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Amendment to the Record of Decision for Phase I Interim Source Control Actions in the Upper East Fork Poplar Creek Characterization Area, Oak Ridge, Tennessee

Water Treatment at Outfall 200

APPROVED FOR PUBLIC RELEASE

This document has been approved for release to the public by:

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DOE Oak Ridge Office Classification Officer Date

APPROVALS

Amendment to the Record of Decision for Phase I Interim Source Control Actions in the Upper East Fork Poplar Creek Characterization Area, Oak Ridge, Tennessee: Water Treatment at Outfall 200

DOE/OR/01-2697&D2

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ACRONYMS

AEA	Atomic Energy Act of 1954
ALARA	As Low As Reasonably Achievable
ARAR	Applicable or Relevant and Appropriate Requirement
ARRA	American Recovery and Reinvestment Act of 2009
AWQC	Ambient Water Quality Criteria
BSWTS	Big Spring Water Treatment System
CA	Characterization Area
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
COC	Contaminant of Concern
D&D	Decontamination and Decommissioning
DOE	U.S. Department of Energy
EMWMF	Environmental Management Waste Management Facility
EPA	U.S. Environmental Protection Agency
ESD	Explanation of Significant Differences
ETTP	East Tennessee Technology Park
FFA	Federal Facility Agreement
FFS	Focused Feasibility Study
FS	Feasibility Study
gpm	Gallons Per Minute
LLW	Low-Level Waste
LUC	Land Use Control
LUCIP	Land Use Control Implementation Plan
Mgd	Million Gallons Per Day
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEPA	National Environmental Policy Act of 1969
NNSA	National Nuclear Security Administration
NPDES	National Pollutant Discharge Elimination System
NPO	Y-12 National Nuclear Security Administration Production Office
NSC	Non-Significant Change Notice
O&M	Operations and Maintenance
ORNL	Oak Ridge National Laboratory

ORR	Oak Ridge Reservation
PCB	Polychlorinated Biphenyl
PIDAS	Y-12 Perimeter Intrusion Detection and Assessment System
ppt	Parts Per Trillion
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act of 1976
RDWP	Remedial Design Work Plan
RI	Remedial Investigation
ROD	Record of Decision
S&M	Surveillance and Maintenance
TBC	To Be Considered
TCA	Tennessee Code Annotated
TDEC	Tennessee Department of Environment and Conservation
UEFPC	Upper East Fork Poplar Creek
UCOR	URS | CH2M Oak Ridge LLC
WAC	Waste Acceptance Criteria
WEMA	West End Mercury Area
Y-12	Y-12 National Security Complex

PREFACE

This *Amendment to the Record of Decision for Phase I Interim Source Control Actions in the Upper East Fork Poplar Creek Characterization Area, Oak Ridge, Tennessee* (DOE/OR/01-2697&D2) was prepared in accordance with requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) to document the modification of the selected remedy for environmental remediation of contaminated areas within the Upper East Fork Poplar Creek (UEFPC) characterization area (CA). This record of decision (ROD) amendment documents a modification to the selected interim remedy agreed on by the U.S. Department of Energy (DOE), the Tennessee Department of Environment and Conservation (TDEC), and the U.S. Environmental Protection Agency (EPA). This modification includes the construction and operation of a new water treatment facility to further reduce mercury discharges from the Y-12 National Security Complex to UEFPC surface water. This modification will supplement the response actions already included in the selected remedy – which address mercury-contaminated sediment in storm sewers, point groundwater discharges, and mercury-contaminated sediment in UEFPC and Lake Reality, each of which contributes to contamination of surface water within the UEFPC watershed – to achieve further reductions in mercury concentrations in UEFPC surface water and releases to the offsite environment. This remedy will be implemented to the extent practicable while minimizing disruption of the continuing mission of the Y-12 National Security Complex (Y-12, formerly the Oak Ridge Y-12 Plant). This decision is based on the Administrative Record file for this project, which includes the following principal documents:

- *Report on the Remedial Investigation of the Upper East Fork Poplar Creek Characterization Area at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee*, DOE/OR/01-1641/V1-V4&D2 (DOE 1998);
- *Feasibility Study for the Upper East Fork Poplar Characterization Area at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee*, DOE/OR/01-1747&D2 (DOE 1999);
- *Addendum to the Feasibility Study for the Upper East Fork Poplar Creek Characterization Area at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee*, DOE/OR/01-1747&D3/A3 (DOE 2000);
- *Record of Decision for Phase I Interim Source Control Actions in the Upper East Fork Poplar Creek Characterization Area, Oak Ridge, Tennessee*, DOE/OR/01-1839&D3 (DOE 2001);
- *Focused Feasibility Study for Water Treatment at Outfall 200 under the Record of Decision for Phase I Interim Source Control Actions in the Upper East Fork Poplar Creek Characterization Area, Oak Ridge, Tennessee*, DOE/OR/01-2660&D3 (DOE 2015a); and
- *Proposed Plan for Water Treatment at Outfall 200 under the Record of Decision for Phase I Interim Source Control Actions in the Upper East Fork Poplar Creek Characterization Area, Oak Ridge, Tennessee*, DOE/OR/01-2661&D2 (DOE 2015b).

These documents and other information supporting the selected remedial action can be found at the DOE Information Center, 1 Science.gov Way, Oak Ridge, Tennessee 37830, (865) 241-4780.

1.0 SITE NAME AND LOCATION

U.S. Department of Energy (DOE)
Oak Ridge Reservation (ORR)
Upper East Fork Poplar Creek Characterization Area (UEFPC)
Oak Ridge, Tennessee
CERCLIS ID TN1890090003

2.0 INTRODUCTION AND PURPOSE

This decision document presents a modification to the selected remedy for interim remedial actions for remediation of specified areas within the Upper East Fork Poplar Creek (UEFPC) Characterization Area (CA) at the Y-12 National Security Complex (Y-12, formerly the Oak Ridge Y-12 Plant) on the U.S. Department of Energy (DOE) Oak Ridge Reservation (ORR) in Oak Ridge, Tennessee. Remediation of the UEFPC Watershed is being conducted through a multi-phase remedial action program under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). The first stage of this program was documented in the *Record of Decision for Phase I Interim Source Control Actions in the Upper East Fork Poplar Creek Characterization Area, Oak Ridge, Tennessee* (DOE 2002) (herein referred to as the UEFPC Phase I ROD), which was signed on May 2, 2002, by DOE, the Tennessee Department of Environment and Conservation (TDEC), and the U.S. Environmental Protection Agency (EPA). The UEFPC Phase I ROD selected remedy included a series of interim source control actions designed to address the most significant sources of mercury contamination in UEFPC for which sufficient data existed at that time to support appropriate remedy selection decisions. Some of the remedial actions selected in the UEFPC Phase I ROD have been successfully completed while others are still scheduled for future implementation.

While the actions completed to date have achieved significant reductions in the mercury releases from the site, the level of mercury in UEFPC surface water remains above the interim goal established in the UEFPC Phase I ROD and applicable regulatory criteria. Therefore, this ROD amendment modifies the selected remedy to include construction and operation of a new water treatment facility designed to achieve further reductions in mercury releases and concentrations in the offsite environment. This new water treatment system will treat discharges from the storm sewer system adjacent to the former mercury-use buildings in the West End Mercury Area (WEMA), which currently constitutes the largest source of mercury releases to UEFPC. The integration point for the WEMA storm sewer network is a location designated Outfall 200. The new water treatment facility will be constructed to treat discharges from Outfall 200 with a treatment capacity of 3000 gallons per minute (gpm) or 4.3 million gallons per day (Mgd) of influent surface water and storage capacity for stormwater flows in excess of treatment capacity up to 2 million gallons to manage stream flows up to 40,000 gpm.

Construction and operation of this new water treatment facility to treat discharges from the WEMA storm sewer system constitutes a fundamental change to the selected remedy in the UEFPC Phase I ROD, and requires documentation under the ROD amendment process, pursuant to CERCLA Section 117 and Section 300.435(c)(2)(ii) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). Other components of the remedial actions identified in the UEFPC Phase I ROD selected remedy are unaffected by this ROD amendment. No other fundamental changes to the UEFPC Phase I ROD remedial actions are being proposed, and therefore, other components of the UEFPC Phase I ROD selected remedy are not within the scope of this ROD amendment.

This modified set of remedial actions for the UEFPC watershed was chosen in accordance with the requirements of CERCLA, as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) (42 United States Code Sect. 9601 et seq.), and, to the extent practicable, the NCP [40 Code of Federal Regulations (CFR) 300]. The Federal Facility Agreement (FFA) (DOE 1992) for Oak Ridge was developed to integrate the requirements of CERCLA and the Resource Conservation and Recovery Act of 1976 (RCRA) and to provide a legal framework for remediation activities at ORR. This integrated approach extends to preparation of decision documents under CERCLA and RCRA. In addition, National Environmental Policy Act of 1969 (NEPA) values are incorporated in the documents prepared for this project in accordance with the *Secretarial Policy Statement on the National Environmental Policy Act of 1969* (DOE 1994). This policy states that DOE will rely on the CERCLA process for review of actions taken under CERCLA and will address and incorporate NEPA values in CERCLA evaluations to the extent practicable. Although not included as part of the selected remedy in the UEFPC Phase I ROD, feasibility study alternatives that included water treatment at Outfall 200 were evaluated under CERCLA and the National Environmental Policy Act of 1969 (NEPA), and deemed to be protective of human health and the environment.

This ROD amendment and other information supporting the selected remedy is part of the Administrative Record file for the UEFPC Watershed, and is available through the DOE Information Center, 1 Science.gov Way, Oak Ridge, Tennessee 37830, from 8:00 am to 5:00 pm Monday through Friday (telephone 865-241-4780). Documentation in this file includes the focused feasibility study (FFS) (DOE 2015a) and the proposed plan (DOE 2015b) developed specifically for evaluation of this modification of the selected remedy, as well as the original UEFPC remedial investigation (RI) report (DOE 1998), draft feasibility study (FS) (DOE 1999), FS Addendum (DOE 2000), proposed plan (DOE 2001) and UEFPC Phase I ROD (DOE 2002). In addition, DOE has considered all comments received on the proposed plan in preparing this ROD amendment.

This document is issued by DOE, as the lead agency. The EPA and TDEC are support agencies as parties of the FFA for this response action.

3.0 SITE HISTORY, CONTAMINATION, AND SELECTED REMEDY

3.1 OVERVIEW OF Y-12 NATIONAL SECURITY COMPLEX AND UPPER EAST FORK POPLAR CREEK

The ~34,000-acre ORR is located within and adjacent to the corporate limits of the city of Oak Ridge, Tennessee, in Roane and Anderson Counties. The ORR is bounded to the east and north by the developed portion of the city of Oak Ridge. The ORR hosts three major industrial research and production facilities originally constructed as part of the World War II-era Manhattan Project: East Tennessee Technology Park (ETTP), Oak Ridge National Laboratory (ORNL), and the Y-12 National Security Complex (Y-12, formerly the Oak Ridge Y-12 Plant) (Figure 1).

The boundaries of the UEFPC watershed, which includes approximately 1170 acres that encompasses the industrialized area of Y-12, extend along the top of Pine Ridge to the north, the top of Chestnut Ridge to the south, the eastern boundary of the Bear Creek Valley watershed to the west, and the DOE property line to the east (Figure 1). Major features of UEFPC with respect to mercury contamination are summarized in Figure 2.

The Y-12 National Security Complex was built by the U.S. Army Corps of Engineers in 1943 as part of the World War II-era Manhattan Project, and remains an active manufacturing and developmental

engineering facility. It occupies approximately 600 acres within Bear Creek Valley near the northeastern corner of the ORR, adjacent to the city of Oak Ridge. The original mission of the facility was to chemically separate and produce fissile ^{235}U from ^{238}U using an electromagnetic separation process (alpha process) and to manufacture weapons components as part of the national effort to produce the atomic bomb. As other uranium enrichment processes were developed and implemented at other installations, the role of Y-12 expanded to include weapon components manufacturing and precision machining, research and development, lithium isotope separation, and special nuclear materials storage and management. The current mission of the installation is multifaceted and includes the following National Nuclear Security Administration (NNSA) assignments: manufacturing and reworking nuclear weapons components, dismantling nuclear weapons components, serving as the nation's stockpile for special nuclear materials, and providing special production support to other programs.

Historic manufacturing processes, programs, and waste management practices associated with Y-12's mission have resulted in the contamination of soil, surface water, sediment, and groundwater. These processes included chemical separation techniques; weapons manufacturing; research and development; waste storage, management, and disposal; and physical plant maintenance activities. These processes also resulted in the release of large quantities of mercury to the environment. As a result of these historical releases, mercury contamination is present in onsite soils, sediments and building structures, and in offsite surface water, sediments and biota. Because of the contaminant releases at Y-12 and other DOE facilities, the Oak Ridge Reservation was placed on the U.S. Environmental Protection Agency's (EPA's) National Priorities List established under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) [54 *Federal Register* 48184, November 21, 1989].

Remediation of the UEFPC watershed is being conducted in stages using a phased approach. The *Record of Decision for Phase I Interim Source Control Actions in the Upper East Fork Poplar Creek Characterization Area, Oak Ridge, Tennessee* (DOE 2002) constitutes the initial phase and addresses interim actions for remediation of principal-threat, mercury-contaminated soil, sediment, and point groundwater discharges that contribute contamination to surface water. The *Record of Decision for Phase II Interim Remedial Actions for Contaminated Soils and Scrapyard in Upper East Fork Poplar Creek, Oak Ridge, Tennessee* (DOE 2006a) (UEFPC Phase II ROD) was issued in 2006 for the remediation of the balance of contaminated soil, scrap, and buried materials at the Y-12 site. Decisions regarding final land use and final goals for surface water, groundwater, and soil for the watershed will be addressed in future decision documents.

As shown in Figure 2, UEFPC flows directly from Y-12 into the City of Oak Ridge. The storm sewer network servicing the former mercury processing buildings in the West End Mercury Area has become contaminated from mercury contamination in soil and groundwater. This contaminated storm drain network discharges through a series of outfalls into UEFPC surface water. Current and historical contaminant releases from the UEFPC watershed exit the ORR via surface water (UEFPC at Station 17) and groundwater (east into Union Valley).

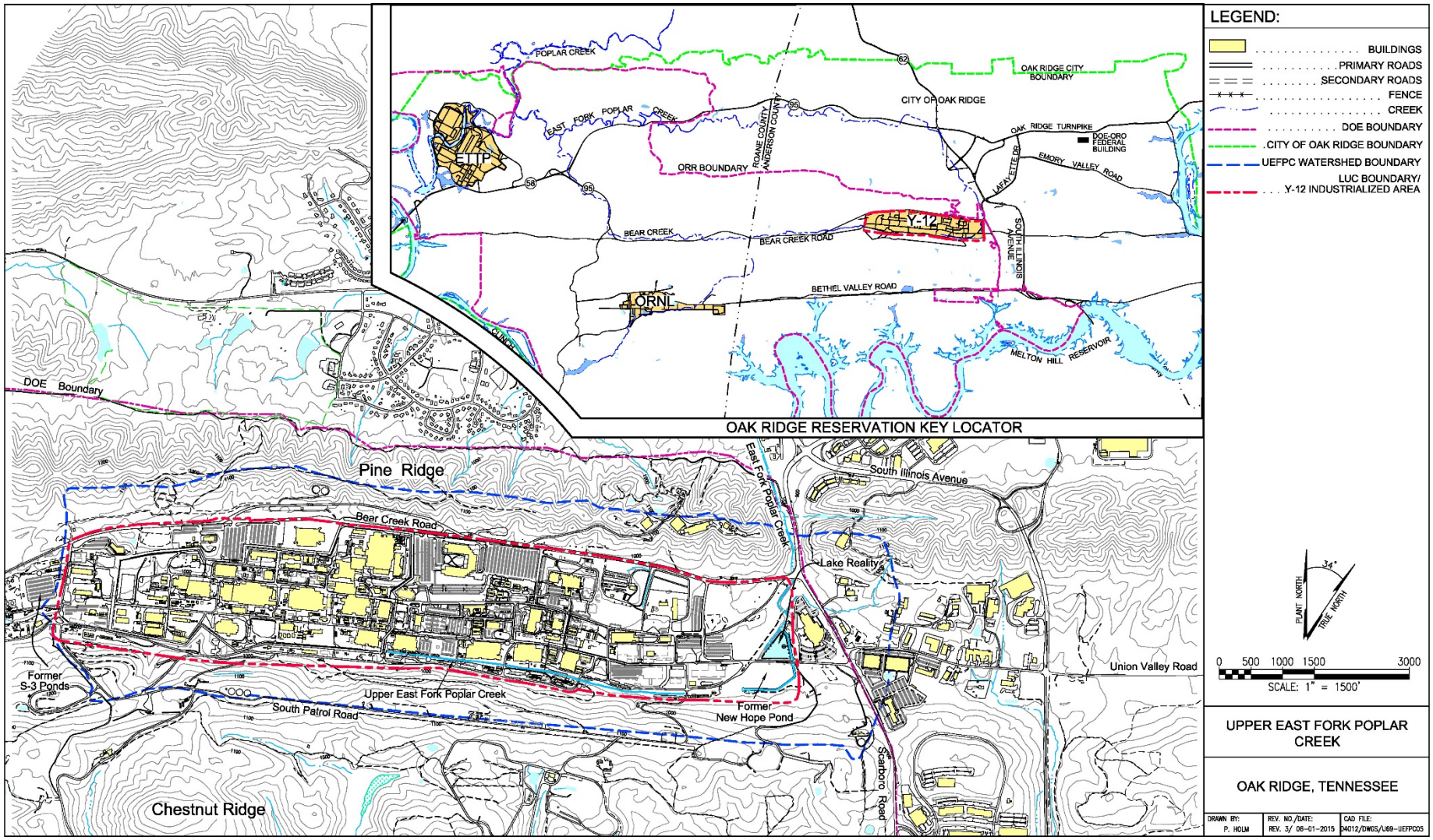

Figure 1. Location of the Upper East Fork Poplar Creek Watershed

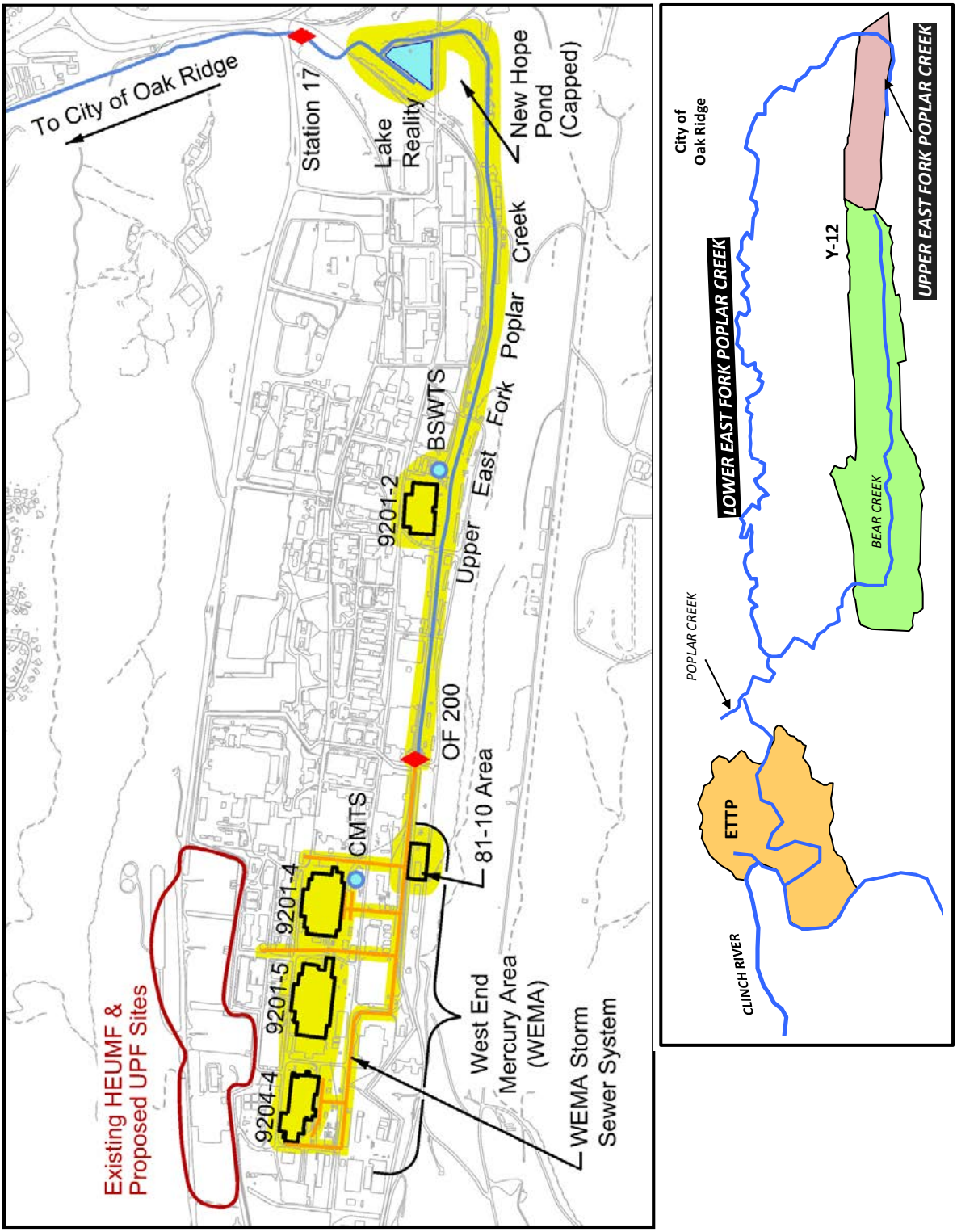

Figure 2. Suspected Areas of Mercury Contamination in UEFPC Watershed

3.2 SUMMARY OF THE UEFPC PHASE I ROD

The UEFPC Phase I ROD considered three alternatives for remediation of specified areas within the UEFPC watershed. These alternatives all included similar source control actions (e.g., hydraulic isolation of contaminated soils and cleanout/relining of contaminated sewer lines in the West End Mercury Area, excavation of contaminated sediments from UEFPC and Lake Reality), land use controls, and monitoring, but they differed primarily in the extent of water treatment operations proposed. Alternative 3a ("Source Control") included construction of a relatively small (300 gpm, 0.43 Mgd) water treatment facility at Building 9201-2 to treat water from in-leakage of groundwater into the basement of this building and the adjacent Outfall 51, while Alternative 4a ("Migration Control Using Water Treatment at Station 17") called for construction of a much larger (10,400 gpm, 15 Mgd) water treatment facility at Station 17 (near the location where UEFPC exits the Y-12 site), and Alternative 6a ("Migration and Source Control with Water Treatment at Outfall 200") called for construction of an intermediate capacity (3000 gpm, 4.3 Mgd) water treatment facility at Outfall 200.

