected for chemical analysis. Container sizes may vary depending on laboratory-specific volumes/requirements for meeting analytical detection limits.

The sample location, depth, and corresponding HEIS numbers will be documented in the sampler's field logbook. A custody seal (e.g., evidence tape) will be affixed to each sample container and/or sample collection package in such a way as to indicate potential tampering.

Each sample container will be labeled with the following information on firmly affixed, water resistant labels:

- SAF and form number
- HEIS number
- Sample collection date and time
- Sampler identification
- Analysis required
- Preservation method (if applicable)

Sample records must include the following information:

- Analysis required
- Sample location
- Matrix (e.g., water or soil)

Sample custody will be maintained in accordance with existing Hanford Site protocols to ensure maintenance of sample integrity throughout the analytical process. Chain-of-custody protocols will be followed throughout sample collection, transfer, analysis, and disposal to ensure that sample integrity is maintained.

All waste (including unexpected waste) generated by sampling activities will be managed in accordance with applicable regulations.

6.2.2 Analytical Methods

All analyses and testing will be performed consistent with this closure plan, laboratory analytical procedures, and HASQARD (DOE/RL-96-68). The approved laboratory must achieve the lowest practical quantitation limits (PQLs) consistent with the selected analytical method to confirm clean closure levels. If a target analyte is detected at or above clean closure level but less than the PQL of the analytical method, Ecology will be notified and alternatives will be discussed to demonstrate clean closure levels.

Analytical methods and performance requirements associated with the target analytes are outlined in Table 4.

Table 4. Soil Analytical Performance Requirements

CAS Number	Analyte	Analytical Method	Closure Performance Standard[a] (mg/kg)		Practical Quantitation Limit (mg/kg)	Accuracy Req't (Percent Recovery)[b]	Precision Req't (Relative Percent Difference)[b]
			Carcinogen	Noncarcinogen			
108-39-4	*m*-cresol	SW-846 Method 8270	N/A	4000	0.66	±30	±30
95-48-7	*o*-cresol	SW-846 Method 8270	N/A	4000	0.33	±30	±30
106-44-5	*p*-cresol	SW-846 Method 8270	N/A	400	0.33	±30	±30
75-09-2	Methylene Chloride	SW-846 Method 8260	133	4,800	0.005	±30	±30
67-64-1	Acetone	SW-846 Method 8260	N/A	72,000	0.02	±30	±30

Source: *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update IV-B.*

a. Closure performance standards are the numeric cleanup levels calculated using unrestricted use exposure assumptions according to "Model Toxics Control Act—Cleanup" (MTCA) regulations (WAC 173-340-740, "Unrestricted Land Use Soil Cleanup Standards;" WAC 173-340-747, "Deriving Soil Concentrations for Groundwater Protection;" and WAC 173-340-7490, "Terrestrial Ecological Evaluation Procedures," through -7494, "Priority Contaminants of Ecological Concern"). These numeric cleanup levels will be calculated according to MTCA Method B (unrestricted use standards). Where both carcinogen and noncarcinogen performance standards are available, the lowest value will be used.

b. Accuracy criteria for associated batch matrix spike percent recoveries. Evaluation based on statistical control of laboratory control samples is also performed. Precision criteria for batch laboratory replicate matrix spike analyses or replicate sample analyses.

CAS = Chemical Abstracts Service

N/A = not applicable

6.2.3 Quality Control

Quality control (QC) procedures must be followed in the field and laboratory to ensure that reliable data are obtained. Field QC samples will be collected to evaluate the potential for cross-contamination and provide information pertinent to field sampling variability. Field QC will include the following samples:

- Collection of full trip blank
- Field transfer blank
- Equipment rinsate blank
- Field duplicate
- Field split samples

Laboratory QC samples estimate the precision and bias of the analytical data. Field and laboratory QC samples are summarized in Table 5.

Date verification, data validation, and data quality assessment will included both the primary samples and quality control samples.

