DOE/OR/01-2661&D2

This Proposed Plan describes:

- Upper East Fork Poplar Creek (UEFPC) Characterization Area (CA) at the Y-12 National Security Complex;
  - Site background and characteristics
  - History of previous actions at UEFPC
  - UEFPC Phase I Record of Decision (ROD)
- Current and future risks to human health and the environment;
- Description and comparative analysis of the remedial action alternatives considered for modification of the selected remedy in the UEFPC Phase I ROD;
- Preferred alternative for modification of the UEFPC Phase I ROD selected remedy;
- How to participate in the selection or modification of the preferred alternative; and
- Where to get more information.

YOUR OPINION IS INVITED

The U.S. Department of Energy invites you to express your opinion on the presented remedial alternatives and the preferred alternative for modification of the selected remedy in the UEFPC Phase I ROD. You are encouraged to read the information in the administrative record for background and more detailed technical information. A comment form is attached to this fact sheet, but you are not restricted to this form. Decision makers will consider any comments received before the end of the public comment period.

Community involvement is critical to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 process. DOE will establish a 45-day public comment period, during which time local residents and interested parties can express their views and concerns on all aspects of this plan. DOE will schedule a public meeting to discuss cleanup alternatives and to address questions and concerns the public may have about the preferred alternative.

United States Department of Energy
Oak Ridge Office of
Environmental Management **DOE/OR/01-2661&D2**

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

July 2015

INTRODUCTION

This proposed plan presents the U. S. Department of Energy's (DOE's) preferred alternative for additional remedial actions to protect human health and the environment from mercury releases from the Y-12 National Security Complex (Y-12) to surface water in Upper East Fork Poplar Creek (UEFPC). These actions would supplement remedial actions previously selected in the *Record of Decision for Phase I Interim Source Control Actions in the Upper East Fork Poplar Creek Characterization Area* (Phase I ROD) (DOE 2002). While response actions taken to date under the Phase I ROD and other mercury reduction programs have achieved significant reductions in mercury releases from the Y-12 site, the level of mercury in UEFPC surface water remains above the interim goal established in the Phase I ROD as well as ambient water quality criteria (AWQC). Mercury contamination at Y-12 has been identified as the greatest environmental risk at the DOE Oak Ridge Reservation, based on the on-going releases of mercury to offsite, public waters and the lack of response in fish mercury concentrations to overall reductions of mercury in UEFPC from pre-1980 highs. The actions proposed in this proposed plan are part of an aggressive program that DOE is undertaking to mitigate potential future risk from mercury at Y-12.

APPROVED FOR PUBLIC RELEASE

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

Larry Sparks 7/16/2015

DOE Oak Ridge Office Classification Officer Date

This proposed plan documents the rationale for selection of the preferred remedial alternative for modification of the selected remedy in the UEFPC Phase I ROD within the framework of and in order to satisfy the public participation requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendment and Reauthorization Act (SARA) of 1986 [42 *United States Code* (USC) Sect. 9601 et seq.] and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) [40 *Code of Federal Regulations* (CFR) 300].

The UEFPC Characterization Area (CA) (Figure 1) encompasses the developed Y-12 industrial complex. 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 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 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) was issued in 2002 to select interim actions for remediation of principal-threat, mercury-contaminated soil, sediment, and point groundwater discharges that contribute contamination to surface water in UEFPC. 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 2006) (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.

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APPENDIX A. ARARS FOR THE PREFERRED ALTERNATIVE A-1

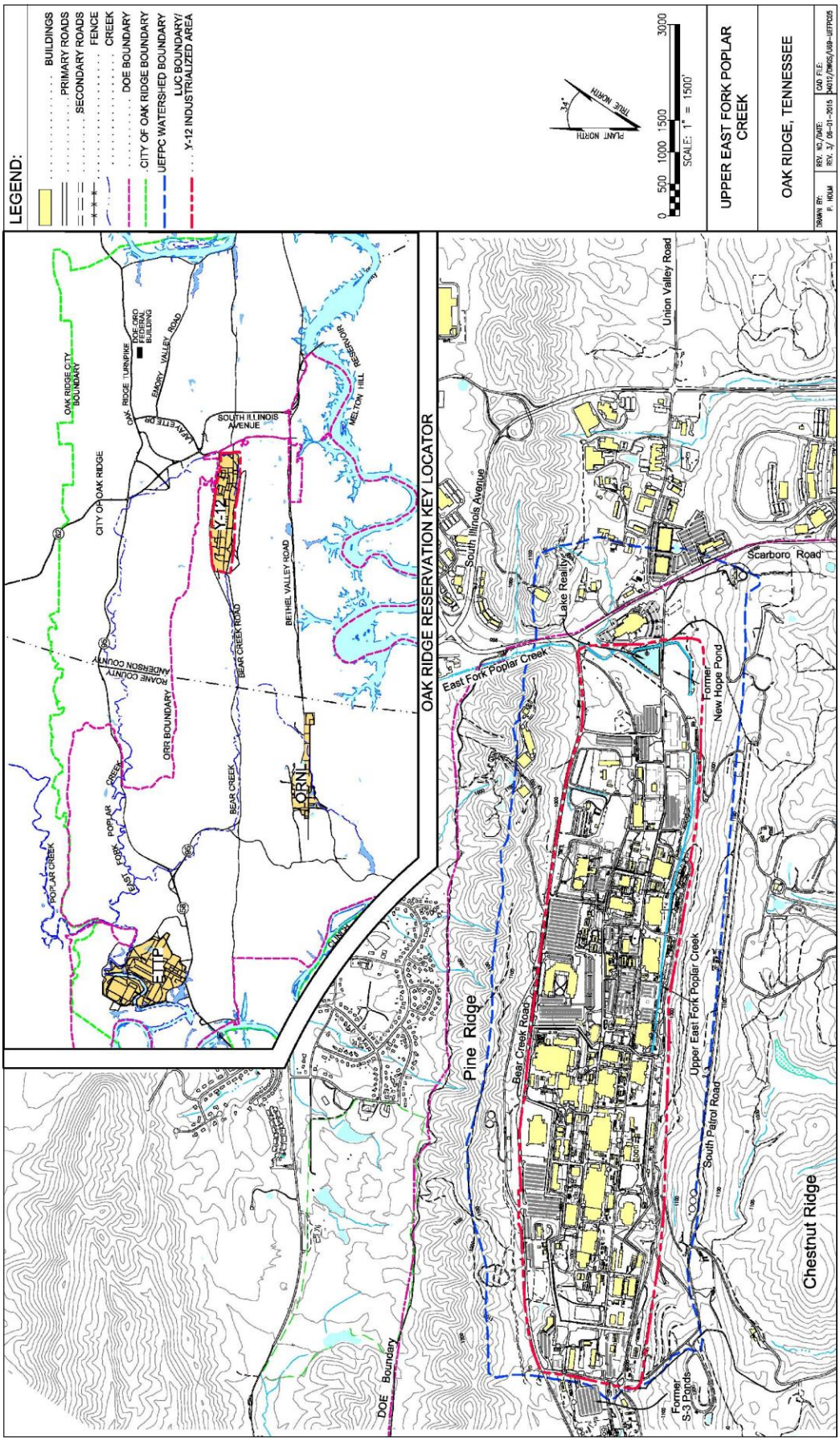

Figure 1. Location of Upper East Fork Poplar Creek (UEFPC) Characterization Area.

A remedial investigation (RI) report was issued in 1998 to evaluate the nature and extent of contamination at UEFPC, and the fate and transport of contaminants within and from the characterization area (DOE 1998). A draft feasibility study (FS) was issued in 1999 (DOE 1999), and an FS Addendum was issued in 2000 (DOE 2000), to evaluate alternatives for potential remedial actions. From the larger range of potential remedial alternatives evaluated in the FS, three modified alternatives were further developed in the FS Addendum. All of these alternatives 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 (WEMA), 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. These three alternatives were carried forward into the proposed plan issued for public comment in 2001 (DOE 2001), and subsequently into the Phase I ROD issued in 2002 (DOE 2002). The selected remedy included construction of a new water treatment facility at Building 9201-2 (Big Spring Water Treatment System, BSWTS) to treat water from in-leakage of groundwater into the basement of this building and the adjacent Outfall 51, while the other alternatives called for construction of a larger treatment system at Outfall 200 (the integration point for the WEMA storm sewers) or at Station 17 (the monitoring location near where UEFPC leaves the Y-12 site and the ORR), respectively, instead of at Building 9201-2.

While the Phase I decision did not include large-scale water treatment operations as part of the selected remedy, it did include studies to evaluate the viability of long-term and large-scale treatment of mercury-contaminated surface water to support a future surface water decision. These studies and the successful operating experience from the BSWTS suggested that construction of an additional water treatment facility to further reduce mercury releases to UEFPC surface water should be considered.

While considerable progress has been made in reducing mercury releases from the Y-12 site to UEFPC surface water, mercury concentrations in surface water at Station 17 continue to exceed both the interim goal of 200 ng/L established in the Phase I ROD and the Tennessee ambient water quality criteria (AWQC) standard of 51 ng/L (for which a waiver was approved in the 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). DOE is proposing additional actions to supplement the actions already included in the Phase I ROD selected remedy to achieve further reductions in mercury concentrations in UEFPC surface water and mercury releases to the offsite environment.

This proposed plan is being published to solicit public review and comment on all alternatives presented in the *Focused Feasibility Study for Supplemental Mercury Abatement Actions under the Record of Decision for Phase I Interim Source Control Actions in the Upper East Fork Poplar Creek Characterization Area* (DOE 2015) and on the rationale for the preferred alternative for modification of the selected remedy in the Phase I ROD to construct a new water treatment facility. DOE (the lead agency for ORR remedial activities) is issuing this plan as part of public participation requirements under Section 117(a) of CERCLA, as amended by SARA, and the NCP 300.430(f)(2). In accordance with the DOE *Secretarial Policy Statement on the National Environmental Policy Act* (DOE 1994), National Environmental Policy Act of 1969 (NEPA) values have been incorporated into CERCLA documentation prepared for this project.

The EPA National Remedy Review Board (NRRB) has reviewed this proposed plan and the associated focused feasibility study. The NRRB review expressed support for the preferred alternative to construct a new water treatment facility and encouraged DOE, EPA, and the Tennessee Department of Environment and Conservation (TDEC) to continue to work together to implement this proposed action.

The actions described in this proposed plan are one part 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 2014b) 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 primarily used 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.

Key components of the *Strategic Plan* include: completion of early actions (including actions in this proposed plan) to reduce mercury releases from Y-12 to UEFPC; identification of desirable studies, technology development, and demonstrations to better understand the behavior of mercury in the local environment and the relationship between mercury concentrations in surface water and in fish; and prioritization and sequencing of these projects for maximum effectiveness and cost efficiency. 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 and studies are obtained and evaluated, and modifications may be proposed as necessary. The plan will be updated, as necessary, to remain effective in organizing and focusing those efforts to define the work, reduce costs and increase efficiencies where possible, and to ultimately achieve the goal of cleaning up mercury from the Y-12 site.

The remedial alternatives considered here for potential modification of the Phase I ROD were developed in the *Focused Feasibility Study for Supplemental Mercury Abatement Actions under the Record of Decision for Phase I Interim Source Control Actions in the Upper East Fork Poplar Creek Characterization Area* (DOE 2015). This document, as well as the earlier RI, FS, FS Addendum, Phase I proposed plan, Phase I ROD and other site-related information can be found in the Administrative Record at the DOE Information Center, 1 Science.gov Way, Oak Ridge, Tennessee 37830. Hours are Monday through Friday, 8 a.m. to 5 p.m.; the telephone number is (865) 241-4780.

DOE will establish a 45-day public comment and review period on this proposed plan and will schedule a public meeting to discuss cleanup alternatives and address questions about the preferred alternative. Comments may be addressed to the DOE Federal Facility Agreement (FFA) Project Manager, Oak Ridge Office of Environmental Management, U. S. Department of Energy, P. O. Box 2001, Oak Ridge, Tennessee 37831.

DOE, EPA, and TDEC may modify the preferred alternative or select a different alternative in response to public input. The public, therefore, is encouraged to review and comment on all information in this proposed plan. After considering public comments, DOE will prepare a ROD Amendment presenting modifications to the remedy selected in the Phase I ROD. When DOE, EPA, and TDEC approve the ROD Amendment, DOE will prepare plans and implement the selected remedial actions at the UEFPC.

SCOPE OF PROPOSED ACTION

The scope of this proposed plan is limited to remedial actions to address releases of mercury contamination from the Y-12 site to surface water in UEFPC. Specifically, DOE proposes to construct a new water treatment facility for removal of mercury from UEFPC surface water. The new water treatment facility would be located near Outfall 200 at Y-12, which is the point where the storm sewer system serving the former mercury-use buildings in the Y-12 West End Mercury Area discharges to the headwaters of UEFPC. The discharge from the WEMA storm sewer system currently constitutes the largest source of mercury releases to UEFPC under base flow conditions.

The proposed actions are consistent with previous CERCLA decisions for UEFPC, will supplement remedial actions previously selected in the Phase I ROD and other Y-12 mercury reduction programs, and will promote attainment of remedial action objectives of the UEFPC Phase I ROD. Decisions regarding final goals for groundwater and final land use controls for the UEFPC watershed will be addressed in future decisions.

The ultimate goal of the remedial action program at Y-12 includes attainment of AWQC levels in surface water as well as target

concentrations in fish tissue. Attainment of this goal will require future actions under the *Strategic Plan*, potentially including actions downstream from UEFPC. However, the scope of this proposed action is focused on the reduction of mercury releases from the Y-12 site to UEFPC surface water.

SITE BACKGROUND

SITE HISTORY

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 Y-12 (Figure 1).

The boundaries of the UEFPC watershed, which 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). The Phase I ROD addressed sources of contaminant releases to surface water and groundwater within the UEFPC watershed, while the Phase II ROD addressed remediation of contaminated soils and scrapyards within the industrialized area of Y-12.

Mercury contamination is widespread at the Y-12 site and has been identified in soil, sediment, surface water, groundwater, buildings, drains, and sumps. 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 and from migration of mercury through storm drains and outfalls and through shallow groundwater. In addition to widespread mercury contamination throughout the UEFPC CA, 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), the Building 81-10 Area, the Building 9201-2 Area (Outfall 51), Lake Reality, and the UEFPC streambed (Figure 2). These areas act as reservoirs for the release and migration of mercury contamination to shallow groundwater and surface water.

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 at the WEMA, 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, while the potential treatment of the discharges from the WEMA storm sewer network is the subject of this proposed plan.

PREVIOUS ACTIONS

Cleanup actions to address a number of waste sources and contaminated media in the UEFPC watershed under CERCLA and other authorities have been completed or are ongoing. Figure 3 depicts the locations for the areas of concern addressed by previous actions. Principal actions within the UEFPC watershed to date are summarized below.

UEFPC Phase I ROD. As noted above, the UEFPC Phase I ROD selected a series of interim source control actions designed to address areas of contaminated soil and sediment that are principal-threat wastes with the potential to impact groundwater and surface water. The Phase I ROD also established an interim goal for mercury concentrations in UEFPC surface water of 200 ng/L. Actions completed to date under the Phase I ROD include the following:

- **Big Spring Water Treatment System.** The Big Spring Water Treatment System (BSWTS) was constructed to treat discharge from Outfall 51 (including the large-volume spring and water from the Building 9201-2 sumps (DOE 2005). Mercury contaminated water was rerouted from Building 9201-2 sumps and the East End Mercury Treatment System (EEMTS) to the BSWTS in December 2006. The EEMTS and Outfall 550 are no longer in operation.

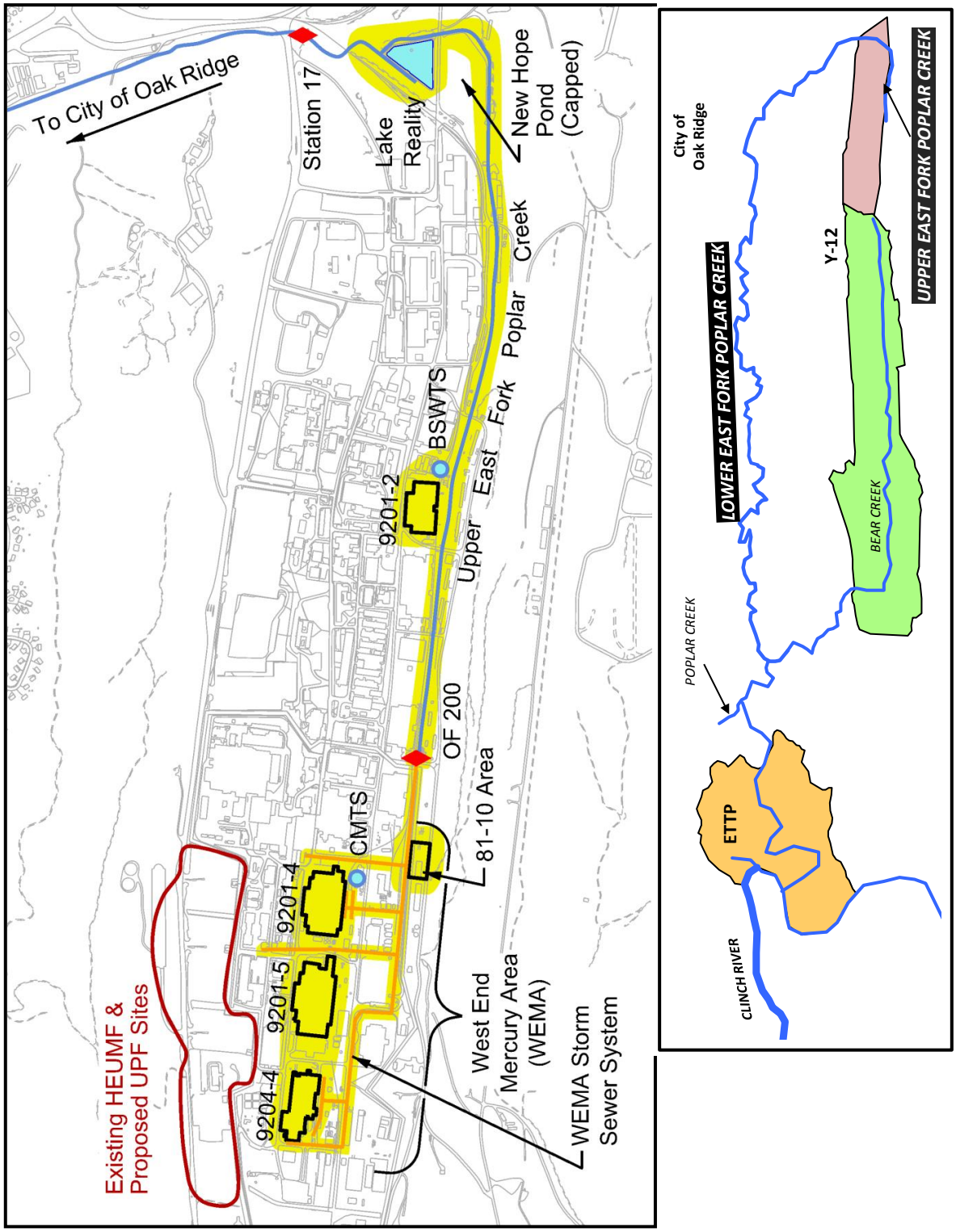

Figure 2. Suspected Areas of Mercury Contamination in the UEFPC Watershed.

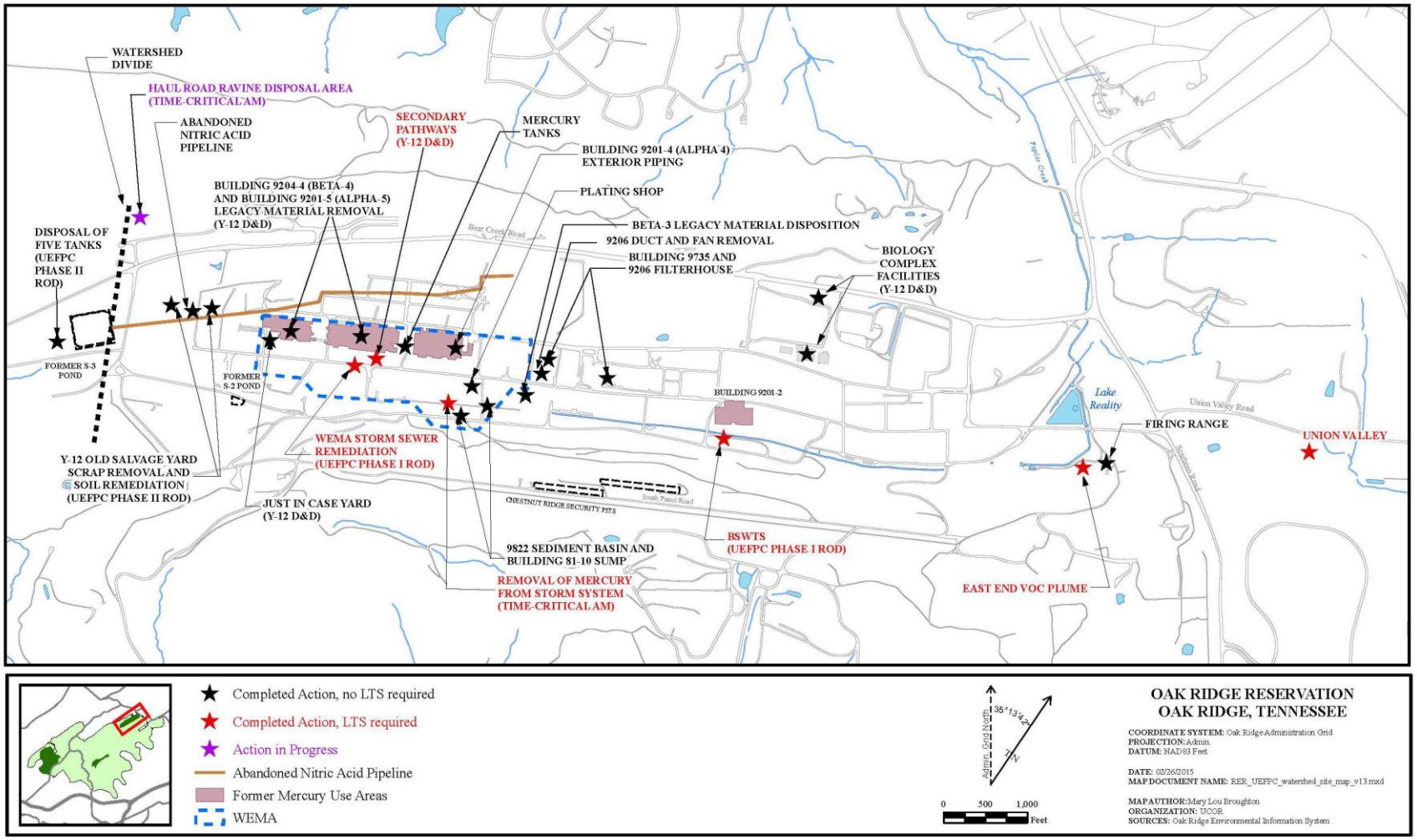

Figure 3. Completed/ongoing cleanup actions in UEFPC Watershed.

- **WEMA Storm Sewer Cleanout/Relining**. Clean up and repair of storm sewers in the West End Mercury Area was initiated in FY 2009. The initial phase included the videotaping of more than 20,000 linear feet of storm sewer to determine the condition of the sewers. More than 8,000 linear feet of storm sewer lines were cleaned, and approximately 1,200 linear feet were lined.

- **Administrative Controls.** Administrative controls have been implemented to prevent consumption of fish from UEFPC and to control access to contaminated areas.

- **Surface Water Monitoring.** Monitoring of surface water has been implemented to evaluate reductions in contaminant concentrations.

