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TRI-PARTY AGREEMENT

Change Notice Number	TPA CHANGE NOTICE FORM	Date:
TPA-CN- 0811		6/7/18

1237706

Document Number, Title, and Revision:	Date Document Last Issued:
DOE/RL-2004-77, Rev. 3, *Removal Action Work Plan for 300 Area Facilities*	February 2016

Approved Change Notices Against this Document: NONE

Originator: Bob Cathel	Phone: 376-1513

Description of Change:
Changes are made to the document to (1) update Appendix C - Air Monitoring Plan for the 324 Facility, (2) update the 300 Area Air Monitor Locations figure B-1, and (3) affect minor editorial changes including, updating, adding, or deleting references.

Mark S. French (DOE) and Benjamin Simes (Lead Regulatory Agency) agree that the proposed change modifies an approved workplan/document and will be processed in accordance with the Tri-Party Agreement Action Plan, Section 9.0, *Documentation and Records*, and not Chapter 12.0, *Changes to the Agreement*.

Added text is denoted by double underline. Deleted text is denoted by ~~strike through~~.

Note: Include affected page number(s) – Pages 1-16, 1-23, 2-8, 4-7, 4-9, 4-10, 5-1, 6-3, 6-4, B-2, B-3, B-10, B-11, B-13, and C-2 through C-8.

Justification and Impacts of Change: Considering the June 2017 rebaselined life-cycle schedule for the 324 facility deactivation, decommissioning, decontamination, and demolition (D4) and partial remediation of the 300-296 waste site, the resultant total effective dose equivalent (TEDE) to the maximally exposed individual (MEI) has been recalculated. The information from this calculation, ECF-324 BLDG-17-0086 *Total Effective Dose Equivalent Calculation for 324 Facility D4 and 300-296 Waste Site Remediation*, Rev. 0, has been used to update Appendix C of this Removal Action Work Plan.

Figure B-1 has been replaced with a new figure with updated windrose information and to provide a more readable figure.

While this document was being updated with the above information editorial changes were made, including, but not limited to, updated document references and references to previous contractor field remediation operations.

Approvals:

DOE Project Manager	6/7/18 Date	[N] Approved [ ] Disapproved
EPA Project Manager	Ben Simes 6/14/18 Date	[X] Approved [ ] Disapproved
Ecology Project Manager (N/A)	Date	[ ] Approved [ ] Disapproved

A-6005-413 (REV 1)

Removal actions will be performed on a schedule that ensures that demolition of the 300 Area facilities is completed by September 30, 2015, in accordance with Tri-Party Agreement Milestone M-94-10. Interim milestones were also established to track the progress in meeting Milestone M-94-00. A listing of these D4 milestones is provided in Table 1-2.

Table 1-2. Summary of Relevant Tri-Party Agreement Milestones. (3 Pages)

Milestone	Description	Due Date
M-94-00	Complete disposition of all 300 Area surplus facilities identified in the removal action work plan(s) for the 300 Area facilities including the 324 Building and its ancillary buildings and structure. Completion of facility disposition is defined as the completion of deactivation, decontamination, decommissioning, and demolition and obtaining EPA and/or Ecology approval of the appropriate project closeout documents. The cleanup of 300-FF-2 waste sites associated with 300 Area surplus facilities and utilities will be performed in accordance with Tri-Party Agreement major milestone M-16-00B, M-16-69, and approved RD/RA Work Plans for 300 Area waste sites by the specified due date as approved in removal or remedial action work plans.	9/30/2018 (Milestone completed July 2017)
M-094-01	Submit a schedule and Tri-Party Agreement milestones to complete disposition of the surplus facilities in the 300 Area. The milestone deliverable shall include at least (1) a schedule for submittals of EE/CAs, removal action memoranda, removal action work plans, closure/post-closure plans, and other documents that require EPA and/or Ecology approval; (2) a schedule that defines initiation and completion dates for the disposition of groups of surplus facilities and associated waste sites; and (3) a Tri-Party Agreement change package that includes milestones for groups of surplus facilities and associated waste sites that will ensure completion of M-094-00. These schedules shall be included (and updated as appropriate) in 300 Area removal action work plans submitted for EPA and/or Ecology approval and will be aligned with the associated schedules required by Milestone M-016-63.	12/31/2005 (milestone completed December 2005)
M-094-03	Complete disposition of the following surplus facilities: 303M, 332, 333, 334, 334A, 3221, 3222, 3223, 3224, 3225, 324, 324B, and 327.	9/30/2010 (Milestone completed September 2009
M-094-05	Complete D4 of the 313 and 314 facilities. Foundations, subsurface structures, and/or soil contamination can be deferred to a comprehensive remedial action program, but waste sites will be established in the interim to track this cleanup commitment.	9/30/2006 (milestone completed February 2006)

1.4.3.13 Biological Hazards. Biological hazards could be encountered in the facilities contained in this RAWP. Examples of biological hazards include bird and rodent carcasses and feces. Biological hazards will be identified as part of the surveillance and maintenance (S&M) and facility deactivation process.

1.4.3.14 Chemicals. Some bulk chemical inventories have been disposed or recycled during deactivation of many of the 300 Area facilities; however, the potential exists for the discovery of old containers of residual chemical constituents (e.g., solvents, greases, hydraulic and fuel oils, and aerosols).

1.5 RETAINED FACILITIES AND AFFECTED REMOVAL ACTIONS

This section discusses retained facilities and impacted removal actions. Since issuance of EE/CA #3 and Action Memorandum #3, DOE determined ~~it is~~ it is necessary to continue operating a limited number of 300 Area facilities in support of ongoing national laboratory and Hanford Site missions. These facilities are referred to as "long-term" retained and include associated active utilities. Retention of these facilities and associated utilities has delayed some removal actions and has interfered with complete removal actions on certain other facilities. In addition, the removal action for the 324 Building has been impacted following discovery of highly contaminated soils discovered beneath B Cell. During deactivation and decommissioning of the 324 Building, radiochemical engineering B Cell was found to have leaked radionuclide contaminated liquids to the soil beneath the building. Remediation of these soils (300-296 waste site) requires use of unique technologies and has resulted in a delay in implementing removal actions on the 324 Building.

1.5.1 Retained Facilities

DOE determined it is necessary to continue operating a limited number of 300 Area facilities in support of ongoing national laboratory and Hanford Site missions. These facilities presently include the following:

- 312 Water Intake / 3614A
- 318 Radiological Calibrations/318 Boiler Annex / 318B / 318C
- 324 Radiochemical Engineering Laboratory/324 Boiler Annex/324B Stack (interim retained) / 324A / 324D
- 325 Radiochemical Processing Laboratory/325 Boiler Annex / 325A / B / C / D
- 331 Life Sciences/331 Boiler Annex
- 339A HLAN Support
- 350 Plant Operation and Maintenance
- 3709A/3709B Fire Station
- 385 Booster Station (not in any EE/CA or Action Memorandum)
- 3802A Steam Valve Station
- 3212 Records Retention
- 3220 Records Retention

equipment (e.g., hydraulic fluid, diesel, oil). These spills are appropriate for ERDF disposal when the spill occurs from equipment supporting the CERCLA activity, the waste meets the ERDF waste acceptance criteria and the spill occurred within the CERCLA onsite area. Waste will be managed in accordance with Section 4.2.3.

EPA has provided its approval for sample waste generated as part of this removal action, which is shipped to Hanford Site laboratories for analysis, to be returned to the point of origin for disposal. The approval is documented within the waste characterization 300 Area SAP (DOE/RL-2001-48).