Table 5. Project Quality Control Sampling Summary

Quality Control Sample Type	Frequency	Characteristics Evaluated
Field Quality Control		
Full Trip Blank	One per 20 samples per media sampled.	Contamination from containers or transportation
Equipment Rinsate Blank	As needed. If only disposable equipment is used, then an equipment blank is not required. Otherwise, one per 20 samples per media[a].	Adequacy of sampling equipment decontamination and contamination from nondedicated equipment
Field Duplicate	One per batch[h], 20 samples maximum of each media sampled (soil samples[b]).	Precision, including sampling and analytical variability
Field Split Sample	As needed. When needed, the minimum is one per analytical method, per media sampled, for analyses performed where detection limit and precision and accuracy criteria have been defined in the Performance Requirements tables.	Precision, including sampling, analytical, and interlaboratory
Laboratory Quality Control[h]		
Method Blanks	1 per batch[h]	Laboratory contamination
Lab Duplicates	[c]	Laboratory reproducibility and precision

Table 5. Project Quality Control Sampling Summary

Quality Control Sample Type	Frequency	Characteristics Evaluated
Matrix Spikes	[c]	Matrix effect/laboratory accuracy
Matrix Spike Duplicates	[c]	Laboratory reproducibility, accuracy, and precision
Surrogates	[c]	Recovery/yield
Tracers	[c]	Recovery/yield
Laboratory Control Samples	1 per batch[h]	Evaluate laboratory accuracy
Performance Evaluation Parameters[d]	Annual	Evaluate laboratory accuracy
Double-Blind Standards	Quarterly[e]	Evaluate laboratory accuracy
Audit/Assessment	Annually[f] or every 3 years[g]	Evaluate overall laboratory performance and operations

a. Whenever a new type of nondedicated equipment is used, an equipment blank shall be collected every time sampling occurs until it can be shown that less frequent collection of equipment blanks is adequate to monitor the decontamination procedure for the nondedicated equipment.

b. Soil grab samples are exempted from duplicate sampling.

c. As defined in the laboratory contract or quality assurance plan and/or analysis procedures.

d. Nationally recognized program, such as DOE Mixed Analyte Performance Evaluation Program or Environmental Resource Associates.

e. Soil matrix double-blind standards are submitted by request of Analytical Services.

f. DOE Quality Systems for Analytical Services requires annual audit of commercial laboratories.

g. DOE/RL-96-68, *Hanford Analytical Services Quality Assurance Requirements Document* (HASQARD), does not define a frequency for assessment of onsite laboratories. Three year evaluated supplier list requirement is typically applied.

h. Batching across projects is allowing for similar matrices.

DOE = U.S. Department of Energy

6.2.4 Data Verification

Analytical results will be received from the laboratory, loaded into a database (e.g., HEIS), and verified. Verification includes, but is not limited to, the following items:

- Amount of data requested matches the amount of data received (number of samples for requested methods of analytes).
- Procedures and methods used.
- Documentation/deliverables are complete.
- Hard copy and electronic versions of the data are identical.
- Data seem reasonable, based on analytical methodologies.

6.2.5 Data Validation and Assessment

Data validation is performed by a third party. The laboratory supplies contract laboratory program equivalent analytical data packages intended to support data validation by the third party. The laboratory submits data packages that are supported by QC test results and raw data.

Controls are in place to preserve the data sent to the validators and allow only additions to be made, not changes to the raw data.

The format and requirements for data validation activities are based upon the most current version of USEPA-540-R-08-01, *National Functional Guidelines for Superfund Organic Methods Data Review* (OSWER 9240.1-48), and USEPA-540-R-10-011, *National Functional Guidelines for Inorganic Superfund Data Review* (OSWER 9240.1-51). Five percent of the results will undergo Level C validation, as defined by the validation guidelines.