Other source control actions prescribed under the Phase I ROD selected remedy planned for future implementation include the following:

- **Removal of Contaminated Sediments from UEFPC and Lake Reality.** Contaminated sediments in the streambed and banks of UEFPC and in Lake Reality constitute a significant source of contaminants to UEFPC surface water. 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 actions for UEFPC in a generally upgradient-to-downgradient sequence under an *Explanation of Significant Differences (ESD)* for the Phase I ROD (DOE 2012a).

- **Phase I Actions Eliminated in ESD.** The ESD also eliminated some components of the Phase I selected remedy: (1) the construction of temporary asphalt caps over approximately 3.5 acres of unpaved areas at WEMA; and (2) two treatability studies that are no longer considered useful (evaluations of horizontal groundwater capture well, and in-situ treatment of soils at the 81-10 area).

The remedial action objective for the source control actions at UEFPC under the Phase I ROD was to restore UEFPC surface water to risk-based values for protection of human health for recreational exposure (ingestion of fish). While significant reductions in mercury releases to UEFPC have been achieved, surface water concentrations still exceed the interim goal of 200 ng/L and the AWQC of 51 ng/L (for which a waiver was approved in the Phase I ROD).

UEFPC Phase II ROD. The Phase II ROD (DOE 2006) was issued in 2006 for the remediation of the balance of contaminated soil, scrap, and buried materials in Y-12, the major contaminated area in the UEFPC watershed. Actions completed to date under the Phase II ROD include the following:

- **Y-12 Old Scrapyard Cleanup.** Cleanup of the 7-acre Y-12 Old Salvage Yard was initiated in 2009. Removal of all scrap was completed in FY 2011. Soil characterization was initiated in FY 2011, and removal of soil contaminated with volatile organic contaminants (VOCs) contributing to future groundwater contamination was completed. Characterization and disposal of staged soil was completed in FY 2012.

- **EU-9 Characterization.** Exposure Unit 9 (EU-9), an 11.7-acre area that includes the 81-10 Area, the former site of a mercury recovery process, was characterized in FY 2012. The characterization results indicated that future remedial action (soil excavation) is required in a portion of the 81-10 Area for protection of the industrial work force.

Response Actions Prior to Phase I and Phase II RODs. Numerous cleanup actions were undertaken in the UEFPC watershed prior to the Phase I and Phase II RODs, including the following:

- **National Pollutant Discharge Elimination System (NPDES) Permit Compliance Program Phase 1 Actions.** Characterization of point sources of mercury discharge has been ongoing since 1982 under the Reduction of Mercury in Plant Effluent (RMPE) program, with comprehensive surveys conducted in the mid-1980s, 1990, and mid-1990s. Estimated mercury loading from Y-12 to UEFPC in the early 1980s was calculated to be more than 150 g/d, with most of this loading coming from point sources. As a result, many of the point sources have been eliminated or reduced, and substantial reductions (>90%) in mercury loading have occurred since the early 1990s. Phase I actions consisted of

identifying major mercury sources and completing interim remediation, such as storm sewer inspection, cleaning, relining, and rerouting of process water flows. Phase I actions were completed in the late 1980s and succeeded in reducing mercury loading to UEFPC.

- **NPDES Permit Compliance Program Phase 2 Actions.** Phase 2 actions focused on reducing continued migration of residual mercury and on meeting the mercury compliance schedule specified in the 1995 NPDES permit. Actions included the elimination of mercury sources and the rerouting of process pipe in Buildings 9201-2, 9201-4, 9201-5, and 9204-4; the installation and operation of the Interim Mercury Treatment System and the subsequent East End Mercury Treatment System at Building 9201-2; the installation and operation of the Central Mercury Treatment System treating contaminated sump water from Buildings 9201-4, 9201-5, and 9204-4; and the rerouting of UEFPC around Lake Reality to prevent formation of methyl-mercury-contaminated sediments.

- **UEFPC Stream Bank Stabilization Study.** A treatability study was completed in 2000 to assess the impact of stabilization of portions of the UEFPC stream bank on the release of mercury to UEFPC. The results of the study indicated that stabilization of UEFPC banks has successfully reduced releases of contaminants during storm-flow events.

- **Flow Management.** The 1995 NPDES permit for Y-12 indicated a need to manage flow in UEFPC to make it "stabilize at a value which will protect the stream water quality and the aquatic life now in recovery." A flow of 7 Mgd measured at Station 17 was determined to be acceptable, with flow to be maintained by pumping water from the Clinch River above Melton Hill Dam. Flow management began in 1996 to add approximately 4.5 Mgd. However, this flow augmentation resulted in the unintended consequence of increased mobilization of mercury from contaminated UEFPC stream sediments, and was terminated in 2014.

- **Basin 9822 Removal Action.** Basin 9822, adjacent to Building 81-10 was identified as a source of mercury and polychlorinated biphenyls (PCBs). A removal action was completed in 1998, which included pumping the basin and treating the water at an onsite facility, removing the sludge, disposing of the sludge in a disposal facility, demolishing the basin walls, and placing fill in the sediment basin. This action also included cleanout and closure of a mercury- and PCB-contaminated sump at the Building 81-10 Area.

- **Firing Range Removal Action.** A removal action was completed in 1998, which included the excavation and disposal of 864 yd^3 of lead-contaminated soil from the Firing Range.

- **Union Valley Interim Action (Ongoing).** An interim action was implemented for Union Valley to address the portion of the East End VOC Plume that has migrated beyond the boundary of Y-12. The interim ROD issued in 1997 selected institutional controls (license agreements with property owners requiring them to notify DOE of any changes in groundwater and/or surface water use) to ensure protection of public health pending the development and implementation of final actions. In the interim-action ROD, an interim-action boundary was designated beyond the DOE boundary in impacted areas in Union Valley.

- **East End VOC Plume Removal Action (Ongoing).** A non-time-critical removal action was undertaken in 1999 to mitigate future releases at the Y-12 boundary by taking actions at the east end of the complex to contain the VOC plume that is migrating offsite. The scope of this removal action includes VOC contamination; other contaminants, if detected in the future, will be addressed as part of a subsequent CERCLA action. The selected method of containing offsite releases is extraction of groundwater to intercept the plume near the ORR boundary with Union Valley, with subsequent treatment using filtration and air strippers. The treatment system has been in operation since 2000.

UEFPC Deactivation/Decommissioning and Demolition (D&D) Projects. A number of D&D projects have been taken at Y-12 which impact UEFPC. These include D&D projects taken in support of the Y-12 modernization program and the Integrated Facilities Disposition Program (IFDP) and projects utilizing funding from the American Recovery and Reinvestment Act of 2009 (ARRA):

- **Y-12 Facilities Deactivation/Demolition Project.** This removal action includes the demolition of more than 100 buildings and facilities at Y-12 that are no longer needed for Y-12 operations, in support of the Y-12 modernization program and the Integrated Facilities Disposition Program (IFDP).

- **Removal of Legacy Materials from Buildings 9201-5 and 9204-4.** A time-critical removal action was completed in 2012 to remove legacy materials from Buildings 9201-5 (Alpha 5) and 9204-4 (Beta 4) in preparation for eventual decommissioning and demolition of these facilities.

- **Demolition of Y-12 Buildings 9211, 9220, 9224, 9769, 9735, and 9206 Bag House.** Two time-critical removal actions were completed for the demolition of surplus contaminated facilities at the Y-12 site. The subject facilities included Building 9735, the Building 9206 Bag Filter House, and Buildings 9211, 9220, 9224, and 9769 of the ORNL Biology Complex.

Mercury Reduction Project Actions. A number of projects were taken at UEFPC under the American Recovery and Reinvestment Act of 2009 (ARRA), collectively labelled the Mercury Reduction Project, to facilitate reduction and lessened mobility of mercury at Y-12. Subprojects under the Mercury Reduction Project include the following:

- **Removal of Mercury from Storm Sewer System.** A time-critical removal action was completed to install mercury traps in WEMA storm drains and pipelines to collect and remove free mercury. A total of seven mercury traps were installed in the WEMA storm sewer system, primarily upstream from Outfalls 150, 160, 163, and 169, for collection of mercury (elemental mercury and associated contaminated sediments) from those locations and other locations within the storm sewer system as needed for appropriate waste storage, treatment and disposal.

- **Mercury Secondary Pathways Project.** An interim action was completed to control and re-route stormwater runoff at WEMA buildings away from areas of known or suspected mercury contamination to storm drains and reduce percolation through contaminated soil. An evaluation was conducted of mercury source pathways that could impact the mobility of mercury in soils or actual discharge of mercury in the immediate vicinity of Buildings 9201-4, 9201-5, and 9204-4. Drains that could potentially discharge to soils were inspected. Designs were completed to retrofit selected building drains with mercury collection devices intended to remove mercury from building drain discharges prior to discharge to the storm sewer system. Impervious surfaces were constructed around each building and direct drainage to the storm sewer system was corrected.

- **Disposal of Five Tanks.** A tank removal project was initiated under the UEFPC Phase II ROD to remove five tanks used for mercury-related activities at Y-12. These tanks were removed from service in the 1980s. Characterization was completed along with the necessary documentation needed for disposal of these tanks. Based on characterization results, two tanks were sent to the sanitary landfill at Y-12, and three tanks were transported for residual removals of tank contents, size reduction, and disposal. About 650 pounds of elemental mercury were removed from these tanks and disposed.

- **Mercury Soils Treatability Study.** A treatability study was conducted under the UEFPC Phase I ROD to define a treatment option for Y-12 soils contaminated with mercury. Mercury contaminated soil samples from EU-9 were successfully treated by three vendors using sulfur polymerization solidification/stabilization to meet required RCRA treatment standards.

- **Outfall 200 Conceptual Design.** A treatability study and conceptual design of

a treatment system to reduce discharge of mercury at Outfall 200 were initiated in FY2012 under the UEFPC Phase I ROD. Collected samples of stormwater effluent and grit from the bottom of the storm sewers were analyzed for constituents of concern and subjected to treatability analysis for removal of suspended solids and mercury. An alternatives analysis was performed for an Outfall 200 treatment system and a conceptual design based on the alternatives was developed. The Conceptual Design Report (UCOR 2014) and Remedial Design Work Plan (DOE 2014d) developed under this project serve as the basis for the alternatives considered in this proposed plan.

Additional discussion of completed actions within the UEFPC watershed, as well as other areas throughout the ORR, and associated performance monitoring is provided in the annual remediation effectiveness report (DOE 2014a).

SUMMARY OF SITE RISKS

SITE CHARACTERISTICS

The original topography of Bear Creek Valley within the UEFPC CA was altered substantially by grading activities during construction of the Y-12 Plant. Before plant construction, UEFPC surface water hydrology was similar to that of Bear Creek Valley, with tributaries flowing from Pine Ridge to UEFPC at the base of Chestnut Ridge to the south. During plant construction, the entire western half of the UEFPC system was captured in subsurface drains. The UEFPC CA affects three surface drainage basins: UEFPC Drainage Basin, West Union Valley Drainage Basin (Scarboro Creek Drainage Basin), and East Union Valley Drainage Basin. The UEFPC Drainage Basin originates in the subsurface storm-flow system in the western portion of the Y-12 site. UEFPC is underground from its westernmost point up to its emergence from a pipe (labelled the north-south pipe) at Outfall 200, where it then flows in an aboveground channel. After passing the Y-12 site boundary, it discharges into Lower East Fork Poplar Creek (LEFPC) to East Fork Poplar Creek (EFPC) and ultimately into the Clinch River. West Union Valley is drained by Scarboro Creek, which discharges into Melton Hill Lake. The East Union Valley Drainage Basin is drained by an unnamed creek that flows along the main length of Union Valley east of West Union Valley. It eventually empties into an embayment of Melton Hill Lake.

On a UEFPC watershed-wide scale, groundwater movement in the unconsolidated zone is generally towards UEFPC and is locally influenced by preferential pathways imposed by manmade and natural features. For example, an active zone of flow is usually present along the interface between the unconsolidated zone and bedrock. Water infiltrating bedrock moves mostly along strike, slowly in the sandstone and shale units, and quickly in the Maynardville Limestone. Some of the groundwater flow in the Maynardville Limestone discharges to UEFPC and Scarboro Creek through springs and seeps. The shallow groundwater divide between the UEFPC and West Union Valley (Scarboro Creek) prevents shallow contaminants from the Y-12 site from migrating into West Union Valley. Deep groundwater flow is mainly controlled by primary and secondary bedrock structures and can move into West Union Valley as indicated by tracer studies and contamination plumes.

SUMMARY OF SITE CONTAMINATION

The RI (DOE 1998) identified widespread mercury contamination at the Y-12 site in soil, sediment, surface water, groundwater, buildings, drains, and sumps. Mercury contamination includes both discrete point sources and diffuse non-point sources which contribute to the release and migration of mercury contamination to shallow groundwater and surface water. UEFPC and the Maynardville Limestone provide the conduits for offsite contaminant migration.

Soils. Areas of contaminated soil are located throughout the UEFPC CA. In addition to mercury contamination, the RI indicates widespread radiological shallow soil contamination, primarily ^{238}U from historical uranium-processing operations. Areas of PCB contamination have also been identified.

Surface Water. Surface water receives contamination through groundwater discharge, stormwater runoff, and process outfall discharges, and is a route of contaminant migration offsite from ORR via UEFPC. Mercury concentrations in UEFPC have been decreasing as a result of response actions taken to date, but remain above the interim goal established in the

Phase I ROD and AWQC levels. In addition, mercury levels in fish in East Fork Poplar Creek exceed acceptable levels. PCB concentrations in UEFPC are below detection limits, but PCBs have been detected in the food chain within the creek. Sediments contribute mercury and PCBs to the food chain. The 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 multiple contaminants, primarily mercury and PCBs, which are subject to remobilization and/or downstream transport.

Groundwater. Shallow (soil and other unconsolidated materials and uppermost bedrock <100 feet deep) and deeper (bedrock >100 feet deep) aquifers contain contaminants associated with the Y-12 site. Data indicate that dense non-aqueous-phase liquids (DNAPLs), such as organic solvents, may be present. VOCs in groundwater suggest the presence of DNAPL at several sites within the plant. The East End VOC Plume, a dissolved-phase carbon tetrachloride groundwater plume above maximum contaminant levels (MCLs) that extends eastward into Union Valley was addressed in a removal action to contain and treat contaminated groundwater. Final watershed-scale remedial actions for groundwater at UEFPC and throughout the DOE-ORR have been deferred to future decisions, and will be developed consistent with the ORR-wide groundwater strategy (DOE 2014d). Requirements for monitoring of groundwater at UEFPC are specified in the comprehensive monitoring plan (DOE 2014e).

As described in the preceding pages, numerous response actions have already been taken to address the site contaminants identified in the RI and others are planned for future implementation. While these response actions include comprehensive contamination control measures and best management practices to minimize the release of contaminants to the environment, the water treatment facility proposed in this plan would provide an additional level of protection against releases to UEFPC surface water from the WEMA storm sewer system associated with future actions.

CONCEPTUAL SITE MODEL

Most of the Y-12 site is underlain by anthropogenic fill (placed during plant construction) and shale-dominated units of the lower Conasauga Group. Most groundwater flow in these materials is south–southeast at depths of less than 70 feet toward the southern edge of Bear Creek Valley, which is underlain by the Maynardville Limestone (primary groundwater exit pathway). The storm sewer system and buried tributaries of UEFPC also play a significant role in transport of groundwater contaminants to UEFPC and the Maynardville Limestone.

UEFPC is the only surface water exit pathway. The natural flow path was altered during construction of the plant site, including rerouting of the natural streams, development of the underground utility system, and building of the dewatering sumps. In 1996, flow augmentation measures significantly increased flow volumes and rates in UEFPC and altered flux trends of major contaminants, including mercury; this flow augmentation was terminated in 2014.

Contamination is introduced into groundwater through multiple paths including spills, pipeline leaks, and dissolution from contaminated soils and sediments. Due in part to the non-wetting properties and high density of liquid mercury, spills and leaks of mercury at the surface or within buildings may result in deposits of subsurface liquid mercury in both the unconsolidated and bedrock systems. Such deposits can provide a long-term source of mercury contamination in the groundwater that feeds UEFPC, as evidenced by the presence of mercury from Outfall 51, which drains a large spring adjacent to Building 9201-2. Basement sumps in Buildings 9201-2, 9201-4, and 9201-5 collect groundwater from the immediate area surrounding the former mercury processing buildings. These sumps historically fed groundwater into the storm drain system but have been rerouted to water treatment facilities. Sumps at Building 9201-5 are no longer in operation, allowing groundwater to accumulate in the basement of the building. (ORNL 2011)

Figure 4 shows the most recent version of the site conceptual model for mercury releases to UEFPC, from a conceptual model study conducted in 2008-2010 (ORNL 2011). This study found that the combined inputs from

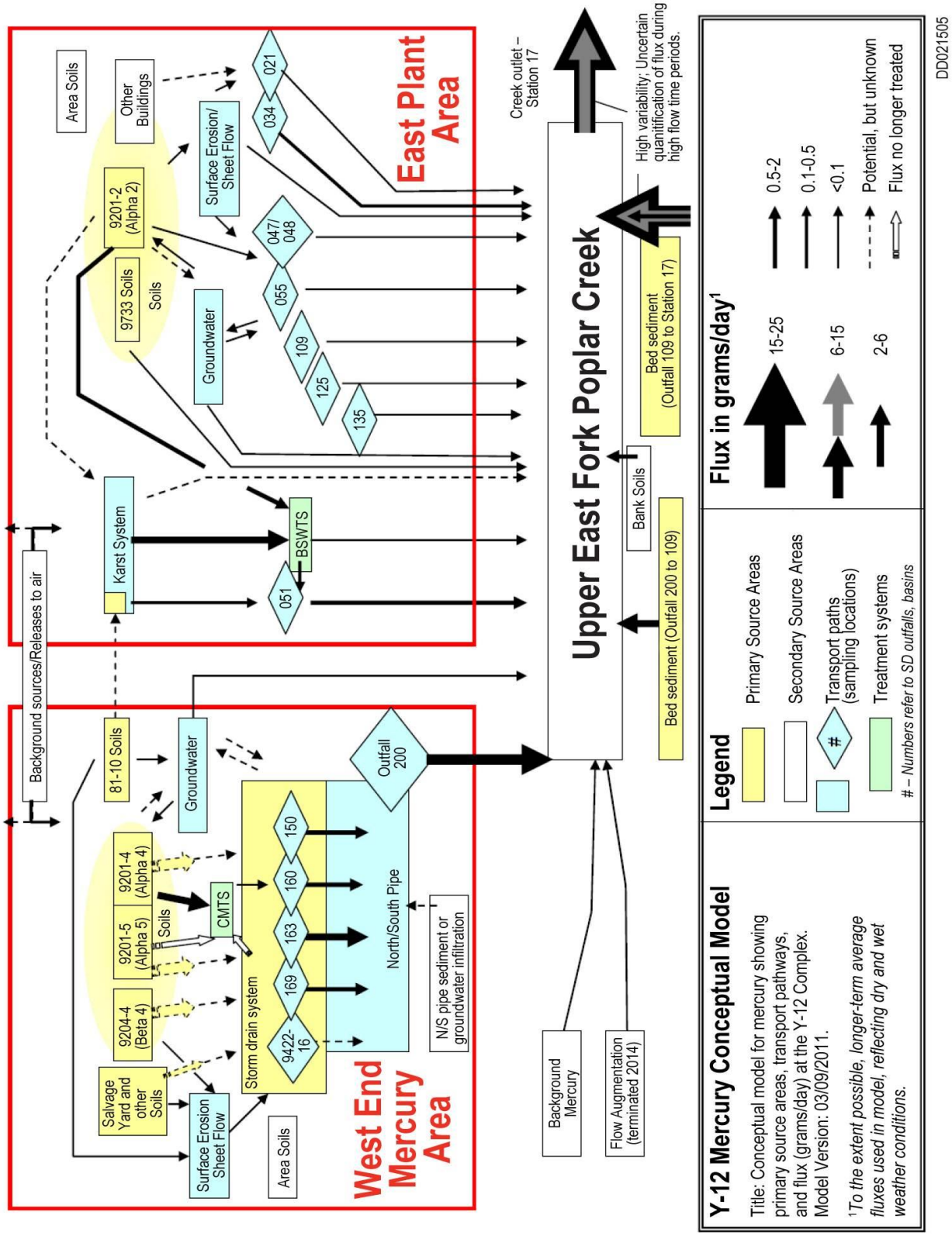

Figure 4. Conceptual Model for Contaminant Migration in UEFPC (ORNL 2011).

WEMA and other upstream areas (as measured at Outfall 200) now represent the most important source of mercury inputs to UEFPC surface water – i.e., this source now contributes up to 70-80% of the mercury flux at Station 17, particularly under low to average flow conditions, as opposed to an estimate of approximately 20% of the flux at Station 17 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). The conceptual model also notes that mercury concentrations in fish at UEFPC and downstream areas 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.

SITE-RELATED RISK

The baseline human health and ecological risk assessment developed as part of the UEFPC RI (DOE 1998) identified unacceptable risks to human health in soil, sediment, surface water, and groundwater in the UEFPC CA. Unacceptable risks to the environment were estimated in surface water and fish. If not addressed, actual or threatened releases of hazardous substances from the UEFPC CA may present a current or future unacceptable risk to human health or the environment.

The predominant contaminants of concern (COCs) [defined as those COCs with total carcinogenic risks greater than 10^{-4} and or total noncarcinogenic hazards greater than a hazard index (HI) of 1] for the most likely expected future land uses, as well as those contaminants that could remobilize and/or transport downstream (into surface water and ultimately into fish), include the following:

- soil: $^{238/235}$Uranium, $^{226/228}$Radium, ^{137}Cesium, PCBs and dibenzo(a,h)-anthracene;
- surface water (including fish): mercury and PCBs;
- sediments: benzo(a)pyrene, ^{226}Radium, cadmium, mercury, and PCBs; and
- groundwater: carbon tetrachloride, trichloroethene, tetrachloroethene, dichloroethene, benzene, chloroform, arsenic, beryllium, cadmium, manganese, and nitrate.

Since the purpose of this proposed plan is to present a preferred alternative for modification of the remedy selected in the Phase I ROD to include additional actions to reduce mercury releases to UEFPC surface water from the Y-12 site, only risks associated with the surface water pathway are pertinent to this study. The only unacceptable risk to potential human receptors was estimated to be that associated with the ingestion of fish from UEFPC (as well as LEFPC and EFPC) – i.e., UEFPC surface water exceeds the primary AWQC for mercury (51 ng/L) as well as the risk-based goal of 200 ng/L derived in the Phase I ROD for ingestion of fish by recreational receptors. However, risk from this pathway to current receptors is precluded by institutional controls, including postings and periodic patrols. Consequently there is currently no unacceptable risk to human health associated with UEFPC surface water, so long as the current institutional controls are maintained. After the waters of EFPC leave the ORR, EFPC also has been designated an “impaired water” under Section 303(d) of the Clean Water Act, and is also posted to prevent fishing. The ability of those postings to prevent fishing is less certain that for the portions of UEFPC and EFPC “on-reservation.”

While the RI identified mercury and PCBs as COCs for the surface water pathway, more recent monitoring data (DOE 2014a) indicate that only mercury exceeds any applicable or relevant and appropriate regulatory criteria (e.g., the AWQC of 51 ng/L) or risk-based goals (e.g., the interim goal of 200 ng/L). PCBs are rarely detected in UEFPC surface water and are well below regulatory criteria. The ongoing monitoring program for UEFPC surface water also includes uranium and zinc as COCs. The average uranium concentration measured at Station 17 was about 15 µg/L in FY2013 and only four of the weekly composite samples exceeded the MCL of 30 µg/L (which is used only as a screening level for UEFPC). Zinc is measured in weekly grab samples and is well below the AWQC level of 120 µg/L (FY2013 average 18 µg/L, maximum 40 µg/L). The scope of this proposed plan is limited to supplemental response actions to achieve further reductions in mercury concentrations in UEFPC surface water.