All three alternatives were determined to meet the CERCLA threshold criteria of protectiveness and compliance with ARARs (with an interim waiver for the AWQC in-stream standard for mercury), and Alternative 3a was determined to provide the best balance of trade-offs among the alternatives with respect to the CERCLA balancing and modifying criteria. Alternative 3a was estimated to have the lowest cost of all alternatives, at less than one-half the estimated cost of the other action alternatives, and to have the least uncertainties regarding implementability and long-term effectiveness. In particular, TDEC expressed concerns regarding the selection of a remedy that was dependent on the ability of a large-scale water treatment facility to consistently achieve the desired levels for mercury, and expressed a preference to proceed with source control actions and to defer decisions on large-scale water treatment to future decision documents.

As reflected by the inclusion of "Phase I" in the title, the UEFPC Phase I ROD was designed to be the first stage of a multi-stage remediation program. The UEFPC Phase I ROD selected Alternative 3a, Source Control, as the response action that best met the CERCLA evaluation criteria to achieve the Remedial Action Objective (RAO): "restore surface water to human health recreational risk-based values at Station 17". The selected alternative focused on a series of interim source control actions designed to reduce the release of mercury to the offsite environment. These actions were designed to address the most significant sources of mercury contamination in UEFPC for which sufficient data existed at that time to support appropriate remedy selection decisions through the CERLCA process. The interim source control actions selected in the UEFPC Phase I ROD included:

- Hydraulic isolation of contaminated soils and cleanout/relining of contaminated sewer lines in the West End Mercury Area;
- Excavation of contaminated sediments from UEFPC and Lake Reality;
- Construction and operation of a water treatment system at Building 9201-2 to treat discharge from Outfall 51;
- Continued operation of previously existing water treatment systems [i.e., Central Mercury Treatment System (CMTS) and East End Mercury Treatment System (EEMTS)] as needed;
- Land use controls to prevent fish consumption and to restrict access to contaminated areas; and
- Surface water monitoring to evaluate reductions in contaminant concentrations.

In addition to these source control actions, the selected remedy also included three short-term studies and two long-term studies to evaluate potential additional response actions:

- The technical feasibility of a horizontal groundwater capture well as an additional component of hydraulic isolation of the WEMA;
- The depth and mobility of contamination and alternative technologies for in situ treatment of mercury-contaminated soil at the Building 81-10 site;
- Treatment and disposal options for soil and sediment that fail to meet the Waste Acceptance Criteria (WAC) for the Environmental Management Waste Management Facility (EMWMF);
- Evaluation of the viability of large-scale treatment of mercury-contaminated surface water in UEFPC; and
- Groundwater studies to facilitate a better understanding of the dynamics of the groundwater plumes underlying the UEFPC watershed.

Previous modifications to the UEFPC Phase I ROD have included three non-significant change (N-SC) notices and the *Explanation of Significant Differences for the Record of Decision for Phase I Interim Source Control Actions in the Upper East Fork Poplar Creek Characterization Area* (DOE 2012a), which documented more significant changes:

- A non-significant change was documented in 2006 (DOE 2006b) to modify the UEFPC surface water monitoring requirements to upgrade sampling equipment at Station 200A6 for collection of continuous mercury flux samples as 7-day composites and discontinue sampling at Outfalls 150, 160, 163, and 169 until one year prior to the WEMA remedial actions.
- A non-significant change was documented in 2006 (DOE 2007) to discontinue treatment of water collected in sumps at Building 9201-5 (Alpha 5) at the Central Mercury Treatment System due to the leakage of brine solution from cooling systems into the building sumps; methanol in the brine solution was found to contribute to enhanced bacterial growth at CMTS which negatively impacted the system treatment efficiency. Water is being allowed to accumulate in the basement of Building 9201-5.
- A non-significant change was documented in 2014 (DOE 2014a) to clarify that monitoring requirements and sampling protocols for UEFPC will be documented in the *East Fork Poplar Creek and Chestnut Ridge Administrative Watersheds Remedial Action Report Comprehensive Monitoring Plan* (DOE 2014b), rather than the UEFPC Remedial Design Work Plan (RDWP) as stated in the UEFPC Phase I ROD.
- An ESD was approved in 2012 (DOE 2012a) to modify components of the selected remedy: (1) the construction of interim asphalt caps over approximately 3.5 acres of unpaved areas at WEMA was eliminated; (2) the schedule for excavation of contaminated sediments from UEFPC and Lake Reality was revised to be consistent with the overall remediation strategy to conduct remedial action for UEFPC in a generally upgradient-to-downgradient sequence; and (3) two treatability studies that are no longer considered useful (evaluations of horizontal groundwater capture well, and in-situ treatment of soils at 81-10 area) were eliminated.

Some of the response actions selected in the UEFPC Phase I ROD have been successfully completed while others are still scheduled for future implementation. The following response actions selected in the UEFPC Phase I ROD have been completed or are currently in operation:

- Water Treatment at Outfall 51 – The Big Spring Water Treatment System (BSWTS) was constructed in FY2005 to treat mercury-contaminated discharge from Outfall 51 (including the large-volume spring designated Big Spring located near the southeast corner of Building 9201-2) and water from the Building 9201-2 sumps. BSWTS has a treatment capacity of 300 gpm. Mercury contamination within shallow groundwater beneath and adjacent to Building 9201-2 discharges at this spring. Following construction in FY2005, mercury-contaminated water was rerouted from Outfall 51 and the Building 9201-2 sumps to the BSWTS in December 2006. Influent previously treated at the East End Mercury Treatment System also was rerouted to the BSWTS at this time and the EEMTS operation was discontinued. During FY2014, the average concentration of mercury in BSWTS influent was 4.2 µg/L and 0.026 µg/L in system effluent; only one of the weekly composite samples exceeded the performance goal of 200 ppt (0.2 µg/L) specified in the ROD. During FY2014, the volume of water treated at BSWTS was approximately 99 million gallons, and the total mercury flux discharged in the treated effluent was approximately 6 grams. In addition, water bypassing treatment during periods of high flow during FY2014 contributed an estimated mercury flux of approximately 10 grams. (DOE 2015c)
- Hydraulic isolation actions in the West End Mercury Area (WEMA) – Cleaning and repair of the storm sewer network in WEMA was initiated in FY2009. More than 20,000 linear-feet of storm sewer lines were inspected using videotape to determine their condition. During FY2011, more than 8,000 linear-feet of these sewer lines were cleaned and approximately 1,200 linear-feet were re-lined. The construction of temporary asphalt caps over approximately 3.5 acres of unpaved areas in WEMA was eliminated under the ESD (DOE 2012a); this component of hydraulic isolation for WEMA soils was determined to be no longer needed, due to the acceleration of the schedule for demolition of the WEMA former mercury-use buildings, making contaminated soils in these areas accessible for excavation, where appropriate, under the Phase II ROD.
- Continued operation of previously existing water treatment systems – The selected remedy included the continued operation of previously existing treatment systems for treatment of mercury contaminated waters as needed. These included the East End Mercury Treatment System (EEMTS), which continued operation only until the new BSWTS was constructed, and is no longer in operation; and the Central Mercury Treatment System (CMTS), which continues operation today. CMTS was designed to treat mercury contaminated water collected in sumps at the WEMA buildings, most notably Buildings 9201-4 and 9201-5, with a treatment capacity of 50 gpm. Treatment of water from the sumps in Building 9201-5 was discontinued following an accidental introduction of methanol from a leaking cooling system in 2005 that interfered with mercury treatment, but treatment of sump water from Building 9201-4 (a much larger source of mercury) continues. The total volume of water treated during FY2014 was approximately 2.6 million gallons; no effluent sample exceeded the goal of 200 ppt and the total mercury discharge was estimated at less than 2 mg (DOE 2015c).
- Land Use Controls – Land use controls (LUCs), including postings and periodic patrols of UEFPC, have been implemented to ensure protection of potential human receptors. LUCs will be implemented in accordance with the Land Use Control Implementation Plan (LUCIP) developed as part of the Remedial Action Report Comprehensive Monitoring Plan (DOE 2014b). LUCs are checked regularly for protectiveness and any issues or changes are reported in the annual Remediation Effectiveness Report. DOE is committed to implementing and maintaining LUCs to ensure that the selected remedy remains protective of human health and the environment.
- Surface Water Monitoring – Surface water monitoring is conducted in accordance with the RAO to evaluate reductions in contaminant concentrations and flux. UEFPC surface water is monitored at Station 17, where UEFPC exits Y-12, as well as at the midpoint of the UEFPC channel, at storm sewer outfalls, and at treatment system effluents. The objective of this monitoring is to determine attainment of the interim goal for mercury of 200 ppt in UEFPC at Station 17. Monitoring also is performed to assess reduction of mercury in fish and to assess the effectiveness of individual actions.

Remedial actions completed to date have achieved reductions in mercury flux and concentrations in UEFPC surface water but have not achieved the interim goal. The daily median mercury flux at Station 17 was measured at 11.4 g/d from FY2000-FY2005 and at 7.0 g/d from FY2006-FY2010. Mercury flux increased during FY2011-FY2013 due to the WEMA storm drain cleanout project, and then began to decline toward the pre-storm drain cleanout levels in FY2014 (DOE2015c). Only in 2007 did the average mercury concentration at Station 17 achieve the interim goal of 200 ng/L. No reduction of mercury concentration in fish tissue was observed during this period.

The following response actions selected in the UEFPC Phase I ROD are scheduled for future implementation:

- Removal of contaminated sediments from UEFPC and Lake Reality – Contaminated sediments will be removed from UEFPC and Lake Reality to reduce mercury and PCB levels in fish and to protect recreational surface water users. Sediment will be removed from the UEFPC streambed to bedrock (1 to 6 feet deep). Contaminated soil will also be removed from the UEFPC banks. An estimated total volume of 8000 yd3 of contaminated material will be removed. The streambed will be backfilled and graded to restore the creek channel. Approximately 1 foot of contaminated sediment (approximately 4000 yd3) will be removed from Lake Reality. The total estimated volume of contaminated sediment and soil is 12,000 yd3. Contaminated soils and sediments that meet the waste acceptance criteria (WAC) of the onsite Environmental Management Waste Management Facility (EMWMF) or successor facility will be disposed of at that facility, while materials that exceed these criteria will be sent off-site for treatment and disposal. The schedule for implementation of this action was revised under the ESD (DOE 2012a) to follow completion of upstream decontamination and decommissioning actions and remedial actions, for consistency with the overall remediation strategy to conduct remedial actions for UEFPC in a generally upgradient-to-downgradient sequence and reduce risk of recontamination in remediated areas.

This ROD amendment identifies an additional response action to be taken to supplement the actions already included in the UEFPC Phase I ROD selected remedy to achieve further reductions in mercury concentrations in UEFPC surface water and releases to the offsite environment. This ROD amendment modifies the selected remedy to include construction and operation of a new water treatment facility to treat discharges from the storm sewer system adjacent to the former mercury-use buildings in the West End Mercury Area (WEMA), which currently constitutes the largest source of mercury releases to UEFPC under base flow conditions. The integration point for the WEMA storm sewer network is a location designated Outfall 200:

- Water Treatment at Outfall 200 – A new water treatment facility will be constructed to treat discharges from Outfall 200 with a treatment capacity of 3000 gpm (4.3 Mgd) of influent surface water and storage capacity for stormwater flows in excess of treatment capacity up to 2 million gallons to manage stream flows up to 40,000 gpm. Treatment operations will include 40,000 gpm capacity for grit removal, followed by chemical co-precipitation/clarification (sulfide-functional polymer precipitation, and ferric chloride co-precipitation with clarification) and filtration (multi-media filtration) for influent surface water flows and stored stormwater up to 3000 gpm plus recycle flows (e.g., backwash water, filter press filtrate) up to 1000 gpm. Stormwater storage capacity of 2 million gallons will be provided using above-ground tanks or lined stormwater retention basins. Peak flows from larger storm events will bypass the treatment facility, although the initial runoff flow from these larger storm events (i.e., the “first flush”, defined as the runoff from the 60-minute period surrounding the hydrograph peak) will be captured up to 40,000 gpm. Stormwater flows that exceed the treatment and storage capacity will bypass the facility to UEFPC without treatment.

Remediation of the entire UEFPC watershed will be conducted in stages using a phased approach. The remedial actions presented in the UEFPC Phase I ROD selected remedy, and as modified by this ROD amendment, constitute an initial phase, focusing on interim source control actions for remediation of mercury-contaminated soils, sediments, and groundwater that contribute contamination to surface water. These actions are expected to reduce the mercury releases to UEFPC and attain the interim goal established by the FFA parties for surface water quality and to make substantial progress toward attainment of the long-term water quality goal. Subsequent phases of remediation will address additional contaminated soils and sediments, groundwater, and buildings.

The selected remedy, as modified by this ROD amendment, fits into the overall DOE-ORR cleanup strategy by removing and disposing of contaminated media to the extent practicable. The remedial actions implemented under this interim ROD will be completed, evaluated, and used as the basis for determining what, if any, additional remedial actions may be necessary to meet final goals. Decisions regarding final land use and final goals for surface water, groundwater, and soils will be determined in future decision documents.

The UEFPC Phase I ROD, as modified by this ROD amendment, is one component of an integrated multi-part strategy to reduce mercury contamination at Y-12. The *Strategic Plan for Mercury Remediation at the Y-12 National Security Center* (DOE 2014c) describes DOE's integrated plan to remediate mercury contamination at Y-12 and impacted surface water downstream from Y-12 using an adaptive management approach. Adaptive management is an approach for natural resource management that promotes flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood. Adaptive management acknowledges uncertainty about how ecological and natural resource systems function and how they respond to management actions, and makes use of management interventions and follow-up monitoring to promote understanding and improve subsequent decision making through an iterative process. The *Strategic Plan* recognizes that the cleanup of mercury contamination and sources at Y-12 is a complex, multi-faceted problem that requires an equally multi-layered remediation approach. As an adaptive plan, the *Strategic Plan* is expected to evolve as results of implemented actions are obtained and evaluated, and modifications may be proposed as necessary.

4.0 BASIS FOR THE DOCUMENT

This section discusses the justification for reevaluating water treatment at Outfall 200 as an appropriate component of the remedy for UEFPC and summarizes the information gathered during the remedial design process that prompted and supports significant differences from the UEFPC Phase I ROD selected remedy.

After a ROD is signed, new information may be received that could affect the implementation of the remedy selected in the ROD or could prompt reassessment of that remedy. The selected remedy in the UEFPC Phase I ROD was designed to achieve the following Remedial Action Objective (RAO): "to restore surface water to human health recreational risk-based values at Station 17." This RAO was selected with the recognition that remediation of the UEFPC watershed would be conducted using a phased approach, and that an ultimate long-term goal would be the attainment of the AWQC in-stream standard for mercury. The ROD also established an interim goal of 200 ng/L (200 ppt) for mercury in UEFPC surface water to monitor progress toward attainment of the RAO.

While considerable progress has been made in reducing mercury releases from the Y-12 site to UEFPC surface water (Figure 3), mercury concentrations in surface water continue to exceed both the interim goal established in the UEFPC Phase I ROD and the Tennessee ambient water quality criteria (AWQC)

standard of 51 ng/L (for which an interim waiver was approved in the UEFPC Phase I ROD). As a result of the continued mercury concentrations at Station 17 in excess of the interim risk-based goal, the most recent CERCLA Five-Year Review concluded that the Phase I ROD is not currently protective for ecological receptors (DOE 2012b).

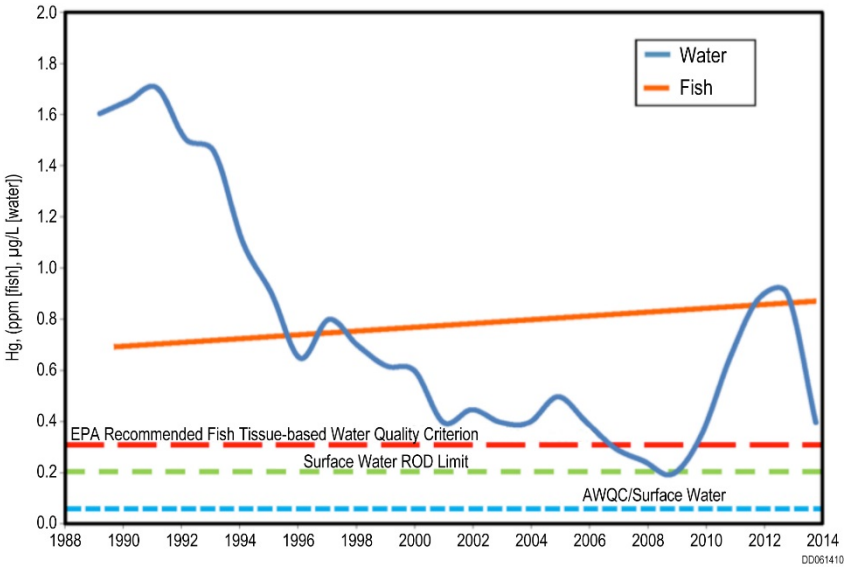

Figure 3. Mercury Concentration in UEFPC Surface Water at Station 17 and in Fish

While the UEFPC Phase I ROD did not include large-scale water treatment operations as part of the selected remedy, it did include a study to evaluate the viability of long-term and large-scale treatment of mercury-contaminated surface water to support a future surface water decision. A treatability study and conceptual design study for a treatment system to reduce discharge of mercury from the WEMA storm sewer system was initiated in 2012 to fulfill this requirement. These studies led to the development of a conceptual design for a water treatment system to treat discharges at Outfall 200, which was documented in a conceptual design report (UCOR 2014) and a Remedial Design Work Plan (DOE 2014d). The successful performance of the existing water treatment systems (BSWTS, CMTS) for mercury reduction also suggest that additional water treatment facilities could achieve further reductions of mercury in UEFPC surface water.

In support of the conceptual design, a series of pre-design studies were conducted to provide data to be used in the design of the water treatment facility and evaluate opportunities to reduce the volume of base-flow and stormwater sewer contributions reaching the new treatment facility. Pre-design studies to evaluate potential diversion of stormwater (UCOR 2015a, 2015b) or non-contaminated process water (UCOR 2015c) from entering the WEMA storm sewer network did not identify significant opportunities for reducing the quantity of water requiring treatment. Stormwater characterization (UCOR 2015d) and mercury flux modeling (UCOR 2015e) studies provide a better understanding of flow dynamics in UEFPC and the flux of mercury and total suspended solids during base-flow conditions and storm events. Approximately 68 percent of the mercury flux and only 18 percent of the total suspended solids flux occur during base-flow conditions (UCOR 2015e). These studies also observed that the initial runoff from storm events contains an elevated loading of both total mercury and total suspended solids, and that these concentrations drop off rapidly after peaking as the flow subsides to pre-storm levels. This initial runoff from storm events is referred to as the “first flush”, and is defined as the runoff from the 60-minute period surrounding the hydrograph peak. During this early phase of a storm event, the concentration of dissolved mercury was observed to decrease (due to dilution by the increase in stream-flow) while the

concentrations of total suspended solids and total mercury were observed to increase similar to the peak in stream-flow (due to an increase in particle-associated mercury). After the peak in stream-flow, the concentration of dissolved mercury increases, while the concentrations of total mercury and total suspended solids decrease as the flow subsides to pre-storm levels. This analysis estimated that approximately 65 percent of the total mercury and 69 percent of the total suspended solids mass released during a storm event occurs during this 60-minute period during the early phase of the storm. This effect is thought to be due to the sudden increase in turbulent flow in the storm drain piping that mobilizes mercury-laden sediment residing in the system (UCOR 2015e).

In addition to achieving reductions in the ongoing mercury releases from Outfall 200 to UEFPC, the proposed water treatment facility also will provide potential benefits for treatment of mercury-contaminated water from other sources. In particular, this facility will provide additional protection from increased mercury releases during future demolition actions at the major mercury process buildings at WEMA and remediation of underlying soils. That is, the WEMA former mercury-use buildings are planned for demolition followed by remediation of underlying soils to remove major sources of mercury contamination. While these future demolition and remediation actions will include comprehensive contamination control measures and best management practices to minimize any release of contaminants to UEFPC surface water, the new water treatment facility could provide an additional level of protection against potential contaminant releases to UEFPC and the offsite environment. To maximize this protection, construction and operation of the proposed mercury treatment facility is scheduled to be completed prior to the start of the Y-12 building demolition.

4.1 CONCEPTUAL SITE MODEL

A new site conceptual model study conducted in 2008-2010 (ORNL 2011) to update the site conceptual model for mercury releases to UEFPC identified changes in key assumptions of the UEFPC Phase I ROD:

- Of the known mercury inputs to UEFPC surface water, Outfall 200 (representing combined inputs from WEMA and other upstream areas) is the most important current source of mercury to the stream, representing up to 70-80 percent of the mercury flux at Station 17, particularly under low to average flow conditions. This is a significant change from the conditions when the Phase I ROD was issued (i.e., prior to the construction of the BSWTS and the resulting reduction in mercury flux from Outfall 51) when Outfall 200 was thought to represent approximately 20 percent of the flux at Station 17.
- Expected responsiveness of fish to reductions of mercury levels in surface water have not been observed – i.e., mercury concentrations in fish tissue have not declined at a rate similar to the mercury concentrations in surface water at Station 17 – indicating a more complex relationship than previously thought.