Planning for the discovery of transuranic waste or mixed waste is to be incorporated into the planning for the resumption of remediation activities under this RAWP, involving DOE and other regulatory agencies with jurisdiction to establish approved storage and/or processing locations for transuranic and/or mixed waste, in the event those waste categories are encountered. If transuranic waste or mixed waste that cannot be sent to ERDF is encountered, storage (for eventual disposition) is allowed at the Central Waste Complex (CWC) per the approved offsite determination for this facility (EPA 2002). Any transuranic waste generated will be shipped to the Waste Isolation Pilot Plant for final disposition in accordance with this work plan and a schedule established for remedial actions no later than September 30, 2024. Liquid waste will either be sent to the Hanford Site's Effluent Treatment Facility (ETF) or treated to meet the acceptance criteria of the receiving facility. Liquid waste sent to the ETF will be treated separately from other non-CERCLA sources, and any treatment residues that meet ~~WCH-191, Rev. 4~~ERDF-00011, Rev. 0, *Environmental Restoration Disposal Facility Waste Acceptance Criteria*, *formerly WCH-191 Rev 4* (ERDF waste acceptance criteria) may be disposed at ERDF. By approval of this work plan, EPA has determined that the ETF is an acceptable facility for storage and treatment of liquid waste (with segregated treatment residues disposed at ERDF) generated from this removal action in accordance with 40 CFR 300.440, "National Oil and Hazardous Substances Pollution Contingency Plan," provided the applicable facility waste acceptance criteria are met.

2.10 DEMOBILIZATION

At the completion of D4 activities, trailers and equipment used to perform this removal action are demobilized or turned over to personnel conducting soil remediation work under the 300-FF-2 work scope.

In some cases, equipment (including change rooms, shower trailers, and connex boxes) may no longer be used due to levels of contamination or disrepair. In these instances, the equipment will be deactivated in accordance with Section 2.4 and demolished with the facility in accordance with Section 2.5.

contamination in accordance with DOE's and the contractor's material release procedures. Additionally, waste containing CERCLA hazardous substances (unless present in de minimis[3] concentrations) may only be released to an offsite facility that has received approval from EPA in accordance with 40 CFR 300.440.

Low-Level Radioactive Waste. Liquids will be collected in appropriate containers. Dependent upon volume and characteristics (e.g., hydrogen ion concentration [pH], oils, waste codes), containers will vary from drums to bulk holding tanks.

Demolition debris will be sized in accordance with the waste acceptance criteria of the disposal facility. Radioactive solids will be placed in containers or wrapped in U.S. Department of Transportation (DOT) compliant packaging (or DOE equivalent requirements per 10 CFR 830) for transport to ERDF for disposal.

Hazardous/Dangerous Waste. Hazardous/dangerous waste managed outside of the BFA will be packaged and stored to prevent dispersion and public exposures as required by WAC 173-303. Waste-specific storage and packaging requirements will be described in the contractor's integrated work control documents and/or procedures, as appropriate, to address WAC and DOT requirements.

Mixed Waste. Mixed waste will be managed in compliance with the substantive requirements for both hazardous/dangerous wastes and radioactive waste. Storage is allowed at the Hanford Site's CWC under the offsite acceptability determination issued by EPA (EPA 2002).

Asbestos. Multiple forms of asbestos are expected to be encountered. Removal and disposal of asbestos and ACM are regulated under the *Clean Air Act Amendments of 1977* (implemented via 40 CFR 61, Subpart M) and under health and safety regulations promulgated pursuant to the OSHA regulations (implemented via 29 CFR 1926.1101, 29 CFR 1910.1001, and WAC 296-62, "General Occupational Health Standards," Part I). The 40 CFR 61 requirements applicable to this removal action are contained in 40 CFR 61.145(c) and 40 CFR 61.150. These regulations establish removal requirements based on quantity present and specify handling, packaging, and disposal requirements for regulated sources having the potential to emit asbestos. Asbestos work, air monitoring, and worker safety requirements will be performed in accordance with 40 CFR 61.145(c), 40 CFR 61.150, 29 CFR 1926.1101, and the contractor's procedures for ACM removal.

Asbestos abatement activities will be performed in full compliance with all substantive National Emission Standards for Hazardous Air Pollutants (NESHAP) standards that are ARAR for the work. Prior to the commencement of the demolition a thorough inspection of the affected facility will be performed for the presence of asbestos, including Category I and Category II nonfriable ACM. All Category II nonfriable ACM will be generally presumed to be potentially friable and will be removed prior to the start of actual demolition activities. If DOE identifies any Category II ACM that should be allowed to remain in place during demolition based on

[3] De minimis is not a CERCLA defined term, but is used to convey the notion that there are some items with very low levels of CERCLA hazardous substances where the CERCLA process does not apply.

encountered. Storage is allowed at the Hanford Site's CWC under the offsite acceptability determination issued by EPA (EPA 2002). An offsite acceptability determination from EPA will be required under 40 CFR 300.440 prior to sending any waste to the Waste Receiving and Processing facility.

Liquid Waste. All liquid waste treated or disposed of at a location other than ERDF or ETF must first be approved by EPA. Possible disposal locations include the ETF or a facility outside of the Hanford Site. This does not include liquid waste that is free or contains de minimis levels of CERCLA hazardous substances. Water meeting groundwater quality criteria (GWQC) (WAC 173-200) can be used for dust suppression.

Radiological Counting Facility Sample Wastes. The RCF (MO-~~432~~423, MO-265, and MO-870) will continue to process samples under CERCLA authority for an extended period of time prior to being subject to D4. The primary waste materials generated from radiological counting at the RCF includes samples, sample residues, and secondary waste (e.g., personnel protective equipment such as gloves and wipes). Laboratory calibration standard wastes or inter-laboratory comparison sample wastes may be generated. Some waste may be generated from maintenance or calibration of sample equipment.

Sample counting wastes, including any associated secondary waste, will routinely be sent back to the project of origin for disposition. Alternatively, sample counting associated wastes, including existing sample wastes from Hanford Site CERCLA projects, may be sent directly to ERDF for disposal if the waste meets the ERDF waste acceptance criteria.

Other RCF sample-related waste, such as inter-laboratory comparison samples and maintenance/calibration waste, may also be sent to ERDF for disposal if it contains CERCLA hazardous substances (including potentially radiologically contaminated wastes) and meets the waste acceptance criteria. Otherwise, the wastes will be handled as solid waste as described above. Some oils associated with the equipment may be recycled as appropriate.

For wastes containing CERCLA hazardous substances that must be sent offsite for disposal, EPA approval of the offsite facility would be sought in accordance with 40 CFR 300.440.

4.2.4 Waste Treatment

Treatment of waste streams may be necessary to provide for safe transport, storage, and/or disposal to meet the appropriate waste acceptance criteria. For example, if macroencapsulation is to take place in the 300 Area, an EPA-approved waste on-site treatment plan is required. The type of treatment for RCRA hazardous or dangerous waste and the location of treatment are determined by DOE and EPA on a case-by-case basis in accordance with the substantive requirements of RCRA and WAC 173-303. Upon EPA approval, solidification, encapsulation, neutralization, and size reduction/compaction may be employed to treat various wastes. For wastes requiring treatment, the techniques are documented in a treatment plan approved by EPA.

Several mixed waste streams have already been reviewed and approved for treatment and disposal at ERDF outside of the disposal cells. These mixed waste streams are as follows:

- Radioactively contaminated elemental mercury may be amalgamated within the geographical area of the removal action.

- Radioactively contaminated elemental lead or hazardous/dangerous waste debris may be macroencapsulated within the geographical area of the removal action or at ERDF.

- Aqueous solutions may be treated in accordance with an approved waste treatment plan and sent to ERDF.

Stabilization of soils contaminated with lead or other heavy metals may be treated at ERDF outside of the disposal cell, provided the soils meet the ERDF waste acceptance criteria.

The above-listed waste streams will be treated as they are encountered. If waste is encountered for which there is no available treatment, DOE will meet with EPA agencies to determine the appropriate action for the waste stream.

4.2.5 Waste Transportation and Shipping

All shipments will be made in accordance with DOT regulations, 49 CFR 171-179 or DOE equivalent requirements per 10 CFR 830, applicable sections of WAC 173-303, and the contractor's waste transportation procedures.

The removal action is expected to require offsite transportation of wastes and potentially contaminated samples. The offsite handling and shipping of wastes and potentially contaminated samples will be in accordance with the *Hazardous Materials Transportation Act of 1974*, as implemented through 49 CFR 100-179.