While the baseline risk assessment and the RI report were issued in 1998, it is useful to note

that the methodology, assumptions, and key parameter values used in that analysis, are not significantly different than current EPA recommendations with respect to evaluating potential risk from mercury. Specifically, the reference dose (RfD) for chronic oral toxicity has not changed; this is true both for inorganic forms of mercury (e.g., mercuric chloride was assumed for the RI) with a value of 3.0E-4 mg/kg-day and also for the more toxic methyl mercury (which was used for derivation of the interim goal specified in the FS Addendum, Proposed Plan, and Phase I ROD) with a value of 1.0E-4 mg/kg-day (EPA IRIS). Studies are ongoing to better understand the complex mercury methylation and bioaccumulation processes on mercury concentrations in fish.

Similarly, the RI identified potential current and future ecological risks to UEFPC biota. Potential current ecological risks from contaminants in UEFPC water, sediment, and/or fish were identified for fish and macroinvertebrates in UEFPC, aquatic biota in seeps and springs, and piscivorous wildlife. Levels of mercury and PCBs in fish were identified to present a potentially unacceptable risk to fish and fish-eating birds. Potential unacceptable future risks were identified for fish and invertebrates in UEFPC and for aquatic biota in seeps and springs. The primary contaminants of concern that contribute most significantly to future ecological risk include mercury, carbon tetrachloride, chloroform, metals, and PCBs. Future risks to piscivorous biota were identified as significant, primarily due to mercury.

More recent data have suggested a potential concern regarding bioaccumulation of mercury in spiders along EFPC, as identified in the FY2011 CERCLA Five-Year Review (DOE 2012b). Spiders found along EFPC were found to have unusually high ratios of methyl-mercury to total-mercury, which presents a potential hazard to predators that may ingest these spiders. Additional characterization is underway to reduce uncertainty and refine the conceptual model for mercury bioaccumulation to better evaluate this potential risk, and these activities will be documented in a protectiveness statement in the next CERCLA Five-Year Review in FY2016.

The UEFPC Phase I ROD identified areas of mercury-contaminated soils surrounding and underlying the WEMA buildings and mercury-contaminated sediments in UEFPC and Lake Reality to be principal threat waste as defined under CERCLA. Principal threat wastes include those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant threat to human health or the environment should exposure occur. The mercury-contaminated sediments in UEFPC and Lake Reality will be remediated under the Phase I ROD through future excavation, treatment and disposal; the planned implementation schedule for this action was revised in the ESD (DOE 2012a) for consistency with the overall remediation strategy to conduct remedial actions for UEFPC in a generally upgradient-to-downgradient sequence. Remediation of the mercury-contaminated soils at WEMA is planned following the demolition of the WEMA Buildings. The water treatment facility evaluated in this proposed plan would help to reduce ongoing mercury releases from Y-12 to UEFPC pending the future removal and treatment of these principal threat wastes, consistent with the preference for treatment to address principal threats where practicable under CERCLA § 121 and the NCP.

REMEDIAL ACTION OBJECTIVES

Remedial Action Objectives (RAOs) are site-specific goals that are developed from the purpose and scope of remedial actions. The primary goal of remedial action in UEFPC is to protect human health and the environment: specifically, to protect human health to excess cancer risk levels between 1×10^{-4} and 1×10^{-6} for carcinogens and a HI of 1 to 3 for noncarcinogens, and, at a minimum, to protect populations of ecological species. The remedial actions also are designed to meet applicable or relevant and appropriate requirements (ARARs) to the maximum extent practicable.

The UEFPC Phase I ROD specified the following RAO for the selected remedy: “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.

This “risk-based value” for mercury referenced in the RAO from the Phase I ROD was derived for the recreational use scenario using the

adult recreational exposure parameters consistent with the EPA then-current AWQC methodology for ingestion of fish to determine an acceptable mercury concentration in fish. A concentration of 200 ng/L total mercury in UEFPC surface water was predicted to result in mercury concentrations in fish tissue below a hazard index of 1 and acceptable for human consumption. This estimate was derived based on an acceptable target concentration of mercury in fish of 0.4 μg/g, which was well below the FDA recommended value of 1 μg/g in effect at that time. However, EPA now recommends the acceptable concentration limit for mercury in fish tissue at 0.3 μg/g rather than 0.4 μg/g. Other parameters used in the derivation of the interim goal have not changed significantly (e.g., the reference dose (RfD) for chronic oral toxicity is unchanged at 1.0E-4 mg/kg-day for methyl mercury). Separately, in the NPDES Permit issued by the state of Tennessee in 2011, a target average mercury concentration of 87.5 ng/L in UEFPC surface water at Station 17 was predicted to allow mercury concentrations in fish to decrease to the target value of 0.3 μg/g. However, reductions in concentrations of mercury in UEFPC surface water achieved to date have not resulted in corresponding reductions of mercury in fish tissue. Therefore, the simple linear relationship used to derive the interim goal appears to be suspect and the potential effectiveness of reductions in water concentrations to achieve reductions in fish tissue concentrations is uncertain. In any case, the interim goal of 200 ng/L at Station 17 is not directly relevant to the action evaluated in this proposed plan.

This plan is describes proposed modification of the Phase I ROD selected remedy to include the construction 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. The actions proposed in this plan 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. Sub-watershed RAOs specific to the proposed water treatment system are summarized in Table 1 and discussed below.

The proposed water treatment system would 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 capture would be targeted to maximize mercury flux reduction. Configurations that include stormwater storage 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. This reduction of frequency was evaluated among the alternatives considered based on data from 2010, which was considered to be a year of normal precipitation. Collected wastewater would 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 would 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 would 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, 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 bypass water, must not exceed 1400 ng/L dissolved mercury.

Various treatment capacity and stormwater storage capacity levels were evaluated in the FFS and are presented in this proposed plan, and may be further optimized during the remedial design process. The mercury removal achieved by this treatment system would contribute towards attainment of the interim goal established in the Phase I ROD and the long-term goal of meeting the AWQC in-stream standard for mercury. The interim waiver of the in-stream AWQC standard for mercury approved under the Phase I ROD would not be impacted by this proposed modification of the remedy.

In addition to achieving reductions in the ongoing mercury releases from Outfall 200 to UEFPC, the proposed water treatment facility also would provide potential benefits for treatment of wastewater from other sources. For

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
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.

example, this facility could provide additional protection from increased mercury releases during future demolition actions at the major mercury process buildings at WEMA and remediation of underlying soils. However, these future sources remain to be fully characterized.

The action considered in this plan to construct a new water treatment facility to attain further reductions in mercury flux to UEFPC surface water is one component of a series of response actions planned for the UEFPC watershed. Some response actions conducted under the Phase I ROD, Phase II ROD and other CERCLA decisions (e.g., multiple removal actions) have already been implemented or are scheduled for future implementation, while other response actions will be identified and documented in future CERCLA decision documents. Such future actions will be documented and scheduled for implementation in accordance with FFA protocols and requirements. If selected, the new water treatment facility at Outfall 200 would supplement these other actions and would not eliminate or modify any of the previously selected actions. The optimal treatment capacity, stormwater storage capacity, and configuration of unit operations for the treatment facility may be further refined during the remedial design process from the nominal configurations presented in this proposed plan.

SUMMARY OF REMEDIAL ALTERNATIVES

The development of remedial alternatives is a two-step process. The first step is to screen technologies that could be applied to various types of sites that would meet the remedial action objectives. Based on the results of this screening, remedial alternatives providing the most viable means of meeting the RAOs are then developed and evaluated.

Because this proposed action is focused on additional actions to reduce mercury releases to UEFPC surface water from the Y-12 site, the range of alternatives is highly focused. Specifically, the proposed action would involve the construction of a new water treatment facility designed to treat discharges from the WEMA storm sewer system at Outfall 200. The primary problem addressed in this proposed action is exposure of hypothetical future recreational receptors to mercury in the surface water in UEFPC and in the tissue of fish caught from UEFPC, LEFPC, and EFPC. The UEFPC area is expected to remain under DOE/NNSA control in perpetuity. Therefore, institutional controls are expected to be useful tools to be used in conjunction with other containment, removal, and/or treatment technology options.

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. 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. While the remedial actions completed to date under the Phase I ROD have achieved significant reductions in the mercury releases from the site, the level of mercury in surface water and in fish tissue remain above target levels (Figure 5).

Each of the action alternatives incorporates remediation strategies that can be applied to address the key site problem of mercury concentrations in UEFPC surface water that exceed target levels. Since the component actions included in the Phase I selected remedy, as well as planned D&D and soil remediation actions at the primary mercury use buildings, already will achieve extensive reductions in the known primary source areas of mercury contamination at the Y-12 site, the remedial alternatives considered in this proposed plan focus on ex situ treatment of surface water for mercury removal. Specifically, these alternatives include construction of a new water treatment facility to treat discharges from the WEMA storm sewer system at Outfall 200 to reduce mercury releases to UEFPC surface water.

Multiple treatment facility configurations are 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. The water treatment system would be designed to achieve a performance objective of reducing mercury concentrations in the treatment system effluent 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 to the AWQC of 51 ng/L.

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 (Figure 6). 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.

The FS Addendum (DOE 2000) identified the discharge from the WEMA storm sewer system at Outfall 200 as one of the three primary sources of mercury releases to UEFPC under base-flow conditions. The other primary sources included discharge of mercury-contaminated groundwater from Outfall 51 and the Building 9201-2 sumps (which are now treated by the BSWTS) and non-point sources between Outfall 200 and Outfall 109 (which may have been partially attributed to increased erosion resulting from the flow augmentation program initiated in 1996, which was terminated in 2014). With the termination of the flow augmentation program in 2014, discharge from the WEMA storm sewer system at Outfall 200 is estimated to be the predominant source of mercury releases to UEFPC under base-flow conditions.

A treatability study and conceptual design study were initiated in 2012 using available ARRA funding for a treatment system to reduce discharge of mercury at Outfall 200, in support of the Phase I ROD requirement to investigate the viability of large-scale treatment of mercury-contaminated surface water at UEFPC. The resulting Conceptual Design Report (UCOR 2014) and Remedial Design Work Plan (DOE 2014d) helped to define the remedial alternatives described in this proposed plan. While the final facility design would be further defined during the remedial design process if this alternative is selected for implementation,

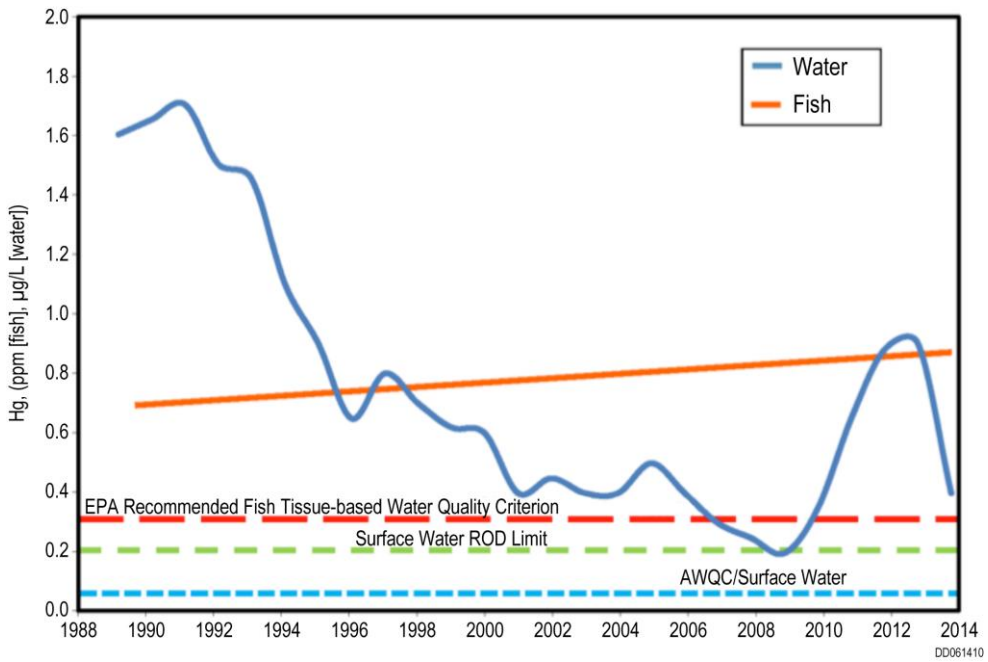

Figure 5. Mercury Concentration in UEFPC Surface Water at Station 17 and in Fish.

the recommended conceptual design for the treatment system would include grit removal, sulfide-functional polymer precipitation and ferric chloride co-precipitation with clarification, and multi-media filtration. 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 large variability in stream-flow is one of the primary challenges in designing a water treatment facility for UEFPC. Stream-flow in UEFPC is characterized by a relatively low base-flow of approximately 1000 gpm during dry conditions, with increased flow during storm events, peaking as high as 40,000 gpm or more. Impacts of climate change on future precipitation patterns and stream-flow may further increase this uncertainty. The annual discharge at Outfall 200 is estimated at approximately 722 million gallons during a year of average precipitation (e.g., 2010); approximately 74% of this discharge occurs during dry weather (base-flow) conditions with the remainder occurring during storm events (UCOR 2015d). Sub-alternatives have been 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. These sub-alternatives would differ in the frequency with which storm events would exceed the treatment and storage capacity and require bypass of the facility without treatment; reduction of this bypass frequency to the extent practicable is one of the criteria considered in the evaluation of these alternatives.

A series of pre-design studies have been performed in support of the conceptual design of the proposed water treatment system. These include studies of potential opportunities to reduce the quantity of water requiring treatment through diversion of noncontaminated stormwater (UCOR 2015a, 2015b) or diversion of non-stormwater sources (e.g., once-through cooling water, condensate)(UCOR 2015c). The watershed diversion alternatives were estimated to achieve a reduction in the annual discharge at Outfall 200 of only 0.5 to 1% and to reduce peak flow during storm events less than 5%. Similarly, the evaluation of non-stormwater diversion opportunities concluded that Y-12 facility discharges to the WEMA storm drain network already have been reduced significantly and that further reductions are not available that would be cost effective. In both cases, potential reductions identified in these studies were not sufficient to significantly impact the design capacity requirements for the proposed water treatment facility.

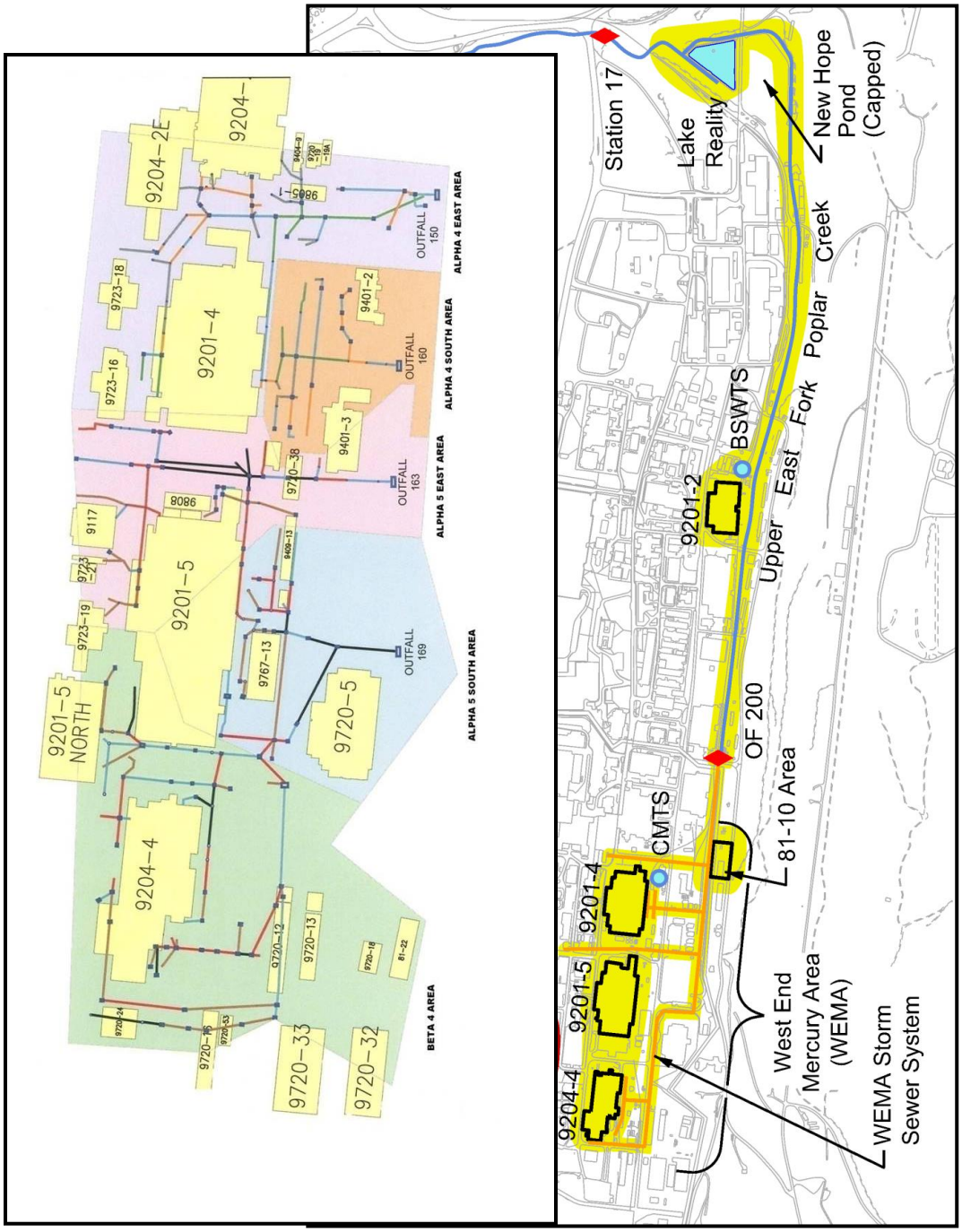

Figure 6. Locations of WEMA Former Mercury-Use Buildings and Outfalls

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% of the mercury flux and only 18% 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% of the total mercury and 69% 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).

Under all action alternatives, the new water treatment facility would be constructed using a modular design that would be conducive to any future modifications that might be needed. Such future modification could include construction of additional unit operations to improve treatment system performance to achieve greater mercury reductions in system effluents (e.g., addition of granular activated carbon adsorption or other unit operations for effluent polishing), construction of storage capacity to address greater amounts of storm flow, or other changes.

Outfall 200 has been identified as the proposed location for a new water treatment facility because it is the integration point for the WEMA storm sewer effluent entering UEFPC, and this storm sewer effluent constitutes the largest source of mercury releases to UEFPC under base flow conditions. Alternative locations that could be considered for a new water treatment facility include the individual WEMA outfalls (Outfalls 150, 160, 163 or 169), Station 17, or locations between Outfall 200 and Station 17. These alternative locations were screened qualitatively in the FFS to be less desirable than Outfall 200. The final facility location, if this alternative is selected, may be further evaluated during remedial design and siting studies.

In addition to achieving reductions in the ongoing mercury releases from Outfall 200 to UEFPC, the proposed water treatment facility also could provide potential benefits for treatment of wastewater from other sources. For example, this facility could provide additional protection from increased mercury releases during future demolition actions at the major mercury process buildings at WEMA and remediation of underlying soils.

The primary treatment components of each remedial alternative are summarized in Table 2, and described in more detail in the following text. A comparative evaluation of these alternatives with respect to criteria prescribed under CERCLA regulations is presented in the following section.

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 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 proposed plan, since some remedial actions have already been performed under the Phase I ROD selected remedy, and other actions are ongoing and planned. This proposed supplemental action would not modify existing components of the Phase I selected remedy. For the purpose of this proposed plan, this “No Further Action” alternative would be defined to mean no change to the existing Phase I selected remedy (as modified to date). Under this alternative, DOE would take no additional remedial action to supplement the selected remedy in the Phase I ROD (as amended).

Table 2. Summary of Treatment System Components Under UEFPC Remedial Alternatives				
Treatment System Component	**Remedial Alternative**			
	Alternative 2a, Water Treatment Facility for Outfall 200 with 1500 gpm Treatment Capacity and No Stormwater Storage Capacity	**Alternative 2b, Water Treatment Facility for Outfall 200 with 3000 gpm Treatment Capacity and No Stormwater Storage Capacity**	**Alternative 2c, Water Treatment Facility for Outfall 200 with 3000 gpm Treatment Capacity and 2 Million Gallons Stormwater Storage Capacity**	**Alternative 2d, Water Treatment Facility for Outfall 200 with 3000 gpm Treatment Capacity and 10 Million Gallons Stormwater Storage Capacity**
Headworks Capacity	3000 gpm to grit removal, flow greater than 1500 gpm and less than 3000 gpm is discharged to UEFPC following grit removal, flow in excess of 3000 gpm overflows to UEFPC without treatment	3000 gpm to grit removal, flow in excess of 3000 gpm overflows to UEFPC without treatment	3000 gpm to baseline grit removal chamber, next 37,000 gpm to storm-flow grit removal chamber, flow in excess of 40,000 gpm overflows to UEFPC without treatment	3000 gpm to baseline grit removal chamber, next 37,000 gpm to storm-flow grit removal chamber, flow in excess of 40,000 gpm overflows to UEFPC without treatment
Stormwater Storage Capacity	0	0	2,000,000 gallons (nominally one 2,000,000 gallon tank)	10,000,000 gallons (nominally five 2,000,000 gallon tanks)
Equalization Tank	500,000 gallons (minimum 1 hour holding time)	500,000 gallons (minimum 1 hour holding time)	500,000 gallons (minimum 1 hour holding time)	500,000 gallons (minimum 1 hour holding time)
pH Control/ Dechlorination Tank	2000 gpm (1500 gpm for influent surface water plus 500 gpm for recycle flows)	4000 gpm (3000 gpm for influent surface water plus 1000 gpm for recycle flows)	4000 gpm (3000 gpm for influent surface water plus 1000 gpm for recycle flows and stored stormwater)	4000 gpm (3000 gpm for influent surface water plus 1000 gpm for recycle flows and stored stormwater)
Precipitation Tanks (Sulfide-functional polymer, ferric chloride coagulant)	2000 gpm (1500 gpm for influent surface water plus 500 gpm for recycle flows)	4000 gpm (3000 gpm for influent surface water plus 1000 gpm for recycle flows)	4000 gpm (3000 gpm for influent surface water plus 1000 gpm for recycle flows and stored stormwater)	4000 gpm (3000 gpm for influent surface water plus 1000 gpm for recycle flows and stored stormwater)
Inclined Plate Clarifiers	2000 gpm (1500 gpm for influent surface water plus 500 gpm for recycle flows)	4000 gpm (3000 gpm for influent surface water plus 1000 gpm for recycle flows)	4000 gpm (3000 gpm for influent surface water plus 1000 gpm for recycle flows and stored stormwater)	4000 gpm (3000 gpm for influent surface water plus 1000 gpm for recycle flows and stored stormwater)
Multi-media Filtration	2000 gpm (1500 gpm for influent surface water plus 500 gpm for recycle flows)	4000 gpm (3000 gpm for influent surface water plus 1000 gpm for recycle flows)	4000 gpm (3000 gpm for influent surface water plus 1000 gpm for recycle flows and stored stormwater)	4000 gpm (3000 gpm for influent surface water plus 1000 gpm for recycle flows and stored stormwater)
Clarifier Sludge Dewatering	2000 gpm (1500 gpm for influent surface water plus 500 gpm for recycle flows)	4000 gpm (3000 gpm for influent surface water plus 1000 gpm for recycle flows)	4000 gpm (3000 gpm for influent surface water plus 1000 gpm for recycle flows and stored stormwater)	4000 gpm (3000 gpm for influent surface water plus 1000 gpm for recycle flows and stored stormwater)

ALTERNATIVE 2: WATER TREATMENT AT OUTFALL 200

Common Elements of Action Alternatives

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 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. Flows 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 where a sulfide-functional polymer would be introduced and then to another tank where 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. 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 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% 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 pumped to a backwash tank and then recycled back into the untreated influent in the pH control and dechlorination tank.