Mercury contamination is widespread at the Y-12 site and has been identified in soil, sediment, surface water, groundwater, buildings, drains, and sumps. Contamination is introduced into groundwater through multiple paths including spills, pipeline leaks, and dissolution from contaminated soils and sediments. Mercury continues to be released into UEFPC from point (discrete) and nonpoint (diffuse) sources within the Y-12 site. Mercury enters UEFPC from direct erosion of contaminated soil, migration of dissolved mercury through storm drains and outfalls, and through shallow groundwater. In addition to widespread mercury contamination throughout the UEFPC watershed, several areas have been identified as significant sources of mercury releases. These areas include the WEMA (under and around Buildings 9201-4, 9201-5, and 9204-4), Building 81-10 Area, Building 9201-2 Area (Outfall 51), Lake Reality, and UEFPC streambed. These areas act as reservoirs for the release and migration of mercury contamination to shallow groundwater and surface water.

Surface water receives contamination through groundwater discharge, stormwater runoff, and process outfall discharges, and is a route of offsite contaminant migration via UEFPC, which is the only surface water exit pathway. Mercury concentrations in UEFPC have been decreasing as a result of response actions taken to date, but they remain above the interim goal and regulatory criteria. Mercury concentrations in fish tissue also continue to exceed target levels in East Fork Poplar Creek (EFPC). Sediments in the storm drain system and UEFPC channel are contaminated as a result of historic releases from operations at the Y-12 site and continue to receive contaminant inputs from storm sewer discharges and nonpoint source runoff during storm events. The UEFPC streambed and Lake Reality contain sediments with elevated concentrations of mercury and other contaminants, which are subject to remobilization and/or downstream transport. These contaminated sediments will be excavated under the UEFPC Phase I ROD, although the schedule for implementation of this remedial action has been revised under the ESD (DOE 2012a) to follow demolition of the WEMA former mercury-use buildings and remediation of underlying soils.

Historically, the primary point sources of mercury to UEFPC at Y-12 have included mercury-contaminated water discharge from the basement sumps of former mercury-use buildings (i.e., Buildings 9201-2, 9202, 9201-4, 9201-5, and 9204-4), mercury-contaminated pipes (internal and external to buildings) and storm drains that ultimately discharge through Outfall 200, and the mercury-contaminated natural spring flow surfacing near the historic mercury-use area and discharging via Outfall 51. The point source at Outfall 51 is now treated by the BSWTS and discharge from the WEMA building basement sumps (with the exception of Building 9201-5) is treated at CMTS. Treatment of the discharge from the WEMA storm sewer system at Outfall 200 is the subject of this ROD amendment.

5.0 DESCRIPTION OF SIGNIFICANT DIFFERENCES

The previous section established that new information has been obtained since the signing of the UEFPC Phase I ROD that warrants a reassessment of larger-scale water treatment to achieve further reductions in mercury releases from the Y-12 site to the offsite environment. This ROD amendment formally presents the construction and operation of a new water treatment facility to treat discharges from the WEMA storm sewer system at Outfall 200 as an additional component of the selected remedy under the UEFPC Phase I ROD. This change is expected to improve the performance of the selected remedy in achieving the UEFPC Phase I RAO.

5.1 REMEDIAL ACTION OBJECTIVES

Performance in achieving the RAO specified in the UEFPC Phase I ROD is monitored and reported in the annual *Remediation Effectiveness Report* (DOE 2015c). Surface water quality metrics utilized to evaluate progress toward attainment of the Phase I RAO include a 200 ng/L (200 ppt) performance metric for mercury in surface water at Station 17. Surface water monitoring at Station 17 is conducted to gauge the cumulative effects of the various actions as they are completed with regard to the contaminants of concern. Biological monitoring is performed to assess levels of mercury in fish tissue.

As shown in Figure 3, mercury concentrations in UEFPC surface water have been decreasing over time but continue to exceed the interim goal and regulatory criteria. The temporary increase in mercury concentrations during 2011-2012 is thought to be partially attributed to the discharge of mercury contaminated sediment that was disturbed during the 2011 West End storm drain cleanout project, as well as the relatively high rainfall levels during this period. Higher mercury flux at Station 17 relative to upstream monitoring locations is thought to be partially attributable to entrainment of contaminated sediment from the UEFPC streambed in this reach. A flow augmentation program, where approximately 3 million gallons per day of

water from the Clinch River was released to the UEFPC channel just below Outfall 200 beginning in 1996 to improve stream conditions for aquatic biota, was terminated in 2014, resulting in a reduction of the base-flow at Station 17 by a factor of approximately two-thirds. The impact of this change on the dynamics of mercury flux in UEFPC will be evaluated through ongoing monitoring.

This ROD amendment modifies the UEFPC Phase I ROD selected remedy to include the construction and operation of a new water treatment facility designed to treat discharges from the WEMA storm sewer system at Outfall 200, to achieve further reductions in mercury releases from Y-12 and in the concentrations of mercury in UEFPC surface water. This additional response action would supplement the remedial actions already included in the selected remedy of the UEFPC Phase I ROD (as amended) to support attainment of the Phase I RAO and to make substantial progress toward attainment of the long-term water quality goal of meeting the AWQC in-stream standard for mercury in UEFPC surface water. To supplement the UEFPC Phase I RAO, sub-watershed RAOs specific to the proposed water treatment system are summarized in Table 1 and discussed below.

The proposed water treatment system will be designed to capture discharges from the WEMA storm sewer system to UEFPC under base-flow and storm-flow conditions to mitigate uncontrolled releases of mercury (and other hazardous substances) into UEFPC surface water. Stormwater storage capacity will allow the collection of flow exceeding treatment capacity for future treatment, and reduce the frequency with which Outfall 200 discharges would bypass the facility without treatment. Stormwater capture will be targeted to maximize mercury flux reduction. Collected wastewater will be treated to achieve reductions in mercury concentrations to 51 ng/L total mercury in the treated effluent for discharge to UEFPC. Treated effluent from the proposed water treatment facility will be discharged in compliance with ARARs and at levels that are protective of the receiving water. Discharges from Outfall 200 that exceed the facility's treatment capacity and stormwater storage capacity will bypass the facility without treatment. In order to limit the total mercury flux to UEFPC from Outfall 200, mercury concentrations in UEFPC surface water, including any water bypassing the treatment facility, will be limited to a daily maximum concentration of 2000 ng/L total mercury and an annual rolling flux of 1 kg/year total mercury. To prevent acute toxicity to fish and aquatic life, mercury concentrations in UEFPC stream-flow, including any bypass water, will be limited not to exceed 1400 ng/L dissolved mercury.

Table 1. Remedial Action Objectives
UEFPC Remedial Action Objectives in Phase I ROD (DOE 2002)
1. Restore surface water to human health recreational risk-based values at Station 17.
Sub-watershed Remedial Action Objectives Specific to the Outfall 200 Water Treatment Facility (DOE 2015b)
1. Capture discharges from the WEMA storm sewer system to UEFPC for treatment and/or storage under base-flow and storm-flow conditions to mitigate uncontrolled releases of mercury (and other hazardous substances) into UEFPC surface water Stormwater capture would be targeted to maximize mercury flux reduction. 2. Store captured wastewater with sufficient capacity to minimize mercury flux bypassing the facility without treatment (i.e., the mercury flux contained in stream-flow discharged at Outfall 200 that exceeds treatment capacity and stormwater storage capacity that would bypass the facility without treatment) to the extent practicable. 3. Treat collected water to achieve reductions in mercury concentrations to meet the AWQC standard of 51 ng/L total mercury in the treated effluent. 4. Discharge treated effluent in compliance with ARARs and at levels that are protective of the receiving water. 5. Minimize the total mercury flux discharged to UEFPC from Outfall 200. Mercury concentrations in UEFPC surface water, including any water bypassing the treatment facility, must meet a daily maximum concentration of 2000 ng/L total mercury and an annual rolling flux of 1 kg/year total mercury. To prevent acute toxicity to fish and aquatic life, mercury concentrations in UEFPC stream-flow, including any water bypassing the treatment facility, must not exceed 1400 ng/L dissolved mercury.

5.2 IDENTIFICATION OF NEW REMEDIAL ACTION ALTERNATIVES

This ROD amendment modifies the selected remedy in the UEFPC Phase I ROD to include the construction of a new water treatment facility designed to treat discharges from the WEMA storm sewer system at Outfall 200. As discussed previously, Outfall 200 is the integration point for the Y-12 storm sewer effluent entering UEFPC, which constitutes the largest source of mercury releases to UEFPC under base flow conditions. The storm sewer system adjacent to former mercury-use Buildings 9201-4, 9201-5, and 9204-4 is drained by Outfalls 150, 160, 163 and 169. This storm sewer system is badly deteriorated and has numerous leaks, despite previous attempts to reline the system, that result in the infiltration of mercury-contaminated groundwater and accumulation of mercury-contaminated sediment in the storm sewer that is a source for base flow discharges of mercury to UEFPC. Stormwater runoff through mercury-contaminated soils into the storm sewers and catch basins also results in the release of mercury-contaminated sediments to UEFPC during storm events. These storm sewer system flows converge at Outfall 200.

Remedial alternatives were developed and evaluated in the focused feasibility study (DOE 2015a) and proposed plan (DOE 2015b) for construction of a new water treatment facility to treat discharges from the WEMA storm sewer system at Outfall 200. These remedial alternatives would supplement the actions already included in the Phase I ROD selected remedy (as amended) to achieve further reductions in mercury concentrations in UEFPC surface water and mercury releases to the offsite environment, but would not impact other components of the selected remedy. Multiple treatment facility configurations were evaluated with different levels of treatment capacity and stormwater storage capacity to manage UEFPC base-flow, various amounts of storm-flow, and potentially other inputs of mercury-contaminated water. In each case, storm-flow above the facility treatment and storage capacity would be bypassed around the facility and released to UEFPC without treatment.

5.2.1 Alternative 1. No Further Action

The “No Action” alternative is required under CERCLA to provide a comparative baseline against which other alternatives can be evaluated. The no-action alternative does not initiate any action, and normally assumes that present security measures limiting access and use are not maintained, and that short- and

long-term monitoring is eliminated. However, a true no-action alternative is not relevant for this remedy modification, since some remedial actions have already been performed under the UEFPC Phase I ROD selected remedy, and other actions are ongoing and planned. This supplemental action would not modify existing components of the UEFPC Phase I selected remedy. This "No Further Action" alternative is defined to mean no change to the existing UEFPC Phase I ROD selected remedy (as modified to date). Under this alternative, DOE would take no additional remedial action to supplement the selected remedy in the UEFPC Phase I ROD (as amended).

5.2.2 Alternative 2. Water Treatment at Outfall 200

Alternative 2 involves the construction of a new water treatment facility designed to treat discharges from Outfall 200 to reduce mercury releases to UEFPC surface water. Multiple treatment facility configurations were evaluated under this alternative with different levels of treatment capacity and stormwater storage capacity to manage UEFPC base-flow, various amounts of storm-flow, and potentially other inputs of mercury-contaminated water. In each case, storm-flow above the facility treatment and storage capacity would be bypassed around the facility and released to UEFPC without treatment. The water treatment system would be designed to achieve a performance objective of reducing mercury concentrations to 51 ng/L (i.e., the AWQC standard for mercury) or less in system effluents. The resulting mercury removal would be expected to contribute substantially towards reducing the mercury concentration in UEFPC surface water at Station 17 to meet the interim goal of 200 ng/L established in the UEFPC Phase I ROD and the long-term goal of attaining the AWQC in-stream standard of 51 ng/L for total mercury.

All action alternatives include the construction of a new water treatment facility at Outfall 200 designed to reduce mercury releases to UEFPC surface water. These alternatives differ only in the level of treatment capacity and stormwater storage capacity to manage UEFPC base-flow, various amounts of storm-flow, and potentially other inputs of mercury-contaminated water. The conceptual design for the treatment process would be similar for all alternatives, with unit operations that include coarse solids (grit) removal, chemical co-precipitation/clarification (sulfide-functional polymer precipitation and ferric chloride co-precipitation with clarification), and dewatering with multi-media filtration. Some alternatives include multiple parallel treatment trains of these unit operations. The system design also would be configured to maintain flexibility and expandability to accommodate scaling up of treatment capacity, treatment processes, and/or stormwater retention, as needed and if warranted by future conditions. The treatment system would be designed to achieve a performance objective of reducing mercury concentrations to 51 ng/L (i.e., the Tennessee AWQC standard for mercury in waters classified for recreational use) or less in system effluents, to support the goal of reducing mercury concentrations in UEFPC surface water at Station 17 to the interim goal of 200 ng/L and ultimately the AWQC of 51 ng/L.

Water flowing from Outfall 200 would be diverted into the inlet channel of the headworks through an intake structure with an adjustable weir. The inlet channel would contain bar racks or other coarse screen to remove oversize material from entering the grit removal chambers. Some alternatives would include multi-stage headworks systems to manage a greater range of flow conditions. Stream flow in excess of the headworks design capacity would overflow the weir and continue to flow down UEFPC without treatment.

The headworks system would include a manual bar screen, grit removal, grit classification and dewatering, and a pump station. Grit removal refers to the process of removing larger solids prior to the treatment processes that target removal of colloidal and dissolved mercury. Grit removal would be accomplished using vortex-grit chambers, which would remove grit particles larger than about 50 µm diameter and other high-density materials, potentially including any droplets of elemental mercury of

sufficient size. Grit and any associated mercury would be periodically removed from the system using a grit pump for dewatering and disposal.

Water that has completed the grit removal process would be pumped through a pump station to an equalization tank prior to further treatment. The equalization tank would be designed to provide a hydraulic retention time of approximately 1 hour. Effluent from the equalization tank would be pumped to a pH control and dechlorination tank, where acid or caustic reagents would be added to adjust pH to the required range (typically 7 to 9 for chemical precipitation of mercury), and agents would be added for dechlorination as required, before the effluent is released to chemical precipitation tanks.

The effluent from the pH control and dechlorination tank first would be pumped to a tank(s) where a sulfide-functional polymer and ferric chloride coagulant would be added in order to produce mercury-sulfide bound solids and ferric oxyhydroxides that adsorb or co-precipitate mercury with other suspended solids. Dissolved mercury would be precipitated by the sulfide groups on the sulfide-functional polymer and adsorbed onto other species formed during the precipitation process, and a flocculation process would promote the formation of larger solids. Solids formed during the coagulation and flocculation process, enhanced by the use of ferric iron and organic polymers, would include colloidal and suspended mercury. The effluent from the flocculation and chemical precipitation process would then go to inclined-plate clarifiers to remove the solids. A portion of the clarifier sludge would be recycled back to the coagulant addition tank to promote growth of denser precipitate solids, settling, fines capture, and drive the precipitation process toward equilibrium. A portion of the clarifier sludge would be sent to a sludge thickening tank to increase the solids concentration to at least 5 percent prior to dewatering. The thickened solids from the sludge thickening tank would be pumped to a filter press for dewatering. The filter cake generated from the filter press would be sent for disposal, while the filtrate would be recycled back into the treatment process.

Clarifier effluent would flow to a multi-media filtration process for additional solids removal, with provisions for pH adjustment and chemical addition prior to filtration. The multi-media filtration system would consist of a series of vessels containing appropriate filter media that would be operated in parallel with individual units being backwashed or taken offline as needed. At least one unit typically would be inactive at any time, so that it can be put into use when another unit reaches capacity and requires backwashing. Filter effluent would flow to a treated water clear well prior to discharge back to UEFPC. A portion of the clean effluent would be used for backwashing of the multi-media filters as needed.

Solid and liquid waste materials generated during facility construction and during treatment operations would be appropriately characterized and disposed. Waste generated during facility construction may include non-contaminated construction debris and asbestos-contaminated debris, as well as soil and debris that may contain mercury or other hazardous materials. The areas impacted by construction of the new facility will be characterized for potential of contamination prior to construction in accordance with an approved Sampling and Analysis Plan. Solid waste streams generated during treatment operations would include coarse debris from the bar screen, grit material from the grit removal system, filter cake from the filter press, spent media from the multi-media filters, laboratory sampling materials, personal protective equipment, and universal waste items. The predominant solid waste streams are expected to be grit material from the grit removal system, filter cake from the filter press, and spent media from the multi-media filters. Liquid waste streams would include liquids from dewatering operations, spent laboratory chemicals, and equipment cleaning materials. Some liquid residuals, such as those generated during backwash operations and solids handling, would be pumped back into the equalization tank and reused in treatment system operations. A Sampling and Analysis Plan and Waste Handling Plan will be developed to characterize waste and determine appropriate disposition paths.

Operation of the new water treatment system would continue until mercury levels in discharges from Outfall 200 have declined to levels that no longer require treatment – that is, planned remediation of mercury source areas at WEMA may result in reduction of mercury releases to UEFPC to levels that no longer require treatment. For planning purposes, a period of operations of 30 years is assumed.

Monitoring would include influent stream water entering the treatment facility and the effluent stream following treatment, in order to evaluate the effectiveness of the treatment operations in attaining the performance objective of 51 ng/L. This effluent monitoring would be additional to the monitoring currently required by the UEFPC Phase I ROD.

Sub-alternatives developed to evaluate different levels of treatment capacity and stormwater storage capacity to manage UEFPC base-flow, various amounts of storm-flow, and potentially other inputs of mercury-contaminated water include the following.

5.2.2.1 Alternative 2a. Water Treatment at Outfall 200 with 1500 gpm Treatment Capacity and No Stormwater Storage

A new water treatment facility would be constructed near Outfall 200 with treatment capacity of 1500 gpm (2.2 Mgd) for influent surface water, and no capacity for retention and storage of stormwater flow in excess of treatment capacity. This capacity would be sufficient to treat the average flow in UEFPC, but most storm events would exceed this treatment capacity. Historical records indicate that approximately 19-24 percent of flow records exceed 1500 gpm (UCOR 2014). The conceptual design for the treatment system would include the general process operations of coarse solids (grit) removal, chemical co-precipitation/clarification, and multi-media filtration. Alternative 2a is intended to represent a minimal system capable of treating UEFPC surface water under base-flow conditions only.

Alternative 2a would have capacity for grit removal from influent surface water flows up to 3000 gpm, and capacity for other treatment operations for flows up to 1500 gpm of influent surface water plus 500 gpm of recycle flows (recycle of backwash water and filter press filtrate). Influent flows greater than 1500 gpm but less than 3000 gpm would flow through the grit removal system and then be released to UEFPC without further treatment, while flows greater than 3000 gpm would overflow the weir and continue to flow down UEFPC without either grit removal or chemical treatment. The headworks capacity of 3000 gpm is based on the 95th percentile stream-flow estimate for UEFPC at this location (i.e., 95 percent of stream-flow records for UEFPC do not exceed 3000 gpm). Therefore, stream-flow would exceed the facility headworks capacity approximately 5 percent of the time on average and would exceed the treatment capacity even more frequently, and would bypass the facility without treatment. Stream-flow monitoring data indicate that such bypass would have occurred more than 100 times during 2010, which is considered a year of average flow conditions.

Preliminary performance modeling (UCOR 2015e) estimates that this treatment system could remove approximately 1600 g/year of mercury or approximately 52 percent of the mercury flux at Outfall 200 during a typical year, based on rainfall data from 2010 which is considered a year of average precipitation and stream-flow. Additional mercury reduction potentially may be achieved for stream-flow between 1500 and 3000 gpm, which would be processed through the grit removal system only, but data are not currently available to quantify any such reduction. Costs for Alternative 2a are estimated at approximately $115 million capital cost, and operations and maintenance cost of approximately $2.2 million per year. The present value cost for construction and 30 years of operation is estimated at approximately $142 million.

5.2.2.2 Alternative 2b. Water Treatment at Outfall 200 with 3000 gpm Treatment Capacity and No Stormwater Storage

A new water treatment facility would be constructed near Outfall 200 with treatment capacity for 3000 gpm (4.3 Mgd) of influent surface water plus 1000 gpm of recycle flows (recycle of backwash water and filter press filtrate), and no capacity for retention and storage of stormwater flow in excess of treatment capacity. The conceptual design for the treatment system would include the general process operations of coarse solids (grit) removal, chemical co-precipitation with clarification, and multi-media filtration; and would be configured with two parallel treatment trains, each equivalent to that in Alternative 2a. Alternative 2b is intended to represent a system capable of treating UEFPC surface water under base-flow conditions and up to the 95th percentile stream-flow in UEFPC at Outfall 200 (i.e. 95 percent of stream-flow records for UEFPC do not exceed 3000 gpm). Therefore, stream-flow would exceed the facility treatment capacity approximately 5 percent of the time on average and bypass the facility without treatment. Stream-flow monitoring data indicate that such bypass would have occurred at least 88 times during 2010, which is considered a year of average flow conditions (UCOR 2015e).

The headworks and grit removal chamber for this facility would be identical to those in Alternative 2a, and would be constructed to manage flow up to 3000 gpm of influent surface water. However, this facility differs from Alternative 2a in that the subsequent treatment operations also are designed to treat flows up to 3000 gpm of influent surface water, which is approximately equivalent to the 95th percentile stream-flow estimate for UEFPC at Outfall 200. The treatment system also would have capacity for up to 1000 gpm of recycle flows (e.g., backwash water and filter press filtrate). Influent flows greater than 3000 gpm would overflow the weir and continue to flow down UEFPC without either grit removal or further treatment.

Preliminary performance modeling (UCOR 2015e) estimates that this treatment system could remove approximately 2100 g/year of mercury or approximately 68 percent of the mercury flux at Outfall 200 during a typical year (i.e., 2010). Costs for Alternative 2b are estimated at approximately $125 million capital cost, and operations and maintenance cost of approximately $2.7 million per year. The present value cost for construction and 30 years of operation is estimated at approximately $158 million.