A data quality assessment will be performed using the guidance in EPA/240/B-06/002, *Data Quality Assessment: A Reviewer's Guide* (EPA QA/G-9R), and implementing the specific requirements in Sections 6.2.1 to 6.2.5.

6.2.6 Verification of VSP Input Parameters

Analytical data from VSP sampling will be entered back into the VSP software. If all the analytical data for a particular analyte are nondetect, verification of VSP input parameters is not required for that analyte. The VSP software uses the analytical data to determine if the user input parameters were estimated appropriately. Once analytical data are entered into the VSP software, VSP will calculate the true standard deviation and determine whether the null hypothesis can be rejected. If the calculated standard deviation is smaller than the estimated user input standard deviation, no additional sampling will be required. If the calculated standard deviation is larger than the estimated standard deviation, additional sampling may be required. Verification of the null hypothesis through VSP will determine if the mean value of the site analytical data supports rejection of the null hypothesis (Section 6.2).

6.2.7 Documents and Records

The Project Manager is responsible for ensuring that the current version of the SAP is being used and for providing any updates to field personnel. Version control is maintained by the administrative document control process. Changes to the SAP affecting the data needs will be submitted as a permit modification in accordance with WAC 173-303-610(3)(b) to DOE and the lead regulatory agency.

Logbooks are required for field activities. A logbook must be identified with a unique project name and number. The individual(s) responsible for logbooks will be identified in the front of the logbook and only authorized persons may make entries in logbooks. Logbooks will be signed by the field manager, supervisor, cognizant scientist/engineer, or other responsible individual. Logbooks will be permanently bound, waterproof, and ruled with sequentially numbered pages. Pages will not be removed from logbooks for any reason. Entries will be made in indelible ink. Corrections will be made by marking through the erroneous data with a single line, entering the correct data, and initialing and dating the changes.

The project manager is responsible for ensuring that a project file is properly maintained. The project file will contain the records or references to their storage locations. The following items will be included in the project file, as appropriate:

- Field logbooks or operational records
- Data forms
- GPS data

- Chain-of-custody forms
- Sample receipt records
- Inspection or assessment reports and corrective action reports
- Interim progress reports
- Final reports
- Laboratory data packages
- Verification and validation reports

The laboratory is responsible for maintaining, and having available upon request, the following items:

- Analytical logbook
- Raw data and QC sample records
- Standard reference material and/or proficiency test sample data
- Instrument calibration information

Records may be stored in either electronic or hard copy format. Documentation and records, regardless of medium or format, are controlled in accordance with internal work requirements and processes to ensure the accuracy and retrievability of stored records. Records required by the TPA (Ecology et al., 1989a, *Hanford Federal Facility Agreement and Consent Order*) will be managed in accordance with the requirements therein.

6.2.8 Revisions to the Sampling and Analysis Plan and Constituents to Be Analyzed

If changes to the SAP are necessary due to unexpected events during closure that will affect sampling, a revision to this SAP will be submitted no later than 30 days after the unexpected event as a permit modification as required in WAC 173-303-610(3)(b)(iii) and WAC 173-303-830, "Dangerous Waste Regulations," "Permit Changes."

7 Contingent Closure Plan

A contingent closure plan is not required at this time since the expected outcome is clean closure. If contaminated soil is identified as a result of clean closure verification sampling activities (i.e., samples indicate contamination above clean closure standards), the nature and extent of contamination will be evaluated. If further closure actions are determined that cannot be performed under this closure plan, a contingent post-closure plan will be developed. A permit condition to the Hanford RCRA Facility Permit will be added to the closure unit section to submit this plan.

8 Schedule for Closure

Table 6 describes the primary and secondary closure activities and the expected duration of activities. Basin removal, verification sampling, and analysis activities will be completed within 180 days after approval of the permit modification incorporating this closure plan. Should unexpected circumstances arise and an extension to the 180-day closure activity expiration date be deemed necessary, a Class 1 permit modification request will be submitted to Ecology for approval at least 30 days prior to the 180-day expiration date, in accordance with WAC 173-303-610(4)(c) and WAC 173-303-830, Appendix I. The extension request would also demonstrate that all steps to prevent threats to HHE, including compliance with all applicable permit requirements and criteria in WAC 173-303-610(4)(b)(i) or (ii), have been and will be taken.