Clarifier effluent would be pumped to a clarified water tank for pH adjustment prior to multi-media 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. Effluent from the multi-media filtration tanks would go to a holding tank and then would be discharged back to UEFPC. A portion of the clean effluent from the holding tank also would be used for backwashing of the multi-media filtration tanks 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 noncontaminated construction debris and asbestos-contaminated debris, as well as soil and debris that may contain mercury or other hazardous materials. 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. All wastes would be characterized in accordance with the Sampling and Analysis Plan and Waste Handling Plan requirements developed during remedial design to determine the appropriate disposition path.

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 the purpose of this analysis, a period of operations of 30 years is assumed.

Surface water monitoring would be conducted to evaluate the effectiveness of the treatment system operations. 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 Phase I ROD.

The new water treatment facility would be constructed using a modular design that would be conducive to any future modifications that might be needed, based on an adaptive management approach. Such future modifications could include construction of additional unit operations to improve treatment system performance to achieve greater mercury reductions in system effluents, construction of additional storage capacity for storm flow, or other changes. In particular, the facility footprint would be designed to accommodate future addition of additional treatment operations for effluent polishing and/or stormwater storage. Similarly, the headworks and diversion structure of the facility would be constructed in a manner to allow future expansion to accommodate flow up to 40,000 gpm, if warranted by performance monitoring data and/or any future changed conditions, consistent with the adaptive management approach. Potential modifications of the treatment system would be evaluated by the FFA parties based upon monitoring of the treatment system performance, and would be evaluated by the FFA parties relative to other potential response actions to achieve further mercury reductions under the adaptive management approach.

Decontamination facilities and staging areas would need to be developed during construction of the new water treatment facility under all action alternatives. These areas would have containment means to prevent decontamination water or rainwater from leaving the area without appropriate sampling. Any water that cannot be discharged directly to a storm drain would be treated as needed. The size of these areas would depend on the scope

covered by an activity. Some modification/relocation of roads and other infrastructure construction may be needed to implement this alternative, depending on the final location.

The new water treatment system constructed under all action alternatives would be designed to supplement other response actions already underway or planned for future implementation under the Phase I ROD, and would not modify or replace any of those actions. Similarly, construction of this new facility would not impact the additional actions and studies are planned under the Y-12 Mercury Reduction Project and the *Strategic Plan for Mercury Remediation* (DOE 2014b) which are separate from the actions being conducted under the Phase I ROD.

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% 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 comparable to Scalability Option 2 described in the Conceptual Design Report (UCOR 2014), and much of the conceptual design information presented here is summarized from that document. This alternative 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% of stream-flow records for UEFPC do not exceed 3000 gpm). Therefore, stream-flow would exceed the facility headworks capacity approximately 5% of the time on average and 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.

Treatment operations following grit removal would include the following unit operations:

- Equalization tank (minimum 1 hour holding time).
- pH control and dechlorination system – reaction tank for pH adjustment and dechlorination, as needed.
- Chemical precipitation tanks - including a sulfide-functional polymer addition system and reaction tank, followed by a ferric chloride coagulant addition system and reaction tank.
- Inclined plate clarifiers for solids removal, with rapid mix and flocculation chambers.
- Sludge thickening and dewatering - sludge from the clarifiers would go to a sludge thickening tank and then to a filter press for dewatering. The resulting filter cake would be sent for disposal while the filtrate would go to a backwash tank and then recycled back into the influent stream.
- Multi-media filtration - liquid effluent from the clarifiers would go to a tank for pH adjustment and then to a multi-media filtration tank, prior to discharge of the treated effluent back to UEFPC.

A conceptual flow diagram of the treatment process for Alternative 2a is shown in Figure 7.

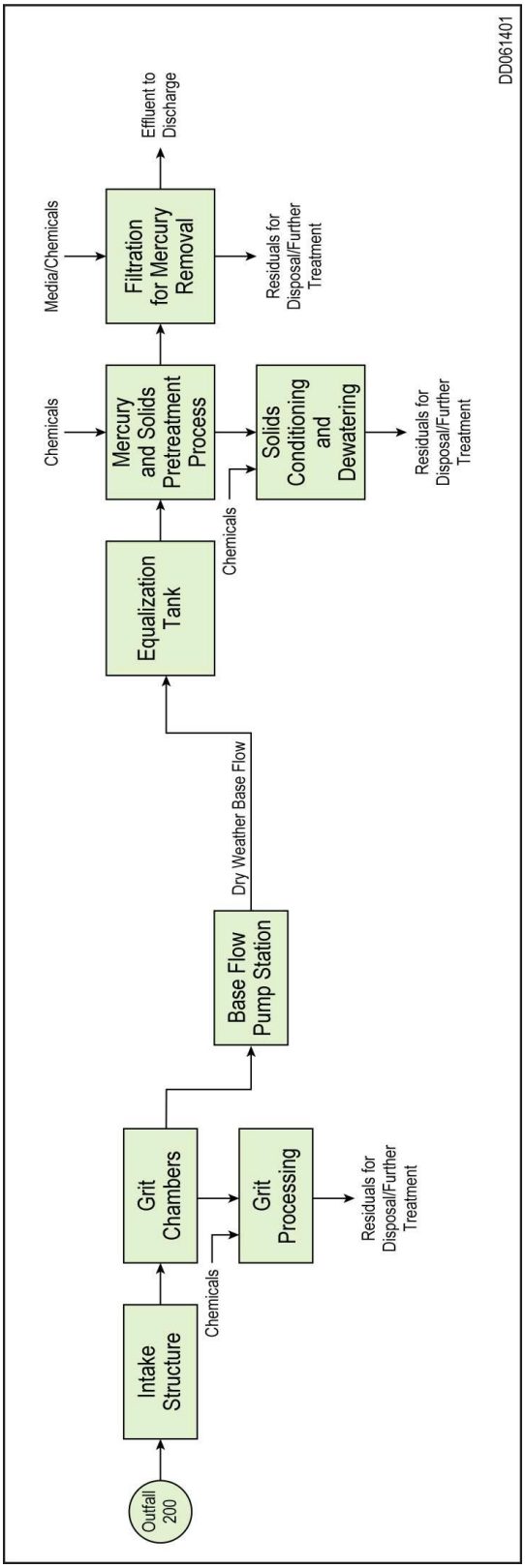

Figure 7. Conceptual Process Flow Diagram for Alternatives 2a and 2b (UCOR 2014).

Preliminary performance modeling (UCOR 2015e) estimates that this treatment system could remove approximately 1600 g/year of mercury or approximately 52% 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.

Surface water monitoring would be conducted to evaluate the effectiveness of the treatment system operations. 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 reducing mercury concentrations to 51 ng/L total mercury in the treated effluent. This effluent monitoring would be in addition to the monitoring currently required by the Phase I ROD, which would continue to measure progress toward attaining the interim goal of 200 ng/L at Station 17 and the ultimate goal of attaining the AWQC in-stream standard of of 51 ng/L.

The new water treatment facility would be constructed using a modular design that would be conducive to any future modifications that might be needed, based on an adaptive management approach. Such future modifications could include construction of additional unit operations to improve treatment system performance to achieve greater mercury reductions in system effluents, construction of storage capacity for storm flow, or other changes. In particular, the facility footprint would be designed to accommodate future addition of additional treatment operations for effluent polishing and/or stormwater storage. Similarly, the headworks and diversion structure of the facility would be constructed in a manner to allow future expansion to accommodate stream-flow up to 40,000 gpm, if warranted by performance monitoring data and/or any future changed conditions, consistent with the adaptive management approach. Potential modifications of the treatment system would be evaluated by the FFA parties based upon monitoring of the treatment system performance for a period of two years, and would be evaluated by the FFA parties relative to other potential response actions to achieve further mercury reductions under the adaptive management approach.

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 comparable to Scalability Option 4 described in the Conceptual Design Report (UCOR 2014), and much of the conceptual design information presented here is summarized from that document. This alternative 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% of stream-flow records for UEFPC do not exceed 3000 gpm). Therefore, stream-flow would exceed the facility treatment capacity approximately 5% 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

to3000 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.

Treatment operations following grit removal would include the following unit operations:

- Equalization tank (minimum 1 hour holding time).
- pH control and dechlorination system – reaction tank for pH adjustment and dechlorination, as needed.
- Chemical precipitation tanks - including a sulfide-functional polymer addition system and reaction tank, followed by a ferric chloride coagulant addition system and reaction tank.
- Inclined plate clarifiers for solids removal, with rapid mix and flocculation chambers.
- Sludge thickening and dewatering - sludge from the clarifiers would go to a sludge thickening tank and then to a filter press for dewatering. The resulting filter cake would be sent for disposal while the filtrate would go to a backwash tank and then recycled back into the influent stream.
- Multi-media filtration - liquid effluent from the clarifiers would go to a tank for pH adjustment and then to a multi-media filtration tank, prior to discharge of the treated effluent back to UEFPC.

A conceptual flow diagram of the treatment process for Alternative 2b is shown in Figure 7.

Preliminary performance modeling (UCOR 2015e) estimates that this treatment system could remove approximately 2100 g/year of mercury or approximately 68% 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.

New surface water monitoring requirements would be similar to that described for Alternative 2a to evaluate the effectiveness of the treatment system operations. This effluent monitoring would be additional to the monitoring currently required by the Phase I ROD.

As described for Alternative 2a, the new water treatment facility would be constructed using a modular design that would be conducive to any future modifications (e.g., construction of additional unit operations to achieve greater reductions of mercury in system effluents, construction of larger headworks to manage larger stream-flow, construction of stormwater storage capacity, or other changes) that might be needed, based on the adaptive management approach. Such potential modifications of the treatment system would be evaluated by the FFA parties based upon monitoring of the treatment system performance for a period of two years, and would be evaluated by the FFA parties relative to other potential response actions to achieve further mercury reductions under with the adaptive management approach.

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 not directly comparable to a Scalability Option described in the Conceptual Design Report (UCOR 2014), but is similar to Scalability Option 4 with the addition of the 2 million gallon storage capacity. This Alternative 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 at least 12 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, and would include the following sequence of unit operations:

- Equalization tank (minimum 1 hour holding time).
- pH control and dechlorination system – reaction tank for pH adjustment and dechlorination, as needed.
- Chemical precipitation tanks - including a sulfide-functional polymer addition system and reaction tank, followed by a ferric chloride coagulant addition system and reaction tank.
- Inclined plate clarifiers for solids removal, with rapid mix and flocculation chambers.
- Sludge thickening and dewatering - sludge from the clarifiers would go to a sludge thickening tank and then to a filter press for dewatering. The resulting filter cake would be sent for disposal while the filtrate would go to a backwash tank and then recycled back into the influent stream.
- Multi-media filtration - liquid effluent from the clarifiers would go to a tank for pH adjustment and then to a multi-media filtration tank, prior to discharge of the treated effluent back to UEFPC.

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. A conceptual flow diagram of the treatment process for Alternative 2c is shown in Figure 8.

Preliminary performance modeling (UCOR 2015e) estimates that this treatment system could remove approximately 2600 g/year of mercury or approximately 84% 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.

New surface water monitoring requirements would be similar to that described for Alternative 2a to evaluate the effectiveness of the treatment system operations. This effluent monitoring would be additional to the monitoring currently required by the Phase I ROD.

As described for the previous alternatives, the new water treatment facility would be constructed using a modular design that would be conducive to any future modifications (e.g., construction of additional unit operations to achieve greater reductions of mercury in system effluents, construction of additional stormwater storage capacity, or other changes) that might be needed, based on the adaptive management approach. Such potential modifications of the treatment system would be evaluated by the FFA parties based upon monitoring of the treatment system performance for a period of two years, and would be evaluated by the FFA parties relative to other potential response actions to achieve further mercury reductions under with the adaptive management approach.

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 comparable to Scalability Option 7 described in the Conceptual Design Report (UCOR 2014), and 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 at least 12 times during 2010, which is considered a year of average flow conditions (UCOR 2015e).

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.

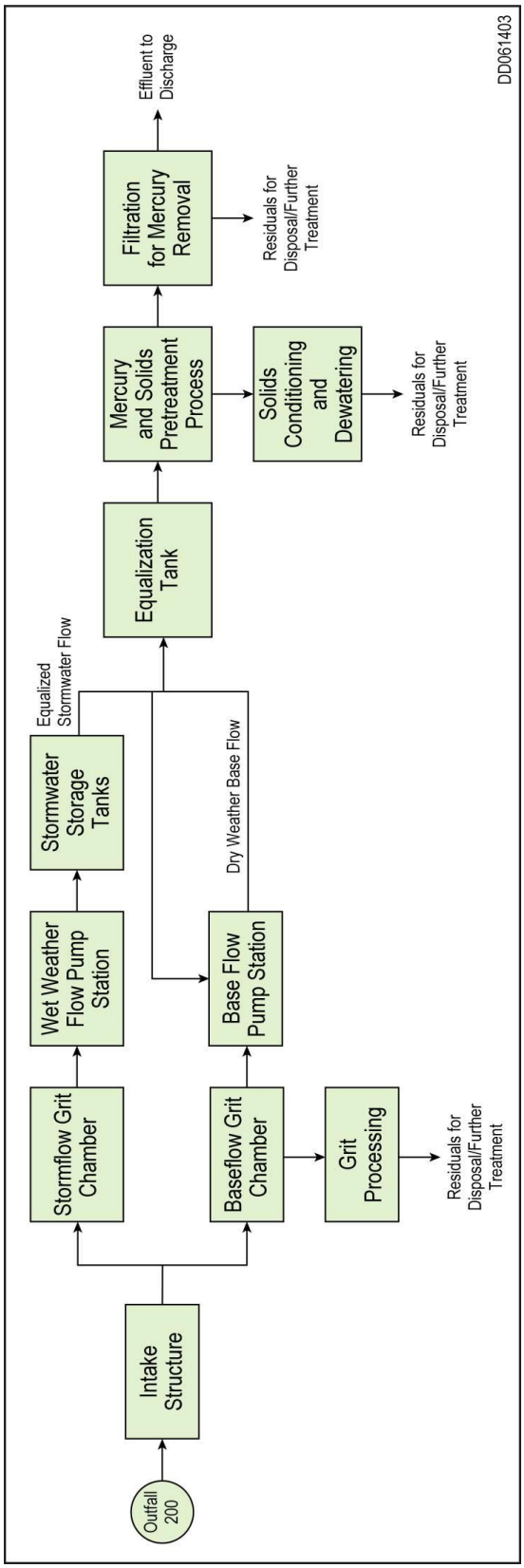

Figure 8. Conceptual Process Flow Diagram for Alternatives 2c and 2d.

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, and would include the following sequence of unit operations:

- Equalization tank (minimum 1 hour holding time).
- pH control and dechlorination system – reaction tank for pH adjustment and dechlorination, as needed.
- Chemical precipitation tanks - including a sulfide-functional polymer addition system and reaction tank, followed by a ferric chloride coagulant addition system and reaction tank.
- Inclined plate clarifiers for solids removal, with rapid mix and flocculation chambers.
- Sludge thickening and dewatering - sludge from the clarifiers would go to a sludge thickening tank and then to a filter press for dewatering. The resulting filter cake would be sent for disposal while the filtrate would go to a backwash tank and then recycled back into the influent stream.
- Multi-media filtration - liquid effluent from the clarifiers would go to a tank for pH adjustment and then to a multi-media filtration tank, prior to discharge of the treated effluent back to UEFPC.

Alternative 2d differs from Alternative 2c primarily in the larger storage capacity for up to 10 million gallons of stormwater flow. The remaining unit operations of the treatment system are equivalent to those under Alternatives 2b and 2c, 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. A conceptual flow diagram of the treatment process for Alternative 2d is shown in Figure 8.

Mass balance modeling predicts capture rates of water above 92% for both average and heavy rainfall years for the system configuration in Alternative 2d, with 10 million gallons of storage capacity and maximum flow rates of 3000 gpm pumping capacity to the treatment facility directly and 37,000 gpm pumping capacity to the storage tanks. This capacity also would be sufficient to capture the “first flush” rainfall (i.e., the runoff from the 60-minute period surrounding the hydrograph peak) even from larger storm events for which the total volume exceeds the 10 million gallon storage capacity.

Preliminary performance modeling (UCOR 2015e) estimates that this treatment system could remove approximately 2800 g/year of mercury or approximately 91% 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.

New surface water monitoring requirements would be similar to that described for Alternative 2a to evaluate the effectiveness of the treatment system operations. This effluent monitoring would be additional to the monitoring currently required by the Phase I ROD.

As described for the previous alternatives, the new water treatment facility would be constructed using a modular design that would be conducive to any future modifications (e.g., construction of additional unit operations to achieve greater reductions of mercury in system effluents, construction of additional stormwater storage capacity, or other changes) that might be needed, based on the adaptive management approach. Such potential modifications of the treatment system would be evaluated by the FFA parties based upon monitoring of the treatment system performance for a period of two years, and would be evaluated by the FFA parties relative to other potential response actions to achieve further mercury reductions under with the adaptive management approach.

EVALUATION OF ALTERNATIVES

All remediation alternatives must be evaluated against nine criteria (see box) prescribed by CERCLA. The first two criteria (overall protection of human health and the environment, and compliance with ARARs) must be met by any alternative to be eligible for selection. The next five criteria (long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost) are the primary balancing criteria that form the basis for the comparative analysis of eligible alternatives. The preferred alternative for UEFPC presented in this proposed plan has been selected based on an evaluation against these first seven criteria. The remaining two criteria (state acceptance and community acceptance) will be evaluated after review and consideration of comments received. 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 3 and is discussed below.

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 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 Phase I ROD and Phase II ROD, as well as the Mercury Reduction Project and other related actions, mercury concentrations in surface water at Station 17 continue to exceed both the interim goal of 200 ng/L established in the Phase I ROD and the AWQC. As a result of the continued mercury concentration measured at Station 17 in excess of these criteria, the no-further-action alternative is not considered protective of human health or the environment.

EVALUATION CRITERIA

The following criteria are used to evaluate potential alternatives as required by CERCLA and the NCP. The first seven criteria are highlighted in this proposed plan. The last two criteria, state and community acceptance, will be addressed after the public comment period.

1. *Overall protection of human health and the environment* addresses whether an alternative eliminates, reduces, or controls threats to public health and the environment.

2. *Compliance with ARARs* addresses whether an alternative meets federal and state environmental laws and regulations or a waiver has been invoked.

3. *Long-term effectiveness and permanence* considers the ability of an alternative to protect public health and the environment long after remedial action is complete.

4. *Reduction of toxicity, mobility, or volume through treatment* evaluates use of treatment to reduce the harmful nature of contaminants; the contaminants' ability to move in the environment; and the amount, or volume, of contamination present.

5. *Short-term effectiveness* considers the time needed for an alternative to achieve remedial response objectives and the risks posed to workers, residents, and the environment during the remedial action.

6. *Implementability* addresses the feasibility of an alternative from a technical and an administrative standpoint.

7. *Cost* considers the amount of money it will take to design, construct, operate, and maintain the alternative.

8. *State acceptance* addresses TDEC comments concerning the alternatives considered.

9. *Community acceptance* addresses public comments on the alternatives being considered. Public comments will be addressed in the responsiveness summary section of the ROD.

Table 3. 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 & 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 action alternatives.
Compliance with ARARs	Not applicable.	Meets ARARs. [a]	Meets ARARs. [a]	Meets ARARs. [a]	Meets ARARs. [a]
Long-term Effectiveness and Permanence	Not effective.	Effective with ongoing O&M (~52% mercury flux reduction)	Effective with ongoing O&M (~68% mercury flux reduction)	Effective with ongoing O&M (~84% mercury flux reduction)	Effective with ongoing O&M (~91% mercury flux reduction)
Reduction of Toxicity, Mobility, or Volume Through Treatment	No treatment; therefore no reduction.	Removal of mercury from UEFPC surface water of 1600 g/year for 52% flux reduction through ex situ treatment.	Removal of mercury from UEFPC surface water of 2100 g/year for 68% flux reduction through ex situ treatment.	Removal of mercury from UEFPC surface water of 2600 g/year for 84% flux reduction through ex situ treatment.	Removal of mercury from UEFPC surface water of 2800 g/year for 91% flux reduction through ex situ treatment.
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	TBE	TBE	TBE	TBE	TBE
Community Acceptance	TBE	TBE	TBE	TBE	TBE

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.

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. Stormwater flow in excess of treatment and storage capacity would be discharged untreated to UEFPC under all alternatives. While all action alternatives achieve overall protectiveness, Alternative 2d employs the most robust actions, due to the inclusion of the largest amount of storage capacity (10 million gallons) to contain storm flows above the capacity of the treatment system for future treatment, followed by Alternative 2c, which includes 2 million gallons of stormwater storage capacity. Alternative 2a would provide the least amount of treatment capacity at 1500 gpm, such that UEFPC stream-flow would bypass treatment more frequently than the other alternatives. Alternative 2b would provide a comparable level of treatment capacity to Alternatives 2c and 2d, but without the storage capacity to capture storm flow above the capacity of the treatment system.

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 could 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. Alternatives 2c and 2d would offer significant advantages over Alternatives 2a and 2b for potential future treatment of this source due to the presence of stormwater storage capacity which could allow more flexible wastewater inputs. While the future WEMA demolition and remediation actions will include comprehensive contamination control measures and best management practices to minimize the release of contaminants to UEFPC surface water, the proposed water treatment facility could 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 would 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 would facilitate any change that might be needed.

Short-term risks during implementation of remedial actions would be maintained at acceptable levels through engineering and institutional controls under all action alternatives. Short-term risks to the community and site (non-remediation) workers would be negligibly small under all action alternatives. Short-term risks to remediation workers also would be very small under all alternatives. There would be limited opportunity for contact with hazardous materials under all alternatives, primarily associated with excavation of stream sediments and floodplain soils during initial facility construction and the ongoing disposal of treatment system residual wastes during operations. Otherwise, most risks would be standard industrial risks associated with major construction projects.

COMPLIANCE WITH ARARS

All action alternatives would meet the chemical-specific, location-specific, and action-specific ARARs identified for the alternative [see Appendix A for ARARs and to-be-considered (TBC) guidance for the preferred alternative], except as noted. The no further action alternative has no ARARs because no remedial action would be taken. 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.

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 Phase I ROD for the recreational AWQC in-stream standard for mercury would not be affected and would remain in effect.

All action alternatives may 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. All alternatives would include control of fugitive emissions, best management practices for stormwater runoff, and proper management of all waste streams generated. All ARARs for transportation and disposal would be met. Under all action alternatives, the proposed 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. 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 waiver of this action-specific ARAR or could involve other actions which may result in achieving this action-specific ARAR.

LONG-TERM EFFECTIVENESS

The no further action alternative would not be effective in the long term, because no additional remedial actions would be conducted at the UEFPC to supplement the selected remedy in the Phase I ROD and mercury concentrations in surface water would continue to exceed both the interim goal established in the Phase I ROD and the AWQC.

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%), followed by Alternative 2c (84%), 2b (68%), and 2a (52%), 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 – 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.

All alternatives also would continue to rely on existing land use controls included in the selected remedy in the Phase I ROD for protection of human receptors from fish consumption until mercury concentrations in fish fall to acceptable levels.

REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT

The no further action alternative does not include treatment and will not result in a reduction of toxicity, mobility, or volume of contaminants.

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%), followed by Alternative 2c (84%) and 2b (68%), respectively, while Alternative 2a would treat the smallest volume of surface water and achieve the smallest reduction in mercury flux (52%).

SHORT-TERM EFFECTIVENESS

The no further action alternative would not involve any new remedial actions, and therefore, would result in no increase in short-term risks and no short-term environmental impacts.

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 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 (e.g., bulldozers, excavators, etc.) and trucks were brought to the site for construction of the new facility. However, the increase in vehicle traffic would relatively small for all alternatives, and transportation accidents are projected to result in less than one injury or fatality over the duration of the project under all alternatives. These impacts would be controlled 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. 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.

While relative differences among the action alternatives are small with respect to each of these short-term impacts, Alternative 2a would have the smallest short-term impacts due to the slightly smaller construction activities, while Alternative 2d would have the greatest impacts, with Alternatives 2b and 2c intermediate between these.

The estimated time required for implementation of all action alternatives is estimated at 5 years for design and construction. All alternatives also would have similar ongoing costs for O&M associated with water treatment operations that would be permanent costs. It also should be noted that implementation schedules for any action alternative could be significantly lengthened due to funding constraints in addition to constructability logic. The new treatment system under each of the action alternatives would be expected to achieve an immediate reduction in mercury releases from the WEMA storm sewer network to UEFPC surface water.

IMPLEMENTABILITY

Under the no further action alternative, no new remedial actions would be taken. Therefore, there would be no activities to implement.

All action alternatives would be technically feasible to implement. All activities associated with implementation of the action alternatives (water collection/treatment systems) 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.

While relative differences among the action alternatives are relatively small with respect to implementability, Alternative 2a would be the most easily implemented as a result of its lower treatment capacity and absence of stormwater storage capacity, followed by Alternative 2b; Alternatives 2c and 2d also would be readily implementable but would require additional construction associated with the much larger headworks and stormwater storage tanks.

COST

Cost estimates are used in the CERCLA evaluation process to eliminate remedial alternatives that are significantly more expensive than competing alternatives without offering commensurate increases in performance or overall protection of human health and the environment. The cost estimates are preliminary estimates with an intended accuracy range of +50 to -30 percent. Final costs will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, final scope, final schedule, final engineering design, and other variables.

Table 3 presents the estimated capital, annual O&M, and total present value costs for each alternative. 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.

NEPA VALUES

In accordance with DOE policy (DOE 1994), DOE evaluations under CERCLA and associated documents 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. The DOE-controlled industrial land-use designation for the UEFPC area would continue in all cases.

Because the no further action alternative is the baseline condition, the socioeconomic conditions of this alternative are those against which other alternatives will be compared. Land use under the no-action alternative normally is assumed to be unrestricted; however, the presence of the Y-12 National Security Complex and its ongoing national security mission renders the future use of the UEFPC site for any activities other than DOE-controlled industrial use completely implausible.

No environmental justice impacts have been identified for the no further action alternative. The Scarboro community is the only formally identified environmental justice community near the ORR. This community is located on the opposite side of Pine Ridge from the Y-12 site and UEFPC. Similarly, no environmental justice impacts are anticipated for any action alternative, since no adverse impacts to the Scarboro community would be expected to result from construction of the new water treatment facility.

No irretrievable commitment of resources would result directly from implementation of the no further action alternative. All action alternatives would require an irretrievable commitment of the site selected for construction of the new water treatment facility and restricted from other uses. All action alternatives also would require an irretrievable commitment of fuel and other nonrenewable resources during implementation of remediation activities, as well as other materials such as fertilizers, riprap, etc.

Because the no further action alternative is the baseline condition, there would be no cumulative impacts for this action. The potential for cumulative impacts related to the remedial actions implemented at UEFPC under any of the action alternatives is not considered significant due to the limit scope of this action. Numerous additional remedial actions as well as other construction activities will occur at Y-12 and throughout the ORR that could have cumulative impacts such as increases in vehicle traffic, degradation of habitat, etc. However, the likelihood of significant cumulative impacts is considered very remote.

SUMMARY OF PREFERRED ALTERNATIVE

Following is a summary description of the preferred alternative for modification of the selected remedy in the UEFPC Phase I ROD to construct a new water treatment facility to treat discharges from the WEMA storm sewer network at Outfall 200. The selected alternative in the ROD Amendment could differ from the preferred alternative presented in this proposed plan based on stakeholder comment.

SCOPE AND ROLE OF PROPOSED REMEDIAL ACTION

The scope of this focused remedial action decision is limited to construction of a new water treatment facility designed to reduce mercury releases to UEFPC surface water by treatment of discharges from the WEMA storm sewer system at Outfall 200. This action is intended to supplement remedial actions already included in the selected remedy of the UEFPC Phase I ROD (as amended), and this action would not eliminate

or modify any of those actions previously selected, as summarized in Table 4.

DESCRIPTION OF PREFERRED ALTERNATIVE

The preferred alternative is Alternative 2c. This alternative includes construction of a new water treatment facility near Outfall 200 to manage UEFPC stream-flow of 40,000 gpm. This system would 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 preferred alternative 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 preferred alternative is shown in Figure 9, while the general facility location and layout is shown in Figure 10.

Table 4. Summary of Remedial Actions under the Preferred Alternative for Modification of the UEFPC Phase I ROD.

Remedial Actions	Protection Goals
New Actions: 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 Action): 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. ESD (DOE 2012a) postponed implementation until all upgradient remedial actions have been completed. Scheduled for future implementation in out-years. (Construction of the new water treatment system potentially could support acceleration of these actions.) 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.

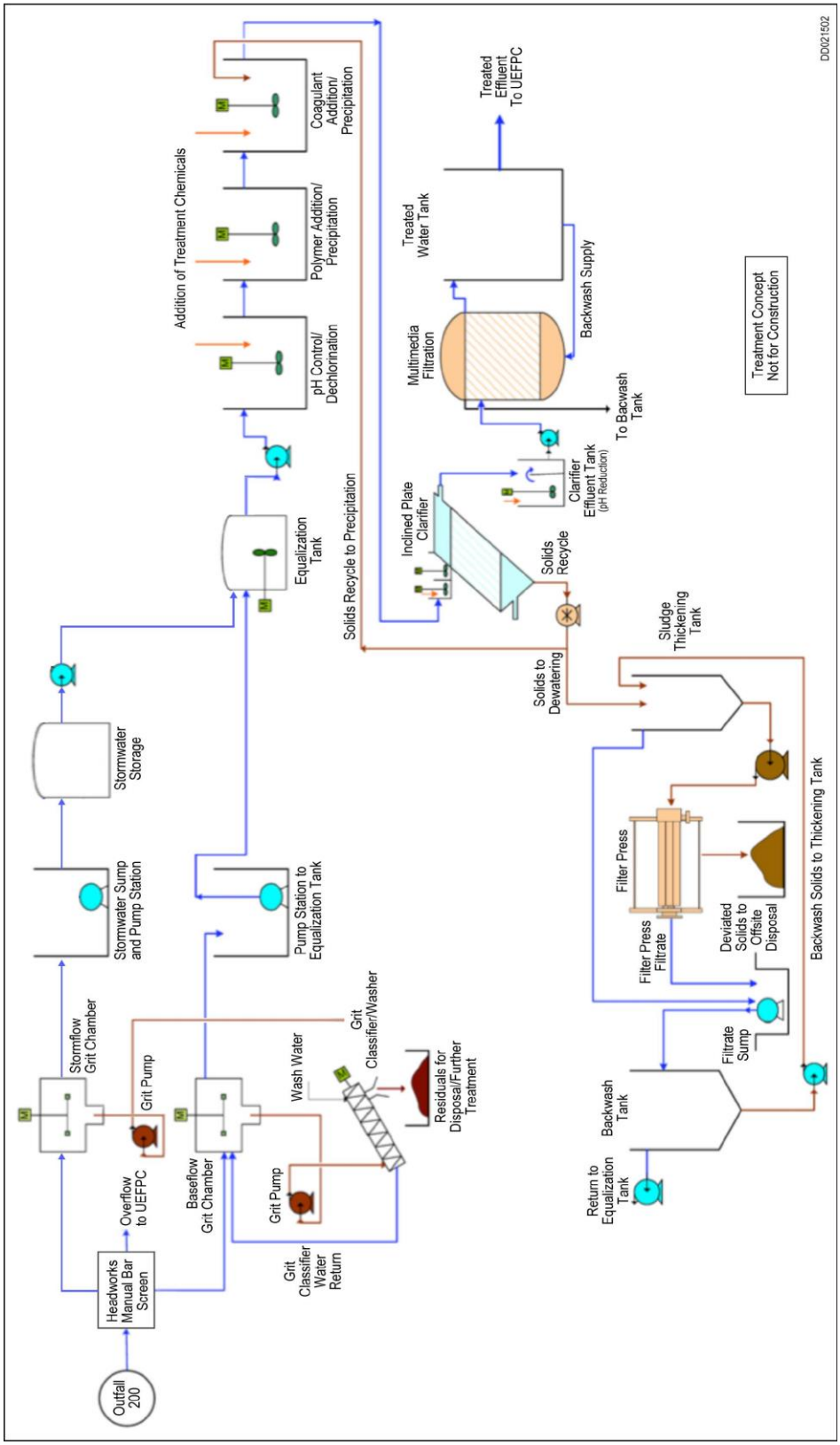

Figure 9. Outfall 200 Water Treatment System, Preliminary System Process Flow Diagram.

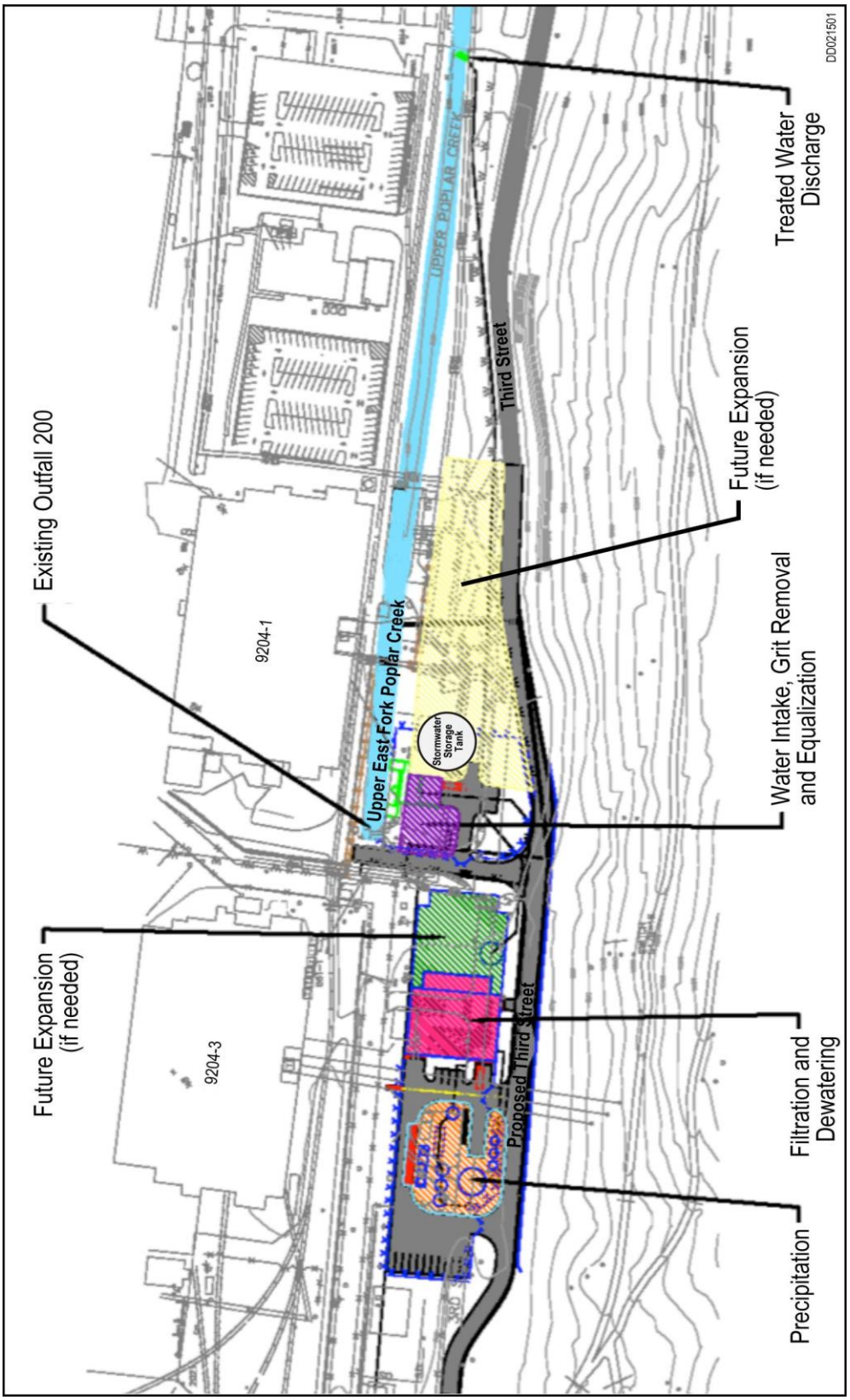

Figure 10. Outfall 200 Water Treatment System, Preliminary Facility Location and Layout.

Treatment operations for the preferred alternative would include the following unit operations:

- Headworks capacity to manage a maximum flow of 40,000 gpm, using a two-stage weir system, including manual bar screen, base-flow and storm-flow grit removal chambers, and grit classification.
- Equalization tank with minimum 1 hour holding time.
- pH control and dechlorination tank for pH adjustment and dechlorination, as needed.
- Chemical precipitation tanks, including a sulfide-functional polymer addition system and reaction tank, followed by a ferric chloride coagulant addition system and reaction tank.
- Inclined plate clarifiers for solids removal, with rapid mix and flocculation chambers.
- Sludge thickening and dewatering for clarifier sludge. Sludge from the clarifiers would go to a sludge thickening tank and then to a filter press for dewatering. The resulting filter cake would be sent for disposal while the filtrate would go to a backwash tank and then recycled back into the influent stream.
- Multi-media filtration for clarifier liquid effluent. Liquid effluent from the clarifiers would go to a tank for pH adjustment and then to a multi-media filtration tank, prior to discharge of the treated effluent back to UEFPC.

All unit operations would be designed to treat a maximum influent flow of 3000 gpm of influent stream-flow, which is approximately equivalent to the 95th percentile stream-flow estimate for UEFPC at Outfall 200. In addition to influent surface water, the system also would treat recycle flows up to 1000 gpm, for management of backwash water and filter press filtrate as well as stored stormwater. Stream-flow greater than 3000 gpm up to 40,000 gpm would be pumped to the stormwater storage tank following grit removal for future treatment. Stream-flow exceeding the total 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 at least 12 times during 2010, which is considered a year of average flow conditions (UCOR 2015e).

Waste materials generated during facility construction and during treatment operations will be appropriately characterized and disposed. Waste generated during facility construction may include noncontaminated construction debris and asbestos-contaminated debris, as well as soil and debris that may contain mercury or other hazardous materials. Residual wastes generated during facility operations will 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 will include grit material from the grit removal system (~1,300,000 lbs/year), filter cake from the filter press (~440,000 lbs/year), and spent media from the multi-media filters (~44,000 lbs/year) (UCOR 2014). All wastes will be appropriately characterized in accordance with the Sampling and Analysis Plan and Waste Handling Plan requirements developed during remedial design, and sent for compliant onsite or offsite disposal as sanitary/industrial waste, RCRA-regulated hazardous waste, low-level radioactive waste, or mixed waste, as appropriate, and consistent with the NCP requirements of 40 CFR 300.440.

The new water treatment facility at Outfall 200 would be constructed using a modular design that would be conducive to any future modifications that might be needed, based on the adaptive management approach. Such future modifications could include construction of additional unit operations to achieve greater mercury reductions in system effluents, construction of additional stormwater storage capacity, or other changes, if warranted by performance monitoring data and/or any future changed conditions, consistent with the adaptive management approach. Such potential modifications of the treatment system would be evaluated by the FFA parties based upon monitoring of the treatment system performance for a period of two years, and would be evaluated by the FFA parties relative to other potential response actions to achieve further

mercury reductions using the adaptive management approach.

Costs for the preferred alternative 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.

Integration with Phase I ROD Actions. As described previously, the new water treatment system constructed under this alternative would be designed to supplement other response actions already underway or planned for future implementation under the Phase I ROD (as amended), and would not modify or replace any of those actions. Specifically, the following Phase I ROD actions would not be impacted by this alternative:

- Phase I ROD Source Control Actions - The source control actions previously selected in the Phase I ROD (as amended) would be unaffected by this alternative – that is, operation of the BSWTS would continue and the sediment/soil removal at UEFPC and Lake Reality would be implemented in the future as planned.

- Surface Water Monitoring - Surface water monitoring requirements already established under the Phase I ROD would be maintained under this alternative, and additional monitoring of the water treatment system effluent would be implemented to evaluate the effectiveness of this alternative.

- Land Use Controls - Land use controls already established under the Phase I ROD would be maintained under this alternative. No new land use controls would be required for the proposed action.

Integration with Strategic Plan for Mercury Remediation at Y-12. As discussed previously, numerous additional actions and studies are planned under the Y-12 Mercury Reduction Project and the *Strategic Plan for Mercury Remediation* (DOE 2014b) which are separate from the actions being conducted under the Phase I ROD. These actions would continue and would not be impacted by this alternative, including:

- Removal of Mercury from Storm Sewer System – The ongoing collection and disposal of mercury (elemental mercury and associated contaminated sediments) from mercury traps installed in the WEMA storm sewer system would continue.

- Field and Laboratory Studies – Numerous will be conducted over the next several years to develop better understanding of mercury source contributions to UEPFC, mercury methylation processes, relationships between mercury in surface water and in fish, ecological management and enhancement, water chemistry manipulation, sediment and bank soil stabilization, and potential stream reclassification.

- Mercury-Use Building Demolition – The WEMA former mercury-use buildings are planned for demolition followed by remediation of underlying soils to remove major sources of mercury contamination. Building demolition and soil remediation are planned to proceed in a generally west-to-east sequence, to reduce potential for recontamination. The new water treatment facility at Outfall 200 would provide a high level of protection to prevent increased releases of mercury from these sources.

Modifications of the Remedy Using Adaptive Management. Performance of the new water treatment system will be monitored and any potential modifications would be selected using an adaptive management approach. That is, as data is collected regarding the performance of this treatment system, and as results of other implemented remediation actions and studies are obtained and evaluated, modifications to this action or other response actions may be proposed as necessary. For example, additional unit operations for treatment could be added to this water treatment system to obtain greater reductions in mercury concentrations or additional storage capacity could be constructed to reduce storm-flow bypass requirements. Alternatively, evaluations 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 in UEFPC. DOE, EPA, and TDEC initially would monitor the treatment system performance for a period of two years, and then evaluate potential system modifications relative to other potential response actions to achieve further mercury reductions to UEFPC surface water.

EVALUATION OF PREFERRED ALTERNATIVE

Overall Protection of Human Health and the Environment. The preferred alternative will protect human health and the environment under expected land use scenarios through construction of a new water treatment facility to reduce mercury in discharges from Outfall 200 to UEFPC surface water not to exceed 51 ng/L total mercury in the treated effluent. This additional water treatment would contribute to further reductions of mercury concentrations in UEFPC surface water, in support of the interim goal of 200 ng/L at Station 17 established in the Phase I ROD and the ultimate goal of meeting the AWQC in-stream standard of 51 ng/L. The new treatment facility will be designed to treat UEFPC surface water with a maximum influent flow of 3000 gpm, which is approximately equivalent to the 95th percentile stream-flow estimate for UEFPC at Outfall 200. Stream-flow greater than 3000 gpm up to 40,000 gpm will be pumped to a stormwater storage tank following grit removal for future treatment. Stream-flows exceeding the total headworks capacity of 40,000 gpm or the storage capacity of 2 million gallons will 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 during at least 12 storm events during 2010, which is considered a year of average flow conditions (UCOR 2015e).

In addition to achieving reductions in the ongoing mercury discharges from Outfall 200 to UEFPC, the new water treatment facility also would provide benefits for treatment of wastewater from other sources, such as wastewaters from future demolition of the major mercury process buildings at WEMA and remediation of the mercury contaminated soils beneath the buildings. This potential future source has not been specifically evaluated in the design of the treatment system to date, but would be evaluated during the planning for these future projects as additional characterization data become available. The stormwater storage capacity provided in the preferred alternative would support flexible wastewater inputs, and the modular design of the water treatment system would facilitate any change that might be needed.

The preferred alternative will depend upon ongoing O&M to maintain protectiveness of the new water treatment facility. Remedial actions for groundwater are deferred to a future decision, so groundwater use restrictions established in the Phase I ROD will continue under this alternative. Short-term risks during implementation of preferred alternative will be maintained at acceptable levels through engineering and institutional controls. Most short-term risks would be standard industrial risks associated with major construction projects.

Compliance with ARARs. The preferred alternative will meet chemical-specific, location-specific, and action-specific ARARs and TBC guidance. No new waiver of any ARAR would be requested, but 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. Because the preferred alternative is an interim action that will not address groundwater remediation, groundwater ARARs are not considered. The primary goal for the proposed action is to protect UEFPC surface water in accordance with the goals established in the UEFPC Phase I ROD. Compliance with general construction and remedial action ARARs will be ensured for all base actions by control of fugitive emissions, best management practices for stormwater runoff, and proper management of all waste streams generated. All construction activities with the potential to impact UEFPC will be designed using best management practices and erosion/siltation controls to meet requirements for aquatic resource alteration activities. No federal- or state-listed threatened or endangered species are present at UEFPC, nor are there any known historical or archaeological resources that would be affected by the preferred alternative.

Long-Term Effectiveness. The preferred alternative relies primarily on removal of mercury from UEFPC surface water using established treatment technologies. This alternative will be

effective in the long term and provide permanent solutions for removal of mercury contamination from UEFPC surface water for permanent disposal. Approximately 84% of the total mercury flux at Outfall 200 would be removed for permanent disposal.

This alternative will require commitment to long-term O&M of the water treatment system, since proper system operation, maintenance, and upkeep will be required to maintain effectiveness. Existing land use controls included in the selected remedy in the Phase I ROD for protection of human receptors from fish consumption will continue until mercury concentrations in fish fall to acceptable levels. CERCLA Five-Year Reviews will be conducted to evaluate the protectiveness of the remedial actions and the effectiveness of the engineering and institutional controls.

Reduction of Toxicity, Mobility, or Volume Through Treatment. The preferred alternative includes the treatment of discharges from the WEMA storm sewer system at Outfall 200 to UEFPC surface water to reduce mercury concentrations to 51 ng/L or less in treated effluent. Removal of mercury from WEMA storm sewer discharges will be achieved using well established water treatment technologies to achieve an estimated removal of approximately 84% of the total mercury flux at Outfall 200. The treatment technology selected for the preferred alternative is expected to be effective for removal of all forms of mercury potentially present in UEFPC surface water, including elemental mercury, inorganic mercury, and organic mercury (including methylmercury).

Short-Term Effectiveness. Short-term impacts to the community during implementation of remedial actions will be minimized through the use of engineering and institutional controls. Short-term risks to workers will be mitigated through the proper use of safety protocols, protective clothing, PPE, environmental monitoring (e.g., ambient air for external gamma radiation and airborne radioactivity), and restrictions on access to contaminated areas. All machinery and equipment will be inspected regularly, surveyed for radioactive contamination, and decontaminated if necessary. Dust-control measures will be implemented to limit the release of and exposure to contaminated particulate matter.