5.2.2.3 Alternative 2c. Water Treatment at Outfall 200 with 3000 gpm Treatment Capacity and 2 Million Gallons Stormwater Storage

A new water treatment facility would be constructed near Outfall 200 with treatment capacity for 3000 gpm (4.3 Mgd) of influent surface water plus 1000 gpm of recycle flows and stored stormwater, and capacity for retention and storage of 2 million gallons of stormwater flow to manage stream-flow up to 40,000 gpm. The conceptual design for the treatment system would include the general process operations of coarse solids (grit) removal, solids precipitation/clarification, and multi-media filtration. Alternative 2c is intended to represent a treatment system capable of treating UEFPC surface water under base-flow conditions and up to the 95th percentile stream-flow in UEFPC at Outfall 200, and capable of capturing stormwater in excess of these flow rates for future treatment. The 2 million gallon storage capacity is designed to capture the initial runoff from most storm events (i.e., the “first flush”, defined as the runoff from the 60-minute period surrounding the hydrograph peak) (UCOR 2015d) even where the total volume exceeds the 2 million gallon storage capacity. Stormwater flows in excess of this storage capacity would bypass the treatment facility.

The headworks for this facility would be constructed to manage a maximum flow of 40,000 gpm, using a two-stage weir system. Water flowing from Outfall 200 would be diverted into the inlet channel of the headworks through an intake structure with an adjustable weir as in the previous alternatives. Again, the

inlet channel would contain manual bar screens or other coarse screens to remove oversize material from entering the grit removal chambers. Under normal flow conditions, all influent water would be directed to the base-flow grit removal chamber, as described for Alternatives 2a and 2b. However, unlike Alternatives 2a and 2b, this system would also contain a much larger grit removal chamber for stormwater flows, capable of treating influent flows up to 37,000 gpm (52 Mgd). When stream-flow does not exceed the capacity of the smaller base-flow unit, all influent water would be processed for grit removal in the base-flow unit. The larger wet-weather unit would operate only during storm events or when flows exceed base-flow conditions, and the stormwater treated in that unit would be pumped to the stormwater storage tanks following grit removal. Influent flows exceeding the headworks capacity of 40,000 gpm or the storage capacity would overflow the weir system and bypass the facility and continue to flow down UEFPC without treatment. Stream-flow monitoring data indicate that such bypass would have occurred approximately 14 times during 2010, which is considered a year of average flow conditions (UCOR 2015e).

Stormwater storage would consist of one above-ground steel tank with a capacity of 2 million gallons. This tank would be equipped with mixers to keep in suspension any solids that remain after the grit removal processing. Stormwater stored in this tank would be pumped to the equalization tank for treatment during non-storm conditions at a flow rate up to 1000 gpm. During remedial design, alternative storage configurations may be evaluated, including use of concrete retention basins versus the above-ground tank. The remainder of the treatment system would be equivalent to that in Alternative 2b, with two parallel treatment trains to provide a total treatment capacity of 4000 gpm (3000 gpm for influent surface water plus 1000 gpm for treatment of recycle flows and stored stormwater) for all treatment operations.

Alternative 2c differs from Alternative 2b primarily in: (1) the larger and more complex headworks system to feed both the base-flow grit removal system and the storm-flow grit removal system, as needed; (2) the inclusion of the large capacity (37,000 gpm) storm-flow grit removal system; and (3) the inclusion of storage capacity for up to 2 million gallons of stormwater flow. The remaining unit operations of the treatment system are equivalent to those under Alternative 2b and double that of Alternative 2a – that is two parallel treatment trains to provide a total treatment capacity of 3000 gpm for influent surface water plus 1000 gpm for management of recycle flows and stored stormwater. Preliminary performance modeling (UCOR 2015e) estimates that this treatment system could remove approximately 2600 g/year of mercury or approximately 84 percent of the mercury flux at Outfall 200 during a typical year (i.e., 2010). Costs for Alternative 2c are estimated at approximately $146 million capital cost, and operations and maintenance cost of approximately $ 3.1 million per year. The present value cost for construction and 30 years of operation is estimated at approximately $185 million.

5.2.2.4 Alternative 2d. Water Treatment at Outfall 200 with 3000 gpm Treatment Capacity and 10 Million Gallons Stormwater Storage

A new water treatment facility would be constructed near Outfall 200 with a treatment capacity for 3000 gpm (4.3 Mgd) of influent surface water plus 1000 gpm of recycle flows and stored stormwater, and capacity for retention and storage of stormwater flow up to 10 million gallons to manage flows up to 40,000 gpm. The conceptual design for the treatment system would include the general process operations of coarse solids (grit) removal, solids precipitation/clarification, and multi-media filtration. Alternative 2d is intended to represent a treatment system capable of treating UEFPC surface water under base-flow conditions and up to the 95th percentile stream-flow in UEFPC at Outfall 200, and capable of capturing stormwater in excess of these flow rates for future treatment. Stormwater storage of up to 10 million gallons would be provided using above-ground tanks. This storage capacity is designed to capture stormwater from a 1-year 24-hour storm (UCOR 2014). Peak flows from larger storm events

would still bypass the treatment facility, although the initial runoff flow from these storm events (i.e., the "first flush") would be captured. Influent flows exceeding the treatment and storage capacity would bypass the facility to UEFPC without treatment. Stream-flow monitoring data indicate that such bypass would have occurred approximately 12 times during 2010, which is considered a year of average flow conditions (UCOR 2015e).

Alternative 2d differs from Alternative 2c primarily in the larger storage capacity for up to 10 million gallons of stormwater flow. The headworks for this facility would be constructed to manage a maximum flow of 40,000 gpm, using a two-stage weir system identical to that described for Alternative 2c. Stormwater storage would consist of five above-ground steel tanks with a capacity of 2 million gallons each, for a total storage capacity of 10 million gallons. Each tank would be equipped with mixers to keep in suspension any solids that remain after the grit removal processing. Stormwater stored in these tanks would be pumped to the equalization tank for treatment during non-storm conditions at a flow rate up to 1000 gpm. During remedial design, alternative storage configurations may be evaluated, including use of concrete retention basins versus above-ground tanks. The remainder of the treatment system would be equivalent to that in Alternatives 2b and 2c with two parallel treatment trains to provide a total treatment capacity for 3000 gpm of influent surface water plus 1000 gpm of recycle flows and stored stormwater for all treatment operations.

Preliminary performance modeling (UCOR 2015e) estimates that this treatment system could remove approximately 2800 g/year of mercury or approximately 91 percent of the mercury flux at Outfall 200 during a typical year (i.e., 2010). Costs for Alternative 2d are estimated at approximately $179 million capital cost, and operations and maintenance cost of approximately $3.4 million per year. The present value cost for construction and 30 years of operation is estimated at approximately $221 million.

5.2.3 Change in Facility Location

The proposed plan (DOE 2015b) assumes that all facilities and equipment associated with the proposed new water treatment facility would be sited in the immediate proximity of Outfall 200. This assumption was based on the conceptual design study (UCOR 2014) for the proposed water treatment facility and its preliminary site screening, in support of the general siting objective to locate the water capture and treatment equipment near the source, in order to minimize site disturbance and project cost. However, the Y-12 National Nuclear Security Administration Production Office (NPO) expressed concerns that the proposed facility location posed security concerns due to the proximity to the Y-12 Perimeter Intrusion Detection and Assessment System (PIDAS) as well as concerns regarding the need for temporary road closures and rerouting, and relocation of many significant utilities. NPO indicated a preference for relocation of the proposed facility to another site further east to alleviate these concerns.

DOE has completed a resiting study (UCOR 2015f) that recommends the former Building 9720-8 site as the best available location for the proposed water treatment facility. This site previously was the location of a warehouse facility that was demolished to the slab, and the remaining slab was partially covered with asphaltic paving for conversion to a parking lot. This site offers numerous advantages for construction of the new water treatment facility. The available acreage at this site is larger than the site originally assumed in the conceptual design, would not require the extensive site work (e.g., relocation of site roads and utilities, associated retaining walls, or road elevation changes) required for the original location, and has a lower likelihood of encountering legacy contamination during construction. The revised site also has significant advantages in terms of site access, availability of laydown and staging areas during construction, and less potential for impact to Y-12 mission-critical activities.

As a result of these considerations, the primary water treatment operations will be constructed at the revised location at the former Building 9720-8 slab rather than at Outfall 200. The unit operations and process equipment would be unchanged from the conceptual design, but only relocated to the revised site. The headworks facilities (water diversion, degritting, and pumping facilities) and stormwater storage tank would remain at the original location at Outfall 200. A transfer pipeline to connect the headworks facilities to the water treatment facility would be constructed of high-density polyethylene flexible pipe, located at-grade, with below-grade road crossings.

This change in facility location is not expected to impact the schedule for construction of the facility and is estimated to potentially reduce project costs by approximately $2 million relative to the previously assumed location, primarily due to the reduced site preparation work required.

6.0 EVALUATION OF ALTERNATIVES

6.1 COMPARATIVE ANALYSIS OF ALTERNATIVES

All remediation alternatives must be evaluated against nine criteria prescribed by CERCLA. The threshold criteria (overall protection of human health and the environment and compliance with ARARs) relate directly to statutory findings that must be met by any alternative to be eligible for selection. The five primary balancing criteria (long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost) form the basis for the comparative analysis of eligible alternatives. The two modifying criteria (state acceptance and community acceptance) are evaluated after review and consideration of public comments received on the proposed plan. DOE policy (DOE 1994) also requires evaluation of the alternatives against additional NEPA values, including socioeconomic impacts, environmental justice impacts, irreversible and irretrievable commitment of resources, and cumulative impacts. The comparative analysis of alternatives for the UEFPC is summarized in Table 2 and is discussed below.

6.1.1 Overall Protection of Human Health and the Environment

The No Further Action alternative would not protect human health or the environment, because no additional remedial actions would be conducted at the UEFPC to supplement the selected remedy in the UEFPC Phase I ROD. While releases of mercury to UEFPC have decreased significantly in recent years, partly as a result of implementation of the remedial actions under the UEFPC Phase I ROD and other related actions, mercury concentrations in surface water at Station 17 continue to exceed both the interim goal established in the UEFPC Phase I ROD and the AWQC. All action alternatives would achieve protection of human health and the environment through treatment of water discharged from the WEMA storm sewer system that is captured, treated and discharged to UEFPC surface water. All action alternatives would be dependent upon ongoing operation and maintenance of the new water treatment facility to maintain protectiveness. All alternatives defer actions for groundwater to a future decision, so groundwater use restrictions would continue under all alternatives. In addition to achieving reductions in the ongoing mercury discharges from Outfall 200 to UEFPC, the water treatment facility that would be constructed under all action alternatives also would have potential benefits for treatment of wastewater from other sources, such as future demolition of the major mercury process buildings at WEMA and remediation of the mercury contaminated soils beneath the buildings.

6.1.2 Compliance with ARARs

The No Further Action alternative has no ARARs because no remedial action would be taken. All action alternatives would meet the chemical-specific, location-specific, and action-specific ARARs identified for the alternative [see Appendix B for ARARs and to-be-considered (TBC) guidance for the selected alternative], except as noted. All action alternatives would achieve chemical-specific ARARs. No new waiver of any ARAR would be required, but the interim waiver previously approved under the UEFPC Phase I ROD for the recreational AWQC in-stream standard for mercury would not be affected and would remain in effect. All action alternatives potentially involve activities in floodplains and would comply with ARARs for these locations; any adverse effects on floodplains would be very localized and limited in extent, and any adverse effects would be minimized and mitigated as specified in 10 CFR 1022. All action alternatives would comply with all action-specific ARARs, including control of fugitive emissions, best management practices for stormwater runoff, and proper management of all waste streams generated. Under all action alternatives, the new water treatment system would be expected to reduce mercury concentrations to 51 ng/L or less in the treated effluent. Actual system performance would be evaluated following facility construction and two years of operation, and the FFA parties would collaborate on the selection and implementation of follow-on actions as necessary if the actual performance does not attain this target level. Since decisions regarding remediation of groundwater at UEFPC are outside the scope of this focused action for UEFPC surface water treatment and are deferred to a future decision, groundwater ARARs are not considered here.

6.1.3 Long-Term Effectiveness

All action alternatives would be effective in the long term and provide permanent solutions for removal of mercury contamination from UEFPC surface water. Mercury would be removed from UEFPC surface water for permanent disposal through the water treatment operations under each of the action alternatives. Alternative 2d would achieve the greatest reduction in mercury flux at Outfall 200 (91 percent), followed by Alternative 2c (84 percent), 2b (68 percent), and 2a (52 percent), respectively. All action alternatives would require a commitment to long-term operations of the water treatment system, and proper system operation, maintenance, and upkeep would be required to maintain effectiveness. Operation of the new water treatment system would continue until mercury source areas at WEMA have declined to levels that no longer require treatment.

6.1.4 Reduction of Toxicity, Mobility, or Volume through Treatment

All action alternatives include the construction of a new water treatment facility to treat WEMA storm sewer discharges at Outfall 200 to remove mercury contamination from UEFPC surface water, and differ only with respect to the levels of treatment capacity and stormwater storage capacity. The unit operations for the treatment system would be similar for all alternatives, except that storage capacity for stormwater flows in excess of treatment capacity is provided only in Alternatives 2c and 2d. Removal of mercury from UEFPC surface water would be achieved by precipitation and filtration technologies in each alternative. Alternative 2d would provide the greatest reduction in toxicity, mobility, and volume by treating the largest volume of UEFPC surface water and achieving the greatest reduction in mercury flux at Outfall 200 (91 percent), followed by Alternative 2c (84 percent) and 2b (68 percent), respectively, while Alternative 2a would treat the smallest volume of surface water and achieve the smallest reduction in mercury flux (52 percent).

Table 2. Comparative Analysis of Remedial Alternatives

Criteria	Remedial Alternative				
	Alternative 1 No Further Action	**Alternative 2a, Water Treatment Facility for Outfall 200 with 1500 gpm Treatment Capacity & No Stormwater Storage**	**Alternative 2b, Water Treatment Facility for Outfall 200 with 3000 gpm Treatment Capacity & No Stormwater Storage**	**Alternative 2c, Water Treatment Facility for Outfall 200 with 3000 gpm Treatment Capacity and 2 Million Gallons Stormwater Storage**	**Alternative 2d, Water Treatment Facility for Outfall 200 with 3000 gpm Treatment Capacity & 10 Million Gallons Stormwater Storage**
Overall Protection of Human Health and the Environment	Not protective.	Protective of human health and the environment. Least protective of action alternatives.	Protective of human health and the environment. Intermediate among action alternatives.	Protective of human health and the environment. Intermediate among action alternatives.	Protective of human health and the environment. Most protective of the action alternatives.
Compliance with ARARs	Not applicable.	Meets all ARARs. [a]	Meets all ARARs. [a]	Meets all ARARs. [a]	Meets all ARARs. [a]
Long-term Effectiveness and Permanence	Not effective.	Effective with ongoing O&M (~52 percent mercury flux reduction)	Effective with ongoing O&M (~68 percent mercury flux reduction)	Effective with ongoing O&M (~84 percent mercury flux reduction)	Effective with ongoing O&M (~91 percent mercury flux reduction)
Reduction of Toxicity, Mobility, or Volume Through Treatment	No treatment; therefore no reduction.	Least reduction of volume, toxicity, and mobility through ex situ treatment of UEFPC surface water.	Intermediate reduction of volume, toxicity, and mobility through ex situ treatment of UEFPC surface water.	Greater reduction of volume, toxicity, and mobility through ex situ treatment of UEFPC surface water.	Greatest reduction of volume, toxicity, and mobility through ex situ treatment of UEFPC surface water.
Short-term Effectiveness	No short-term impacts	Minor short-term impacts. Standard construction risks to workers.	Minor short-term impacts. Standard construction risks to workers.	Minor short-term impacts. Standard construction risks to workers.	Minor short-term impacts. Standard construction risks to workers.
Implementability	No remedial actions; no implementability issues.	Technically & administratively feasible; materials & services available.	Technically & administratively feasible; materials & services available.	Technically & administratively feasible; materials & services available.	Technically & administratively feasible; materials & services available.
Cost	None	CC: $ 115 Million O&M: $ 2.2 Million/year PV: $ 142 Million	CC: $ 125 Million O&M: $ 2.7 Million/year PV: $ 158 Million	CC: $ 146 Million O&M: $ 3.1 Million/year PV: $ 185 Million	CC: $ 179 Million O&M: $ 3.4 Million/year PV: $ 221 Million
NEPA Values	No impacts.	No socioeconomic, environmental justice, cumulative impacts; minor IRR.	No socioeconomic, environmental justice, cumulative impacts; minor IRR.	No socioeconomic, environmental justice, cumulative impacts; minor IRR.	No socioeconomic, environmental justice, cumulative impacts; minor IRR.
State Acceptance	Not Preferred.	Not Preferred.	Not Preferred.	Preferred.	Not Preferred.
Community Acceptance	Not Preferred.	Not Preferred.	Not Preferred.	Preferred.	Not Preferred.

CC = capital cost
O&M = operation and maintenance (30 years)
PV = present value cost
IRR = irretrievable & irreversible commitment of resources
TBE= to be evaluated after public comment
UEFPC = Upper East Fork Poplar Creek.

[a]The interim waiver previously approved under the Phase I ROD for the recreational AWQC in-stream standard for mercury would not be impacted by this decision and would remain in effect

6.1.5 Short-Term Effectiveness

All action alternatives would protect the community during implementation of remedial actions through the use of engineering and institutional controls. All activities would be conducted in accordance with applicable codes and requirements, DOE Directives, and as low as reasonably achievable (ALARA) principles to minimize exposure to radioactive and hazardous materials and control accident risks to acceptable levels. Stormwater runoff controls would be implemented throughout all excavation and construction activities to prevent impacts to surface waters. Dust emission controls also would be implemented during all construction activities to minimize airborne releases. All onsite activities would occur on DOE property and DOE roads that are currently inaccessible to the public. Access controls already in place at the Y-12 site prevent public access to the UEFPC area. Increases in onsite and local vehicle traffic would occur under all action alternatives as equipment is brought to the site for construction of the new facility. However, the increase in vehicle traffic would relatively small for all alternatives, and these impacts would be mitigated by engineering controls and transportation planning to minimize traffic. Risk to workers would be very small and similar for all action alternatives; worker risks would be mitigated through the proper use of safety protocols, personal protective clothing and equipment, environmental monitoring, and access restrictions. Short-term disturbance of vegetation and wildlife habitat would occur under all action alternatives; however, construction of the new water treatment facility would occur in areas that have been previously disturbed and do not present significant habitat. All activities would be conducted to minimize erosion and sediment deposition to UEFPC, such that only minor short-term effects to water quality would occur.

6.1.6 Implementability

All action alternatives would be technically feasible to implement. All activities associated with implementation of the action alternatives (water collection and treatment) would be performed using standard construction equipment and techniques. Services and materials required for implementation of all action alternatives would be readily available. Only standard construction equipment, trades, and materials would be required.

6.1.7 Cost

The estimated capital, annual O&M, and total present value costs for each alternative are summarized in Table 2. Alternative 2d is the most expensive alternative with a present value cost of $221 million. Alternative 2a is the least expensive alternative, with a present value cost estimate of $142 million, followed by Alternative 2b with a present value cost estimate of $158 million, and Alternative 2c with a present value cost estimate of $185 million.

6.1.8 NEPA Values

In accordance with DOE policy (DOE 1994), DOE evaluations under CERCLA incorporate NEPA values to the extent practicable. Short-term impacts of the action alternatives on the human environment will include increased road traffic, increased noise, and slightly increased employment opportunities. There also will be short-term impacts to floodplains during construction of the new water treatment facility under all action alternatives. The negative short-term impacts are balanced with the long-term gains and are controlled to minimize impacts to the extent practicable. None of the action alternatives would be expected to result in any long-term change in the local economy or significant socioeconomic impacts. No environmental justice impacts or significant cumulative impacts have been identified for any action alternative. All action alternatives would require an irretrievable commitment of resources for the site

selected for construction of the new water treatment facility, as well as the construction materials, fuel and other nonrenewable resources used during construction and operation of the facility. The DOE-controlled industrial land-use designation for the UEFPC area would continue in all cases.

6.2 SELECTED REMEDY

Alternative 2c, Section 5.2.2.3, has been determined to meet the threshold criteria and to provide the best balance of tradeoffs among the action alternatives with respect to the balancing and modifying criteria. This selected remedy includes construction of a new water treatment facility near Outfall 200 to manage UEFPC stream-flow of 40,000 gpm. This system will provide treatment capacity for 3000 gpm (4.3 Mgd) of influent surface water plus 1000 of recycle flows (e.g., backwash water and filter press filtrate) and stored stormwater, with capacity for retention and storage of stormwater flow in excess of treatment capacity of 2 million gallons. This selected remedy is designed for treatment of UEFPC surface water under base-flow conditions and up to the 95th percentile stream-flow in UEFPC at Outfall 200 and capable of capturing stormwater in excess of these flow rates for future treatment. The conceptual design for the treatment system includes the unit operations of grit removal, chemical co-precipitation and clarification, and multi-media filtration in order to reduce mercury concentrations in system effluents to 51 ng/L or below. A conceptual flow diagram of the treatment process for the selected remedy is shown in Figure 4, while the general facility location and layout is shown in Figure 5. This remedial action is intended to supplement remedial actions already included in the selected remedy of the UEFPC Phase I ROD (as amended), and this action will not eliminate or modify any of those actions previously selected, as summarized in Table 3.

Based on available information, DOE believes that the selected remedy to construct and operate the new water treatment facility to treat discharges from the WEMA storm sewer system at Outfall 200 meets the threshold criteria and provides the best balance of tradeoffs among the action alternatives with respect to the balancing and modifying criteria. The selected remedy is protective of human health and the environment through the treatment of UEFPC surface water. It will meet all identified chemical-specific, location-specific, and action-specific ARARs. No new waiver of any ARAR would be requested, but the interim waiver previously approved under the UEFPC Phase I ROD for the recreational AWQC in-stream standard for mercury would not be impacted by this decision and would remain in effect. The selected remedy is considered cost effective in that it is protective in the long-term, and it is permanent as a result of removal of contaminants from UEFPC surface water through treatment. There are no significant short-term impacts to workers, the community, or the environment that cannot be easily controlled. The most significant short-term impacts would occur as a result of onsite construction activities during construction of the new treatment facility and the transportation of the required materials to the site. The selected remedy includes treatment of UEFPC surface water to reduce the toxicity, mobility, or volume of contaminants. The implementability of Alternative 2c is straightforward and relies on standard construction techniques and water treatment technologies. There are available disposal locations for all wastes generated by the selected remedy. The capital costs of the selected remedy are estimated at $146 million, operations and maintenance costs are estimated at approximately $3.1 million per year, and the total present value cost for construction and 30 years of operation is estimated at approximately $185 million. Estimated costs for the selected remedy are summarized in Table 4.