Table 6. Closure Activity Description

Primary Activity	Secondary Activity	Expected Duration
Basin structure demolition and disposal • Demolish concrete structure • Rubblize concrete • Load rubble/debris into ERDF Cans • Transport to ERDF • Dispose of into ERDF	Verify sampling and analysis of soil for clean closure levels • Prepare sample grid • Take samples • Analyze samples • Validate data • Analyze data	180 days
Closure Activities Complete		
Prepare closure documentation and obtain Independent Qualified Registered Professional Engineer certification	Transmit closure certification to Ecology	60 days

ERDF = Environmental Restoration Disposal Facility

9 Certification of Closure

Within 60 days of completion of field activities for closure, Ecology will be notified that all closure plan activities required for this TSD unit have been met. In accordance with WAC 173-303-610(6), DOE will submit a certification of closure to the lead regulatory agency (Ecology). Both DOE and the co-operator identified on the current Part A Form will sign the certification of closure, and an Independent Qualified Registered Professional Engineer (IQRPE) will certify that the unit has been closed in accordance with the approved closure plan.

An IQRPE will be retained to provide certification of the closure, as required by WAC 173-303-610(6). The engineer will be responsible for observing field activities and reviewing documents associated with closure of 207-A South Retention Basin. At a minimum, field activities and documents reviewed would include the following:

- Review of the basin storage cells visual inspection
- Review of sampling procedures and results
- Observe and/or review of sampling activities
- Observe and/or review contaminated environmental debris removal (as applicable)
- Verify that locations of samples are as specified in the SAP

The engineer will record his or her observations and reviews in a written report that will be retained in the operating record. The resulting report will be used to develop the clean closure certification, which will then be provided to Ecology. Documentation supporting certification by the IQRPE will be placed in the Administrative Record.

Documentation supporting closure certification will be placed in the Administrative Record and will be provided to Ecology. At a minimum, the following documentation and information supporting closure certification will be included:

1. Field notes and photographs related to closure activities
2. Description of minor deviations from approved closure plan and their justifications
3. Documentation of removal and final disposition of all dangerous wastes and waste residues, including contaminated media, debris, and any treated residuals
4. Documentation that decontamination procedures were followed and decontamination standards achieved
5. All laboratory and/or field data, including sampling procedures and locations, QA/QC samples, chain-of-custody procedures, and required sample measurements
6. Final summary report from the IQRPE, itemizing all data reviewed and including analytical results used to determine a final closure status

10 Post-Closure Plan

The closure strategy is clean closure. If the conditions for verification described in Chapter 6 meet the closure performance standards, then a post-closure plan will not be needed. If clean closure is not achieved, then a post-closure plan will be provided, with a revised closure plan, within 180 days after the Permittees and Ecology agree that the plan is needed.

11 Amendment of Closure Plan

As required by WAC 173-303-610(3)(b), the closure plan will be amended if changes to closure activities require modification of the approved closure plan.

12 References

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Appendix A

Systematic Sampling Locations for Comparing a Median with a Fixed Threshold (Nonparametric - MARSSIM)

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Contents

Figures

Tables

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Terms

LBGR	lower bound of gray region
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
VSP	Visual Sample Plan

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A1 Summary

This report summarizes the sampling design used and associated statistical assumptions, as well as general guidelines for conducting post-sampling data analysis. Sampling plan components presented here include how many sampling locations to choose and where within the sampling area to collect those samples. The type of medium to sample (i.e., soil or groundwater) and how to analyze the samples (e.g., in situ or fixed laboratory) are addressed in other sections of the sampling plan.