Erosion controls will be implemented throughout all excavation and construction activities to prevent impacts to surface waters. Dust emission controls also will be implemented during all construction activities to minimize airborne releases. All remediation activities will take place on DOE property and DOE roads that are restricted from public access. Access controls already in place at the Y-12 site prevent public access to the UEFPC area. There may be some increase in traffic on local roads as equipment (e.g., bulldozers, excavators, etc.) and trucks are brought to the site for construction of the new facility. Some limited construction to relocate paved roads may be required. The increase in vehicle traffic will not be excessive. Short-term disturbance of the vegetation and wildlife habitat will occur during the construction of the treatment facility, but these effects are expected to be minor, and the overall impact on UEFPC is expected to be positive.

The preferred alternative would achieve an immediate reduction in mercury releases from the WEMA storm sewer network to UEFPC surface water.

Implementability. All actions included in the preferred alternative are technically and administratively feasible and implementable. The proposed remedial actions will be performed using standard construction equipment and techniques, and conventional water treatment operations. All services and materials required for implementation of the preferred alternative are readily available. Only standard construction equipment, trades, and materials are required for this alternative. No administrative barriers to implementation have been identified.

All actions will be conducted onsite and thus will not require permits; however, substantive provisions of any permits that otherwise would be required will be considered to be ARARs. The duration for implementation of the preferred alternative is estimated at approximately 5 years.

Table 5. Cost Estimate for Outfall 200 Preferred Alternative

Remedial Action Component	Costs ($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**	

Cost. Estimated costs for the preferred alternative are summarized in Table 5. The total capital cost for the preferred alternative is estimated at approximately $146 million, including approximately $113 million direct costs and $33 million indirect costs (e.g., design, characterization, project integration). The present worth cost is estimated at $185 million.

O&M costs for operation of the new treatment system are estimated at approximately $3.1 million per year and include costs for routine maintenance and periodic repair of equipment, treatment chemicals and supplies, and disposal of treatment residuals. Additional ongoing costs will be incurred for environmental monitoring. While much of the environmental monitoring at UEFPC would continue to be conducted under the ongoing ORR-wide surveillance program, a portion of this cost is considered in this estimate to allow for additional monitoring that would be required to verify effectiveness of the new treatment facility. O&M cost associated with implementation of institutional controls is already part of the Y-12 security mission. Similarly, costs for the required CERCLA Five-Year Reviews for ORR remediation projects are already included in the OREM program budget.

NEPA Values. The preferred alternative is not expected to have any significant socioeconomic impact on the local community. Short-term impacts to the environment will occur during construction activities, but these impacts will be effectively controlled and mitigated. No cumulative impacts, impacts to historic resources, or environmental justice impacts are anticipated from this alternative. Irretrievable commitment of resources will include the commitment of the site selected for construction of the new water treatment facility which will be restricted from other uses, as well as the consumption of fuel and other nonrenewable resources during implementation of the alternative and other materials of construction such as borrow soil, riprap, etc.

State and Community Acceptance. State and community acceptance of the preferred alternative will be evaluated based on public comments received. The selected alternative in the ROD Amendment may differ from the preferred alternative presented in this proposed

plan based on regulator and stakeholder comment. The ROD Amendment will provide specific details of future actions at UEFPC.

Conclusion. Based on available information, DOE believes that the preferred alternative to construct and operate the proposed 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 other alternatives with respect to the balancing and modifying criteria. DOE expects the preferred alternative to satisfy the following statutory requirements of CERCLA § 121(b): (1) to be protective of human health and the environment, (2) to comply with ARARs or invoke a waiver under CERCLA § 121(d)(4), (3) to be cost effective, (4) to use permanent solutions and alternate treatment technologies to the maximum extent practicable, and (5) to satisfy the preference for treatment as a principal element; as well as the NCP preference to use treatment to address principal threats posed by a site, wherever practicable [40 CFR 300.430 (a)(1)(iii)(A); 40 CFR 300.430(f)(1)(ii)(E)].

The preferred alternative has been evaluated against seven of the nine CERCLA evaluation criteria (see the box on page 33 for description of these criteria). Consistent with DOE policy, NEPA values also are incorporated in this evaluation. In summary, the preferred alternative 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 Phase I ROD for the recreational AWQC in-stream standard for mercury would not be impacted by this decision and would remain in effect. It 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 preferred alternative includes treatment of UEFPC surface water to reduce the toxicity, mobility, or volume of contaminants. The implementability of the preferred alternative is straightforward and relies on standard construction techniques and water treatment technologies. There are available disposal locations for all wastes generated by the proposed actions. The capital costs of the preferred alternative are estimated at $146 million and the total present value cost at approximately $185 million.

The preferred alternative to modify the Phase I selected remedy to achieve further reductions in mercury releases to surface water in UEFPC is only one part 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 2014b) 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. Consistent with the adaptive management approach, the *Strategic Plan* is expected to evolve as results of implemented actions are obtained and evaluated, and modifications may be proposed as necessary. The *Strategic Plan* will be updated as necessary to remain effective in organizing and focusing those efforts to define the work, reduce costs and increase efficiencies where possible, and to ultimately achieve the goal of cleaning up mercury from the Y-12 site.

Similarly, the new water treatment system constructed under this preferred alternative also 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 FFA parties initially will monitor the treatment system performance for a period of two years, and then evaluate potential system modifications relative to other potential response actions to achieve further mercury reductions to UEFPC surface water.

The new water treatment facility at Outfall 200 will be designed to supplement other response actions already underway or planned for future implementation under the 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* which are separate from the actions being conducted under the Phase I ROD.

NATURAL RESOURCE DAMAGES

Hazardous substances known to be above risk-based levels for unrestricted use will remain onsite at the UEFPC under the proposed action. However, no unacceptable risk to human health or the environment would exist for the current and anticipated future land use of DOE-controlled industrial use.

It is recognized by DOE, TDEC, and EPA that Natural Resource Damage claims, in accordance with CERCLA, could be applicable. This proposed plan only addresses partial restoration or rehabilitation of any natural resource injuries that might have occurred. DOE has agreed to fund a pilot study of the Watts Bar Operable Unit that will examine natural resource issues and could prove to be a model for addressing these issues in the future. In the interim, neither DOE nor TDEC waives any rights or defenses they may have under CERCLA Sect. 107(1)4(c).

COMMITMENT TO STEWARDSHIP

This proposed remedy will result in leaving hazardous material on-site that will remain hazardous for thousands of years. DOE is committed to maintaining necessary land use controls to ensure that unacceptable exposures do not occur (DOE 2003). Consistent with its commitment, DOE has agreed in a 1999 Memorandum of Understanding with EPA and TDEC to implement certain facility-wide periodic site inspection, certification, and notification procedures set forth in the ORR LUCAP (DOE, EPA, and TDEC 1999). As provided in the LUCAP, details for implementing and maintaining all land use controls included in the response action encompassed by this proposed plan will be specified by DOE in a LUCIP submitted for regulatory approval as part of post-ROD documentation, the remedial design work plan. Upon final approval, the LUCIP will establish land use control implementation and maintenance requirements enforceable under CERCLA and the FFA (DOE 1992). Certain aspects of this proposed remedy and other decisions on the ORR may need to be re-evaluated following decisions by DOE, TDEC, EPA, and local stakeholders regarding implementing an effective stewardship program.

COMMUNITY PARTICIPATION

DOE, EPA, and TDEC encourage the public to review this document and other relevant documents in the Administrative Record file to gain an understanding of the proposed cleanup actions for the Upper East Fork Poplar Creek. A copy of this proposed plan, as well as the entire Administrative Record file, is located at the DOE Information Center. The telephone number is (865) 241-4780. Hours for the center are Monday through Friday, 8 a.m. to 5 p.m.

Community involvement is critical to the CERCLA process. The SSAB, a citizen's panel, has helped facilitate this community involvement. The SSAB End Use Working Group has been involved in developing end use recommendations for UEFPC and the ORR. This decision is part of a phased approach for remediation of UEFPC, and decisions for remediation of groundwater and final land use controls have been deferred to a future document. Nevertheless, this decision is consistent with achieving the final land use recommended by the End Use Working Group.

DOE will schedule a public meeting to discuss cleanup alternatives and to address questions and concerns the public may have

about all alternatives. DOE has established a 45-day public comment period, which allows the public time to review the document and submit comments on the preferred and other alternatives. DOE will document, evaluate, and respond to comments as part of the subsequent ROD Amendment. Comments may be addressed to FFA Project Manager, Office of Environmental Management, DOE Oak Ridge Office, P. O. Box 2001, Oak Ridge, Tennessee 37831.

The preferred alternative identified in this proposed plan represents a recommended remedial action – i.e., construction of a new water treatment facility to treat discharges from the WEMA storm sewer system at Outfall 200 – to supplement the actions already included in the Phase I ROD selected remedy to achieve further reductions in mercury concentrations in UEFPC surface water and mercury releases to the offsite environment. This proposed plan provides stakeholders the information necessary to determine if action is warranted at the UEFPC and to provide comments on the potential alternatives. DOE will select the remedial actions after all comments are considered. DOE, EPA, and TDEC will consider all comments and suggestions before the remedial action alternative for additional remedial actions for UEFPC is selected and documented.

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GLOSSARY

Applicable or relevant and appropriate requirement (ARAR)—Those cleanup standards and other substantive requirements, criteria, or limitations promulgated under federal or more stringent state environmental or facility siting laws that are either legally "applicable" or "relevant and appropriate" to the hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at the CERCLA site.

Baseline risk assessment—An assessment that evaluates the potential threat to human health and the environment in the absence of any remedial action. Provides basis for determining if remedial action is necessary and justification for performing remedial actions.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)—The federal law that establishes, among other requirements, a program for parties (including federal agencies) for identifying, investigating and, if determined necessary, remediating inactive site/facilities contaminated with a hazardous substance, pollutant, or contaminant. It is also known as the "Superfund law."

Contaminants of concern (COCs)—Chemicals and radioactive contaminants that pose an unacceptable risk to a human or ecological receptor.

Contamination plume—A column of contamination with measurable horizontal and vertical dimensions that is dissolved and moves with groundwater.

Deactivation/Decontamination and Demolition (D&D)—The removal of radioactive and hazardous contaminants from a facility, and disassembly and removal of the facility.

Ecological receptors—Animals or plants potentially exposed to contaminants in the environment.

Feasibility study (FS)—The step in the CERCLA process in which alternatives for remediation of a contaminated site are developed and evaluated. A focused feasibility study is performed when the scope is limited or the number of options is limited.

Groundwater—Underground water that fills pores in soils or openings in rocks to the point of saturation.

Hazard index (HI)—An index used to evaluate risk to human health from noncarcinogenic substances. The daily intake over a specified time period is compared to a reference dose. An HI applies to all chemicals added together. A hazard quotient (HQ) is the same idea applied to a single contaminant.

Low-level (radioactive) waste (LLW)—Under DOE Order 435.1 Radioactive Waste Management, radioactive waste that is not high-level waste, transuranic waste, spent nuclear fuel, by-product material [as defined in Section 11(e) of the AEA of 1954, as amended], or naturally occurring radioactive material as defined in the Order.

Monitoring—The ongoing collection of information about the environment that helps gauge the effectiveness of a cleanup action.

National Environmental Policy Act of 1969 (NEPA)—A federal law that requires federal agencies to consider and evaluate environmental impacts associated with any significant proposed actions or activities. For CERCLA actions undertaken by the DOE, any impacts (i.e., NEPA values) associated with the proposed action are considered along with other factors required to be evaluated.

Potable groundwater—Groundwater that is suitable for drinking water

Proposed Plan—The formal document in which the lead agency identifies its preferred alternative for remedial action, explains why this alternative was preferred, and solicits comments from the public.

Record of Decision (ROD)—The formal document in which the lead agency sets forth the selected remedial action and the reasons for its selection.

Resource Conservation and Recovery Act of 1976 (RCRA)—A federal law that established, among other requirements, a regulatory system for tracking hazardous waste from the time it is generated until disposal occurs. The law required EPA to promulgate regulations addressing the treatment, storage, and disposal of hazardous waste that are considered protective of human health and the environment. These regulations (including the State counterparts) may be ARARs for the management of remediation wastes that are also considered hazardous under RCRA.

Sampling—A collection of analytical data to support one of the following activities: (1) Design: supports further identification of boundaries of excavation, (2) WAC: supports demonstration of compliance with a disposal facility's waste acceptance criteria, (3) Confirmation: supports determination of sufficient excavation in an area, and (4) Verification: supports demonstration that remediation levels throughout an exposure unit have been met.

ACRONYMS

AEA	Atomic Energy Act of 1954
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
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	*Code of Federal Regulations*
COC	contaminant of concern
D&D	Deactivation/Decontamination and Demolition
DNAPL	dense, non-aqueous phase liquid
DOE	U.S. Department of Energy
EFPC	East Fork Poplar Creek
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
GRA	general response action
HI	hazard index
HQ	hazard quotient
LEFPC	Lower East Fork Poplar Creek
LLW	low-level (radioactive) waste
LUC	land use control
LUCAP	Land Use Control Assurance Plan
LUCIP	Land Use Control Implementation Plan
MCL	maximum contaminant level
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
O&M	operations and maintenance
ORNL	Oak Ridge National Laboratory
ORR	Oak Ridge Reservation
PCB	polychlorinated biphenyl
PPE	personal protective equipment
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act of 1976
RI	Remedial Investigation
ROD	record of decision
S&M	surveillance and maintenance
SARA	Superfund Amendments and Reauthorization Act of 1986
SSAB	Site Specific Advisory Board
TBC	to be considered
TDEC	Tennessee Department of Environment and Conservation
TSCA	Toxic Substances Control Act of 1976
UEFPC	Upper East Fork Poplar Creek
VOC	volatile organic compound
WAC	waste acceptance criteria
WEMA	West End Mercury Area
Y-12	Y-12 National Security Complex

UPPER EAST FORK POPLAR CREEK
PUBLIC COMMENT SHEET

DOE is interested in your comments on the alternatives being considered in the *Proposed Plan for Supplemental Mercury Abatement Actions under the Record of Decision for Phase I Interim Source Control Actions in the Upper East Fork Poplar Creek Characterization Area, Oak Ridge, Tennessee,* including the preferred alternative. The mailing address is preprinted on the back of this form. You may use this form to submit your comments. We must receive your comments on or before the close of the public comment period. If you have questions, please contact Mr. John Michael Japp, FFA Project Manager; Oak Ridge Office of Environmental Management; U. S. Department of Energy, P. O. Box 2001, Oak Ridge, TN 37831; (865) 241-6344.

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Name: _____

Address: _____

City: _____ State/Zip: _____

Phone: _____

MAILING LIST ADDITIONS:

Please add my name to the Environmental Management Program mailing list to receive additional information on the progress at the Oak Ridge Reservation: ☐ Yes ☐ No

DOE/OR/01-2661&D2

Place
stamp
here

Mr. John Michael Japp, FFA Project Manager
Oak Ridge Office of Environmental Management
U.S. Department of Energy
P. O. Box 2001
Oak Ridge, TN 37831

APPENDIX A

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS AND TO-BE-CONSIDERED GUIDANCE FOR THE PREFERRED ALTERNATIVE

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Table A.1. Applicable or relevant and appropriate requirements and to-be-considered guidance for the preferred alternative for modification of the UEFPC Phase I ROD selected remedy.

Requirements	Citations
CHEMICAL-SPECIFIC	
Must achieve in-stream general water quality criteria for release of wastewater or effluents into surface water.	TDEC 0400-40-03-.03 **– applicable**
Must limit radiation exposure to individual members of the public not to exceed a total TEDE of 0.1 rem/year (100 mrem/year). Must use, to the extent practicable, procedures and engineering controls based on sound radiation protection principles to achieve doses ALARA	TDEC 0400-20-05-.60(1) **– relevant and appropriate**
LOCATION-SPECIFIC	
General requirements—all proposed activities in or near archaeological resources, critical habitat, aquatic resources, wetlands, and floodplains	
Must protect aquatic resources	TCA 69-3-108(b)(1)(j); 40 *CFR* 230.10(a) to (d); 40 CFR 230 Subpart H – **applicable**; 16 USC 662(a) – **relevant and appropriate** TDEC ARAP Program General Requirements - **TBC guidance**
Must avoid construction in floodplains	10 *CFR* 1022.3(a), (b), (c), and (d); 10 *CFR* 1022.13(a)(3); 10 CFR 1022.14(a) - **applicable**
ACTION-SPECIFIC	
General construction standards—all land-disturbing activities (e.g., site preparation, soil excavation, debris removal)	
Must control fugitive dust emissions	TDEC 1200-03-08-.01(1) and (2) - **applicable**
Must comply with NESHAP for radionuclide emissions from DOE facilities	40 *CFR* 61.92; TDEC 1200-03-11-.08(6) - **applicable**
Must implement stormwater runoff controls during construction	TCA 69-3-108(1); TDEC 0400-40-07-.01 – **applicable** TDEC General Permit No. TNR10-0000 – **TBC guidance**
Must meet requirements for construction of outfall structures for discharge of wastewater	TCA 69-3-108(1); TDEC 0400-40-07-.01 – **applicable** TDEC General Permit for Construction of Intake and Outfall Structures – **TBC guidance**
Must meet requirements for discharge of treated wastewater	40 CFR 261.4(a)(2); TDEC-0400-12-01-.02(1)(d)(1)(ii); 40 CFR 268.1(c)(4)(iv); TDEC 0400-12-01-.10(1)(a)(3)(iv)(IV); TDEC 0400-4-5-.08 - **applicable**
Must meet requirements for radionuclide air emissions from water treatment off-gas system	TDEC 1200-03-09-.01(1)(d) and (f); 40 CFR 61.93(b)(4)(i); TDEC 1200-03-11-.08(6) - **applicable**
Waste generation, characterization, segregation, and storage—excavated soil/waste/debris, secondary wastes	
Must meet generator requirements for characterization and management of solid and hazardous waste	40 *CFR* 262.11(a–d); 40 *CFR* 264.13(a)(1); 40 *CFR* 268.7(a) and .9(a); TDEC 0400-12-01-.03(1)(b)(1) to (4); 0400-12-01-.06(2)(d); 0400-12-01-.10(1)(g)(1) and (i)(1) - **applicable**
Must meet requirements for temporary storage and staging of RCRA waste	40 *CFR* 262.34(a)(1) to (3); TDEC 0400-12-01-.03(4)(e)(2); 40 *CFR* 262.34(c)(1); TDEC 0400-12-01-.03(4)(e)(5); 40 *CFR* 264.175(a) and (c); TDEC 0400-12-01-.06(9)(f); 40 CFR 265.171-173; and TDEC 0400-12-01-.05(9)(c) and (d); - **applicable**
Management of PCB-contaminated waste or PCB/radioactive waste must be in accordance with the storage requirements of Subpart D of TSCA	40 *CFR* 761.50(a) and (b)(7)(i) and (ii); 40 *CFR* 761.61; 40 *CFR* 761.65(b)(2) and (c) - **applicable**

Table A.1. Applicable or relevant and appropriate requirements for the preferred alternative, UEFPC (continued)

Requirements	Citations
Treatment and Disposal of waste	
RCRA-restricted characteristic waste is not prohibited from land disposal if such waste is managed in a treatment system that subsequently discharges to waters of the United States pursuant to a permit issued under Sect. 402 of CWA	40 *CFR* 268.1(c)(4)(i); TDEC 0400-12-01-.10(1)(a)(3)(iv)(IV) - **applicable**
Must meet land disposal requirements before disposal of hazardous waste (e.g., contaminated soils and sediments)	40 *CFR* 268.40(a) and (e); TDEC 0400-12-01-.10(3)(a); 40 *CFR* 268.1(c)(4)(iv); TDEC 0400-12-01-.10(1)(a)(3)(iv); 40 *CFR* 268.44; TDEC 0400-12-01-.10(3)(e); 40 *CFR* 268.49(b); TDEC 0400-12-01-.10(3)(j)(2) - **applicable**
Must meet requirements for disposal of PCB remediation waste, PCB bulk product waste, PCB decontamination wastes, etc.	40 *CFR* 761.61(a)(5), (b)(1)-(2), and (c); 40 *CFR* 761.79(g) - **applicable**
Shall deposit RACM as soon as possible at an approved disposal site	40 *CFR* 61.150(a)(4), (b)(1) and (2); TDEC 1200-03-11-.02(j)(2) - **applicable**
Must satisfy requirements for disposal of universal waste	40 CFR 273.33; TDEC 0400-12-01-.12(3)(d)) - **applicable**
Transportation	
Must comply with packaging and transport requirements for hazardous materials (including radioactive materials), hazardous waste, and PCB waste	40 *CFR* 262.10(h); 40 *CFR* 263.10(a); TDEC 0400-12-01-.03(1)(a)(8); 0400-12-01-.04(1)(a)(1); 49 *CFR* 171.1(c); 40 *CFR* 761.207(a); 40 *CFR* 262.20(f); TDEC 0400-12-01-.03(3)(a)(6); 40 CFR 273.38; TDEC 0400-12-01-.12-(3)(i); 40 CFR 279.24; TDEC 0400-12-01-.11(3)(e) - **applicable**

ARAP = Aquatic Resources Alteration Permit
CFR = *Code of Federal Regulations*
CWA = Clean Water Act
DOE = U.S. Department of Energy
LLW = low-level (radioactive) waste
NESHAP = National Emission Standards for Hazardous Air Pollutants
NPDES = National Pollutant Discharge Elimination System
PCB = polychlorinated biphenyl
PPE = personal protective equipment
RACM = Regulated Asbestos Contaminated Material
RCRA = Resource Conservation and Recovery Act of 1976
TBC = to be considered
TCA = *Tennessee Code Annotated*
TDEC = Rules of the Tennessee Department of Environment and Conservation
TSCA = Toxic Substances Control Act of 1976
TWRCP = Tennessee Wildlife Resources Commission Proclamation
U.S.C. = *United States Code*
WAC = waste acceptance criteria

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REVIEW COMMENT AND RESOLUTION MATRIX

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Comment Number	**Page/ Section**	**Comment**	**Resolution**
General 1	-	Note: these comments on the D1 include review and comment on redline changes made to the D1R1 in June, after the Dispute Resolution Agreement.	DOE appreciates EPA's expedited review of the D1/R1 Proposed Plan.
General 2	-	Describe, where appropriate, how treatment residuals will be managed on site or off site in a manner consistent with NCP Section 300.440.	Text added to describe management of treatment residuals in the Description of Preferred Alternative section (page 43).
Specific 1	Page 2, Contents	Suggest including as an inset box on page 2.	Revised as requested.
Specific 2	Page 2, Introduction	In the first partial sentence, please add the following text after "within the framework of": "and in order to satisfy the public participation requirements of."	Revised as requested.
Specific 3	Page 3, Figure 1	Please add "Characterization Area" to the title of Figure 1 in order to be consistent with the text on page 2. Without it, it might suggest to the reader that the "Characterization Area" is some subset of the area on Figure 1.	Revised as requested.
Specific 4	Page 2, Introduction	In the second full paragraph, second sentence, please delete the word "interim".	Per follow-up discussion, DOE would prefer to retain this term here for description of the source control actions selected in the Phase I ROD.
Specific 5	Page 4, Introduction	In the second full paragraph, last sentence, it probably makes more sense to change "now suggest" to "suggested" in order to convey that those studies provided the direction to evaluate the alternatives in a Focused Feasibility Study for Outfall 200	Revised as requested.
Specific 6	Page 4, Introduction	In the fourth full paragraph, please revise the first sentence to read, "The proposed plan is being published to solicit public review and comment on all alternatives presented in the *Focused Feasibility Study for Supplemental Mercury Abatement Actions under the Record of Decision for Phase I Interim Source Control Actions in the Upper East Fork Poplar Creek Characterization Are* (DOE 2015) and on the rationale for the Preferred	Revised as requested.