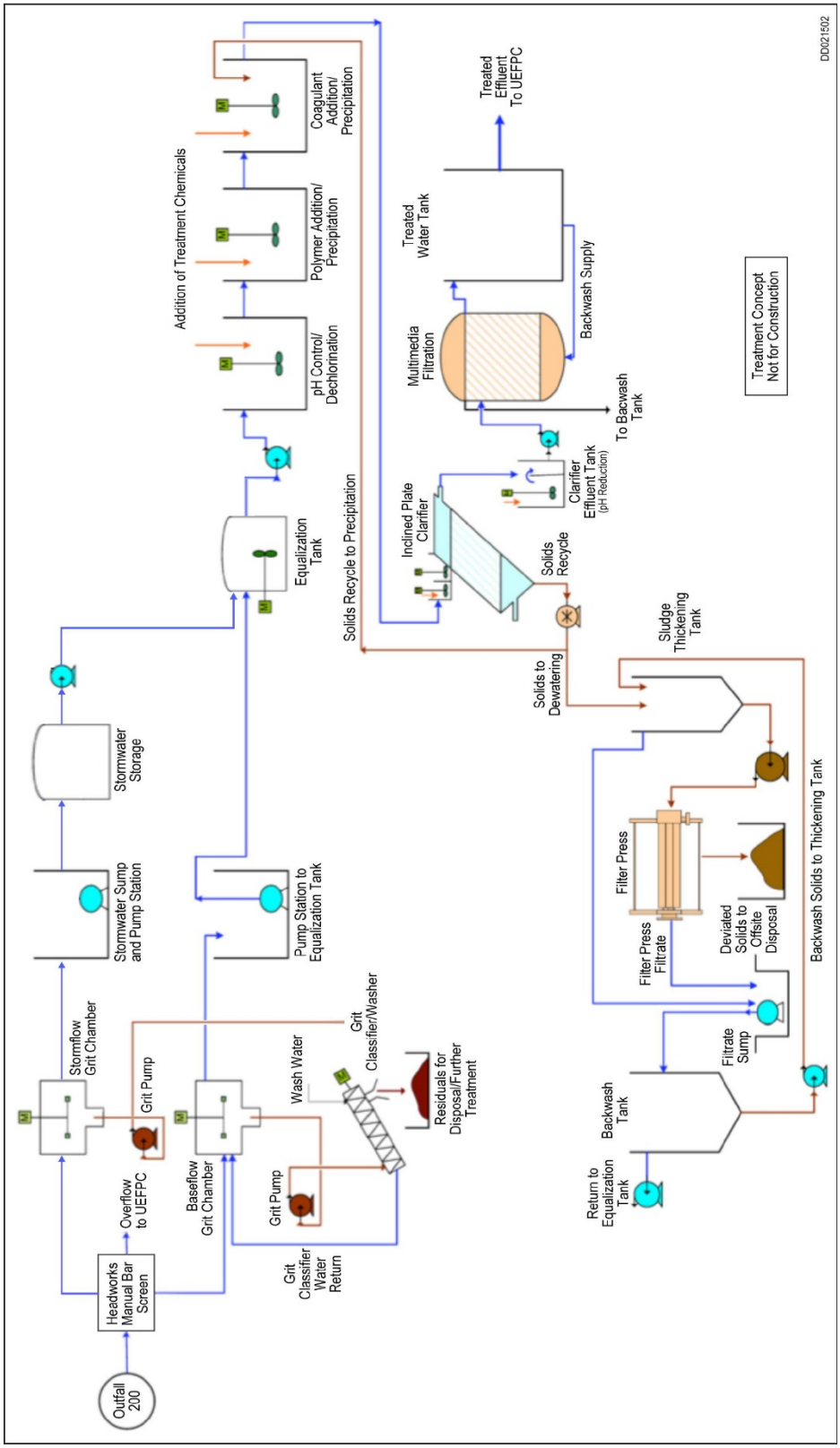

Figure 4. Outfall 200 Water Treatment System Preliminary System Process Flow Diagram

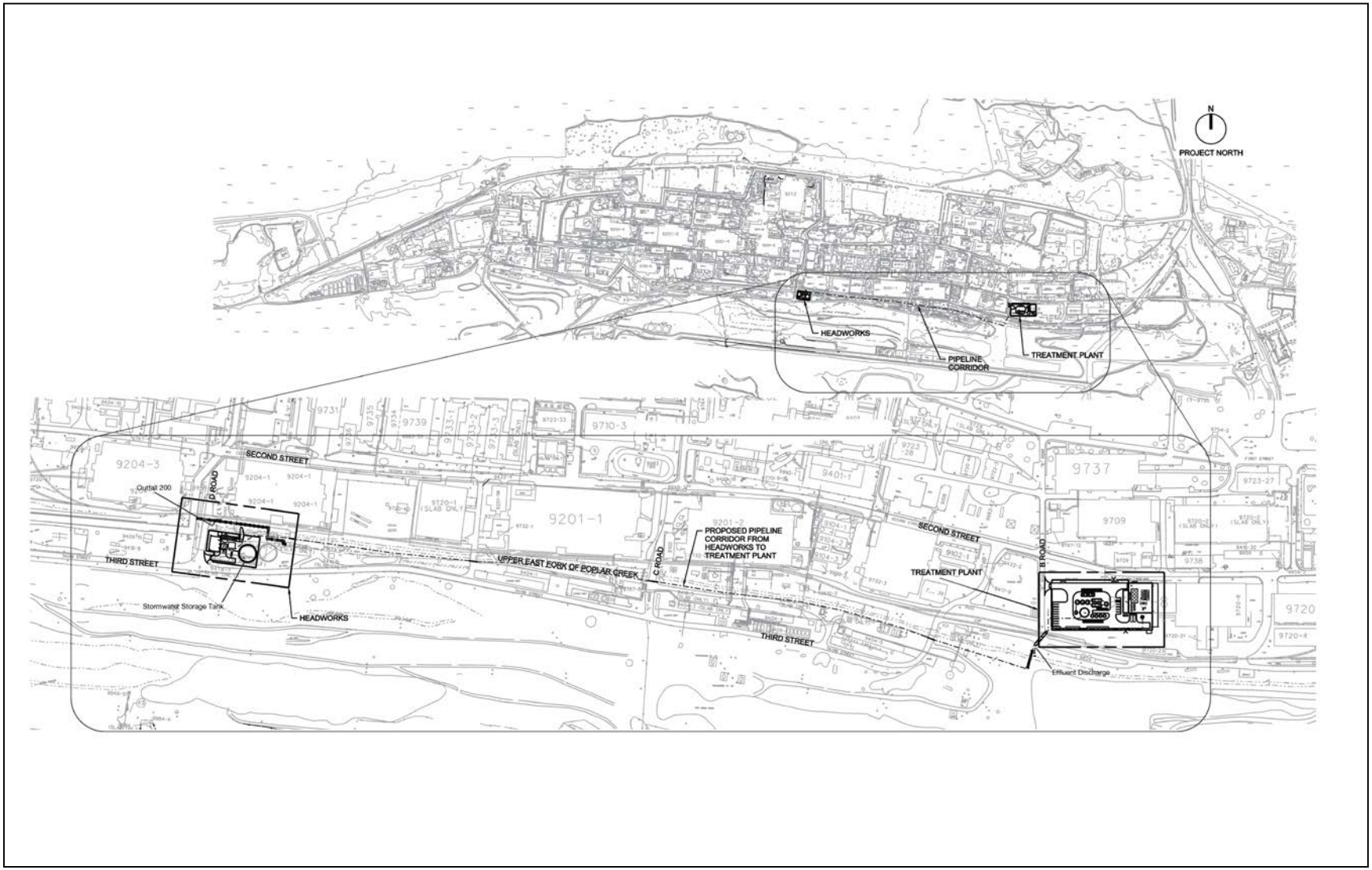

Figure 5. Outfall 200 Water Treatment System Preliminary Site Location

Table 3. Summary of Remedial Actions under the Selected Remedy for Modification of the UEFPC Phase I ROD

Remedial Actions	Protection Goals
New Actions (Scope of this ROD Amendment): Construct a new water treatment facility to treat discharges from the WEMA storm sewer system at Outfall 200 with headworks capture capacity of 40,000 gpm, treatment capacity of 3000 gpm for influent surface water, and 2 million gallons capacity for stormwater storage.	Reduce mercury concentrations in treated effluent to the AWQC standard of 51 ng/L to reduce mercury releases to UEFPC surface water in support of the Phase I RAO and ultimately the AWQC in-stream standard.
Existing Phase I ROD Actions (Unaffected by this ROD Amendment): Hydraulic Isolation at WEMA – Cleaning and relining of contaminated storm sewers is complete. Construct Building 9201-2 Water Treatment Facility – System (BSWTS) has been complete and operational since 2006. Continue ongoing operations. Continue temporary water treatment at CMTS and EEMTS as needed. CMTS operation continues, EEMTS was replaced by BSWTS in 2006. Removal of contaminated sediment from UEFPC and Lake Reality is scheduled for future implementation. ESD (DOE 2012a) postponed implementation until all upgradient remedial actions have been completed. Surface Water Monitoring – Monitoring of surface water has been implemented to monitor effectiveness of remedial actions, and will continue. Institutional Controls – Land use controls are implemented to limit access to contaminated areas and prevent fish consumption, and will continue unchanged.	Protect human health for DOE workers and the public; reduce mercury to surface water to achieve the RAO.

Table 4. Cost Estimate for Outfall 200 Selected Remedy

Remedial Action Component	Cost ($1000)	
	Direct	Indirect
Capital Costs		
Conceptual Design		$ 9,000
Pre-Design Studies		$ 4,000
Preliminary & Final Design & Project Mgmt.		$ 20,000
Title III Engineering	$ 5,500	
Construction	$ 95,000	
Start-up and Operational Readiness	$ 6,000	
DOE Direct Costs	$ 6,500	
Subtotal Capital Costs	**$ 113,000**	**$ 33,000**
Total Capital Cost	**$ 146,000**	
Annual Operations & Maintenance (O&M) Costs		
Treatment System Operation & Maintenance	$ 3,100	-
Total Annual O&M Costs	**$ 3,100**	**-**
Present Worth Cost (30-year)		
Total Present Worth Costs	**$ 185,000**	

The new water treatment system is expected to reduce mercury concentrations to 51 ng/L or less in the treated effluent. Actual system performance will be evaluated following facility construction and two years of operation. If the actual performance does not attain this target level, the FFA parties will collaborate on the selection and implementation of follow-on actions, which could include modifications of the facility to improve performance or waiver of this action-specific ARAR. The new water treatment facility will be constructed using a modular design that will be conducive to any future modifications that might be needed.

The new water treatment facility will be designed with sufficient flexibility to treat mercury contaminated waters from sources in addition to the flow captured at Outfall 200, within the constraints of the system treatment capacity. In particular, the new facility will provide potential benefits for treatment of wastewater (e.g., contact stormwater and decontamination waters) from the future demolition of the major mercury process buildings at WEMA and remediation of the mercury contaminated soils beneath the buildings, in addition to achieving reductions in the ongoing mercury discharges from Outfall 200 to UEFPC. While the future WEMA demolition and remediation actions will include comprehensive contamination control measures and best management practices to minimize any release of contaminants to UEFPC surface water, the new water treatment facility will provide an additional level of protection against potential contaminant releases to UEFPC. However, this source has not been specifically evaluated in the conceptual design of the treatment system, but will be evaluated during the planning for these future projects as additional characterization data become available to better define potential contaminants of concern. The modular design of the water treatment system will facilitate any change that might be needed. To maximize this protection, construction and operation of the proposed mercury treatment facility is scheduled to be completed prior to the start of the Y-12 building demolition.

The new water treatment system constructed under this selected remedy may be modified in the future if warranted by performance monitoring data and/or any future changed conditions, using the adaptive management approach. The facility will be designed for maximum flexibility to support any such future changes that may be needed. As performance monitoring data is collected for this treatment system, and as results of other implemented remediation actions and studies are obtained and evaluated, modifications to this treatment facility may be proposed as necessary. Such changes could include incorporation of additional unit operations in the treatment train to obtain greater reductions in mercury concentrations, or the construction of additional stormwater storage capacity to allow treatment of greater quantities of stormwater and reduce the amount of stormwater bypassing treatment. Alternatively, the FFA parties may determine that other response actions unrelated to the water treatment facility might have greater impact on reducing mercury flux in UEFPC. Such decisions to pursue modifications of the water treatment system or other response actions would be made through FFA-party agreement, to achieve the goal of reducing mercury levels and ultimately meeting the AWQC in UEFPC.

The schedule of remedial actions under the selected remedy will depend on numerous factors, including funding, logistics, and availability of resources. Pursuant to Section XXXVIII of the FFA, DOE will take all necessary steps to obtain sufficient funding for activities required by this ROD amendment. This is to be accomplished, as set forth in the FFA, through consultation with EPA and TDEC and the submission of timely budget requests. Any milestones, timetables, or deadlines for remedial actions under this ROD amendment will be identified and established in accordance with the existing FFA protocols independent of this ROD amendment. Enforceable milestones and non-enforceable milestones for performance of remedial actions covered in this ROD amendment will be set forth in Appendix E and Appendix J of the FFA, respectively.

The new water treatment system will be designed to supplement other response actions already underway or planned for future implementation under the UEFPC Phase I ROD, and will not modify or replace any

of those actions. Similarly, construction of this new facility will not impact the additional actions and studies are planned under the Y-12 Mercury Reduction Project and the *Strategic Plan for Mercury Remediation* (DOE 2014c) which are separate from the actions being conducted under the UEFPC Phase I ROD. Completion of all response actions to reduce mercury in UEFPC surface will require many years and the interim action presented in this ROD amendment is only one component of this comprehensive remediation program. A CERCLA Alternatives Analysis planned for ~2021 will provide input to a future FFA-party agreement on any additional actions to be implemented in UEFPC and would be followed by final RODs for UEFPC surface water and groundwater. However, these actions are beyond the scope of this ROD amendment.

Land use controls (LUC's) established and implemented under the UEFPC Phase I ROD to ensure protection of potential human receptors will remain in effect under this ROD amendment. There are no new LUCs associated with this ROD amendment. LUCs will be implemented in accordance with the Land Use Control Implementation Plan (LUCIP) developed as part of the Remedial Action Report Comprehensive Monitoring Plan (DOE 2014b). LUCs are checked regularly for protectiveness and any issues or changes are reported in the annual Remediation Effectiveness Report. DOE is committed to implementing and maintaining LUCs to ensure that the selected remedy remains protective of human health and the environment.

6.3 CONCLUSION

Based on the information available, DOE believes that the selected remedy to construct and operate the new water treatment facility to treat discharges from the WEMA storm sewer system at Outfall 200 would significantly improve the performance of the UEFPC Phase I ROD selected remedy. The selected remedy meets the threshold criteria and provides the best balance of tradeoffs among the action alternatives with respect to the balancing and modifying criteria. DOE, with the concurrence of EPA and TDEC, has determined that the selected remedy to construct the new water treatment facility is an appropriate addition to the UEFPC Phase I ROD selected remedy.

7.0 EPA AND TDEC COMMENTS

Regulator comments and DOE responses regarding this ROD amendment and the focused feasibility study (DOE 2015a) and the proposed plan (DOE 2015b) developed for evaluation of this modification of the UEFPC Phase I ROD selected remedy are contained in the Administrative Record file. Through signature of this document, EPA and TDEC endorse the selection of the new water treatment facility to treat discharges from the WEMA storm sewer system at Outfall 200 under the UEFPC Phase I ROD.

8.0 STATUTORY DETERMINATIONS

As required under CERCLA Section 121, the modified remedy is protective of human health and the environment, is cost effective, and uses permanent solutions and alternative treatment technologies to the maximum extent practicable. This remedy meets all applicable or relevant and appropriate requirement (ARARs) that are directly associated with the scope and objectives of the interim action, with the exception of attaining the recreational in-stream AWQC for mercury. An interim action ARAR waiver under CERCLA 121(d)(4)(A) was invoked as part of the selected remedy in the UEFPC Phase I ROD, and is not impacted by this ROD amendment. The modified remedy also satisfies the statutory preference for treatment as a principal element of the remedy (i.e., it reduces the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants as a principal element through treatment).

Because this interim remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted no less often than every 5 years after initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

Because hazardous substances above health-based levels may remain after implementation of this remedy, DOE, TDEC, and EPA recognize that Natural Resource Damage claims, in accordance with CERCLA, may be applicable. This document does not address restoration or rehabilitation of all natural resource injuries that may have occurred, nor does it address whether such injuries have occurred. Neither DOE nor TDEC waives any rights or defenses each may have under CERCLA, Sect. 107(a)4(c).

9.0 PUBLIC PARTICIPATION COMPLIANCE

The public participation requirements set forth in 40 CFR 300.435(c)(2)(ii) will be met. Prior to issuance of this ROD amendment, a proposed plan was prepared and issued on August 5, 2015, to the public for review and public comment. A notice of document availability and a brief description of the proposed plan were printed in local newspapers of general circulation, including *The Oak Ridger* and *Roane County News*. The proposed plan was placed in the Administrative Record file and was made available to the public, along with other information supporting the decision, through the DOE Information Center. The public comment period closed on October 18, 2015.

Decision makers considered written and oral comments received before the end of the public comment period, before making a final decision to amend the UEFPC Phase I ROD selected remedy. A public meeting was held on September 2, 2015 (partway through the public comment period), at the DOE Information Center to discuss the proposed change in remedial action. A summary of the proposed plan was presented to the Oak Ridge Site Specific Advisory Board (ORSSAB) on September 9, 2015, and project representatives participated in a meeting of the ORSSAB Environmental Management and Stewardship Committee on September 16, 2015, to discuss the proposed plan. Subsequently, the ORSSAB issued a formal recommendation in support of the preferred alternative identified in the proposed plan and carried forward as the selected remedy in this ROD amendment. No other comments were received during the public comment period. Responses to comments received are provided in Appendix A, *Responsiveness Summary*, of this ROD amendment.

After approval by DOE, EPA, and TDEC of this ROD amendment, DOE will publish a public notice of availability and a brief description of the ROD amendment in local newspapers of general circulation. Also the ROD amendment will be made available to the public through placement in the Administrative Record file and the DOE Information Center prior to the commencement of construction of the new water treatment facility.

Additional information regarding this decision and the UEFPC watershed can be found in the Administrative Record file for this site, available through the DOE Information Center, 1 Science.gov Way, Oak Ridge, Tennessee 37830, (865) 241-4780.

10.0 REFERENCES

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APPENDIX A.

RESPONSIVENESS SUMMARY

PUBLIC COMMENT AND RESPONSES

DOE solicited public comment on the proposed plan in accordance with the public participation requirements set forth in 40 CFR 300.435(c)(2)(ii). Prior to issuance of this ROD amendment, a proposed plan was prepared and issued to the public for review and comment on August 5, 2015. A notice of document availability and a brief description of the proposed plan were printed in local newspapers of general circulation. The proposed plan was placed in the Administrative Record file and was made available to the public, along with other information supporting the decision, through the DOE Information Center.

A public meeting was held on September 2, 2015, at the DOE Information Center to discuss the proposed modification of the selected remedy in the UEFPC Phase I ROD. A summary of the proposed plan was presented to the Oak Ridge Site Specific Advisory Board (ORSSAB) on September 9, 2015, and project representatives participated in a meeting of the ORSSAB Environmental Management and Stewardship Committee on September 16, 2015, to discuss the proposed plan. The ORSSAB has issued a recommendation supporting the preferred alternative identified in the proposed plan for construction and operation of a new water treatment facility at Outfall 200. The ORSSAB recommendation is shown in Exhibit A-1.

After the public comment period closed on October 18, 2015, DOE, EPA and TDEC considered all written and oral comments received during the public comment period before making a final decision to amend the selected remedy under the UEFPC Phase I ROD. Other than the ORSSAB recommendation supporting the proposed new water treatment facility, no other public comments were received. Both EPA and TDEC have endorsed the selection of the new water treatment facility to treat discharges from the WEMA storm sewer system at Outfall 200 under the UEFPC Phase I ROD.

After approval of this ROD amendment by DOE, EPA, and TDEC, DOE will publish a public notice of availability and a brief description of the ROD amendment in local newspapers of general circulation. Also the ROD amendment will be made available to the public through placement in the Administrative Record file and the DOE Information Center prior to the commencement of construction of the new water treatment facility.

Additional information regarding this decision and the UEFPC watershed can be found in the Administrative Record file for this site, available through the DOE Information Center, 1 Science.gov Way, Oak Ridge, Tennessee 37830, (865) 241-4780.

OAK RIDGE SITE SPECIFIC ADVISORY BOARD RECOMMENDATION

"The Oak Ridge Site Specific Advisory Board recommends Alternative 2c in the Proposed Plan for Water Treatment at Outfall 200: the construction of a new water treatment facility near Outfall 200 to manage UEFPC stream flow of 40,000 gpm. The system would provide treatment capacity for 3000 gpm of influent surface water plus 1000 gpm of recycle flows (e.g., backwash water and filter press filtrate) and stored stormwater. The stormwater storage capacity will be 2 million gallons.

The Adaptive Management strategy is reasonable and with modularization being part of the design, construction, and operation process, revisions and/or additions to the treatment system may be necessary."

DOE RESPONSE

DOE appreciates the endorsement by the ORSSAB for the preferred alternative, Alternative 2c, identified in the proposed plan.

Oak Ridge Site Specific Advisory Board Recommendation 229: Recommendation on the Preferred Alternative for the Proposed Plan for Water Treatment at Outfall 200 at Y-12 National Security Complex

Background

Mercury contamination at the Y-12 National Security Complex (Y-12) is widespread and has been indentified in soil, sediment, surface water, groundwater, in and underneath buildings, drains, and sumps. Mercury continues to be released into Upper East Fork Poplar Creek (UEFPC) from several sources.