Table A-1 summarizes the sampling design developed. Figure A-1 shows sampling locations in the field, and Table A-2 lists sampling location coordinates.

Table A-1. Summary of Sampling Design

Primary Objective of Design	Compare a site mean or median to a fixed threshold
Type of Sampling Design	Nonparametric
Sample Placement (Location) in the Field	Systematic with a random start location
Working (Null) Hypothesis	The median (mean) value at the site exceeds the threshold
Formula for Calculating Number of Sampling Locations	Sign test (MARSSIM version)
Calculated Total Number of Samples	20
Number of Samples on Map[a]	20
Number of Selected Sample Areas[b]	1
Specified Sampling Area[c]	1,313.6 m^2 (14,140.00 ft^2)
Size of Grid/Area of Grid Cell[d]	28.5722 m/707 m^2 (93.7 ft/7,610 ft^2)
Grid Pattern	Triangular

Reference: EPA 402-R-97-016, *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM).*

a. This number may differ from the calculated number because of grid edge effects, adding judgment samples, or selecting or unselecting sample areas.

b. The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.

c. The sampling area is the total surface area of the selected colored sample areas on the map of the site.

d. Size of grid/area of grid cell gives the linear and square dimensions of the grid used to systematically place samples.

e. Including measurement analyses and fixed overhead costs.

A1.1 Primary Sampling Objective

The primary purpose of sampling at this site is to compare a site median or mean value with a fixed threshold. The working hypothesis (or null hypothesis) is that the median (mean) value at the site is equal to or exceeds the threshold. The alternative hypothesis is that the median (mean) value is less than the threshold. Visual Sample Plan (VSP) calculates the number of samples required to reject the null hypothesis in favor of the alternative one, given a selected sampling approach and inputs to the associated equation.