4.2.6 Disposal

All waste resulting from this action are evaluated to determine if the waste meets ERDF waste acceptance criteria for disposal. CERCLA waste disposed of at any disposal facility other than ERDF requires EPA approval in accordance with 40 CFR 300.440. Any PCB waste that does not meet ERDF waste acceptance criteria (~~WCH-191~~ERDF-00011) may be transported for disposal to a TSCA offsite disposal facility following the receipt of an offsite acceptability determination by EPA.

Solid waste may be sent for offsite disposal at a municipal/industrial landfill. Disposal of materials containing no or de minimis levels of CERCLA hazardous substances would not require an offsite acceptability determination per 40 CFR 300.440.

HNF-EP-0063, *Hanford Site Solid Waste Acceptance Criteria*, identifies criteria for acceptance of waste at the CWC. HNF-3172, *Liquid Waste Processing Facilities Waste Acceptance Criteria,* identifies criteria for acceptance of waste at the ETF. The ERDF waste acceptance criteria (~~WCH-191~~ERDF-00011) and ERDF supplemental waste acceptance criteria provide the waste acceptance criteria for ERDF.

5.0 PROJECT MANAGEMENT AND ORGANIZATION

5.1 PROJECT SCHEDULE AND COST ESTIMATE

The majority of 300 Area facilities demolition has been completed by issuance of revision 3 to this RAWP. Remaining surplus facilities ~~will be~~were removed in accordance with TPA milestone M-094-00. Certain remaining 300 Area facilities continue to support ongoing missions ~~of~~ including the Pacific Northwest Science ~~office~~ Office and the Pacific Northwest National Laboratory.

5.1.1 Project Cost and Schedule Tracking

Performance measurement and analysis is performed by the contractor. Project cost and schedule are controlled and updated using the contractor's Management Control System.

An earned-value system tracks the cost, schedule, and performance as the project progresses towards completion. Cost/schedule performance reports provide budgeted cost of work-scheduled comparisons and budgeted costs of work performed against the actual cost of work performed. These reports provide variances to the baseline schedule and cost as budgeted in the project's detailed work plan. Variances above threshold values are documented, as well as the rationale for the variance(s) and any recovery plan required.

Trends and baseline change proposals are readily identified through the contractor's formal trend and change control program. All changes that affect the baseline are documented. The contractor's trend register, which is reviewed monthly by contractor senior management, categorizes trends from conception to final resolution. Trends are identified as either performance trends or scope trends and are further defined as resolved or unresolved.

Fiscal year project staffing, as budgeted, is reconciled monthly during project review meetings to the actual number of full-time-equivalent personnel used during the month. Likewise, the corresponding number of hours actually worked are presented and compared to the budgeted current work plan.

Cost and schedule variances to the current budget are tracked both on a monthly and to-date basis and are reconciled back to the cause of the variance. Project impacts due to the cost and/or schedule variance are described and corrective actions are identified and tracked to the point of final resolution.

5.2 CONDUCT OF OPERATIONS

Conduct of operations is imposed to ensure that work is performed in a controlled and organized manner, such that all facets of work activities have been considered and that necessary documentation is maintained. Line organizations review existing and planned programs

References

DOE/RL-2005-87, 2006, *Engineering Evaluation/Cost Analysis #3 for the 300 Area,* Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-2005-95, 2006, *Removal Action Work Plan #2 for the 324/327 Buildings and Ancillary Facilities,* Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-2010-34, 2013, *Removal Action Work Plan for River Corridor General Decommissioning Activities,* Rev. 2, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-2014-13-ADD1, ~~2014~~2016, *Remedial Design Report/Remedial Action Work Plan for the 300-FF-2 Soils*, Rev. ~~0~~1, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

Ecology, 2001, *Hanford Site Air Operating Permit,* Department of Ecology Publication Number 00-05-006, Washington State Department of Ecology, Olympia, Washington.

Ecology, 2005, *State Waste Discharge Permit Number ST 4511*, Washington State Department of Ecology, Olympia, Washington.

Ecology, EPA, and DOE, 1989, *Hanford Federal Facility Agreement and Consent Order,* 89-10, 2 vols., as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.

Endangered Species Act of 1973, 16 U.S.C. 1531, et seq.

EPA, 2002, *CERCLA Off-Site Acceptability Determination,* EPA ID #WA7 89000 8967, U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

EPA, 2013, *Record of Decision for 300-FF-2 and 300-FF-5, and Record of Decision Amendment for 300-FF-1, Hanford Site, Benton County, Washington,* U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

ERDF-00011, 2017, *Environmental Restoration Disposal Facility Waste Acceptance Criteria, formerly WCH-191 Rev. 4*, Rev. 0, CH2M HILL Plateau Remediation Company, Richland, Washington

HNF-EP-0063, ~~2006~~2017, *Hanford Site Solid Waste Acceptance Criteria*, Rev. ~~13~~17, ~~Fluor Hanford, Inc.~~CH2M HILL Plateau Remediation Company, Richland, Washington.

HNF-3172, ~~2005~~2016, *Liquid Waste Processing Facilities Waste Acceptance Criteria*, Rev. ~~8~~3, ~~Fluor Hanford, Inc.~~CH2M HILL Plateau Remediation Company, Richland, Washington.

Hazardous Materials Transportation Act of 1974, 49 U.S.C. 1801-1813, et seq.

References

Migratory Bird Treaty Act of 1918, 16 U.S.C. 703, et seq.

National Historic Preservation Act of 1966, 16 U.S.C. 470, et seq.

Native American Graves Protection and Repatriation Act of 1990, 25 U.S.C. 3001, et seq.

RCW 70.94, "Washington Clean Air Act," *Revised Code of Washington* 70.94, as amended.

Resource Conservation and Recovery Act of 1976, 42 U.S.C. 6901, et seq.

Toxic Substances Control Act of 1976, 15 U.S.C. 2601, et seq.

WAC 173-160, "Minimum Standards for Construction and Maintenance of Wells," *Washington Administrative Code*, as amended.

WAC 173-200, "Water Quality Standards for Ground Waters of the State of Washington," *Washington Administrative Code*, as amended.

WAC 173-216, "State Waste Discharge Permit Program," *Washington Administrative Code*, as amended.

WAC 173-218, "Underground Injection Control Program," *Washington Administrative Code*, as amended.

WAC 173-303, "Dangerous Waste Regulations," *Washington Administrative Code*, as amended.

WAC 173-350, "Solid Waste Handling Standards," *Washington Administrative Code*, as amended.

WAC 173-400, "General Regulations for Air Pollution Sources," *Washington Administrative Code*, as amended.

WAC 173-460, "Controls for New Sources of Toxic Air Pollutants," *Washington Administrative Code*, as amended.

WAC 232-012-297, "Endangered, Threatened, and Sensitive Wildlife Species Classification," *Washington Administrative Code*, as amended.

WAC 246-247, "Radiation Protection -- Air Emissions," *Washington Administrative Code*, as amended.

WAC 296-62, "General Occupational Health Standards," *Washington Administrative Code*, as amended.

~~WCH-191, Rev. 4, 2015, *Environmental Restoration Disposal Facility Waste Acceptance Criteria*, Rev. 4, Bechtel Hanford, Inc., Richland, Washington.~~

utility systems are removed and drains plugged. Piping is drained and residual materials are removed from tanks, lubricant reservoirs, refrigerant systems, etc.

Decontamination activities are conducted to remove loose accessible contamination from components, equipment, structures, etc. Decontamination activities also include stabilizing or "fixing" contaminants in place so that contaminants are attached to the materials and would be less likely to be disturbed during subsequent demolition activities. Decontamination methods may include, but are not limited to, wiping; applying decontamination solutions, paint, asphalt, or other fixatives; scabbling; abrasive blasting; and vacuuming.

Demolition generally means large-scale facility destruction using heavy equipment. Demolition methods will be selected based on the structural elements to be demolished, remaining contamination, location, and integrity of the structure. Standard equipment such as the following will be used:

- Excavator with a hoe-ram
- Hydraulic shears with steel shear jaws
- Concrete pulverizer jaws or breaker jaws
- Pneumatic/hydraulic hammers
- Controlled explosives
- Crane to remove and size reduce materials
- Mechanical/power saws
- Cutting torch
- Diamond wire (cutting)
- Cryogenic decontamination (e.g., CO2 blasting or liquid nitrogen jet).