Mercury contamination at Y-12 is the result of operations that took place primarily in three buildings at the west end, namely, Alpha 4, Alpha 5, and Beta 4, and to a lesser extent in Alpha 2. These buildings are located in an area known as the West End Mercury Area (WEMA).

From the 1950s to 1963 large amounts of mercury were used in the three buildings where lithium isotopes were separated for weapons production. About 24 million pounds of mercury were used, of which about 2 million pounds were unaccounted for and of this, about 700,000 pounds are estimated to have escaped in the air, surface water, soils, and sediments.

The most urgent issue to address at Y-12 is the presence of mercury in surface water. Mercury moves through the storm sewer system in the WEMA to Outfall 200, where the headwaters of UEFPC emerge. Mercury in the creek flows through Y-12 to Station 17, where the creek exits the plant, becoming East Fork Poplar Creek, which eventually empties into the Clinch River to the west.

The objectives for mercury cleanup at Y-12 are to reduce mercury in surface water and stabilize and eliminate mercury in the soils. The Department of Energy Oak Ridge Office of Environmental Management (DOE EM) has been working with the Environmental Protection Agency and the Tennessee Department of Environment and Conservation to arrive at a solution for mercury remediation. A draft mercury strategy plan was submitted to the regulators in March 2013 followed by a workshop where discussions were held about mercury challenges and what can be done. The consensus of the participants was that the problem was complex and will require a number of solutions that are complementary with an adaptive management plan.

One of those solutions is to reduce mercury leaving the Y-12 Plant via surface water. Remedial alternatives have been developed for construction of a new water treatment facility to treat discharges from the WEMA storm sewer system at Outfall 200. Water emerging at Outfall 200 would be treated at that point with a mercury treatment plant.

In July 2015 DOE EM issued a Proposed Plan for Water Treatment at Outfall 200 Under the Record of Decision for Phase I Interim Source Control Actions in the Upper East Fork Poplar Creek Characterization Area (DOE/OR/01-2661&D2). The proposed plan describes several alternatives for constructing a water treatment plant and proposed a preferred alternative.

Exhibit A-1. ORSSAB Recommendation Regarding Proposed Water Treatment Facility.

Discussion

The proposed plan offers two basic alternatives and several modifications under Alternative 2. Alternative 1 is a No Action Alternative that is required under the Comprehensive Environmental Response, Compensation, and Liability Act to provide a comparative baseline against which other alternatives can be evaluated.

Alternative 2 is to build a water treatment plant at Outfall 200. Alternative 2 includes several proposed modifications:

- Alternative 2a: Water Treatment at Outfall 200 with 1500 gallons per minute (gpm) Treatment Capacity and No Stormwater Storage;
- Alternative 2b: Water Treatment at Outfall 200 with 3000 gpm Treatment Capacity and No Stormwater Storage;
- Alternative 2c: Water Treatment at Outfall 200 with 3000 gpm Treatment Capacity and 2 Million Gallons of Stormwater Storage;
- Alternative 2d: Water Treatment at Outfall 200 with 3000 gpm and 10 Million Gallons of Stormwater Storage.

Details of all of these alternatives are found in the proposed plan (DOE/OR/01-2661&D2).

DOE's preferred alternative is Alternative 2c. Members of the Oak Ridge Site Specific Advisory Board Environmental Management & Stewardship Committee reviewed the proposed plan and discussed the preferred alternative at its September 16, 2015, meeting and endorsed DOE's preferred Alternative 2c.

Recommendation

The Oak Ridge Site Specific Advisory Board recommends Alternative 2c in the Proposed Plan for Water Treatment at Outfall 200: the construction of a new water treatment facility near Outfall 200 to manage UEFPC stream flow of 40,000 gpm. The system would provide treatment capacity for 3000 gpm of influent surface water plus 1000 gpm of recycle flows (e.g., backwash water and filter press filtrate) and stored stormwater. The stormwater storage capacity will be 2 million gallons.

The Adaptive Management strategy is reasonable and with modularization being part of the design, construction and operational process, revisions and/or additions to the treatment system may be necessary.

Exhibit A-1. Continued.

APPENDIX B.

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

B.1 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

The for the selected remedial action alternative for Outfall 200 for Upper East Fork Poplar Creek (Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) Section 121 and 40 Code of Federal Regulations (CFR) 300.430(f)(1)(ii)(B*)* specify that remedial actions for cleanup of hazardous substances must attain or have legally waived applicable or relevant and appropriate requirements (ARARs) under federal or more stringent state environmental laws. The purpose of this appendix is to summarize federal and state ARARs identified UEFPC).

Applicable requirements are "those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site" (40 CFR 300.5). Relevant and appropriate requirements are "those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting law that, while not applicable to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site" (40 CFR 300.5). Pursuant to U.S. Environmental Protection Agency (EPA) guidance, where EPA has delegated to the State of Tennessee the authority to implement a federal program, the Tennessee regulations replace the equivalent federal requirements as the potential ARARs.

CERCLA on-site remedial response actions must comply only with the substantive requirements of a regulation and not the administrative requirements to obtain federal, state, or local permits [CERCLA Section 121(e)]. To ensure that CERCLA response actions proceed as rapidly as possible, EPA has reaffirmed this position in the final National Oil and Hazardous Substances Pollution Contingency Plan (NCP) [55 *Federal Register* (FR) 8756, March 8, 1990]. Substantive requirements pertain directly to the actions or conditions at a site, while administrative requirements facilitate their implementation (e.g., approval of or consultation with administrative bodies, documentation, permit issuance, reporting, record keeping, and enforcement).

The NCP at 40 CFR 300.400(e)(1) defines "on-site" as meaning "the areal extent of contamination and all suitable areas in very close proximity to the contamination necessary for the implementation of the response action." CERCLA Sect. 104(d)(4) [as discussed further in the preamble to the final NCP, 55 FR 8690] states where two or more noncontiguous facilities are reasonably related on the basis of geography, or on the basis of the threat or potential threat to the public health or welfare or the environment, these related facilities may be treated as one for the purpose of conducting response actions. Section 104(d)(4) allows the lead agency to manage waste transferred between such noncontiguous facilities without having to obtain a permit [i.e., manage as "on-site" waste]. This approach was proposed and agreed to by all Federal Facility Agreement (FFA) parties for the Oak Ridge Reservation (ORR) Environmental Management Waste Management Facility (EMWMF) project and was acknowledged and documented in the signed EMWMF Record of Decision (ROD) [U.S. Department of Energy (DOE), 1999] and reaffirmed in the East Tennessee Technology Park Zone 2 ROD (DOE, 2005). This agreement serves as the basis for designating waste TSD facilities on the ORR as "on-site" facilities not subject to the CERCLA Off-site Rule (40 CFR 300.440) when accepting wastes from CERCLA on-site response actions.

ARARs include only those federal and state regulations that are designed to protect the environment and do not include occupational safety or worker radiation protection requirements. The U.S. Environmental

Protection Agency (EPA) requires compliance with the Occupational Safety and Health Administration (OSHA) standards through Sect. 300.150 of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), independent of the ARARs process. Therefore, neither the regulations promulgated by OSHA nor U.S. Department of Energy (DOE) Orders related to occupational safety are addressed as ARARs. These regulations would appear in the appropriate health and safety plans for this action.

Per EPA regulation and guidance, reporting and recordkeeping requirements, as well as requirements related to training, inspections, contingency planning, test procedures, and sampling methods are considered administrative requirements, not substantive environmental protection standards, therefore are not ARARs [40 CFR 300.5; EPA, 1992b, Pg. 2; Preamble to the Final NCP, 55 FR 8756, March 8, 1990; EPA, 1988, Pg. 1-11]. Although these requirements will be met as mandated by internal DOE and company policy and procedures and will be completed in accordance with those procedures and CERCLA requirements and guidance, and documented in project files, they are not listed as ARARs.

In addition to ARARs, 40 CFR 300.400(g)(3) states that federal or state nonpromulgated advisories or guidance may be identified as “to be considered” (TBC) guidance for contaminants, conditions, and/or actions at the site. TBCs include non-promulgated criteria, advisories, guidance, and proposed standards. TBCs are not ARARs because they are neither promulgated nor enforceable. TBCs may be used to interpret ARARs and to determine preliminary remediation goals (PRGs) when ARARs do not exist for particular contaminants or are not sufficiently protective to develop cleanup goals.

ARARs can specify maximum concentrations of contaminants that can remain at a site (chemical-specific), specify design or performance requirements for remedial technologies (action-specific), or impose consideration of sensitive resources present at a site (location-specific). In accordance with 40 CFR 300.400(g), ARARs and TBCs have been identified for the remedial action alternative evaluated in this Record of Decision (ROD) amendment. Tables B.1, B.2 and B.3 list the chemical-specific, location-specific, and action-specific ARARs/TBCs, respectively, for the chosen remedial action alternative. The requirements listed in Tables B.1, B.2, and B.3 are triggered as ARARs if the particular jurisdictional prerequisite for that requirement (listed in Column 3 of the table) is met. For example, although there are wetlands in the project area, if the response action does not result in harm to or loss of these wetlands, then the requirements addressing mitigation of wetlands would not be triggered as ARARs.

This ROD amendment proposes no changes to the ARARs identified in the UEFPC Phase I ROD for UEFPC issued in May 2002. Regulatory citations have been updated to reflect changes by the respective state and federal agencies over the years. Additional detail has been included in some cases to better define the specific requirements for these actions. The remedial action alternative selected under this ROD amendment is expected to meet all identified ARARs, with the exception of attaining the recreational in-stream ambient water quality criterion (AWQC) of 51 ng/L for mercury. An interim action waiver of this ARAR under CERCLA 121(d)(4)(A) was invoked and granted as part of the selected remedy under the UEFPC Phase I ROD and would not be impacted by this ROD amendment. The water treatment facility evaluated in this ROD amendment would be an additional interim action under the UEFPC Phase I ROD and would help to achieve the interim goal of 200 ng/L for mercury at Station 17 established in the UEFPC Phase I ROD and ultimately the AWQC for mercury.

B.1.1 Chemical-Specific ARARs/TBCs

Chemical-specific ARARs provide health- or risk-based concentration limits or discharge limitations in various environmental media (i.e., surface water, groundwater, soil, air) for specific hazardous substances,

pollutants, or contaminants. Chemical-specific ARARs identified for the selected alternative in this ROD amendment are listed on Table B.1 and discussed below.

Surface Water

Under Tennessee water quality regulations, streams may be designated for multiple use classifications (TDEC 0400-40-04) and different AWQC may be specified for each use classification (TDEC 0400-40-03). The entire length of East Fork Poplar Creek (EFPC) is currently designated for four use classifications: (1) fish and aquatic life, (2) recreation, (3) livestock watering and wildlife, and (4) irrigation. Among these four designated use classifications, recreation has the most stringent criterion for mercury at 51 ng/L. At the time that the UEFPC Phase I ROD was issued, the FFA parties agreed to waive this surface water AWQC until other phases of the interim action captured and/or removed more of the mercury sources that were located within the scope of the interim ROD. This ROD amendment implements one additional interim action that is intended to capture and treat sources of mercury at UEFPC. No new waiver of any ARAR is requested, but the interim waiver previously approved under the UEFPC Phase I ROD for the recreational AWQC for mercury would not be impacted by this decision and would remain in effect. The proposed water treatment system is expected to reduce mercury concentrations to 51 ng/L or less in the treated effluent. If actual performance does not attain this target level, the FFA parties will collaborate on the selection and implementation of follow-on actions, which could include use of this interim waiver or could involve other actions that may result in achieving the mercury AWQC.

UEFPC begins in the Y-12 industrial area and extends to the site boundary (near the Station 17 monitoring location) where it enters into Lower East Fork Poplar Creek (LEFPC). Following remediation of upstream mercury contaminant sources, a subsequent CERCLA decision document will address final surface water decisions regarding attainment of AWQC for the UEFPC and LEFPC.

Radiation Protection

In accordance with relevant and appropriate TDEC and U.S. Nuclear Regulatory Commission (NRC) radiation protection requirements (Tennessee is an NRC-agreement state) and DOE policy, the radiation dose to members of the public must not exceed 100-mrem/year total effective dose equivalent from all sources excluding dose contributions from background radiation, medical exposures, or voluntary participation in medical/research programs [TDEC 0400-20-05-.60(1)(a), 10 CFR 20.1301(a)(1)] and must be further reduced below this limit as low as reasonably achievable (ALARA) [TDEC 0400-20-05-.40(2), 10 CFR 20.1101(b)]. This dose limit addresses exposure to radiation from all sources and activities, including both operations and removal/remedial actions, at a facility and requires DOE to utilize procedures to maintain the dose ALARA. Thus, the actual dose that the public might receive from any individual activity such as this remedial action is expected to be a very small fraction of the 100 mrem/year dose limit.

Groundwater and Soil

Final decisions regarding groundwater at UEFPC were deferred under the UEFPC Phase I ROD to a future decision document following completion of the Phase I response actions. At that time, a decision will be made as to whether the Safe Drinking Water Act of 1974, as amended, maximum contaminant levels and maximum contaminant level goals are applicable or relevant and appropriate for groundwater response actions at UEFPC. Depending on the classification of the groundwater, remediation goals may include restoring groundwater to meet any corresponding criteria (both numeric and narrative) that are ARAR.

Excavation of contaminated surface and subsurface soils is being addressed under both the UEFPC Phase I ROD and UEFPC Phase II ROD, and removal of contaminated storm sewer sediments is being conducted to reduce releases of mercury to UEFPC. While the selected alternative may involve limited removal and/or treatment of some contaminated streambed/bank soils and sediments during facility construction activities, the primary purpose of this action is the treatment of mercury-contaminated surface water, not soil or sediment. Soil and sediment requiring excavation will be managed and treated in accordance with the pertinent ARARs as identified in Table B.1.

B.1.2 Location-Specific ARARs/TBCs

Location-specific requirements establish restrictions on permissible concentrations of hazardous substances or requirements for how activities will be conducted because they will take place in special locations (e.g., wetlands, floodplains, critical habitats, historic districts, streams). Location-specific ARARs identified for the selected alternative are listed on Table B.2 and discussed below. The remedial action alternative includes construction of a new water treatment facility near Outfall 200, which is located within the Y-12 main industrial area, which has been extensively disturbed over the years. Potential location-specific ARARs, as listed in Table B.2, include those addressing floodplains, aquatic resources and cultural/archeological resources. No wetlands and no threatened or endangered species or their environments were identified within the area that would be impacted by this project. Therefore, the requirements for protection of wetlands and threatened or endangered species are not identified as ARARs for these actions.

Floodplains

The remedial action alternative includes construction of a new water treatment facility adjacent to the UEFPC stream channel near Outfall 200. Construction activities would take place at and adjacent to the UEFPC stream channel and may include excavation of floodplain soil or stream sediments. Floodplain requirements would be considered in siting and constructing the facility. Actions must avoid, to the extent possible, adverse impacts to the floodplains in accordance with Executive Order 11990 and 10 CFR 1022. Appropriate mitigation measures would be implemented, such as minimum grading requirements, runoff controls, and design and construction constraints.

Aquatic Resources

Removal of streambed sediments and floodplain soils may involve diversion of stream flow, bank stabilization, removal of riparian vegetation, and dredging. All land-disturbing construction activities (e.g., excavation of soils or sediments) with the potential to impact surface waters from stormwater runoff would be designed and implemented using best management practices and erosion and sedimentation controls, as needed, to comply with stormwater control and aquatic resource alteration requirements. The adverse effects of water-related projects on fish and wildlife resources should be considered per the Fish and Wildlife Coordination Act. The Clean Water Act of 1972, as amended, Section 404 requirements for protection of aquatic resources (40 CFR 230.10) must be met if the action involves any discharges of dredged or fill material into aquatic ecosystems.

Cultural Resources

Y-12 has proposed historic districts and buildings that are eligible for inclusion on the National Register of Historic Places (NRHP). One building within the NRHP-eligible historic district at Y-12, Building 9204-3 (Beta 3), has been recommended for national historic landmark status. The remedial action alternative selected in this ROD amendment includes potential construction of a new water treatment facility

immediately to the south of Building 9204-3. The National Historic Preservation Act of 1966 (NHPA), Section 106, requires that a proposed activity be assessed for impacts to buildings or historic structures that are considered historic properties. The proposed water treatment facility, as currently designed, would not be expected to impact Building 9204-3, so these requirements are not identified as ARARs in Table B.2. The substantive requirements of the NHPA, however, will be considered in the future if the project design changes.

An archeological survey conducted for Y-12, *Archeological Evaluation of Y-12 Plant Facility Within the Fenced Areas of the Bear Creek Valley* (DuVall 1992), stated that "the potential for preserved prehistoric or historic archaeological sites is virtually non-existent due to the previous amount of disturbance observed within the valley." In accordance with the "Programmatic Agreement Among the Department of Energy Oak Ridge Operations Office, the Tennessee State Historic Preservation Officer, and the Advisory Council on Historic Preservation Concerning Management of Historical and Cultural Properties at the Oak Ridge Reservation" (1994), ground disturbance activities associated with remedial actions may proceed without further consultation with the Tennessee State Historic Preservation Officer or the Advisory Council on Historic Preservation as long as the depth and extent of new disturbance do not exceed the depth and extent of previous disturbances.

B.1.3 Action-Specific ARARs/TBCs

Action-specific ARARs include operation, performance, and design requirements or limitations based on the waste types, media, and remedial activities. Component actions include treatment of mercury-contaminated surface water in a newly constructed onsite wastewater treatment facility, waste management (characterization, staging, treatment, and disposal) and transportation of waste for onsite or offsite disposal, as appropriate. ARARs for each component of the selected remedial action alternative are listed in Table B.3 and discussed below.

General Construction Activities

Requirements for the control of fugitive dust and stormwater runoff potentially provide ARARs for all site preparation, construction, and excavation activities. Reasonable precautions must be taken, including the use of best management practices for erosion control to prevent runoff and application of water on exposed soil/debris surfaces to prevent particulate matter from becoming airborne. In addition, diffuse or fugitive emissions of radionuclides to the ambient air from the remediation activities, which are only one of potentially many sources of radionuclide emissions at a DOE facility, must comply with the Clean Air Act of 1970 (CAA), as amended, requirements in 40 CFR 61.92 [and TDEC 1200-3-11-.08(6)].

Removal of Contaminated Media

Removal of contaminated streambed sediments and/or floodplain soil in UEFPC may occur during construction of a new water treatment facility. Such soils and sediments will be collected, dewatered, characterized, and managed accordingly. Excavated soils and sediments may potentially include low-level waste (LLW), Toxic Substances Control Act of 1976 (TSCA) polychlorinated biphenyls (PCBs), Resource Conservation and Recovery Act of 1976 (RCRA) solid or hazardous waste, or mixed waste, depending on the extent of contamination, and will be characterized and disposed in an appropriate CERCLA-approved onsite or offsite facility.

Much of the soil and sediment may be contaminated with mercury, and may, depending on the concentrations, be considered RCRA hazardous waste due to the toxicity characteristic (RCRA Waste Code D009). Any RCRA hazardous waste removed from the areal extent of contamination for subsequent disposal must meet the pertinent RCRA land disposal restrictions for hazardous waste at 40

CFR Part 268 et. seq. Alternative treatment standards for soil listed in 40 CFR 268.49 require treatment of any constituent subject to treatment to a 90 percent reduction standard, as measured in leachate from the treated media, capped at 10 times the universal treatment standard levels listed in 40 CFR 268.48 for the constituents subject to treatment.

PCB remediation waste, as defined in 40 CFR 761.3, is waste containing PCBs as a result of a spill, release, or other unauthorized disposal and includes soil, rags, and debris generated as a result of any PCB spill cleanup. Bulk PCB remediation waste includes environmental media containing PCBs, such as soil and dredged sediments and aqueous decantate from sediment. Excavated PCB-contaminated soil or sediment will be disposed of in an appropriate CERCLA-approved onsite or offsite facility in accordance with the performance-based disposal requirements of 40 CFR 761.61(b)(2). Contaminated soil/sediment that is generated during excavation may be temporarily stored in containers that meet the RCRA/TSCA requirements. (See waste generation, characterization, management, treatment, and disposal requirements listed in Table B.3.)

There are no action-specific ARARs for these excavation activities other than the general requirements to control fugitive dust emissions and stormwater runoff as discussed above. However, depending on the location of the soil/sediment removal, location-specific ARARs to protect sensitive resources such as aquatic resources and floodplains may be triggered (see above).

Water Treatment

This interim action implements a modification to the selected remedy specified in the UEFPC Phase I ROD to include an additional “discrete phase” response action to those response actions that have been and will be implemented within the scope of the UEFPC Phase I ROD. The interim action implemented under this ROD amendment is intended to capture, treat and release waters that flow through certain areas covered under the UEFPC Phase I ROD. Because this water would be treated to remove mercury prior to release into UEFPC, the requirements that are applicable to discharges of treatment system effluent into surface waters are ARARs for this action. Meeting these requirements is consistent with and will assist in meeting the AWQC that will be likely be chemical-specific ARARs in the final Record of Decision for UEFPC. Mercury-contaminated surface water would be captured and treated in a water treatment facility before discharge to UEFPC. Discharges from the treatment facility will meet designated project-specific effluent limitations to ensure the discharge does not contribute to an exceedance of TDEC water quality standards in the stream. The interim waiver previously approved under the UEFPC Phase I ROD of the recreational AWQC for mercury (51 ng/L) would not be impacted by this decision and would remain in effect. The proposed water treatment system is expected to reduce mercury concentrations to the 51 ng/L or less in the treated effluent. If actual performance does not attain this target level, follow-on actions could include use of this interim waiver (see Section B.1.1). Other wastewaters collected during construction, dewatering soil/sediment, or decontamination activities will, if necessary, be transported to an onsite wastewater treatment facility for treatment and discharge.