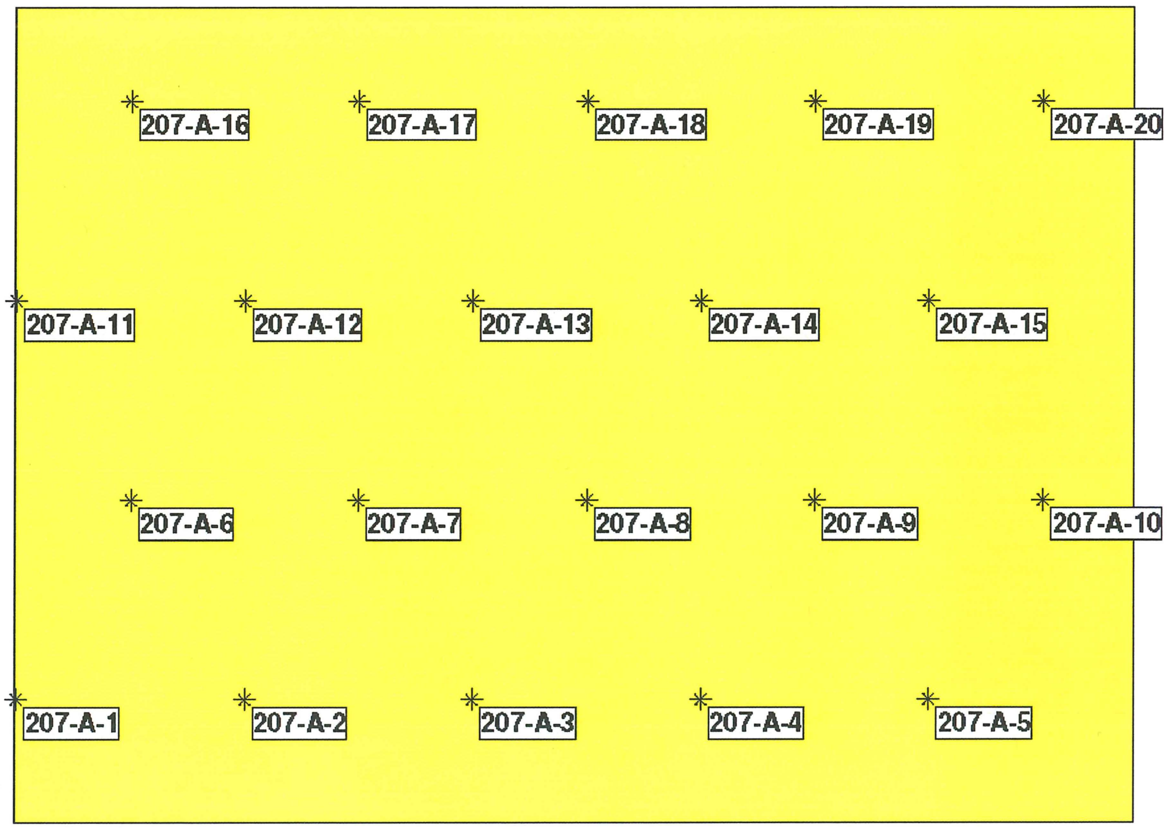


Figure A-1. Sampling Grid

Table A-2. X and Y Coordinates

Area: 207-A South Retention Basin			
X Coordinate	**Y Coordinate**	**Label**	**Type**
0.2535	15.1433	207-A-1	Systematic
28.8257	15.1433	207-A-2	Systematic
57.3980	15.1433	207-A-3	Systematic
85.9702	15.1433	207-A-4	Systematic
114.5425	15.1433	207-A-5	Systematic
14.5396	39.8876	207-A-6	Systematic
43.1119	39.8876	207-A-7	Systematic
71.6841	39.8876	207-A-8	Systematic
100.2564	39.8876	207-A-9	Systematic
128.8286	39.8876	207-A-10	Systematic
0.2535	64.6318	207-A-11	Systematic
28.8257	64.6318	207-A-12	Systematic
57.3980	64.6318	207-A-13	Systematic
85.9702	64.6318	207-A-14	Systematic

Table A-2. X and Y Coordinates

Area: 207-A South Retention Basin			
X Coordinate	**Y Coordinate**	**Label**	**Type**
114.5425	64.6318	207-A-15	Systematic
14.5396	89.3761	207-A-16	Systematic
43.1119	89.3761	207-A-17	Systematic
71.6841	89.3761	207-A-18	Systematic
100.2564	89.3761	207-A-19	Systematic
128.8286	89.3761	207-A-20	Systematic

A1.2 Selected Sampling Approach

A nonparametric systematic sampling approach with a random start was used to determine the number of samples and to specify sampling locations. A nonparametric formula was chosen because the conceptual model and historical information (e.g., historical data from this site or a very similar site) indicate that typical parametric assumptions may not be true.

Both parametric and nonparametric equations rely on assumptions about the population. Typically, however, nonparametric equations require fewer assumptions and allow for more uncertainty about the statistical distribution of values at the site. The trade-off is that if the parametric assumptions are valid, the required number of samples is usually less than if a nonparametric equation were used.

Locating the sample points over a systematic grid with a random start ensures spatial coverage of the site. Statistical analyses of systematically collected data are valid if a random start to the grid is used. One disadvantage of systematically collected samples is that spatial variability or patterns may not be discovered if the grid spacing is large relative to the spatial patterns.

A1.3 Number of Total Samples: Calculation Equation and Inputs

The equation used to calculate the number of samples is based on a sign test (PNNL-13450, *Visual Sample Plan (VSP) Models and Code Verification*). For this site, the null hypothesis is rejected in favor of the alternative one if the median (mean) is sufficiently smaller than the threshold. The number of samples to collect is calculated so that if the inputs to the equation are true, the calculated number of samples will cause the null hypothesis to be rejected.