It is assumed that deactivation and demolition work will make use of a high-efficiency particulate air (HEPA)-filtered vacuum cleaner. Portable ventilation filter units and gloveboxes may also be used. Standard construction equipment will be used for excavation, loading, and hauling. If extensive soil contamination is found in adjacent and underlying soils, it will be remediated in accordance with DOE/RL-2014-13-ADD1, *Remedial Design Report/Remedial Action Work Plan for the 300 –FF-2 Soils*. ~~work will be deferred to the Field Remediation Closure Project, with approval from the U.S. Department of Energy, Richland Operations Office and the U.S. Environmental Protection Agency (EPA).~~

Equipment (e.g., haul trucks, containers) used in D4 activities will also be decontaminated, as necessary. Conventional methods (e.g., brushing or wiping, water wash, or HEPA-filtered vacuum cleaners) will be used. More aggressive equipment decontamination methods (e.g., grinding, steam cleaning, or wet grit blasting) may be used for equipment decontamination if other methods fail.

B.2 AIRBORNE SOURCE INFORMATION

The potential exists for radioactive airborne emissions resulting from the D4 activities. The characterization, surveillance, and D4 activities will be conducted over several years. There is a small potential for radioactive airborne emissions resulting from surveillance and

characterization activities. The PTE for these types of activities is expected to be insignificant compared to that of the actual D4 activities. Because potential emissions are anticipated to be inconsequential, no estimate will be made for potential emissions from surveillance and characterization activities. Prior to the D4 of a facility, radioactive emissions estimates will be provided to the EPA for review and approval. Approval will be received from the EPA prior to the facilities being deactivated/demolished.

In addition, many of the facilities identified within this RAWP are believed to have little or no radiological contamination based on historical data reviews. The PTE from facilities with no appreciable radiological contamination is negligible. In lieu of an emission estimate, a summary of the facility environmental hazards will be provided to EPA for their review and approval that an emission estimate is not required. If, however, contamination is discovered during the D4 activities, an emission estimate will be prepared and provided to EPA for review and approval.

Emission estimates will be developed based on inventory assumptions for the facilities. The PTE will be determined by applying a release fraction of 1E-03 for particulate and liquids for most of the pre-demolition and demolition activities. A release fraction of 1 will be assumed for gases (if any are present) and activities involving torch cutting; the use of HEPA-filtered vacuums and HEPA-filtered decontamination tools (e.g., scabblers, scarifiers) are assigned a release fraction of 1E-03 for particulates. It is anticipated that no more than 1% of the total inventory will be subject to techniques that assume a release fraction of 1. The CAP-88-PC, ~~Version 3.0~~current version model will be used to determine the total effective dose equivalent (or annual unabated offsite dose) to the maximally exposed individual.

When D4 activities will include the use of the large portable ventilation units (e.g., ~560 m^3/min [20,000 ft^3/min]), the emission estimate documentation will include a 40 CFR 61 Appendix D calculation to supplement the monitoring information discussed in Section B.4. For those facilities that are estimated to be potential major sources (>0.1 mrem/yr) of radionuclide air emissions, further evaluation of appropriate monitoring requirements for the ventilation units will be conducted. Any additions or changes to this work plan will be documented in UMM minutes or equivalent.

The emission estimates will be based on the primary isotopes (e.g., uranium isotopes) that are anticipated to be encountered and that make up most of the potential offsite dose. It is recognized that other isotopes may be present in very limited quantities that would not impact the emission estimates. Characterization data will be used to verify the inventory assumptions for the facilities and the emission estimates will be revised if the inventory is not within the assumptions used for the PTE calculations. Table B-1 contains a list, by year, of emission estimates prepared for 300 Area D4 activities (see Appendix C for 324 Facility removal action emissions estimates). Additions to Table B-1 will be documented in UMM minutes. Facility descriptions are provided in Appendix A of this RAWP.

Any residual contamination in soils removed during D4 of structures will be assumed to be accounted for in the inventory for that structure. If extensive soil contamination is found, remediation will be accomplished in accordance with 300-FF-2 remedial action documents.

demolition. When using water, quantities used will be minimized to prevent water accumulation, puddles, and runoff within the area where the water is being used.

The following provides additional details concerning the implementation of the controls described above.

- Water will be applied during demolition, excavation, container loading, and backfilling processes to minimize airborne releases.

- Fixatives will be applied to any contaminated debris or soils that are being stockpiled and that will be inactive for more than 24 hours, excluding items that have been wrapped. However, if a soil fixative has already been applied and the soil and/or debris will remain undisturbed, further uses of fixatives will not be reapplied unless needed. The fixatives or other controls will not be applied when the contaminated soils and/or debris are frozen or it is raining, snowing, or other freezing precipitation is falling at the end of work operations.

- Dust control is to be applied at the end of the work shift and verified in the field superintendent's status log.

- Haul trucks transporting bulk materials with removable contaminants will be covered to contain the materials while in transit to the Environmental Restoration Disposal Facility.

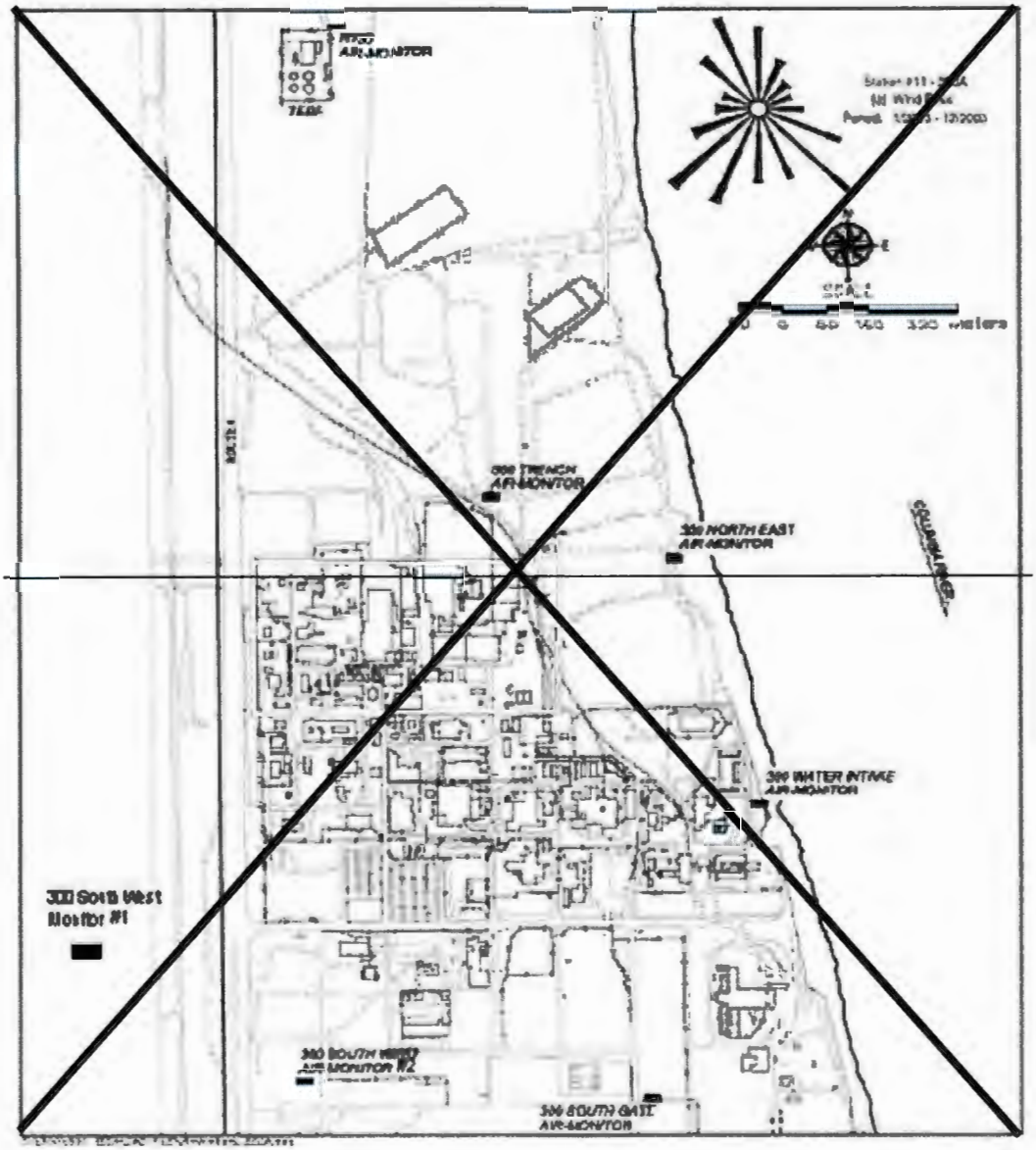
B.4 MONITORING

Air monitoring stations 300 South West #1 (N557), 300 Trench (N904), 300 NE (N902), South Gate (N903), and 300 Water Intake (N905) will be used to monitor radionuclide air emissions from the D4 activities discussed in this plan in accordance with 40 CFR 61, Appendix B, Method 114(3) and WAC-246-247-075(3). The locations of the air monitoring stations are shown in Figure B-1.