ARARs for point source effluent discharges include a requirement in TDEC 0400-40-05-.10(4) that such discharges comply with the anti-degradation statement in TDEC 0400-40-03-.06 for waters with “unavailable parameters” as that term is defined in TDEC 0400-40-03-.06(2). UEFPC meets the definition of waters with unavailable parameters because of mercury contamination. TDEC 0400-40-03-.06 does not allow new or increased discharges that would cause measurable degradation of the parameter that is unavailable. Water to be released from the new wastewater treatment system, however, represents a pass-through of mercury-loaded water that was removed from the creek, treated to remove the mercury, and then subsequently released back into the creek. In keeping with the intent of the anti-degradation policy, the treatment system is meant to reduce water contamination and prevent further degradation of the stream.

Wastewaters that are hazardous only because they exhibit a hazardous characteristic, and which are otherwise restricted from land disposal, are not prohibited if such wastes are managed in a treatment system that subsequently discharges to waters of the United States pursuant to a permit issued under Sect. 402 of the Clean Water Act of 1972 (CWA) unless the wastes are subject to a specified method of treatment other than DEACT in 40 CFR 268.40 or are D003 reactive cyanide [40 CFR 268.1(c)(4)(i); TDEC 0400-12-01-.10(1)(a)(30(iv)]. In addition, onsite wastewater treatment units that are part of a wastewater treatment facility subject to regulation under Section 402 or Section 307(b) of the CWA [i.e., are regulated under the CWA National Pollutant Discharge Elimination System (NPDES) program] are exempt from the requirements of RCRA Subtitle C for all tank systems, conveyance systems (whether piped or trucked), and ancillary equipment [40 CFR 264.1(g)(6); 40 CFR 260.10; 40 CFR 720.1(c)(2); 53 FR 34079 (September 2, 1988)].

Discharge of any air contaminants from the water treatment system must be in accordance with the appropriate provisions of TDEC 1200-03 et. seq. Potential releases of regulated air pollutants must be analyzed to determine compliance with TDEC air emission requirements. Air emission controls may be required to implement compliance (TDEC 1200-03-09-.01(1)(d)]. Release points that have the potential to discharge radionuclides into the air in quantities that could cause an effective dose equivalent (EDE) in excess of 1 percent of 10 mrem/year to any member of the public must also be monitored. Emission measurements in accordance with 40 CFR 61.93(b)(4)(1) [TDEC 1200-03-11-.08(6)] must be made and all radionuclides that could contribute greater than 10 percent of the total EDE for a release point must be taken.

Waste Management

All primary wastes (contaminated soil, sediments, and surface water) and secondary wastes (contaminated personal protective equipment, treatment residuals, and decontamination wastewaters) generated during remedial activities will be appropriately categorized as either RCRA (solid or hazardous waste), universal waste, asbestos-containing material, PCB waste, radioactive waste, or mixed waste, and managed in accordance with the appropriate RCRA, TSCA, or DOE requirements for the particular waste(s). Solid wastes generated from remedial actions will be disposed of in an appropriate CERCLA-approved onsite disposal facility where possible. Wastes that do not meet the waste acceptance criteria for disposal at an onsite facility will be transported offsite for treatment and disposal at an approved offsite facility. Paved equipment/waste staging areas, as well as temporary stockpile areas, will be set up for the various waste types. These areas will be in close proximity to the area(s) of contamination, are necessary for implementation of this remedial action, and are therefore deemed “onsite” under CERCLA 121(e)(1) [and 40 CFR 300.400(e)(1)]. The stockpiled wastes will be scanned, characterized, and disposed of at an onsite disposal facility, as appropriate. If the chemical and/or radiological waste acceptance criteria for onsite disposal cannot be achieved, the waste will be shipped to an approved offsite facility. Table B.3 lists in detail the requirements associated with the characterization, storage, treatment, and disposal of the aforementioned waste types.

Land-Use Controls

Land-use controls established and implemented under the UEFPC Phase I ROD will remain in effect to prevent access to any residual contamination and inappropriate future use of the site by residents. No new land use controls are required under this ROD amendment. In accordance with the NCP [40 CFR 300.430(a)(1)(iii)] and TDEC 0400-15-01-.08(10), institutional controls such as water use and restrictions/notices are required to prevent or limit exposure to hazardous substances left in place that might pose an unreasonable threat to public health, safety, or the environment. Such controls will apply after completion of the remedial actions. These controls could include land use restrictions, as well as

notices designed to warn and restrict potential users of the areas that contain residual contamination. Administrative restrictions will be recorded in accordance with state law on the original property acquisition records of DOE (and its predecessor agencies) that will notify anyone searching Oak Ridge Reservation property records that certain areas at UEFPC are contaminated. Controls including signs and appropriate radiological and excavation safety measures will be used to prevent disturbance of residual radioactive material where necessary. An existing program for excavation/penetration permits will be used to limit or prohibit such activities in areas with residual contamination. Information on the extent of site contamination will be available to permit requestors.

These land use restrictions will be implemented and administered in accordance with appropriate sections of §TCA 68-212-225 "Land use restrictions", and in accordance with the Land Use Control Implementation Plan developed as part of the Remedial Action Report Comprehensive Monitoring Plan. LUCs are checked regularly for protectiveness and any issues or changes are reported in the annual Remediation Effectiveness Report. DOE is committed to implementing and maintaining LUCs to ensure that the selected remedy remains protective of human health and the environment.

Transportation

Any remediation wastes that are transferred offsite for treatment and/or disposal must meet the requirements summarized in Table B.3 depending on the type of waste (e.g., RCRA, PCB, LLW, or mixed). These include packaging, labeling, marking, manifesting, and placarding requirements for the specific waste type. Wastes transported in commerce along public rights-of-way must meet the U.S. Department of Transportation requirements for hazardous materials, as well as the specific requirements for the type of waste. Pursuant to a regulatory decision approved by the Federal Facility Agreement parties, the Oak Ridge Reservation is treated as one site for purposes of conducted CERCLA response actions, and transferring wastes between noncontiguous facilities on the ORR is considered onsite transfer. The transfer of waste off of the ORR is considered offsite transfer.

In addition, CERCLA Sect. 121(d)(3) provides that the offsite transfer of any hazardous substance, pollutant, or contaminant generated during CERCLA response actions be to a treatment, storage, or disposal facility that is in compliance with applicable federal and state laws and that has been approved by EPA for acceptance of CERCLA waste (see also the "Off-Site Rule" at 40 CFR 300.440 et seq.). Accordingly, DOE will verify with the appropriate EPA regional contact that any needed offsite facility is acceptable for receipt of CERCLA wastes before transfer.

Table B.1. Chemical-Specific ARARs and TBC Guidance for Upper East Fork Poplar Creek Record of Decision Selected Remedial Alternative, Oak Ridge, Tennessee

Action/medium	Requirements	Prerequisite	Citation(s)
Surface water quality criteria for release of treated water into UEFPC	Waters shall not contain substances or combination of substances including disease-causing agents which, by way of either direct exposure or indirect exposure through food chains, may cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunctions in reproduction), physical deformations, or restrict or impair growth in fish or aquatic life or their offspring.	Release of wastewater or effluents into surface water—**applicable** as instream criteria beyond the mixing zone *	TDEC 0400-40-03-.03(3) – (6)
	Water shall not contain toxic substances that will render the water unsafe or unsuitable for water contact activities including the capture and subsequent consumption of fish and shellfish, or will propose toxic conditions that will adversely affect man, animal, aquatic life, or wildlife.		
	Water shall not contain other pollutants that will be detrimental to fish or aquatic life, or adversely affect the quality of the waters for recreation, irrigation, or livestock watering and wildlife.		
Radionuclides in the environment	Exposure to individual members of the public from radiation shall not exceed a TED of 0.1 rem/year (100 mrem/year), exclusive of the dose contributions from background radiation, any medical administration the individual has received, or voluntary participation in medical/research programs.	Release of radionuclides to the environment from an active NRC-licensed operation—**relevant and appropriate**	TDEC 0400-20-05-.60(1)(a)
	The dose in any unrestricted area from external sources, exclusive of the dose contributions from patients administered radioactive material and released in accordance with 1200-02-07-.35, does not exceed 0.002 rem (0.02 mSv) in any one hour.		TDEC 0400-20-05-.60(1)(b)
	Shall use, to the extent practicable, procedures and engineering controls based on sound radiation protection principles to achieve doses to members of the public that are ALARA.		TDEC 0400-20-05-.40(2)

*The waiver approved in the UEFPC Phase I ROD under CERCLA 121(d)(4)(A) for the AWQC for mercury would not be impacted by this ROD amendment and would remain in effect.

ALARA = as low as reasonably achievable
ARAR = applicable or relevant and appropriate requirement
AWQC = ambient water quality criteria
BAT = best available technology
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NRC = Nuclear Regulatory Commission
ROD = Record of Decision
TBC = To Be Considered
TDEC = Tennessee Department of Environment and Conservation
TED = total effective dose
UEFPC = Upper East Fork Poplar Creek

Table B.2. Location-Specific ARARs and TBC Guidance for Upper East Fork Poplar Creek Record of Decision Selected Remedial Alternative, Oak Ridge, Tennessee

Location characteristic(s)	Requirement(s)	Prerequisite	Citation(s)
Floodplains			
Presence of floodplain as defined in 10 CFR 1022.4	Design or modify selected alternatives to reduce risk of flood loss, minimize harm to or within floodplains, and restore and preserve floodplain values to extent practicable. Structures constructed in a floodplain shall meet, at a minimum, building standards pursuant to the National Flood Insurance Program.	DOE actions that involve potential impacts to, or take place within, floodplains—**applicable**	10 CFR 1022.3(a)(1) through (4)
	Undertake a careful evaluation of the potential effects of any new construction in floodplains. Identify, evaluate, and, as appropriate, implement alternative actions that may avoid or mitigate adverse impacts on floodplains.		10 CFR 1022.3(b) and (d)
	Avoid, to the extent possible, the long- and short-term adverse effects associated with occupancy and modification of floodplains.		10 CFR 1022.3(c)
	Measures to take to mitigate adverse effects of actions in floodplains include, but are not limited to, minimum grading requirements, runoff controls, design and construction constraints, and protection of ecology-sensitive areas.		10 CFR 1022.13(a)(3)
	If no practicable alternative to locating or conducting the action in the floodplain is available, then before taking action design or modify the action in order to minimize potential harm to or within the floodplain, consistent with the policies set forth in Executive Order 11990.		10 CFR 1022.14(a)
Aquatic Resources			
Within area impacting stream or any other body of water -and- presence of wildlife resources (e.g., fish)	The effects of water-related projects on fish and wildlife resources and their habitat shall be considered with a view to the conservation of fish and wildlife resources by preventing loss of and damage to such resources.	Action that impounds, modifies, diverts, or controls a stream or other body of water, except where the maximum surface area of an impoundment is less than 10 acres or for land management activities by federal agencies with respect to federal lands under their jurisdiction—**relevant and appropriate**	16 USC 662(a) (*Fish and Wildlife Coordination Act*)

Location characteristic(s)	Requirement(s)	Prerequisite	Citation(s)
Waters of the state as defined in TCA 69-3-103(33)	Must comply with the substantive requirements of the ARAP for erosion and sediment control to prevent pollution of waters of the state.	Action potentially altering the properties of any waters of the state—**applicable**	TCA 69-3-108(b)(1)(j)
	Pollution control requirements, as detailed in each particular General Permit, include but are not limited to, the following: Activity must not result in discharge of waste or substances that may be harmful to humans or wildlife; Material may not be placed in a location or manner so as to impair surface water flow into or out of any wetland area; • Work must be carried out in a manner that does not violate water quality criteria as stated in TDEC 0400-4-3-.03, including, but not limited to, prevention of discharges that cause a condition in which visible solids, bottom deposits, or turbidity impairs the usefulness of waters of the state for any of the designated uses for that water body by TDEC 0400-4-4; • Excavation and fill activities shall be kept to a minimum, and all excess material shall be hauled upland and properly stabilized or disposed of. • Sediment shall be prevented from entering waters of the state; erosion and sediment controls shall be designed according to the size and slope of disturbed or drainage to detain runoff and trap sediment, and shall be properly selected, installed, and maintained in accordance with manufacturer's specifications and good engineering practices. • Erosion and sedimentation control shall be in place and functional before earthmoving operations begin and must be maintained throughout the construction period. Temporary measures may be removed at the beginning of the work day but shall be replaced at the end of the work day. • Litter, construction debris, and construction chemicals exposed to stormwater shall be picked up prior to anticipated storm events or otherwise prevented from becoming a pollutant source for stormwater discharges.	Action potentially altering the properties of any waters of the state—**TBC**	TDEC ARAP Program conditions common to all General Permits

Location characteristic(s)	Requirement(s)	Prerequisite	Citation(s)
Waters of the state as defined in TCA 69-3-103(33) (continued)	• Clearing, grubbing, or other disturbance of areas immediately adjacent to waters of the state shall be limited to the minimum necessary to accomplish the proposed activity. Unnecessary vegetation removal is prohibited, and disturbed areas shall be stabilized and revegetated as soon as practicable. • Appropriate steps shall be taken to ensure petroleum products or other chemical pollutants are prevented from entering waters of the state, including groundwater; • Adverse impacts to T&E species or cultural, historical, or archeological features or sites are prohibited.		
Location encompassing aquatic ecosystem as defined in 40 CFR 230.3(c)	The discharge of dredged or fill material into waters of the United States is prohibited if there is a practical alternative that would have less adverse impact. No discharge shall be permitted that results in violation of state water quality standards, violates any toxic effluent standard, and/or jeopardizes an endangered species or its critical habitat. No discharge will be permitted that will cause significant degradation of waters of the United States. No discharge of dredged or fill material shall be permitted unless appropriate and practicable steps in accordance with 40 CFR 230.70 et. seq. are taken that will minimize potential adverse impacts of the discharge on the aquatic ecosystem.	Action that involves the discharge of dredged or fill material into waters of the United States, including jurisdictional wetlands—**applicable**	40 CFR 230.10(a), (b), (c), and (d) 40 CFR 230 Subpart H

ARAP = Aquatic Resource Alteration Permit
ARAR = applicable or relevant and appropriate requirement
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR = Code of Federal Regulations
DOE = U.S. Department of Energy
EO = Executive Order
T&E = threatened and endangered
TCA = Tennessee Code Annotated
TBC = To Be Considered
TDEC = Tennessee Department of Environment and Conservation
USC = United States Code

Table B.3. Action-Specific ARARs and TBC Guidance for Upper East Fork Poplar Creek Record of Decision Selected Remedial Alternative, Oak Ridge, Tennessee

Action	Requirements	Prerequisite	Citation(s)
General Construction Standards—All Remediation Activities			
Activities causing fugitive dust emissions	Shall take reasonable precautions to prevent particulate matter from becoming airborne; reasonable precautions shall include, but are not limited to, the following:	Fugitive emissions from demolition of existing buildings or structures, construction operations, grading of roads, or the clearing of land —**applicable**	TDEC 1200-03-08-.01(1)
	• use, where possible, of water or chemicals for control of dust, and		TDEC 1200-03-08-.01(1)(a)
	• application of asphalt, oil, water, or suitable chemicals on dirt roads, materials stock piles, and other surfaces which can create airborne dusts;		TDEC 1200-03-08-.01(1)(b)
	Shall not cause or allow fugitive dust to be emitted in such a manner as to exceed 5 minute/hour or 20 minute/day beyond property boundary lines on which emission originates.		TDEC 1200-03-08-.01(2)
Activities causing radionuclide emissions	Shall not exceed those amounts that would cause any member of the public to receive an EDE of 10 mrem per year	Radionuclide emissions from point sources, as well as diffuse or fugitive emissions, at a DOE facility —**applicable**	40 CFR 61.92 TDEC 1200-03-11-.08(6)
Activities causing stormwater runoff (e.g., clearing, grading, excavation)	Implement good construction management techniques (including sediment and erosion controls, vegetative controls, and structural controls) in accordance with the substantive requirements of General Permit No. TNR10-0000 ("General Permit for Stormwater Discharges Associated with Construction Activities") to ensure that stormwater discharge:	Dewatering or stormwater runoff discharges from land disturbed by construction activity—disturbance of ≥ 1 acres total—**applicable**	TCA 69-3-108(l) TDEC 0400-40-10-.03(2)(a) General Permit No. TNR10-0000 (effective May 24, 2011) (**TBC** guidance)
	• does not violate water quality criteria as stated in TDEC 0400-40-03-.03 including but not limited to prevention of discharges that causes a condition in which visible solids, bottom deposits, or turbidity impairs the usefulness of waters of the state for any of the designated uses for that water body by TDEC 0400-40-04;	Stormwater discharges from construction activities—**TBC**	General Permit No. TNR10-0000, Sect. 5.3.2
	• does not contain distinctly visible floating scum, oil, or other matter;		
	• does not cause an objectionable color contrast in the receiving stream; and		

Action	Requirements	Prerequisite	Citation(s)
	• results in no materials in concentrations sufficient to be hazardous or otherwise detrimental to humans, livestock, wildlife, plant life, or fish and aquatic life in the receiving stream.		
	Water Treatment		
Construction or modification of intake and outfall structures for effluents	Construction, maintenance, repair, rehabilitation, or replacement of intake or outfall structures shall be carried out in such a way that work: Does not violate water quality criteria as stated in TDEC 0400-40-03-.03, including, but not limited to, prevention of discharges that causes a condition in which visible solids, bottom deposits, or turbidity impairs the usefulness of waters of the state for any of the designated uses for that water body by TDEC 0400-40-04. Activities in non-navigable streams shall be conducted in the dry; in navigable streams, where impracticable to work in the dry, work may be conducted within the water column. Shall be located and oriented so as to avoid permanent alteration or damage to the integrity of the stream channel, including the opposite stream bank. Alignment of the structure (except for diffusers) should be as parallel to the stream flow as is practicable, with the discharge pointed downstream. Diffusers may be placed perpendicular to stream flow for more complex mixing. Intake and outfall structures shall be designed to minimize harm and prevent impoundment of normal or base flows. Velocity dissipation devices shall be placed as needed at discharge locations to provide a non-erosive velocity from the structure. Activity may not be conducted in a manner that would permanently disrupt the movement of fish and aquatic life. Material may not be placed in a location or manner so as to impair surface water flow into or out of any wetland area. Backfill activities must be accomplished in a manner that stabilizes the stream bed and banks to prevent erosion. All contours must be returned to pre-project conditions to the extent practicable and completed activities may not disrupt or impound stream flow. Stream beds must not be used as transportation routes for construction equipment;	Construction of intake and outfall structures in waters of the state—**applicable**	TCA 69-3-108(l) TDEC 0400-40-07-.01 TDEC General Permit for Construction of Intake and Outfall Structures (effective July 1, 2010) **(TBC)**

Action	Requirements	Prerequisite	Citation(s)
	Temporary stream crossings shall be limited to one point in the construction area and erosion control measures shall be utilized where stream banks are disturbed. Crossing shall be constructed so that stream flow is not obstructed. Following work, all materials used for temporary crossing must be removed and disturbed stream banks restored and stabilized.		
Construction or modification of intake and outfall structures for effluents (continued)	Materials used in intake and outfall structures must be free of contaminants and wastes as defined by TCA 69-3-103(18).		
	Clearing, grubbing and other disturbances to riparian vegetation shall be kept to a minimum necessary for slope construction and equipment operations. Unnecessary tree removal is prohibited.		
	Sediment shall be prevented from entering waters of the state. Erosion and sediment control measures shall be properly selected, installed, and maintained and must be in place and functional before earth moving operations begin.		
	Litter, construction debris, and construction chemicals exposed to stormwater shall be picked up prior to anticipated storm events or otherwise prevented from becoming a pollutant source during storms.		
	Excavated materials, removed vegetation, construction debris, and other wastes shall be removed to an upland location and properly stabilized or disposed of to prevent reentry into the waterway.		
	Take appropriate steps to ensure petroleum products or other chemical pollutants are prevented from entering waters of the state. In the event of a spill, take immediate measures to prevent pollution of waters of the state.		
Collection/treatment of surface water	Onsite wastewater treatment units that are part of a wastewater treatment facility subject to regulation under Section 402 or Section 307(b) of the CWA are exempt from the requirements of RCRA Subtitle C for all tank systems, conveyance systems (whether piped or trucked), and ancillary equipment used to store or transport RCRA contaminated water.	Onsite wastewater treatment units that are subject to regulation under Sect. 402 or Sect. 307(b) of CWA (NPDES permitted) — **applicable**	40 CFR 270.1(c)(2)(v) TDEC 0400-12-01-.07(1)(b)(4)(iv) 40 CFR 264.1(g)(6) 40 CFR 260.10 53 FR 34079, September 2, 1988
	Industrial wastewater discharges that are point source discharges subject to regulation under § 402 of the CWA, as amended, are not solid wastes for the purpose of hazardous waste management.	Generation of industrial wastewater for discharge—**applicable**	40 CFR 261.4(a)(2) TDEC 0400-12-01-.02(1)(d)(1)(ii)