The following formula is used to calculate the number of samples:

$$n = \frac{(Z_{1-\alpha} + Z_{1-\beta})}{4(SignP - 0.5)^2}$$

where:

$$SignP = \Phi(\frac{\Delta}{S_{total}})$$

Φ (z) = is the cumulative standard normal distribution on (-•,z) (see PNNL-13450 for details)

n = is the number of samples

S_{total} = is the estimated standard deviation of the measured values including analytical error

Δ = is the width of the gray region α = is the acceptable probability of incorrectly concluding the site median (mean) is less than the threshold

β = is the acceptable probability of incorrectly concluding the site median (mean) exceeds the threshold

$Z_{1-\beta}$ = is the value of the standard normal distribution such that the proportion of the distribution less than Z_{1-a} is 1- α

$Z_{1-\beta}$ = is the value of the standard normal distribution such that the proportion of the distribution less than Z_{1-b} is 1- β

Note: MARSSIM suggests that the number of samples should be increased by at least 20 percent to account for missing or unusable data and uncertainty in the calculated value of n. VSP allows a user supplied percent overage as discussed in EPA 402-R-97-016, *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)*, p. 5-33).

The input values that result in the calculated number of sampling locations are provided in Table A-3.

Table A-3. Input Values

		Parameter					
Analyte	**N**[a]	***S***	**Δ**	***α***	***β***	**$Z_{1-\alpha}$**[b]	**$Z_{1-\beta}$**[c]
Analyte 1	20	0.45	0.4	0.05	0.2	1.64485	0.841621

Reference: EPA 402-R-97-016, *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM).*

a. The final number of samples has been increased by the MARSSIM average of 20%.

b. This value is automatically calculated by VSP based upon the user defined value of a.

c. This value is automatically calculated by VSP based upon the user defined value of b.

VSP = Visual Sample Plan

Figure A-2 is a performance goal diagram, described in EPA/240/B-06/001, *Guidance on Systematic Planning Using the Data Quality Objectives Process* (QA/G-4). It shows the probability of concluding the sample area is dirty on the vertical axis versus a range of possible true median (mean) values for the site on the horizontal axis. This graph contains all of the inputs to the number of samples equation and pictorially represents the calculation.

The red vertical line is shown at the threshold (action limit) on the horizontal axis. The width of the gray shaded area is equal to D; the upper horizontal dashed blue line is positioned at 1-a on the vertical axis; the lower horizontal dashed blue line is positioned at b on the vertical axis. The vertical green line is positioned at one standard deviation below the threshold. The shape of the red curve corresponds to the estimates of variability. The calculated number of samples results in the curve that passes through the lower bound of D at b and the upper bound of D at 1-a. If any of the inputs change, the number of samples that result in the correct curve changes.