The operation of these air monitors will follow the protocol for the Environmental Surveillance Program or the Near-Facility Monitoring Program, as appropriate. The air samples will be changed every 2 weeks and analyzed for total alpha and total beta. The samples are composited semi-annually and analyzed for gamma energy-emitting radionuclides, strontium-90, plutonium isotopes, and uranium isotopes. EPA may choose to take split samples of composite air samples.

The data results for these air monitors are entered into the Hanford Environmental Information System and/or the Automated Bar Coding of Air Samplers at Hanford database. The data collected from air monitoring will be summarized in the annual report that is prepared for the Hanford Site in compliance with 40 CFR 61 Subpart H and WAC 246-247 and that is used to demonstrate compliance with 40 CFR 61.92. EPA may request additional or alternate air monitors as new buildings are deactivated and/or demolished. Existing stack monitoring systems of operating facilities may also be utilized if appropriate. See discussion of operating emission point in Section B.5.

Figure B-1. Scope Boundary and 300 Area Air Monitor Locations.

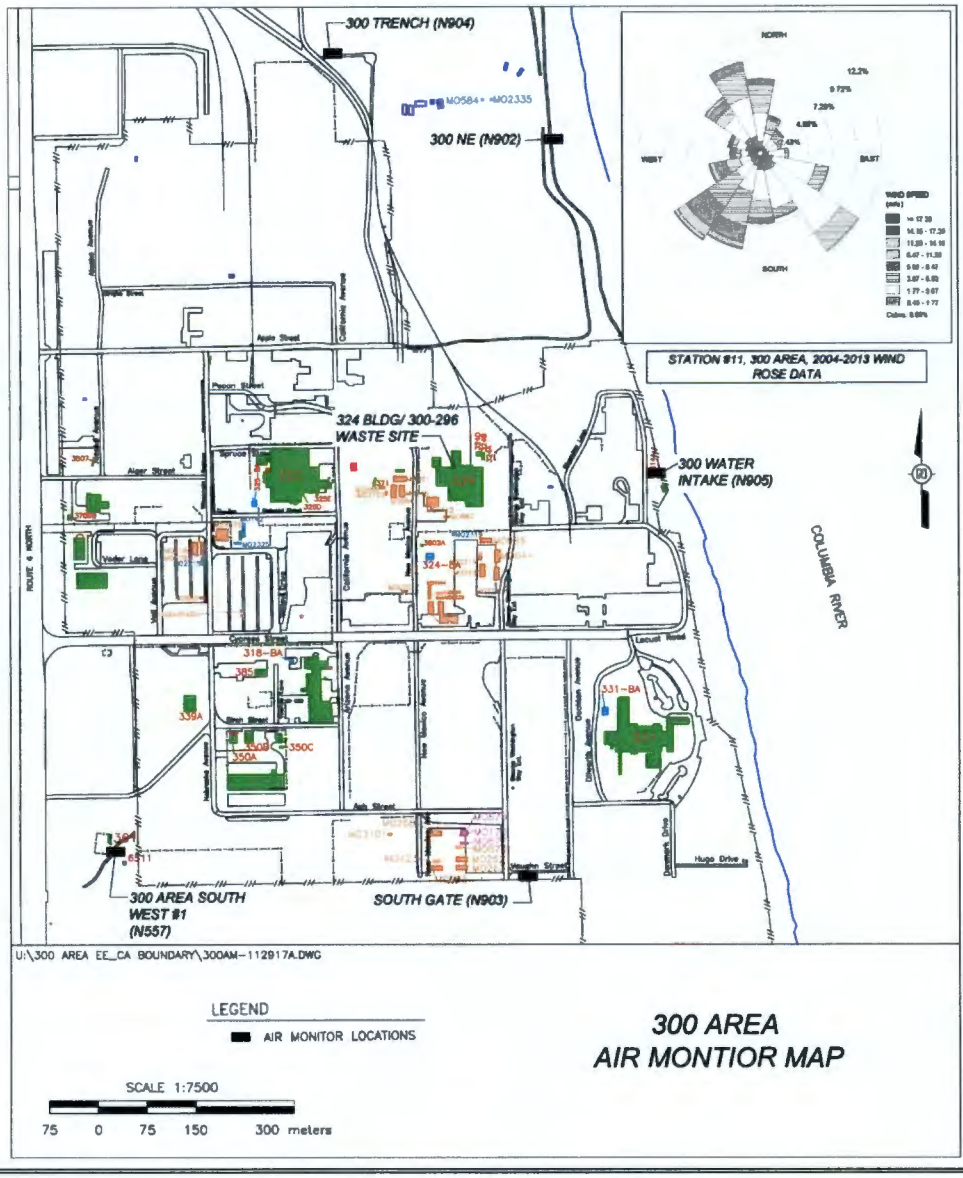


B.5 OPERATION OF ACTIVE EMISSION POINTS

Only two active emissions points remain in the 300 Area subject to the requirements of this RAWP, the 324 Building and the Radiological Counting Facility (RCF).

RCF is expected to operate for purposes of analyzing CERCLA samples throughout the course of the 300 Area D4 activities. Air operating requirements for this facility are presented in Section B.5.1. Air operating requirements for the 324 Building are presented in Appendix C.

Figure B-1. Scope Boundary and 300 Area Air Monitor Locations.



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DOE-RL, 2006a, *Action Memorandum #2 for the 300 Area Facilities*, U.S. Department of Energy, Richland Operations Office, Richland Washington.

DOE-RL, 2006b, *Action Memorandum #3 for the 300 Area Facilities,* U.S. Department of Energy, Richland Operations Office, Richland Washington.

DOE/RL-2014-13-ADD1, 2016, *Remedial Design Report/Remedial Action Work Plan for the 300-FF-2 Soils*, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

WAC 246-247, "Radiation Protection – Air Emissions," *Washington Administrative Code*, as amended.

WCH, 2006, *Radiological Counting Facility Air Monitoring Plan,* CCN 131311, Washington Closure Hanford, Richland, Washington.

radioactive and nonradioactive development laboratories, hot cells, vaults, tanks, galleries, pipeways, a truck lock, and a loadout station.

Routine surveillances are necessary on buildings awaiting D4 to ensure conditions within the facility have not changed to the point where the threat of a release has increased. The purpose of deactivation is to identify and remove barriers (e.g., physical, chemical, and radiological) for demolition of each facility. Hazardous substances and contaminated equipment and materials are removed and disposed. Process systems and utility systems are removed and drains plugged. Piping is drained and residual materials are removed from tanks, lubricant reservoirs, refrigerant systems, etc.