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		Alternative for modification of the selected remedy in the Phase I ROD to construct a new water treatment facility."	
Specific 7	-	(No Comment 7)	NA
Specific 8	Page 4, Introduction	Include here also a brief discussion responsive to NRRB Recommendations that are edited in later sections.	Inserted in paragraph identifying the NRRB review and general results.
Specific 9	Page 5, Introduction	In the last paragraph, please add "and EPA" after the first appearance of "DOE" in order the capture the remedy selection roles described in CERCLA 120(e)(4).	Revised as requested. (Also inserted "and TDEC" for completeness.)
Specific 10	Page 5, Scope of Proposed Action	Include here also a brief discussion responsive to NRRB Recommendations that are edited in later sections.	Per follow-up discussion, text added for Comment 8 adequate addresses Comment 10.
Specific 11	Page 6, Site Background	In the second paragraph, please revise the second sentence by adding "and groundwater" after "releases to surface water."	Revised as requested.
Specific 12	Page 9, Previous Actions, EU-9	Remove "…no action is required for groundwater and surface water protection." If retained, include discussion of residual mercury remaining in subsoils that are a Principal Threat Source.	Revised as requested.
Specific 13	Page 10, Previous Actions, EEVOC Plume	East End VOC Plume Removal Action - Include the date of the Action Memorandum and the type of removal action (e.g., emergency). Include a reference to the Removal Action Work Plan or other document describing the removal action implementation plan, including operations and maintenance (O&M).	The requested information on the date and type of removal action has been inserted. Reference citations for previous actions were included in the FFS but were not included in the abbreviated descriptions in the PP for purposes of brevity. This Removal Action Report (DOE/OR/01-2297&D1) was approved in 2006, and the ongoing monitoring results are summarized each year in the RER.
Specific	Page 11, Previous	Removal of Mercury from Storm Sewer System - Include a reference to the Removal Action Work Plan or other document describing the removal action	Reference citations for previous actions were included in the FFS but were not included in the

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Comment Number	**Page/ Section**	**Comment**	**Resolution**
14	Actions	implementation plan.	abbreviated descriptions in the PP for purposes of brevity. This Removal Action Report was approved in 2014 (DOE/OR/01-2595&D1).
Specific 15	Page 11, Previous Actions	Mercury Secondary Pathways Project - Include a reference to the CERCLA documentation for this project.	Reference citations for previous actions were included in the FFS but were not included in the abbreviated descriptions in the PP for purposes of brevity. This PCCR was approved in 2014 (DOE/OR/01-2596&D1).
Specific 16	Page 11, Previous Actions	Mercury Soils Treatability Study - Although the soils were successfully treated during the study, the ESD description on page 9 describes eliminating this study. This should be clarified.	The ESD eliminated the Phase I ROD requirement to conduct a treatability study for in-situ treatment of 81-10 area soils based on the results of a characterization study for these soils. The treatability study referenced here was conducted for ex-situ soil treatment for disposal.
Specific 17	Page 13, Summary of Site Contamination	Reference the work plan and O&M plan.	Text has been added to reference the DOE-ORR Groundwater Strategy (DOE/OR/01-2628&D2) and the EFPC-CR Watershed Comprehensive Monitoring Plan (DOE/OR/01-2466&D3).
Specific 18	Page 15, Site-Related Risk	Include discussion responsive to NRRB Recommendation on principal threat waste. Specifically, include discussion of the strategy for addressing mercury as a principal threat source, including mercury sources residing in stream bed sediments both above and below Station 17.	Revised as requested.
Specific 19	Page 15, Site-Related Risk	Please add the following text at the end of the third full paragraph. "After the waters from EFPC leave the Oak Ridge Reservation, EFPC has also been designated an "impaired water" under Section 303(d) of the Clean Water Act, and is also posted to prevent fishing. The ability of those postings to prevent fishing is less certain than the portions of UEFPC and EFPC "on-Reservation."	Revised as requested.
Specific	Page 15, RAOs	This discussion includes a statement: "…reduce the frequency with which OF200 discharges would bypass the facility without treatment." Include the	Revised as requested.

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20		statement: "This reduction of frequency was evaluated among the alternatives considered based on data that was from 2010 that was considered to be a normal year of precipitation."	
Specific 21	Pages 17-18, RAOs	Table 1 - In Sub-watershed RAO number 1, please revise "under base-flow conditions and some degree of stormwater flow" to "under base-flow and stormwater conditions." Please revise similar in the body of the Proposed Plan also on page 17 and elsewhere.	Revised as requested.
Specific 22	Page 18, RAOs	Expand the discussion to identify the other actions planned currently in Appendix J related to mercury response actions in UEFPC.	Text has been added to clarify that the proposed treatment facility would supplement other actions but would not modify or eliminate any other previously selected actions.
Specific 23	Page 17, RAOs	Please remove the word "interim" from the last paragraph, first sentence (and anywhere else in the Proposed Plan where the word "interim" is used similarly).	Revised as requested.
Specific 24	Page 21, Summary of Remedial Alternatives	Include a statement that reducing the frequency of storm events that bypass the treatment and or storage system is a part of the objectives.	Revised as requested.
Specific 25	Page 26, Summary of Remedial Alternatives	The August 2014 D1 version lists 6300 g/yr and 52% mercury performance/flux reduction. The June 2015 D1R1 version lists 1600 g/yr with the same % flux reduction. Describe the basis for the change.	This change reflects the results of the mercury flux modeling study completed in 2015, which is correctly referenced, and represents best available information. Earlier flux estimates were referenced to the conceptual design report.
Specific 26	Page 26, Summary of Remedial Alternatives	The costs increased by $19 M from the August D1 to the June D1R1. Describe the basis for the change.	Cost estimates have been revised for consistency with the DOE CD-1 documentation, and are higher than estimates previously derived from the conceptual design report.
Specific	Page 28, Summary of	The August 2014 D1 version lists 7800 g/yr and 65% mercury performance/flux reduction. The June 2015 D1R1 version lists 2100 g/yr with	This change reflects the results of the mercury flux modeling study completed in 2015, which is

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27	Remedial Alternatives	the 68% flux reduction. Describe the basis for the change.	correctly referenced, and represents best available information. Earlier flux estimates were referenced to the conceptual design report.
Specific 28	Page 28, Summary of Remedial Alternatives	The costs increased by $20 M from the August D1 to the June D1R1. Describe the basis for the change.	Cost estimates have been revised for better consistency with the DOE CD-1 documentation, and are higher than estimates previously derived from the conceptual design report.
Specific 29	Page 29, Summary of Remedial Alternatives	Remove "up to" in the first sentence.	Revised as requested.
Specific 30	Page 29, Summary of Remedial Alternatives	In the discussion of capture "most storm events." Include a discussion of the estimated frequency of storm events, based on the 2010 average year precipitation data, that could be expected to exceed the system capacity and would bypass the treatment system on an average year. This discussion could be in the first paragraph or in the third paragraph at the top of the right column.	Revised as requested.
Specific 31	Page 30, Summary of Remedial Alternatives	The updated D1R1 version includes a reference to the 1-year 24 hour storm. Also include a description of the frequency of bypass for this alternative and alternatives 2a and 2b.	Revised as requested.
Specific 32	Page 32, Summary of Remedial Alternatives	The August 2014 D1 version lists 10,500 g/yr and 87% mercury performance/flux reduction. The June 2015 D1R1 version lists 2800 g/yr with the 91% flux reduction. Describe the basis for the change.	This change reflects the results of the mercury flux modeling study completed in 2015, which is correctly referenced, and represents best available information. Earlier flux estimates were referenced to the conceptual design report.
Specific 33	Page 32, Summary of Remedial Alternatives	The costs increased by $49 M capital and $29 M present value from the August D1 to the June D1R1. Describe the basis for the change.	Cost estimates have been revised for better consistency with the DOE CD-1 documentation, and are higher than estimates previously derived from the conceptual design report.

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Comment Number	**Page/ Section**	**Comment**	**Resolution**
Specific 34	Page 34, Table 3	In the fourth row (MTV), include grams/year removed and % flux reduction.	Revised as requested.
Specific 35	Page 35, Overall Protection of Health and Environment	Reword the sentence: "All action alternatives would achieve protection of human health and the environment through treatment of UEFPC surface water, and differ only with respect to the 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" to: All action alternatives would achieve protection of human health and the environment through treatment of for the water that is captured, treated and discharged to UEFPC surface water	Revised as requested.
Specific 36	Page 36, Compliance with ARARs	At the end of the third full paragraph, last sentence, please add the following, "or could involve any other actions which would ensure achieving the action-specific ARAR."	Revised as requested.
Specific 37	Page 39, Table 4	Please add, "headworks capture capacity of 40,000 gpm" to the text in the left-hand column.	Revised as requested.
Specific 38	Page 39, Description of Preferred Alternative	Remove "up to" at the two locations in this paragraph.	Revised as requested.
Specific 39	Page 42, Description of Preferred Alternative	Include a discussion of the estimated frequency of storm events, based on the 2010 average year precipitation data, that could be expected to exceed the system capacity and would bypass the treatment system on an average year.	Revised as requested.
Specific 40	Page 44, Overall Protection of Health and Environment	Include a discussion of the estimated frequency of storm events, based on the 2010 average year precipitation data that could be expected to exceed the system capacity and would bypass the treatment system on an average year.	Revised as requested.

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Specific 41	Appendix A, Table A-1	Please remove this table. The Proposed Plan does not generally include an ARARs table. The ARARs for the selected remedy will be memorialized in the Record of Decision, utilizing the format that was used in the Focused Feasibility Study (based on the *CERCLA Compliance with Other Laws Manual.* Interim Final, EPA, 1988.	Table A-1 is consistent with previously approved DOE-OREM proposed plans. The comment is correct that ARARs will be finalized in the ROD Amendment. The ARARs are also included in the proposed plan for purposes of completeness. This abbreviated format is normally used in DOE-OREM proposed plans, while the expanded tabulation is used in the FS and ROD.

REVIEW COMMENT AND RESOLUTION MATRIX

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Cmnt Number	**Page/ Section**	**Comment**	**Resolution**
General 1	Pg. 2-1 & 2-2, Sec. 2.2	*The Remedial Action Objectives (RAOs) for this evaluation of remedial alternatives needs to be revised consistent with EPA's feedback provided during Project Team scoping meetings*. Attached please find our comments on the RAOs in the form of redline revisions.	DOE appreciates the detailed suggestions for revision of this section. The discussion of RAOs has been revised to incorporate the greater specificity suggested by this comment. The revisions to the RAOs proposed in this comment have been incorporated with minor modifications and also reflect the recent inter-agency agreement. Regarding suggested sub-watershed RAO #5, results from the pre-design studies for stormwater diversion and non-stormwater diversion did not identify significant opportunities for diversions that would significantly impact the treatment system design, so this suggested RAO may not be appropriate. Regarding suggested sub-watershed RAO #6, DOE prefers to include discussion of this topic in the text rather than in the list of RAOs. The OF200 water treatment facility would provide benefits for reducing potential contaminant releases from future D&D and remedial actions at WEMA, but this source has not been specifically evaluated in the conceptual design of the treatment facility to date, but would be evaluated during the planning for these future actions as additional characterization data become available.

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Cmnt Number	**Page/ Section**	**Comment**	**Resolution**
General 2	-	The document is not consistent in describing whether an Interim ARAR Waiver will be required for the treated effluent discharged from the OF 200 treatment plant. Several sections refer to the Phase I ROD ARAR waiver at Station 17 needing to be continued for the scope of this response action (e.g., Executive Summary, Section 3.3, Section 5.2.2.6, Section 5.3.1.2, Section 5.3.4 and Table 5.2). However, in other sections of the document, it appears that DOE ORR's position is that a waiver may not be needed (e.g., Section 5.2.2.2, Section 5.2.3.2, and Section 5.2.4.2*). This FS should be clear throughout as to whether the alternatives will or will not meet ARARs.* EPA agrees that the scope of this response action will contribute toward meeting the Phase I ROD goal of achieving a 200 ppt mercury concentration level in the UEFPC surface water migrating offsite. However, EPA does not agree that the Phase I ROD watershed Interim ARAR waiver for the recreational in-stream ambient water quality criterion (AWQC) of 51 ppt for mercury is necessary or appropriate for the specific ARARs for the OF 200 water treatment plant for three primary reasons. First, as noted in the comment above and as described by DOE during several Project Team scoping meetings, the OF 200 treatment plant effluent discharge is expected to meet 51 ppt for mercury for the primary treatment components and with common industry treatment technologies, including a final stage treatment technology of granular activated carbon). EPA supports the use of a contingency remedy to deploy the final treatment stage, if necessary, based on an initial period of operation monitoring of the primary treatment stage. Second, the treatment of contaminated water in the treatment plant and its subsequent discharge is an action that is not considered interim for which an Action Specific ARAR waiver is appropriate. The treated water will migrate offsite and will not be available for any subsequent final treatment to meet 51 ppt as a part of an action under any final remedy. Moreover, discharging treated effluent to levels greater than 51 ppt for mercury that migrates in surface	The OF200 water treatment facility, if selected and constructed, would be designed to reduce mercury to 51 ng/L in the treated effluent. The interim waiver previously approved in the Phase I ROD for the AWQC in-stream standard for mercury would not be affected and would remain in effect. Text in the FFS and Proposed Plan documents has been revised to more clearly indicate that no new ARAR waivers would be requested, but the previously approved waiver would remain in effect. As noted in this comment, mercury concentrations in fish tissue have not been observed to decrease over time commensurate with the reduction of mercury concentrations in UEFPC surface water. Ongoing and future studies may provide a better understanding of this apparently complex relationship between mercury concentrations in surface water and in fish tissue. The new water treatment facility at OF200, if selected and constructed, would be only one component of the comprehensive mercury remediation program for Y-12 that ultimately would attain reductions in mercury concentrations consistent with the AWQC in-stream standard and target levels in fish.

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		water offsite does not meet 40 CFR 300.430(a)(ii) NCP Program Management Principle that an interim remedy "not be inconsistent with the final remedy." The FFA parties have agreed that the final remedy will achieve 51 ppt for mercury in UEFPC surface water. Discharge of treated effluent greater than this AWQC standard is inconsistent with the anticipated final remedy. Finally, Figure 2.1 shows that despite a historical reduction in mercury flux in water, fish concentrations have remained steady or have increased slightly. Given this lack of response in fish uptake similar to the downward trend in water and the listing of the creek as an impaired water body under Section 303(d) of the Clean Water Act for mercury, *further mercury inputs into the stream should not be allowed to exceed the legally required AWQC standard*. The current uncertainty in the relationship of the water column concentration trend as compared to fish uptake trend has not been demonstrated by DOE ORR as the basis for waiving the AWQC discharge standard. Longer term studies may reveal that the final cleanup goal should be lower than the AWQC to achieve the desired fish uptake goal.	
General 3	Pg 3-26, Fig. 3.3	Figure 3.3 includes activities to "Implement Feasible Diversions" of water run on that will be an important role in designing the feasible storm water runoff treatment capacity. *EPA views the planned and ongoing six pre-design studies and the resultant implementation of diversion of water inputs that add to base and storm flow are key components of the OF 200 remedy evaluation and must be included in the feasibility study.*	Figure 3.3 (and also 3.4) was excerpted from the *Strategic Plan for Mercury Remediation at the Y-12 National Security Complex*, and was included in the D1 FFS only to illustrate that the proposed water treatment system at OF200 is only one component of the comprehensive remedial action program for mercury at Y-12. Results of the pre-design studies conducted in support of the conceptual design of the proposed OF200 water treatment system have been incorporated into the FFS and Proposed Plan. The stormwater and non-stormwater diversion studies did not identify opportunities for

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			stormwater diversion that would significantly impact the facility design. The stormwater characterization and mercury flux modeling studies helped to improve understanding of mercury flux at OF200.
General 4	Pg. 3-26, Fig. 3.3	Figure 3.3 includes additional studies that will lead to a "CERCLA Alternatives Evaluation." These activities are envisioned to be implemented within the current FFA Appendix E and first two years of the current FFA Appendix J time schedules. EPA expects a milestone for a FFA Primary Document work plan to define these studies and the schedule leading to a feasibility study report for subsequent response actions. In response to this comment *provide a plan to modify Appendix E and J for these activities.*	Figure 3.3 (and also 3.4) was excerpted from the *Strategic Plan for Mercury Remediation at the Y-12 National Security Complex*, and was included in the D1 FFS only to illustrate that the proposed water treatment system at OF200 is only one component of the comprehensive remedial action program for mercury at Y-12. The future CERCLA Alternatives Evaluation is outside the scope of this FFS.
General 5	-	The FFS does not indicate if the proposed alternatives are flexible enough to accommodate a final remedy that would meet the AWQC for mercury and effectively manage base flow water inputs, including storm water. The Executive Summary states, "The system design also would be configured to maintain flexibility and expandability to accommodate scaling up of treatment capacity, treatment processes, and/or storm water retention, as needed and if warranted by future conditions." However, the FFS does not present an outline for this future, final remedy and as such it is not clear if any of the proposed alternatives could be used in this scenario. *Revise the FFS to present a more detailed description of how the proposed alternatives would fit in with a potential final remedy for the site.* Also, the FFS does not present adequate alternatives for storm water storage. For example, Section 3.3.2, Alternative 2 – Water Treatment at Outfall 200, indicates	DOE agrees that it is appropriate to add another alternative with stormwater storage capacity less than 10 million gallons, to provide a more complete range of alternatives. The FFS and Proposed Plan have been revised to include this additional alternative. The new water treatment facility at OF200, if selected and constructed, would be only one component of the comprehensive mercury remediation program for Y-12. This facility would supplement the interim source control actions selected in the Phase I ROD. Operation of the new water treatment facility would continue until mercury releases from Y-12 to

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		that the large variability in stream flow is one of the primary challenges in designing a water treatment facility for UEFPC; however, one potential solution to this design issue, storm water storage, is only part of one alternative (Alternative 2c). As the large variability in stream flow is one of primary challenges of the design, it appears the additional alternatives should include storm water storage. *Revise the FFS to include additional alternatives for storm water storage and an explanation for why any alternative would not include storm water storage, given the large variability in stream flow.*	UEFPC have declined to levels that no longer require treatment – that is, completion of these source control actions may reduce mercury releases to the point to the point where this treatment facility is no longer needed, at which time the facility would be decommissioned. The OF200 water treatment system may or may not be a part of the final remedy for UEFPC, which has yet to be determined.
General 6	-	Page 1-24 lists other surface water COCs [e.g. PCBs] for which discharge ARARs may be needed.	The current treatment system design has been developed specifically for removal of mercury. No other COCs in UEFPC surface water currently exceed acceptable levels. The referenced text summarizes findings of the RI report, and has been revised for clarification.
General 7	-	The FFS does not provide alternatives which meet the Tennessee ambient water quality criteria (AWQC) for mercury of 51 nanograms per liter (ng/L) at the site boundary (i.e., Station 17), the Y-12 National Pollutant Discharge Elimination System (NPDES) permit compliance point. While the FFS indicates that the level of mercury in surface water remains above desirable levels, none of the proposed treatment technologies and system configurations (i.e., alternatives) appears capable of capturing and treating all of the yearly Outfall 200 (OF200) discharge volume. As a result, even with the most robust alternative, the FFS indicates approximately 13% of the mercury flux would not be treated, and approximately 8% of the water would bypass the system without being treated. As such, it is not clear why a treatment system which meets the AWQC at Outfall 200 and Station 17 is not proposed or a clear path towards achieving this criterion is not included in the FFS. While it is understood that this is response action is expected to be a	The OF200 water treatment facility, if selected and constructed, would be designed to reduce mercury to 51 ng/L in the treated effluent. The interim waiver previously approved in the Phase I ROD for the AWQC in-stream standard for mercury would not be affected and would remain in effect. Under all action alternatives, some portion of the discharge from OF200 would bypass the treatment facility and would be discharged to UEFPC without treatment under some high flow conditions – that is, it would be cost prohibitive to construct a facility with treatment and storage

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		phased in approach to subsequent final remedial actions for the full scope of the watershed mercury cleanup strategy, a more comprehensive alternative(s) should be presented for this phase which meets AWQCs and is protective of human health and environmental. *Revise the FFS to present an alternative which meets the AWQC at Outfall 200.*	capacity sufficient for any possible storm event. All alternatives incorporate a modular and scalable design to allow for future increases in treatment and/or storage capacity if needed. All action alternatives are considered protective.
General 8	-	The FFS uses qualitative language to describe remedial goals 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/OR/01-1951&D3, dated 2002 (Phase I ROD); however, specific, *quantitative based goals should be referenced*. For example, the Executive Summary indicates that the after the previous actions under the Phase I ROD, the level of mercury in surface water remains above "desirable levels." Also, the FFS indicates that the actions evaluated to modify the Phase I ROD selected remedy are to achieve "further reductions" in mercury releases. For clarity, *the FFS should use quantitative descriptions of the goals of the Phase I ROD and for goals of the FFS. Revise the FFS to use quantitative goals for mercury levels in surface water which are protective of human health and the environment.*	The FFS has been revised to specify remediation goals in a more quantitative manner as requested. The RAO specified in the Phase I ROD is correctly stated (i.e., "to restore surface water to human health recreational risk-based values at Station 17"). While this FFS does not propose to change the watershed-level RAO from the Phase I ROD, it also specifies "sub-watershed" RAOs specific to the proposed water treatment facility that would contribute toward attainment of the Phase I ROD RAO, as suggested by EPA and TDEC.
General 9	Exec. Summary (etc.)	The Executive Summary describes the *Strategic Plan for Mercury Remediation at the Y-12 National Security Complex, Oak Ridge, Tennessee*, DOE/OR/01-2605&D2, dated 2014 (Strategic Plan) and adaptive management as part of the on-going process to reduce mercury in the Upper East Fork of Poplar Creek (UEFPC); however, *the Strategic Plan and adaptive management are not part of the Phase I ROD.* While it appears appropriate to reference the Strategic Plan and adaptive management, it should be clearly stated that these documents/approaches do not supersede the CERCLA process. *Revise the FFS to address this issue.*	This comment is correct that the *Strategic Plan* is not part of this FFS or the Phase I ROD. The *Strategic Plan* is discussed in this FFS only to illustrate that the proposed water treatment system at Outfall 200 is only one component of the comprehensive remedial action program for mercury at Y-12. Appropriate CERCLA documentation will be prepared for other components of the *Strategic Plan* as required, but is outside the scope of this FFS. The FFS has been revised to clarify this issue.