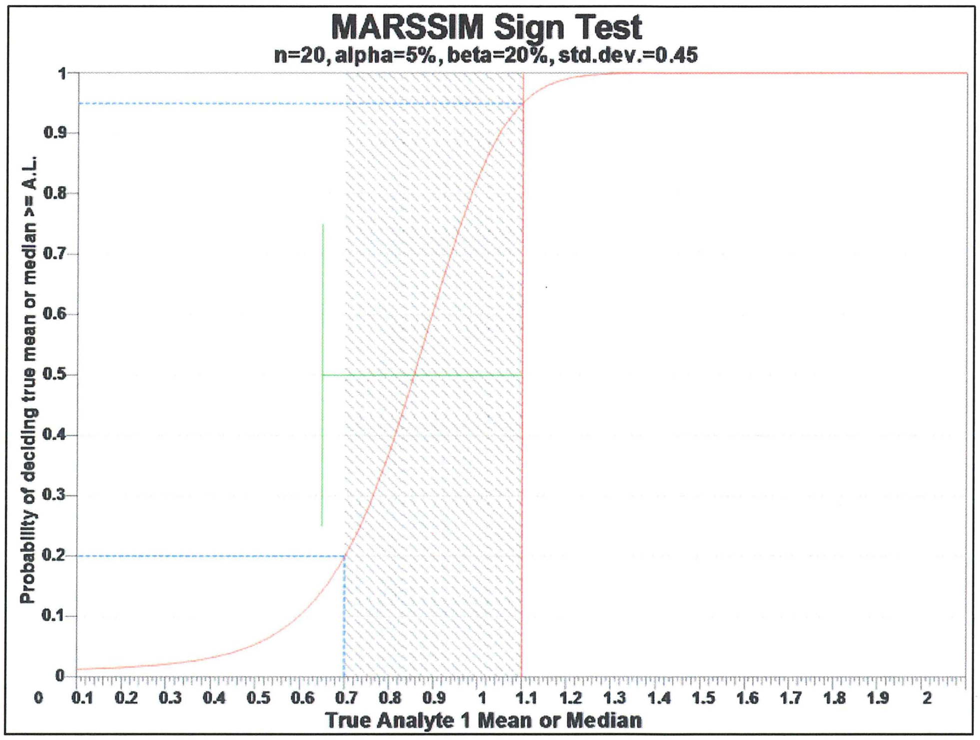
A1.4 Statistical Assumptions

The following assumptions are associated with the formulas for computing the number of samples:

- Computed sign test statistic is normally distributed.

- Variance estimate (S^2) is reasonable and representative of the population being sampled.
- Population values are not spatially or temporally correlated.
- Sampling locations will be selected probabilistically.

The first three assumptions will be assessed in a post-data collection analysis. The last assumption is valid because the gridded sample locations were selected based on a random start.



Reference: EPA 402-R-97-016, *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)*.

Figure A-2. MARSSIM Sign Test

A1.5 Sensitivity Analysis

The sensitivity of the calculation of number of samples was explored by varying the standard deviation, lower bound of gray region (percent of action level), beta (percent), probability of mistakenly concluding that m > action level and alpha (percent), probability of mistakenly concluding that m < action level. Table A-4 shows the results of this analysis.

A1.6 Recommended Data Analysis Activities

Post data collection activities generally follow those outlined in EPA/240/B-06/002, *Data Quality Assessment: A Reviewer's Guide* (EPA QA/G-9R). The data analysts will become familiar with the context of the problem and goals for data collection and assessment. The data will be verified and validated before being subjected to statistical or other analyses. Graphical and analytical tools will be used to verify to the extent possible the assumptions of any statistical analyses that are performed as well as to achieve a general understanding of the data. The data will be assessed to determine whether they are adequate in both quality and quantity to support the primary objective of sampling.

Table A-4. Sensitivity Analysis

Action Level (Threshold)=1		Number of Samples					
		a=5		a=10		a=15	
		S=0.9	S=0.45	S=0.9	S=0.45	S=0.9	S=0.45
LBGR=90	b=15	1,103	280	825	209	659	167
	b=20	948	240	692	176	542	138
	b=25	826	209	587	149	449	114
LBGR=80	b=15	280	75	209	56	167	45
	b=20	240	64	176	47	138	36
	b=25	209	56	149	40	114	30
LBGR=70	b=15	128	36	95	27	77	22
	b=20	110	32	81	23	63	18
	b=25	95	27	69	20	52	15

a = alpha (%), probability of mistakenly concluding that m <action level

b = beta (%), probability of mistakenly concluding that m >action level

LBGR = lower bound of gray region (% of action level)

S = standard deviation

Because the primary objective of sampling for this site is to compare the site median (mean) value with a threshold value, data will be assessed in this context. Assuming that the data are adequate, at least one statistical test will be performed to compare the data and threshold of interest. Results of exploratory and quantitative assessments of the data will be reported, along with conclusions that may be supported by them[1].

A2 References

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[1] This report was automatically produced by Visual Sample Plan (VSP) software version 7.2. This design was last modified 4/22/2015 9:36:49 AM. The report contents may have been modified or reformatted by end user of software.