Decontamination activities are conducted to remove loose accessible contamination from components, equipment, structures, etc. Decontamination activities also include stabilizing or "fixing" contaminants in place so that contaminants are attached to the materials and would be less likely to be disturbed during subsequent demolition activities. Decontamination methods may include, but are not limited to, wiping; applying paint, asphalt, or other fixatives; scabbling; abrasive blasting; and vacuuming. Portions of the f~~F~~acility ~~-~~(e.g., REC Cells, shielded material facility (SMF), high level vaults (HLV), low level vaults (LLV), A-Frame Filter room) ~~hot cells~~ may be solidified with grout. These grouted monoliths may ~~"flood grouted" and~~ then be cut up (or removed in one piece) to minimize radiological dose to workers, the public, and protect the environment. Large items (equipment and waste materials) will be size reduced and packaged for transport to compliant storage/disposal facilities as appropriate. Any loose materials and radiologically contaminated materials will be collected and packaged for disposal. Various decontamination methods will be employed to reduce/remove radiological contamination. Following decontamination work, the associated ventilation ductwork will be isolated and removed prior to building demolition. Conventional methods (e.g., brushing or wiping, water wash, or high-efficiency particulate air [HEPA]-filtered vacuum cleaners) will be used. More aggressive equipment decontamination methods (e.g., grinding or wet grit blasting) may be used for equipment decontamination if other methods fail.

If decontamination, radiological inventory removal, or stabilization has been achieved to acceptable levels for the areas served by the EP-324-S-01 stack, portable exhausters, portable temporary radiological air emission units, HEPA vacuums, or other similar ~~particular~~ particle emission control devices will be removed and/or isolated. Ventilation equipment may be operated both for radiological control to workers, the public, and the environment along with controls needed for worker protection from industrial hazard materials such as beryllium and cadmium, etc. ~~During deactivation the EP-324-S-01 stack will operate at a reduced flow, shutting down in stages over an extended period, culminating in eventual closure of the exhaust stack.~~It is anticipated that during the deactivation process, when the A-Frame filters are grouted, the stack will become nonfunctional and would be shut down.

The stack will be demolished in the course of the facility demolition. During demolition both fixatives and water will be used to effectively control air emissions both in the workspaces and outside the facility in a manner that is protective of both the air and groundwater pathways. ~~The building hot cells may be "flood grouted" or have some other definite solidification measure~~

~~completed and cells cut or size reduced to meet transportation requirements to the Environmental Restoration Disposal Facility.~~

Demolition generally means large-scale facility destruction using heavy equipment. Demolition methods will be selected based on the structural elements to be demolished, remaining contamination, location, and integrity of the structure. Conventional equipment such as the following will be used:

Excavator with a bucket or hoe-ram
Hydraulic shears with steel shear jaws
Concrete pulverizer jaws or breaker jaws
~~Crane with wrecking ball~~
Pneumatic/hydraulic hammers
Controlled explosives
Crane to remove and size reduce materials
Mechanical/power saws
Cutting torch
Diamond wire (cutting)
~~Cryogenic decontamination (e.g., CO2 blasting or liquid nitrogen jet).~~

It is assumed that a portion of concrete demolition work will make use of HEPA-filtered vacuum cleaners. Portable ventilation filter units, glovebags, and gloveboxes may also be used. Standard construction equipment will be used for excavating, loading, and hauling. The highly contaminated soils discovered beneath B Cell (300-296 waste site) will be remediated in accordance with DOE/RL-2014-13-ADD1, *Remedial Design Report/Remedial Action Work Plan for the 300 –FF-2 Soils* (300 Area RDR/RAWP). Additionally, if extensive soil contamination is found in adjacent soils, work will be deferred to the 300 Area RDR/RAWP work scope.
~~If extensive soil contamination is found in adjacent and underlying soils, work will be deferred to the Field Remediation Closure Project with approval from the U.S. Department of Energy, Richland Operations Office and the U.S. Environmental Protection Agency (EPA).~~

Equipment (e.g., haul trucks, containers) used in D4 activities will also be decontaminated, as necessary. Excavation work may also take place in support of removing/blanking/isolation of utilities.

C.3 AIRBORNE SOURCE INFORMATION

The potential exists for radioactive airborne emissions resulting from the D4 activities. This section of the AMP discusses the radiological inventory of the 324 Building, ~~and~~ ancillary facilities, and associated waste sites along with the subsequent PTE radionuclides and the resulting total effective dose equivalent (TEDE) to the maximally exposed individual. As discussed in ECF-324 BLDG-17-0086, *Total Effective Dose Equivalent Calculation for 324 Facility D4 and 300-296 Waste Site Remediation*, point source activities performed while the stack is operational will occur over 3 years and fugitive source activities (after the stack is no longer operational) will occur over 3 years. ~~The activities will be conducted over several years.~~

~~However, the estimates conservatively assume that the activities are accomplished in a single year, when in fact the PTE will be reduced each year as the inventory is reduced. The actual and potential diffuse and fugitive emissions from the proposed activities are not expected to be significant and are bounded within the overall inventory; therefore, a separate estimate has not been provided.~~ Excavation of any significant residual contamination in soils will be deferred to the ~~Field Remediation Closure Project with regulatory approval~~300 Area RDR/RAWP work scope. The ancillary facilities are assumed to be bound by the inventory and emission estimates for the 324 Facility.

~~The radionuclide inventory, PTE, and estimated dose are summarized in Table C-1 for the 324 Building.~~ ECF-324 BLDG-17-0086, *Total Effective Dose Equivalent Calculation for 324 Facility D4 and 300-296 Waste Site Remediation* provides each of the radiological inventories which comprise the total 324 Building and 300-296 waste site radiological inventories. The PTE (unabated and abated) and TEDE (unabated and abated) are calculated in ECF-324 BLDG-17-0086 for the 324 Building and 300-296 waste site and summarized for point source and fugitive source emissions in Table C-1 and C-2, respectively.

~~The inventory for the 324 Building was obtained from the following three calculations with the addition of 100 Ci to account for miscellaneous areas (ductwork, piping, filters, rooms, and hoods):~~

- ~~0300X-CA-N0078, *Radiological Inventory for the 324 Building Shielded Materials Facility*~~
- ~~0300X-CA-N0079, *Bounding Radiological Characterization for the 324 Building Radiochemical Engineering Cells and Airlock*~~
- ~~0300X-CA-N0080, *Radiological Inventory for the 324 Building Low Level Vaults and High Level Vaults.*~~

~~The appropriate release fractions (i.e., for solid or particulate) were applied to the inventory to determine the PTE. The unit dose conversion factors from DOE/RL-2006-29, *Calculating Potential-to-Emit Radiological Releases and Doses*, were applied to the PTE to generate the dose estimate at the offsite maximum public receptor (1,400 m [4,593 ft] to the northeast).~~

~~The total curie content for the 324 Building and ancillary facilities is estimated at 8.15E+04, and the maximum unabated TEDE from the D4 activities of the 324 Building and ancillary facilities is estimated at 9.78E+01 mrem/yr. The abated TEDE, if all emissions are through the stack, would be 4.89E-02 mrem/yr.~~

~~The appropriate release fractions (i.e., for solid or particulate) were applied to the inventory to determine the PTE. The unit dose conversion factors from Calculating Potential-to-Emit Radiological Releases and Doses (DOE/RL-2006-29) were applied to the PTE to generate the dose estimate at the offsite maximum public receptor (1,680 m to the northeast).~~

C.4 BEST AVAILABLE RADIONUCLIDE CONTROL TECHNOLOGY

Implementing BARCT for the control of 324 Building radionuclide air emissions has been identified as an applicable relevant and appropriate requirement. Table C-~~3~~2 lists the current abatement control technology for the 324 Building. Each stationary source shall be maintained and operated, including associated equipment for air pollution control, in a manner consistent with good air pollution control practice for minimizing emissions pursuant to WAC 246-247-040(3) and 40 CFR 61.12(c). After deactivation and decontamination efforts have been completed for a particular area of the building, the ventilation ductwork and any associated controls (e.g., HEPA filter) will be isolated and/or removed.

Portable exhausters and vacuum cleaners will also be utilized to control emissions. For vacuuming and the use of portable ventilation units, HEPA filters are used to collect generated dust. The use of HEPA filters has been generally accepted as BARCT, and their use is encouraged whenever practical during removal activities. HEPA filters shall have efficiency testing performed upon installation and on an annual basis thereafter and must demonstrate 99.95% removal efficiency. Exhaust points from HEPA filters will be monitored on a routine basis for potential radionuclide releases and results recorded (e.g., post-survey results negative). Any positive survey results will require appropriate maintenance on the facility, exhauster, or vacuum to ensure that continued releases do not occur. Records of routine monitoring and necessary maintenance will be provided to EPA staff upon request. Glovebags may also be used to reduce potential emissions. Because structure demolition may be a source of radioactive fugitive emissions, dust suppressants (e.g., water and fixatives) will be used and are considered BARCT for demolition. When using water, quantities used will be minimized to prevent water accumulation, puddles, and runoff within the area where the water is being used.