Action	Requirements	Prerequisite	Citation(s)
	Discharge is not prohibited, unless the wastes are subject to a specified method of treatment other than DEACT in 40 CFR 268.40 or are D003 reactive cyanide.	Restricted RCRA characteristic hazardous wastes managed in a CWA wastewater treatment system—**applicable**	40 CFR 268.1(c)(4)(iv); TDEC 0400-12-01-10(1)(a)(3)(iv)(IV)
Discharge of treated water into UEFPC	All discharges of industrial waste or other waste shall receive, prior to discharge, the degree of treatment or effluent reduction necessary to comply with water quality standards, or state or federal laws and regulations pursuant thereto, and where appropriate will comply with the standards of performance as required by the Tennessee Water Quality Control Act (TCA §§69-3-101, et. seq.)	Point source discharge(s) of pollutants into surface waters of the state as defined in TCA 69-3-103(33)—**applicable**	TDEC 0400-40-03-.05(6) TDEC 0400-40-05-.08(g) 40 CFR 122.44
Point source effluent limitations and standards – technology based	For industrial discharges without applicable federal effluent guidelines, best professional judgment should be employed to determine appropriate effluent limitations and standards.	Industrial point source discharges without applicable federal effluent guidelines—**applicable**	TDEC 0400-40-05-.09(1)(b)(2)
Point source effluent limitations and standards – water-quality based	Effluent limitations on toxic substances will be required in accordance with TDEC's General Water Quality Criteria using the LC_{50} and/or IC_{25} criteria and appropriate application factor for each toxic parameter.	Point source discharge(s) of pollutants into waters of the U.S. —**applicable**	TDEC 0400-40-05-.10(1)
	Appropriate limitations on organic related and other oxygen demanding parameters will be required to ensure adequate dissolved oxygen in the state's waters in accordance with TDEC's General Water Quality Criteria.		TDEC 0400-40-05-.10(2)
	Effluent limitations may be required to insure compliance with the Antidegradation Statement in TDEC 0400-40-03-.06.		TDEC 0400-40-05-.10(4)
Antidegradation requirements	New or increased discharges that would cause measurable degradation of the parameter that is unavailable shall not be authorized. Nor will discharges be authorized if they cause additional loadings of unavailable parameters that are bioaccumulative or that have criteria below current method detection levels.	Waters with "unavailable parameters" [as defined in TDEC 0400-40-03-.06(2)]—**applicable**	TDEC 0400-40-03-.06(2)(a)
	No new or expanded water withdrawals that will cause additional measurable degradation of the unavailable parameter shall be authorized.		TDEC 0400-40-03-.06(2)(b)
	Where one or more of the parameters comprising the habitat criterion are unavailable, activities that cause additional degradation of the unavailable parameter or parameters above the level of de minimis shall not be authorized.		TDEC 0400-40-03-.06(2)(c)

Action	Requirements	Prerequisite	Citation(s)
Bypass of untreated water	Bypass, as defined in Rule 0400-40-05-.02, is prohibited unless: • bypass was unavoidable to prevent loss of life, personal injury, or severe property damage; • there were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate backup equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and • for anticipated bypass, prior notice is given, if possible, at least ten days before the date of the bypass; or • for unanticipated bypass, notice is submitted of an unanticipated bypass within 24 hours from the time that the operator becomes aware of the bypass.	Point source discharge(s) of pollutants into waters of the U.S. **—applicable**	TDEC 0400-40-05-.07(2)(l)
	A bypass that does not cause effluent limitations to be exceeded may be allowed only if the bypass is necessary for essential maintenance to assure efficient operation.		TDEC 0400-40-05-.07(2)(m)
Emissions from water treatment off-gas system	Discharge of air contaminants must be in accordance with the appropriate provisions of Rules of the TDEC Chap. 1200-03 et. seq., any applicable measures of control strategy, and provisions of the Tennessee Air Quality Act.	Emissions of air pollutants from new air contaminant sources—**applicable**	TDEC 1200-03-09-.01(1)(d)
	Source impact analysis shall demonstrate that allowable emission increases would not cause or contribute to air pollution in violation of any ambient air quality standard in Chap. 1200-03-03, of any national ambient air quality standard, or any applicable maximum allowable increase as defined in TDEC 1200-03-09-.01(4) (i.e., maximum increase in pollutant over baseline concentrations).		TDEC 1200-03-09-.01(1)(f)
	Radionuclide emission measurements in conformance with 40 CFR 61.93(b) shall be made. Shall measure all radionuclides which could contribute greater than 10 percent of the potential EDE for a release point.	Release points which have the potential to discharge radionuclides into the air in quantities which could cause an EDE in excess of 1 percent of 10 mrem/year to any member of the public—**applicable**	40 CFR 61.93(b)(4)(i) TDEC 1200-3-11-.08(6)

Action	Requirements	Prerequisite	Citation(s)
	Periodic confirmatory measurements shall be made to verify low emissions.	Other release points which have the potential to release radionuclides into the air—**applicable**	
	Waste Generation, Characterization, Segregation, and Storage		
Characterization of solid waste	Must determine if solid waste is hazardous waste or if waste is excluded under 40 CFR 261.4(b); and	Generation of solid waste as defined in 40 CFR 261.2 and which is not excluded under 40 CFR 261.4(a)—**applicable**	40 CFR 262.11(a) TDEC 0400-12-01-.03(1)(b)(1)
	Must determine if waste is listed under 40 CFR Part 261; or		40 CFR 262.11(b) TDEC 0400-12-01-.03(1)(b)(2)
	Must determine whether the waste is identified in Subpart C of 40 CFR 261, characterizing the waste by using prescribed testing methods or applying generator knowledge based on information regarding material or processes used.		40 CFR 262.11(c) TDEC 0400-12-01-.03(1)(b)(3)
	Must refer to Parts 261, 262, 264, 265, 266, 268, and 273 of Chap. 40 for possible exclusions or restrictions pertaining to management of the specific waste.	Generation of solid waste which is determined to be hazardous—**applicable**	40 CFR 262.11(d); TDEC 0400-12-01-.03(1)(b)(4)
Characterization of hazardous waste	Must obtain a detailed chemical and physical analysis on a representative sample of the waste(s), which at a minimum contains all the information that must be known to treat, store, or dispose of the waste in accordance with pertinent sections of 40 CFR 264 and 268.	Generation of RCRA-hazardous waste for storage, treatment or disposal—**applicable**	40 CFR 264.13(a)(1) TDEC 0400-12-01-.06(2)(d)(1)
	Must determine if the waste meets the treatment standards in 40 CFR 268.40, 268.45, or 268.49 by testing in accordance with prescribed methods or use of generator knowledge of waste.		40 CFR 268.7(a) TDEC 0400-12-01-.10(1)(g)(1)(i)
	Must determine the underlying hazardous constituents (as defined in 40 CFR 268.2[i]) in the waste.	Generation of RCRA characteristic hazardous waste (and is not D001 non-waste waters treated by CMBST, RORGS, or POLYM of Sect. 268.42 Table 1) for storage, treatment or disposal — **applicable**	40 CFR 268.9(a) TDEC 0400-12-01-.10(1)(i)(1)
	Must determine if the waste is restricted from land disposal under 40 CFR 268 et. seq. by testing in accordance with prescribed methods or use of generator knowledge of waste.		40 CFR 268.7 TDEC 0400-12-01-.10(1)(g)(1)(i)

Action	Requirements	Prerequisite	Citation(s)
	Must determine each EPA Hazardous Waste Number (Waste Code) to determine the applicable treatment standards under 40 CFR 268.40 et. seq.		40 CFR 268.9(a) TDEC 0400-12-01-.10(1)(i)(1)
Temporary storage of hazardous waste in containers on-site – "Satellite Accumulation Area"	A generator may accumulate as much as 55 gal. of hazardous waste at or near any point of generation where wastes initially accumulate which is under the control of the operator of the process generating the waste provided that he: • complies with 40 CFR 265.171, 265.172 and 265.173(a); and	Accumulation of 55 gal. or less of RCRA hazardous waste at or near any point of generation—applicable	40 CFR 262.34(c)(1)(i) TDEC 0400-12-01-.03(4)(e)(5)(i)(I)
	• container is marked with the words "Hazardous Waste" or with other words that identify contents.		40 CFR 262.34(c)(1)(ii) TDEC 0400-12-01-.03(4)(e)(5)(i)(II)
Temporary storage of hazardous waste in containers on-site – "90-Day Storage Area"	A generator may accumulate hazardous waste at the facility provided that: • the waste is placed in containers that comply with Subparts I, AA, BB, and CC of 40 CFR 265; and	Accumulation of RCRA hazardous waste on-site as defined in 40 CFR 260.10—applicable	40 CFR 262.34(a)(1)(i) TDEC 0400-12-01-.03(4)(e)(2)(i)(I)
	• container is marked with the date upon which each period of accumulation begins; and • container is marked with the words "Hazardous Waste"		40 CFR 262.34(a)(2) TDEC 0400-12-01-.03(4)(e)(2)(ii) 40 CFR 262.34(a)(3) TDEC 0400-12-01-.03(4)(e)(2)(iii)
Use and management of hazardous waste in containers	If container is not in good condition (e.g., severe rusting, structural defects) or if it begins to leak, must transfer waste into container in good condition.	Storage of RCRA hazardous waste in containers—**applicable**	40 CFR 265.171 TDEC 0400-12-01-.05(9)(b)
	Use container made or lined with materials compatible with waste to be stored so that the ability of the container is not impaired.		40 CFR 265.172 TDEC 0400-12-01-.05(9)(c)
	Keep containers closed during storage, except to add/remove waste.		40 CFR 265.173(a) TDEC 0400-12-01-.05(9)(d)(1)
	Open, handle and store containers in a manner that will not cause containers to rupture or leak.		40 CFR 265.173(b) TDEC 0400-12-01-.05(9)(d)(2)
Storage of hazardous waste in container area	Area must have a containment system designed and operated in accordance with 40 CFR 264.175(b).	Storage of RCRA-hazardous waste in containers with free liquids—**applicable**	40 CFR 264.175(a) TDEC 0400-12-01-.06(9)(f)(1)

Action	Requirements	Prerequisite	Citation(s)
	Area must be sloped or otherwise designed and operated to drain liquid from precipitation, or Containers must be elevated or otherwise protected from contact with accumulated liquid.	Storage of RCRA-hazardous waste in containers that do not contain free liquids —**applicable**	40 CFR 264.175(c) TDEC 0400-12-01-.06(9)(f)(3)
Management of PCB waste	Any person storing or disposing of PCB waste must do so in accordance with 40 CFR 761, Subpart D.	Generation of waste containing PCBs at concentrations 50 ppm—**applicable**	40 CFR 761.50(a)
	Any person cleaning up and disposing of PCBs shall do so based on the concentration at which the PCBs are found.	Generation of PCB remediation waste as defined in 40 CFR 761.3—**applicable**	40 CFR 761.61
Management of PCB/radioactive waste	Any person storing such waste must do so taking into account both its PCB concentration and radioactive properties, except as provided in 40 CFR 761.65(a)(1), (b)(1)(ii) and (c)(6)(i).	Generation for disposal of PCB/ radioactive waste with ≥ 50 ppm PCBs —**applicable**	40 CFR 761.50(b)(7)(i)
	Any person disposing of such waste must do so taking into account both its PCB concentration and its radioactive properties. If, after taking into account only the PCB properties in the waste, the waste meets the requirements for disposal in a facility permitted, licensed, or registered by a state as a municipal or non-municipal nonhazardous waste landfill (e.g., PCB bulk product waste under 40 CFR 761.62[b][1]), the person may dispose of such waste without regard to the PCBs, based on its radioactive properties alone in accordance with applicable requirements.		40 CFR 761.50(b)(7)(ii)
Temporary storage of PCB waste in containers	Container(s) shall be marked as illustrated in 40 CFR 761.45(a).	Storage of PCBs and PCB Items at concentrations ≥50 ppm for disposal —**applicable**	40 CFR 761.65(c)(1)
	A notation must be attached to the PCB container indicating the date the item was removed from service.		40 CFR 761.65(c)(1)
	Storage area must be properly marked as required by 40 CFR 761.40(a)(10).		40 CFR 761.65(c)(3)
	Any leaking PCB Items and their contents shall be transferred immediately to a properly marked non-leaking container(s).		40 CFR 761.65(c)(5)
	Except as provided in 40 CFR 761.65(c)(6)(i) and (ii), container(s) shall be in accordance with requirements set forth in DOT HMR at 49 CFR 171-180.		40 CFR 761.65(c)(6)
Storage of PCB/radioactive waste in containers	For liquid wastes, containers must be non-leaking.	Storage of PCB/radioactive waste in containers other than those meeting DOT HMR performance standards —**applicable**	40 CFR 761.65(c)(6)(i)(A)
	For non-liquid wastes, containers must be designed to prevent buildup of liquids if such containers are stored in an area meeting the containment requirements of 40 CFR 761.65(b)(1)(ii).		40 CFR 761.65(c)(6)(i)(B)

Action	Requirements	Prerequisite	Citation(s)
	For both liquid and nonliquid wastes, containers must meet all regulations and requirements pertaining to nuclear criticality safety.		40 CFR 761.65(c)(6)(i)(C)
Storage of PCB waste and/or PCB/radioactive waste in a RCRA-regulated container storage area	Does not have to meet storage unit requirements in 40 CFR 761.65(b)(1) provided unit:	Storage of PCBs and PCB items designated for disposal—**applicable**	40 CFR 761.65(b)(2)
	• is permitted by EPA under RCRA Sect. 3004, or		40 CFR 761.65(b)(2)(i)
	• qualifies for interim status under RCRA Sect. 3005, or		40 CFR 761.65(b)(2)(ii)
	• is permitted by an authorized state under RCRA Sect. 3006, and		40 CFR 761.65(b)(2)(iii)
	• PCB spills cleaned up in accordance with Subpart G of 40 CFR 761.		40 CFR 761.65(c)(1)(iv)
Treatment/Disposal of Waste			
Disposal of RCRA-hazardous waste in a land-based unit	May be land disposed only if it meets the requirements in the table "Treatment Standards for Hazardous Waste" at 40 CFR 268.40 before land disposal. The table lists either "total waste" standards, "waste-extract" standards, or "technology-specific" standards (as detailed further in 40 CFR 268.42).	Land disposal, as defined in 40 CFR 268.2, of restricted RCRA waste—**applicable**	40 CFR 268.40(a) TDEC 0400-12-01-.10(3)(a)
	For characteristic wastes (D001–D043) that are subject to the treatment standards, all underlying hazardous constituents must meet the UTSs specified in 40 CFR 268.48.	Land disposal of restricted RCRA characteristic wastes (D001-D043) that are not managed in a wastewater treatment unit that is regulated under the CWA, that is CWA equivalent, or that is injected into a Class I nonhazardous injection well —**applicable**	40 CFR 268.40(e) TDEC 0400-12-01-.10(3)(a)(5)
	Soils may be land disposed if treated prior to disposal according to the alternative treatment standards of 40 268.49(c) or according to the UTS specified in 40 CFR 268.48 applicable to the listed hazardous waste and/or applicable characteristic of hazardous waste if the soil is characteristic.	Land disposal, as defined in 40 CFR 268.2, of restricted hazardous soils —**applicable**	40 CFR 268.49(b) TDEC 0400-12-01-.10(3)(j)(2)

Action	Requirements	Prerequisite	Citation(s)
Variance from a treatment standard for RCRA restricted hazardous wastes	A variance from a treatment standard may be approved if it is: • not physically possible to treat the waste to the level specified in the treatment standard, or by the method specified as the standard; or • inappropriate to require the waste to be treated to the level specified in the treatment standard or by the method specified as the treatment standard even though such treatment is technically possible.	Generation of a RCRA hazardous waste requiring treatment prior to land disposal—**applicable**	40 CFR 268.44 TDEC 0400-12-01-.10(3)(e)
Disposal of RCRA wastewaters in an CWA wastewater treatment unit	Are not prohibited, unless the wastes are subject to a specified method of treatment other than DEACT in 40 CFR 268.40, or are D003 reactive cyanide.	Restricted RCRA characteristic hazardous wastewaters managed in a wastewater treatment system which is NPDES permitted—**applicable**	40 CFR 268.1(c)(4)(iv) TDEC 0400-12-01-.10(1)(a)(3)(iv)(IV)
Disposal of PCB decontamination waste and residues	Shall be disposed of at their existing PCB concentration unless otherwise specified in 40 CFR 761.79(g).	PCB decontamination waste and residues for disposal—**applicable**	40 CFR 761.79(g)
Disposal of PCB cleanup wastes	Shall be disposed of either: • in a facility permitted, licensed or registered by a state to manage municipal solid waste under 40 CFR 258 or non-municipal, nonhazardous waste subject to 40 CFR 257.5 thru 257.30; or • in a RCRA Subtitle C landfill permitted by a state to accept PCB waste; or • in an approved PCB disposal facility; or • through decontamination under 40 CFR 761.79(b) or (c).	Generation of non-liquid PCBs at any concentration during and from the cleanup of PCB remediation waste—**applicable**	40 CFR 761.61(a)(5)(v)(A)
Disposal of PCB cleaning solvents, abrasives, and equipment	May be reused after decontamination in accordance with 40 CFR 761.79. For liquids, disposed of in accordance with 40 CFR 761.60(a).	Generation of PCB wastes from the cleanup of PCB remediation waste —**applicable**	40 CFR 761.61(a)(5)(v)(B)
Performance-based disposal of liquid PCB remediation waste	Shall be disposed of according to 40 CFR 761.60(a) or (e), or decontaminate in accordance with 40 CFR 761.79.	Disposal of liquid PCB remediation waste as defined in 40 CFR 761.3—**applicable**	40 CFR 761.61(b)(1)

Action	Requirements	Prerequisite	Citation(s)
Performance-based disposal of PCB remediation waste	May dispose by one of the following methods: • in a high-temperature incinerator approved under 40 CFR 761.70(b), • by an alternate disposal method approved under 40 CFR 761.60(e), • in a chemical waste landfill approved under 40 CFR 761.75, • in a facility with a coordinated approval issued under 40 CFR 761.77, or • through decontamination in accordance with under 40 CFR 761.79	Disposal of non-liquid PCB remediation waste as defined in 40 CFR 761.3 —**applicable**	40 CFR 761.61(b)(2) 40 CFR 761.61(b)(2)(i) and (ii)
Risk-based disposal of PCB remediation waste	May be disposed of in a manner other than prescribed in 40 CFR 761.61 (a) or (b) if approved in writing by EPA and method will not pose an unreasonable risk of injury to human health or the environment.	Disposal of PCB remediation waste —**applicable**	40 CFR 761.61(c)
Disposal of universal waste	The generator of the universal waste must determine whether the waste exhibits a characteristic of hazardous waste. If it is determined to exhibit such a characteristic, it must be managed in accordance with TDEC 0400-12-01-.01 through .10. If the waste is not hazardous, the generator may manage and dispose of the waste in any way that is in compliance with applicable federal, state, and local solid waste regulations.	Generation of universal waste (as defined in 40 CFR 273) for disposal—**applicable**	40 CFR 273.33 TDEC 0400-12-01-.12(3)(d)
Disposal of asbestos-containing waste material (e.g., pipe lagging, insulation, ceiling tiles)	All asbestos-containing waste material must be deposited as soon as practicable at a waste disposal site operated in accordance with Section 61.154 or a site that converts RACM and asbestos-containing waste material into non-asbestos (asbestos free) material according to the provisions of 40 CFR 61.155.	Removal and disposal of RACM except Category I nonfriable asbestos containing material—**applicable**	40 CFR 61.150(b)(1) and (2) TDEC 1200-03-11-.02(2)(j)(2)(i) and (ii)
Transportation			
Transportation of hazardous materials	Any person who, under contract with a department or agency of the federal government, transports “in commerce,” or causes to be transported or shipped, a hazardous material shall be subject to and must comply with all applicable provisions of the HMTA and HMR at 49 CFR 171–180.	Transportation of hazardous materials off site “in commerce”—**applicable**	49 CFR 171.1(c)
Transportation of PCB wastes	Must comply with the manifesting provisions at 40 CFR 761.207 through 40 CFR 761.218.	Relinquishment of control over PCB wastes by transporting, or offering for transport—**applicable**	40 CFR 761.207 (a)

Action	Requirements	Prerequisite	Citation(s)
Transportation of universal waste off site	Offsite shipments of universal waste by a large quantity handler of universal waste shall be made in accordance with 40 CFR 273-38 (TDEC 0400-12-01-.12[3][i]).	Offsite shipment of universal waste by a large quantity generator of universal waste—**applicable**	40 CFR 273.38 TDEC 0400-12-01-.12(3)(i)
Transportation of used oil off site	Except as provided in paragraphs (a) to (c) of this rule, generators must ensure that their used oil is transported by transporters who have obtained EPA ID numbers.	Offsite shipment of used oil by generators of used oil—**applicable**	40 CFR 279.24 TDEC 0400-12-01-.11(3)(e)
Transportation of hazardous waste off site	Must comply with the generator requirements of 40 CFR 262.20–23 for manifesting, Sect. 262.30 for packaging, Sect. 262.31 for labeling, Sect. 262.32 for marking, Sect. 262.33 for placarding, Sect. 262.40, 262.41(a) for record keeping requirements, and Sect. 262.12 to obtain EPA ID number.	Offsite transportation of RCRA hazardous waste—**applicable**	40 CFR 262.10(h) TDEC 0400-12-01-.03(1)(a)(8)
	Must comply with the requirements of 40 CFR 263.11–263.31. A transporter who meets all applicable requirements of 49 CFR 171-179 and the requirements of 40 CFR 263.11 and 263.31 will be deemed in compliance with 40 CFR 263.	Transportation of hazardous waste within the United States requiring a manifest —**applicable**	40 CFR 263.10(a) TDEC 0400-12-01-.04(1)(a)(1)
	The generator manifesting requirements of 40 CFR 262.20–262.32(b) do not apply. Generator or transporter must comply with the requirements set forth in 40 CFR 263.30 and 263.31 in the event of a discharge of hazardous waste on a private or public right-of-way.	Transportation of hazardous wastes on a public or private right-of-way within or along the border of contiguous property under the control of the same person, even if such contiguous property is divided by a public or private right-of-way —**applicable**	40 CFR 262.20(f) TDEC 0400-12-01-.03(3)(a)(6)

ARAR = applicable or relevant and appropriate requirement
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR = Code of Federal Regulations
CMBST = Combustion
CWA = Clean Water Act of 1972
DEACT = deactivation
DOE = U.S. Department Energy
DOE M = Radioactive Waste Management Manual
DOE O = DOE Order
DOT = U.S. Department of Transportation
EPA = U.S. Environmental Protection Agency
FR = Federal Register
HMR = Hazardous Materials Regulations
HMTA = Hazardous Materials Transportation Act
ID = identification
LLW = low-level (radioactive) waste
NPDES = National Pollutant Discharge Elimination System
PCB = polychlorinated biphenyl
POLYM = Polymerization
RACM = regulated asbestos-containing material
RCRA = Resource Conservation and Recovery Act of 1976
RORGS = Recovery of Organics
TBC = To Be Considered
TCA = Tennessee Code Annotated
TDEC = Tennessee Department of Environment and Conservation
UEFPC = Upper East Fork Poplar Creek
UTS = Universal Treatment Standard
WAC = waste acceptance criteria

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