The following provides additional details concerning the control of fugitive emissions:

Water will be applied during demolition, excavation, container loading, soil remediation, and backfilling processes to minimize airborne releases.

Fixatives will be applied to any contaminated debris or soils that are being stockpiled and that will be inactive for more than 24 hours, excluding items that have been wrapped. However, if a soil fixative has already been applied and the soil and/or debris will remain undisturbed, further uses of fixatives will not be reapplied unless needed. The fixatives or other controls will not be applied when the contaminated soils and/or debris are frozen or it is raining, snowing, or other freezing precipitation is falling at the end of work operations.

Dust control is to be applied at the end of the work shift.

Haul trucks transporting bulk materials with removable contamination will be covered to contain the materials while in transit to the Environmental Restoration Disposal Facility.

C.5 MONITORING

The 324-S-01 stack will be continuously sampled in accordance with 40 CFR 61.93(b)(2)(ii) and (iii). All radionuclides that could contribute greater than 10% of the potential effective dose equivalent shall be measured as required by 40 CFR 61.93(b)(4)(i). Flow rate measurements will be made in accordance with 40 CFR 61.93(b)1. The maintenance, calibration, and field check requirements of 40 CFR 61, Appendix B, Method 114, Table 2 will be implemented during stack operation. Stack operating records will be maintained for a period of 1 year at the 300 Area or other nearby location and/or in an electronic format such that the records are readily retrievable.

~~Requirements for the stack may change in the future when the available potential-to-emit drops below 0.1 mrem/yr to the maximally exposed individual. The evaluation of the potential-to-emit will be conducted in accordance with 40 CFR 61.93(b)(4). This plan will be updated and approved by EPA prior to changing stack sampling requirements or shutting down the stacks.~~

Diffuse/fugitive radionuclide emissions from the activities described in the AMP will be monitored by air monitoring stations 300 South West #1 (N557), 300 Trench (N904), 300 NE (N902), 300 Water Intake (N905), and South Gate (N903) in accordance with 40 CFR 61, Appendix B, Method 114(3) and WAC 246-247-075(3). The locations of the air monitoring stations are shown in Figure B-1. The operation of the air monitors will follow the protocol for the Environmental Surveillance Program or the Near-Facility Environmental Monitoring Program on the Hanford Site. The air samples will be changed every 2 weeks and analyzed for total alpha and total beta. The current protocol for these air samplers is as follows:

- 300 South West #1 (N557), 300 Trench (N904), 300 NE (N902), 300 Water Intake (N905), and South Gate (N904) air monitors will be composited quarterly and analyzed for gamma energy emitting radionuclides, strontium, plutonium, and uranium. The EPA may choose to take split samples of composite air samples.

The data results for these air monitors are entered into the Hanford Environmental Information System and/or the Automated Bar Coding of Air Samplers at Hanford database. The data collected from air monitoring described above will be summarized in the annual report that is prepared for the Hanford Site in compliance with 40 CFR 61 Subpart H and WAC 246-247 and that is used to demonstrate compliance with 40 CFR 61.92.

C.6 TEDE to MEI

Two CAP88-PC model runs were used to calculate the TEDE to the MEI from 324 Facility D4 and 300-296 waste site remediation activities, one for point source emissions and one for fugitive source emissions (ECF-324 BLDG-17-0086). The input parameters to the CAP88-PC program were the total point source PTE and total fugitive source PTE values, the wind file data, and the hypothetical onsite and offsite MEI distances from the 324 Facility.

Point Source/ Exhaust Stack Emissions

The unabated TEDE (if the primary HEPA is not credited) was an annual dose of 8.47E+01 mrem/year and was located 1,016m in the South Southeast direction (ECF-324 BLDG-17-0086). A breakdown of contributions from each nuclide to the unabated TEDE are shown in Table C-1.

To calculate the abated TEDE, HEPA filters were credited to filter 99.95% of particulates, hence, 0.05% or 5E-04 was not filtered. Therefore, the abated TEDE for the point source/exhaust stack emissions was an annual dose of 4.24E-02 mrem/year (8.47E+01 mrem/year x 5E-04) and was located 1,016m in the South Southeast direction. A breakdown of contributions from each nuclide to the abated TEDE are shown in Table C-1.

Three nuclides contribute greater than 10% to the TEDE, Sr-90, Cs-137, and Ba-137m.

Fugitive Source Emissions

The Unabated TEDE for fugitive source emissions was an annual dose of 8.46E+01 mrem/year and was located 1,016m in the South Southeast direction. (ECF-324 BLDG-17-0086). A breakdown of contributions from each nuclide to the unabated TEDE are shown in Table C-2.

One nuclide (Sr-90) contributes greater than 10% to the TEDE.

Table C-1 – Point Source PTE and TEDE

Nuclide	Unabated PTE (Ci/yr)	Abated PTE (Ci/yr)	Unabated TEDE (mrem/yr)	Abated TEDE (mrem/yr)
Mn-54	4.19E-10	2.09E-13	2.21E-11	1.11E-14
Co-60	2.47E-04	1.24E-07	2.17E-04	1.09E-07
Se-79	7.93E-07	3.97E-10	1.69E-07	8.45E-11
Sr-90	1.67E+01	8.35E-03	1.48E+01	7.40E-03
Y-90	1.67E+01	8.35E-03	1.98E+00	9.90E-04
Tc-99	2.63E-05	1.32E-08	3.90E-06	1.95E-09
Ag-108	3.11E-10	1.56E-13	4.27E-11	2.14E-14
Ag-108m	3.36E-09	1.68E-12	8.46E-09	4.23E-12
Sb-125	4.62E-05	2.31E-08	3.91E-06	1.96E-09
Te-125m	6.29E-08	3.15E-11	5.62E-08	2.81E-11
Cs-134	2.05E-07	1.03E-10	1.29E-07	6.45E-11
Cs-137	5.40E+01	2.70E-02	3.56E+01	1.78E-02
Ba-137m	5.11E+01	2.55E-02	3.22E+01	1.61E-02
Eu-154	2.98E-03	1.49E-06	1.89E-03	9.45E-07
Eu-155	1.75E-03	8.75E-07	3.44E-05	1.72E-08
U-233/234	2.65E-07	1.33E-10	2.11E-07	1.06E-10
U-235	2.10E-08	1.05E-11	3.26E-12	1.63E-15
U-238	2.24E-07	1.12E-10	1.46E-07	7.30E-11
Np-239	4.31E-10	2.15E-13	--	--

Nuclide	Unabated PTE (Ci/yr)	Abated PTE (Ci/yr)	Unabated TEDE (mrem/yr)	Abated TEDE (mrem/yr)
Pu-238	3.14E-03	1.57E-06	3.62E-02	1.81E-05
Pu-239	6.31E-04	3.16E-07	7.93E-03	3.97E-06
Pu-240	2.28E-04	1.14E-07	2.86E-03	1.43E-06
Pu-241	8.09E-03	4.05E-06	1.86E-03	9.30E-07
Pu-242	3.79E-07	1.90E-10	4.52E-06	2.26E-09
Am-241	4.89E-03	2.44E-06	5.09E-02	2.55E-05
Am-243	4.31E-10	2.15E-13	5.29E-09	2.65E-12
Cm-242	7.98E-06	3.99E-09	--	--
Cm-243	2.94E-03	1.47E-06	2.31E-02	1.16E-05
Cm-244	1.13E-03	5.66E-07	7.34E-03	3.67E-06
			8.47E+01	4.24E-02

Table C-2 – Fugitive Source PTE and TEDE

Nuclide	Unabated PTE (Ci/yr)	Unabated TEDE (mrem/yr)
Mn-54	3.54E-10	1.66E-10
Co-60	6.65E-05	5.17E-04
Se-79e	1.26E-07	2.37E-07
Sr-90	8.99E+00	7.07E+01
Y-90	8.99E+00	9.44E+00
Tc-99	4.20E-06	5.52E-06
Ag-108	3.02E-10	3.66E-10
Ag-108m	3.26E-09	7.26E-08
Sb-125	6.64E-06	4.98E-06
Te-125m	6.10E-08	7.27E-08
Cs-134	1.58E-07	8.81E-07
Cs-137	3.93E-01	2.29E+00
Ba-137m	3.71E-01	2.07E+00
Eu-154	7.79E-04	4.38E-03
Eu-155	5.98E-04	1.06E-04
U-233	1.53E-09	1.29E-08
U-238	1.01E-09	6.95E-08
Np-239	4.18E-10	1.04E-09
Pu-238	1.21E-04	1.50E-02
Pu-239	3.70E-05	5.01E-03

Nuclide	Unabated PTE (Ci/yr)	Unabated TEDE (mrem/yr)
Pu-240	3.63E-05	4.91E-03
Pu-241	1.79E-03	4.43E-03
Pu-242	6.09E-08	7.82E-06
Am-241	5.35E-04	6.00E-02
Am-243	4.18E-10	4.65E-08
Cm-242	1.03E-16	1.16E-15
Cm-243	3.47E-06	2.93E-04
Cm-244	2.38E-04	1.67E-02
		8.46E+01

~~Table C-1. 324 Building Inventory and Potential-to-Emit Assessment. (2 Pages)~~

~~Isotope~~	~~Total Inventory (Ci)~~	~~RF~~	~~Potential to Emit Unabated (Ci/yr)~~	~~Potential to Emit Abated (Ci/yr)~~	~~Dose per Unit Release Factor[e] (mrem/Ci)~~	~~Offsite Unabated Dose (mrem/yr)~~	~~Offsite Abated Dose (mrem/yr)~~
~~Fe-55~~	~~6.13E+03~~	~~1.00E-03~~	~~6.13+00~~	~~3.07E-03~~	~~1.4E-03~~	~~8.58E-03~~	~~4.39E-06~~
~~Mn-54~~	~~1.57E+01~~	~~1.00E-03~~	~~1.57E-02~~	~~7.85E-06~~	~~1.0E-01~~	~~1.57E-03~~	~~7.85E-07~~
~~Mo-93~~	~~4.91E+02~~	~~1.00E-03~~	~~4.91E-01~~	~~2.46E-04~~	~~1.8E-02~~	~~8.84E-03~~	~~4.42E-06~~
~~Co-60~~	~~4.51E+02~~	~~1.00E-03~~	~~4.51E-01~~	~~2.26E-04~~	~~1.6E+00~~	~~7.22E-01~~	~~3.61E-04~~
~~Se-79~~	~~1.55E+02~~	~~1.00E-03~~	~~1.55E-05~~	~~7.77E-09~~	~~7.9E-01~~	~~1.23E-05~~	~~6.14E-09~~
~~Sr-90~~	~~2.60E+04~~	~~1.00E-03~~	~~2.60E+01~~	~~1.30E-02~~	~~7.1E-01~~	~~1.84E+01~~	~~9.22E-03~~
~~Tc-99~~	~~5.21E+01~~	~~1.00E-03~~	~~5.21E-02~~	~~2.61E-05~~	~~1.4E-01~~	~~7.30E-03~~	~~3.65E-06~~
~~Sb-125~~	~~1.53E+00~~	~~1.00E-03~~	~~1.53E-03~~	~~7.65E-07~~	~~1.6E-01~~	~~2.45E-04~~	~~1.22E-07~~
~~Cs-137~~	~~4.79E+04~~	~~1.00E-03~~	~~4.79E+01~~	~~2.4E-02~~	~~1.5E+00~~	~~7.19E+01~~	~~3.59E-02~~
~~Eu-154~~	~~9.69E+01~~	~~1.00E-03~~	~~9.69E-02~~	~~4.85E-05~~	~~1.2E+00~~	~~1.16E-01~~	~~5.82E-05~~
~~Eu-155~~	~~7.58E+01~~	~~1.00E-03~~	~~7.58E-02~~	~~3.79E-05~~	~~5.0E-02~~	~~3.79E-03~~	~~1.90E-06~~
~~Pu-238~~	~~1.23E+01~~	~~1.00E-03~~	~~1.23E-02~~	~~6.14E-06~~	~~4.6E+01~~	~~5.56E-01~~	~~2.82E-04~~
~~Pu-239~~	~~3.74E+00~~	~~1.00E-03~~	~~3.74E-03~~	~~1.87E-06~~	~~5.0E+01~~	~~1.87E-01~~	~~9.34E-05~~
~~Pu-240~~	~~3.67E+0~~	~~1.00E-03~~	~~3.67E-03~~	~~1.83E-06~~	~~5.0E+01~~	~~1.83E-01~~	~~9.16E-05~~
~~Pu-241~~	~~2.18E+02~~	~~1.00E-03~~	~~2.18E-01~~	~~1.09E-04~~	~~7.9E-01~~	~~1.72E-01~~	~~8.62E-05~~
~~Pu-242~~	~~6.12E-03~~	~~1.00E-03~~	~~6.12E-06~~	~~3.06E-09~~	~~4.8E+01~~	~~2.94E-04~~	~~1.47E-07~~
~~Am-241~~	~~5.79E+01~~	~~1.00E-03~~	~~5.79E-02~~	~~2.89E-05~~	~~7.7E+01~~	~~4.46E+00~~	~~2.23E-03~~
~~Cm-243~~	~~3.53E-01~~	~~1.00E-03~~	~~3.53E-04~~	~~1.76E-07~~	~~5.2E+01~~	~~1.83E-02~~	~~9.17E-06~~
~~Cm-244~~	~~2.43E+01~~	~~1.00E-03~~	~~2.43E-02~~	~~1.22E-05~~	~~4.1E+01~~	~~9.98E-01~~	~~4.99E-04~~
~~**Total**~~	~~**8.15E+04**~~		~~**8.15E-01**~~	~~**4.08E-02**~~		~~**9.78E+01**~~	~~**4.89E-02**~~

~~Table C-1. 324 Building Inventory and Potential-to-Emit Assessment. (2 Pages)~~

~~Isotope~~	~~Total Inventory (Ci)~~	~~RF~~	~~Potential to Emit Unabated (Ci/yr)~~	~~Potential to Emit Abated (Ci/yr)~~	~~Dose per Unit Release Factor[e] (mrem/Ci)~~	~~Offsite Unabated Dose (mrem/yr)~~	~~Offsite Abated Dose (mrem/yr)~~

~~Source: Table taken from calculation 0300X-CA-V0078 (WCH 2006d).~~
~~RF = release fraction~~

Table C-32. BARCT Requirements Applicable for Operating the 324 Building Stack.

Zone or Area	Abatement Technology	Number of Units	Additional Description
Zone 2	HEPA	1	Stage is for control of Zone 3
Zone 2	Prefilter	1	
Zone 2	Fan	1	2 in parallel
Cell	Electrostatic precipitator	1	
Cell	Prefilter	2	
Zone 1 cells	Fan	1	3 in parallel, serves B Cell, Zone 1 cells
Zone 1 cells	HEPA	1	Last stage shared with B cell
Zone 1 cells	HEPA	1	Last stage shared with B cell
Zone 1 cells	Prefilter	2	1 for Zone 1 cell, 1 for POG V/V

BARCT = best available radionuclide control technology
HEPA = high-efficiency particulate air
POG = process off-gas
V/V = vessel vent

C.6 REFERENCES

40 CFR 61, "National Emission Standards for Hazardous Air Pollutants," *Code of Federal Regulations*, as amended.

~~0300X-CA-N0078, 2006, *Radiological Inventory for the 324 Building Shielded Materials Facility*, Rev. 0, Washington Closure Hanford, Richland, Washington.~~

~~0300X-CA-N0079, 2006, *Bounding Radiological Characterization for the 324 Building Radiochemical Engineering Cells and Airlock*, Rev. 0, Washington Closure Hanford, Richland, Washington.~~

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