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General 10	Exec. Summary	The Executive Summary describes the remedial actions in the FFS as early actions; however, according to Section *8.2.1 Interim Actions Versus Early Actions of the Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents, dated July 1999 (ROD Guidance),* "Interim remedial actions should not be confused with 'early remedial actions.' 'Early', in this case is simply a description of when the action is taken in the Superfund process. Thus, an early action is one that is taken before the RI/FS for the site or operable unit has been completed." *Revise the Executive Summary to clearly indicate that the action proposed in the FFS is part of interim actions.*	DOE considers the interim source control measures selected in the Phase I ROD and the additional interim source control actions (i.e., additional water treatment at OF200) evaluated in this FFS to be CERCLA interim actions. The FFS has been revised to correct this terminology and eliminate the term "early action" (except where that term is part of the title for that action).
General 11	-	The FFS does not describe the path towards, or timetable for, achieving the long-term goal of attainment of the Tennessee AWQC for mercury in surface water throughout the UEFPC watershed. The Executive Summary states, "This RAO [Remedial Action Objective] 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 Tennessee ambient water quality criteria (AWQC) for mercury." However, the completion of Phase I Interim ROD response actions was originally scheduled to be completed in 2016 and to be followed with a final Remedial Investigation Work Plan in 2017 and a final Upper East Fork Poplar Creek Surface Water ROD in 2018 (See FFA Appendix J April 15 2004). As such, it is not clear why the FFS does not refer to or propose FFA schedules for completing the interim action (e.g., require an Remedial Investigation/Feasibility Study (RI/FS) Work Plan for completing the RI/FS and select a final action) and not leave meeting the AWQC for mercury to an indeterminate future time. It is noted that Figure 3.4, Strategic Schedule for Mercury Cleanup at Y-12, indicates a Surface Water ROD is expected in the 2025 timeframe. *Revise the FFS to present the path forward, and timetable for, achieving the long-term goal of attainment of the Tennessee AWQC for mercury at Station 17 that is consistent with the current Appendix E and J.*	The scope of this FFS is limited to an interim source control action (i.e., treatment of the discharge from the WEMA storm sewer system at OF200) to supplement the source control actions previously selected under the Phase I ROD to further reduce mercury releases to UEFPC surface water. The schedules originally presented in the Phase I ROD for completion of the Phase I interim source control actions have been delayed due to funding constraints, construction logic, and other factors. Schedules and plans for completion of remedial actions at UEFPC may be updated as needed through appropriate documentation. The *Strategic Plan* is outside the scope of this FFS, and is discussed in this FFS only to illustrate that the focused scope of this FFS is only one component of the comprehensive remedial action program for mercury at Y-12.

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General 12	-	The performance objective for mercury in surface water (200 ng/L) at OF 200 proposed in the FFS does not appear to be appropriate. As there is an established AWQC for mercury, it is not clear why a series of alternatives was not developed to meet this criterion *Revise the FFS to include alternatives that meet the AWQC standards for all COCs.*	The OF200 water treatment facility, if selected and constructed, would be designed to reduce mercury to 51 ng/L in the treated effluent. The interim waiver previously approved in the Phase I ROD for the AWQC in-stream standard for mercury would not be affected and would remain in effect. Otherwise, all action alternatives considered in this FFS would meet all ARARs.
General 13	Pg. 1-14 to 1-16, Sec. 1.1.5	Section 1.1.5, Integrated Mercury Strategy for Y-12, indicates studies are underway to evaluate methods to reduce the volume of baseflow and stormwater sewer contributions reaching the new treatment facility, with a goal of ultimately reducing the volume of water requiring treatment; however, these studies are critical to effect the development of alternatives in the FFS. For example, a significant reduction in flow might allow for a more comprehensive treatment system that does not require significant bypass. *Revise the FFS to discuss the implications of these future studies on selection of the remedy.*	Results of the pre-design studies conducted in support of the conceptual design of the proposed OF200 water treatment system have been incorporated into the FFS and Proposed Plan. The stormwater and non-stormwater diversion studies did not identify opportunities for water diversion that would significantly impact the facility design. The stormwater characterization and mercury flux modeling studies helped to improve understanding of mercury flux at OF200.
General 14	Pg. 2-1 & 2-2, Sec. 2.2	The RAO presented in the FFS lacks detail. Section 4.1.2.1 (Development and Screening of Alternatives) of the Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (EPA/540/G-89/004), dated October 1988 (RI/FS Guidance) states that RAOs should specify the contaminants and media of interest, exposure pathways, and preliminary remediation goals that permit a range of treatment and containment alternatives to be developed. However, the RAO presented in Section 2, Remedial Action Objectives, lacks sufficient detail. Specifically, the contaminants and exposure pathways are not presented. In addition, the basis for the preliminary remediation	The FFS and Proposed Plan have been revised to discuss the RAOs in greater detail as suggested by this comment and General Comment 1. The OF200 water treatment facility, if selected and constructed, would be designed to reduce mercury to 51 ng/L in the treated effluent. The interim waiver previously approved in the Phase I ROD for the AWQC in-stream standard for mercury would not be affected and would remain

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		goal (i.e., 200 ng/L) is not supported by calculations and a technical basis is not presented for not using the AWQC of 51 ng/L. As such, a range of treatment and containment alternatives to be developed cannot be adequately identified. *Revise the FFS to provide clearly defined RAOs that specify the contaminants and media of interest, exposure pathways, and preliminary remediation goals that permit a range of treatment and containment alternatives to be developed.*	in effect.
General 15	-	The FFS makes reference to the "first flush" theory on several occasions; however, the FFS does explain why this theory is important or provide data to support the theory. It is noted that Appendix F (Dry Weather Flow and Wet Weather Flow Water Characterization Testing Results) of the Final Conceptual Design for Outfall 200 Mercury Treatment Facility, dated January 18, 2013 (CDR), presents the first flush theory which suggests that early in a storm event and later in the storm event's discharge cycle, the filterable (>0.45 micron) suspended particulate fraction diminishes, and the unfilterable (<0.45 micron) mercury concentrations rebound from the initial dilution during the storm peak. However, *this theory appears to be based on a limited data set from relatively smaller storm events.* The treatment technologies and system configurations presented in the FFS are directly impacted by whether or not the first flush theory is accurate. For example, if the mercury concentration and total suspended solids (TSS) do spike at the beginning of a storm event, an OF200 system can be designed to target this occurrence. However, insufficient data is currently provided to substantiate that the first flush theory is occurring during small and large storm events. *Revise the FFS to provide information to substantiate that the first flush theory is occurring during small and large storm events, and how this influences the proposed alternatives.*	The "first flush" theory – i.e., the enhanced release of mercury during the early stages of storm events – is suggested by available monitoring data for UEFPC and empirical observations during storm events. The stormwater characterization and mercury flux modeling studies conducted in support of the conceptual design of the proposed OF200 water treatment system 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, and confirm the first flush effect. These studies estimated 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. Approximately 65% of the total mercury and 69% of the total suspended solids mass released during a storm event was estimated to occur in the runoff from the 60-minute period surrounding the hydrograph peak during the

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			early phase of the storm. However, these studies also estimate that approximately 68% of the annual mercury flux but only 18% of the total suspended solids flux is estimated to occur during dry weather (base-flow) conditions with the remainder associated with storm events. Results of these studies have been incorporated into the FFS and Proposed Plan.
General 16	-	The FFS does not indicate if the proposed treatment system designs account for increased mercury loading from future demolition activities. As the FFS describes future demolition activities that may increase the mercury loading on the proposed alternatives for surface water treatment systems, it appears that the FFS should describe how this factor is included in the treatment system designs. *Revise the FFS to include information on how the proposed alternatives account for increased mercury loading from future demolition activities.*	The FFS has been revised to provide additional discussion of this potential future source. The proposed water treatment system at Outfall 200 may provide benefits for control of potential releases of contaminants from future WEMA D&D actions; however, this source has not been specifically evaluated in the conceptual design for the treatment system. The future WEMA remediation actions will include comprehensive contamination control measures and best management practices to minimize any release of contaminants. The facility would provide additional protection against potential contaminant releases to UEFPC, but the effectiveness of treatment would be evaluated during the planning for these future WEMA projects as additional characterization data become available. The modular design of the water treatment system would facilitate any changes that might be needed.

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General 17	-	The basis for the requested extension of the interim applicable or relevant and appropriate requirement (ARAR) waiver for the AWQC for mercury of 51 ng/L is not clear. As there appear to be treatment technologies available to meet this criterion, the basis for the continuation of the interim waiver is unclear. *Revise the FFS to provide additional information to support the requested extension of the interim ARAR waiver*.	The OF200 water treatment facility, if selected and constructed, would be designed to reduce mercury to meet the AWQC standard of 51 ng/L in the treated effluent. The interim waiver previously approved in the Phase I ROD for the AWQC in-stream standard for mercury would not be affected and would remain in effect.
General 18	-	The problem(s) to be addressed by the FFS are inconsistently, and potentially inaccurately, defined. Similarly, the RAOs, as they relate to addressing the problem(s) at hand, are unclear. For example, according to Section 1.2.1, Problem Summary, the FFS problems include "releases of mercury to Upper East Fork of Poplar Creek [UEFPC] surface water from shallow groundwater discharge, storm sewers, and other sources remain above interim and long-term goals." However, review of the FFS indicates that groundwater contamination (groundwater-to-surface water discharges) is not being addressed at this time. As such, it appears that the FFS problem summary in Section 1.2.1 warrants revision or additional clarification. In addition, Section 3, Screening of Remedial Action Technologies and Development of Alternatives, states that "the primary problem addressed in this FFS is exposure of human recreational receptors to ingestion of fish containing unacceptable levels of mercury due to the presence of mercury in UEFPC surface water and sediment as well as exposure of ecological receptors to mercury." However, the RAOs presented in Section 2.2, Remedial Action Objectives, do not address exposures to ecological receptors. As such, it is unclear if and how ecological receptor exposures will be addressed. *Revise the FFS to consistently present the problems to be addressed by the remedial alternatives presented in the FFS. In addition, revise the RAOs such that they address all of the problems at hand*.	DOE appreciates the identification of potential inconsistencies pointed out in this comment. The FFS has been revised to describe the site problems with greater consistency. The scope of this FFS is a highly focused interim action to reduce mercury releases from OF200 to UEFPC surface water. This interim action is only one component of a much larger multi-faceted remedial action program for UEFPC. Mercury concentrations in UEFPC surface water do not present an unacceptable risk to human receptors due to the administrative controls already implemented to prevent fish ingestion. Studies are underway to develop a better understanding of potential risks to ecological receptors, but these studies are outside the scope of this FFS. The RAOs for this interim action are not intended to address ecological risks, although the reduction in mercury releases that would result from this action could be beneficial to ecological receptors.

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General 19	-	It is unclear how the alternatives (i.e., Alternative 2 – Water Treatment at Outfall 200 and the associated sub-alternatives) presented in the FFS were developed based on the process options discussed in Section 3.2.2, Evaluation of Remaining Process Options. According to Section 4.2.6, Assemble Alternatives, of the RI/FS Guidance, "In assembling alternatives, general response actions and the process options chosen to represent the various technology types for each medium or operable unit are combined to form alternatives for the site as a whole." As discussed in Section 3.2.2 of the FFS, various institutional controls options, containment options, removal options, treatment options, and disposal options were carried forward as representative process options, and Section 3.3, Development and Description of Alternatives, states that "remedial alternatives have been developed to help achieve the RAO using process options identified in Section 3.2;" however, based on the descriptions of the alternatives presented in Section 3.3, it appears that numerous process options which were supposedly carried forward were actually screened out. The screening process which resulted in the alternatives that were developed is not discussed. In addition, it is noted that the last paragraph of Section 3.3 states that "the remediation strategy for the alternatives considered in this FFS focuses on ex situ treatment of surface water for mercury removal." *The FFS should be revised to more clearly discuss how the alternatives reflect the process options retained. It is recommended that a table be provided which summarizes and supports this discussion. Revise the FFS accordingly.*	This section has been revised to focus more narrowly on only those technologies and process options directly relevant to the proposed water treatment facility, as also suggested in a TDEC comment, and also to directly reference and incorporate the screening of treatment technologies conducted for the conceptual design report. Similarly, Section 3.3 has been revised to better describe how the screening of technologies and process options is carried forward into the development of alternatives for this highly focused interim action. (Note: Some of the text previously located in Section 3.3 describing the earlier evaluations of alternatives in the UEFPC FS and FS-Addendum leading to the Phase I ROD has been moved to Section 1.2 for better readability and logic flow.)
General 20	Sec. 5.3 & Table 5.3	The comparative analysis of alternatives presented in Section 5.3, Comparative Analysis of Alternatives, and on Table 5.2, Comparative Analysis of Remedial Alternatives, is not sufficiently detailed to allow for a meaningful distinction between alternatives. Page 55 FR 8719 of the Preamble of the National Contingency Plan (NCP), Section 300.430(e)(9), Detailed analysis of alternatives, states, "the purpose of the detailed analysis is to objectively assess the alternatives with respect to nine evaluation criteria that encompass statutory requirements and	The comparative analysis section has been revised to better describe the relative merits of each alternative and to clarify the issues identified in this comment. Due to the highly focused scope of this interim action, all action alternatives share many common characteristics and differ only in the system treatment capacity

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		include other gauges of the overall feasibility and acceptability of remedial alternatives (53 FR 51428). This analysis is comprised of an individual assessment of the alternatives against each criterion and a comparative analysis designed to determine the relative performance of the alternatives and identify major trade-offs (i.e., relative advantages and disadvantages) among them. The decision-maker uses information assembled and evaluated during the detailed analysis in selecting a remedial action." In addition, the RI/FS Guidance states in Section 6.2.5, Comparative Analysis of Alternatives, "[a]n effective way of organizing this section is, under each individual criterion, to discuss the alternative(s) that performs the *best overall* in that category, with other alternatives discussed in the *relative order in which they perform* [emphasis added]…the presentation of differences among alternatives can be measured either qualitatively or quantitatively, as appropriate, and should identify substantive differences." Further discrimination between factors is needed to make this process transparent to the public and regulatory agencies. *Revise the FFS to provide a system of rating using a ranking scale that allows for differentiation (i.e., use a range of terminology and identify the differentiating features) so that a straightforward determination of the relative performance of the alternatives and identification of major trade-offs can be made. In addition, ensure that the assessment clearly indicates the alternative(s) that performs the best overall in each category.*	and stormwater storage capacity. Given the commonalities among these alternatives, the relative differences with respect to the CERCLA evaluation criteria shown in this comparative analysis are relatively small. DOE has attempted to present the comparative analysis for this FFS in a level of detail that is appropriately graded for the very limited scope of this focused interim action and consistent with FS documents previously approved for other DOE-OREM CERCLA actions.
General 21	-	The FFS states that Alternative 2 (Water Treatment at Outfall 200) includes monitoring of influent and effluent; however, additional details of the proposed monitoring program are not provided. For example, the frequency of monitoring is not discussed, nor is the analyte list. As such, it is unclear if the remedial alternatives were appropriately scoped and costed so as to reflect a -30%/+50% margin as allowed for during the FS process. *Revise the FFS to provide the details of the proposed monitoring program.*	The text has been revised to provide additional description of monitoring requirements. Additional details of the monitoring requirements will be presented in the subsequent ROD Amendment and post-ROD documentation, consistent with standard practice for the DOE-OREM remedial action program.

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General 22	-	The assessment of long-term effectiveness and permanence in the FFS is inconsistent with the RI/FS Guidance. The analysis to be conducted as part of the assessment of this criterion should focus on any residual risk remaining at the site after the completion of the remedial action. The assessment is to include consideration of the degree of threat posed by the hazardous substances remaining at the site and the adequacy and reliability of any controls (e.g., engineering or institutional controls) used to manage the hazardous substances remaining at the site. *Revise the FFS to discuss the long-term effectiveness of each alternative in terms of the magnitude of residual risk and the adequacy and reliability of controls.*	The FFS has been revised to provide additional discussion of the long-term effectiveness and permanence of each action alternative as requested. The scope of this FFS is a highly focused interim action to reduce mercury releases from Outfall 200 to UEFPC, and this interim action is only one component of a comprehensive remedial action program for UEFPC. Future response actions for removal of primary sources of mercury contamination in the UEFPC watershed may reduce mercury releases to the point where the proposed treatment facility may no longer be needed, at which time it would be decommissioned.
General 23	-	The assessment of reduction in toxicity, mobility, or volume through treatment lacks sufficient detail. For example, according to Section 6.2.3.4, Reduction of Toxicity, Mobility, or Volume Through Treatment, of the RI/FS Guidance, the assessment should discuss factors such as the amount of hazardous materials that will be destroyed or treated and the degree of expected reduction in toxicity, mobility, or volume measured as a percentage of reduction (or order of magnitude). *Revise the FFS to provide a more detailed assessment of reduction in toxicity, mobility, or volume through treatment for each sub-alternative in accordance with the RI/FS Guidance.*	The FFS has been revised to provide additional discussion of the treatment effectiveness for each alternative. All action alternatives meet the NCP preference for treatment, and incorporate treatment technologies for permanent removal of mercury from UEFPC surface water. All alternatives would be constructed using common treatment technologies with a modular design to promote future enhancement of treatment efficiency and/or capacity if needed.
General 24	-	According to Section 6.2.3.5, Short-Term Effectiveness, of the RI/FS Guidance, the evaluation of short-term effectiveness should include a discussion of the amount of time until protection against the threats being addressed by the alternative will be achieved, when any remaining site threats will be addressed,	The FFS has been revised to provide additional discussion of short-term effectiveness. Due to the commonalities among the action alternatives, the differences with respect to short-term

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		and when remedial response objectives will achieved. The assessments of short-term effectiveness for each sub-alternative do not address these issues. *Revise the FFS to include a discussion of these items in the evaluation of short-term effectiveness.*	effectiveness are relatively small. The scope of this FFS is a highly focused interim action to reduce mercury releases from Outfall 200 to UEFPC, and this interim action is only one component of a comprehensive remedial action program for UEFPC.
General 25	-	The FFS does not assess the environmental effects of the proposed remedial alternatives in accordance with Green Remediation: Incorporating Sustainable Environmental Practices into Remediation of Contaminated Sites (EPA 542-R-08-002), dated April 2008 (EPA Green Remediation Guidance) or Methodology for Understanding and Reducing a Project's Environmental Footprint (EPA 542-R-12-002), dated February 2012 (EPA Environmental Footprint Guidance). For example, energy consumption, greenhouse gas emissions (carbon dioxide, methane, and nitrous oxides), pollutant emissions (carbon monoxide, oxides of sulfur, oxides of nitrogen, and particulate matter), water consumption, ecological impacts/change in resource use, resource consumption, and worker safety are not used to evaluate the environmental footprint of the remedial action alternatives. *Revise the FFS to meet the level of detail specified in the EPA Green Remediation Guidance and EPA Environmental Footprint Guidance.*	The FFS has been revised to reference EPA and DOE policies to incorporate sustainability principles into the remediation decision-making process. If the construction of this new water treatment facility is ultimately approved, the final facility design, construction, and operation would further reflect these principles. The scope of this FFS is a highly focused interim action to reduce mercury releases from Outfall 200 to UEFPC, and is only one component of a comprehensive remedial action program for UEFPC.
General 26	Sec. 1.2.1.3	As discussed in Section 1.2.1.3, Summary of Site Risks, the baseline human health and ecological risk assessments were developed as part of the UEFPC RI in 1998. Given that the risk assessments were conducted in 1998, the FFS should discuss pertinent updates to risk assessment methodology and toxicological criteria, as well as the sources of uncertainty and the impact on the quantitative estimates of risk and hazard. *Revise the FFS accordingly.*	This section has been revised to discuss changes in the risk assessment methodology and toxicological criteria for mercury since the RI was issued. A revision of the baseline human health risk assessment is outside the scope of this FFS.
Specific 1	Pg. xii, Exec.	The text states, "All action alternatives also would be expected to achieve all chemical-specific, location-specific, and action-specific ARARs, with the exception of the AWQC for mercury, for which the interim waiver approved in the	No new waivers of ARARs are requested in this FFS. The OF200 water treatment facility, if selected and constructed, would be designed to

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	Summary	Phase I ROD would need to be continued for the near-term." However, the term "near term" is not defined. As such, it is not clear how long the waiver would be required if one were to be granted. *Revise the FFS to provide a timetable for compliance with AWQC if an extension of the interim ARAR waiver were granted.*	reduce mercury to meet the AWQC standard of 51 ng/L in the treated effluent. The interim waiver previously approved in the Phase I ROD for the AWQC in-stream standard for mercury would not be affected and would remain in effect.
Specific 2	Pg. 1-18, Sec. 1.2	This section states, "The Building 9201-2 water treatment system (designated the Big Spring Water Treatment System, BSWTS) has been very successful in reducing mercury releases from this major source area. Mercury flux to UEFPC from Outfall 51 has been reduced from approximately 2-4 g/d to less than 1 g/d." However, in addition to comparing the performance to mercury flux, it appears the effluent discharge mercury concentrations should be discussed. *Revise Section 1.2 to include a discussion of the effluent concentrations from BSWTS.*	The text has been revised as requested to describe the ongoing monitoring of mercury concentrations in BSWTS effluent.
Specific 3	Pg. 1-23, Fig. 1.6	It is not clear if this figure presents a complete conceptual site model (CSM). For example, all surface water sources from the West End discharge through OF200; however, given the complicated nature of the site and stormwater system, it is not clear if this is accurate. In addition, this figure appears outdated as it still shows flow augmentation. Further, this figure shows a number of small downstream sources after OF200; however, this issue is not discussed as part of the remedial alternatives presented in the FFS. *Revise this figure to clarify if all surface water sources from the West End discharge through OF200 and remove flow augmentation from the figure. Also, include a discussion of smaller sources downstream of OF200 in the description and evaluation of the alternatives in the FFS.*	Figure 1.6 depicts the current conceptual site model for UEFPC, as developed by ORNL through a conceptual model study conducted during 2008-2011. This figure has been revised to indicate the termination of flow augmentation. More extensive revision of the CSM is not necessary for the limited scope of this interim action and is outside the scope of this FFS.
Specific 4	Pg. 3-15, Sec. 3.2.2.7	This section states, "existing treatment facilities designed for mercury removal (e.g., BSWTS, CMTS [Central Mercury Treatment System]) do not have sufficient excess treatment capacity for UEFPC surface water;" however, details on the CMTS are not provided in the FFS. As such, it is not clear if the capacity	The text has been revised to include the requested information regarding CMTS. (Note: The referenced text now has been moved from Section 3 to Section 1.2.2, which now describes

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		of BSWTS and CMTS is sufficient to treat UEFPC surface water. For clarity, *revise the FFS to provide a short summary on the CMTS.*	the actions previously implemented under the Phase I ROD.)
Specific 5	Pg. 3-20, Table 3.2	This table does not present planned dates for the UEFPC sediment/soil removal or the Lake Reality sediment removal. Both are indicated in the table as "20??". *Revise this table to included estimated dated for both of these removal activities.*	This table has been revised as requested.
Specific 6	Pg. 3-22, Sec. 3.3.2	This section indicates that the system design would be configured to accommodate scaling up of the treatment capacity and stormwater retention; however, it does not indicate if the system would be scalable to accommodate processing and treatment of all stormwater flow through OF200. *Revise this section to indicate if the proposed systems would be scalable to accommodate processing and treatment of all stormwater flow through OF200, and an estimate of what this conceptual system would include*.	The treatment system will incorporate a modular and scalable design that will be amenable to future modification as needed. However, since stormflow is a stochastic event, it would never be possible to design a system to capture all possible storm events. The text has been revised to clarify these issues.
Specific 7	Pg. 3-22, Sec. 3.3.2	This section states, "UEFPC is characterized by a relatively low baseflow in the range of 800 to 1000 gpm during dry conditions, with significantly increased flow during storm events, peaking as high as 40,000 gpm or more (up to 86,000 gpm);" however, a reference to the source of this data is not provided. For clarity, *revise this section to provide a reference to the source of this data*.	This text has been revised as requested.
Specific 8	Pg. 3-22, Sec. 3.3.2	This section states, "Influent flows greater than 1500 gpm but less than 3000 gpm would flow through the grit removal system and then be discharged to UEFPC without further treatment;" however, this section does not summarize or quantify the benefit of grit removal only on flows from 1,500 gpm to 3,000 gpm. To allow for a full evaluation of the alternatives, *revise this section to quantify the benefit of grit removal only on flows from 1,500 gpm to 3,000 gpm in Alternative 2a.*	The FFS has been revised to note the potential benefit of this grit removal system in Alternative 2a for streamflow greater than 1500 gpm and less than 3000 gpm in a qualitative manner. However, data are not yet available to quantify this additional mercury reduction.
Specific 9	Pg. 3-23, Sec. 3.3.2	This section states, "storage capacity is approximately equivalent to water volume generated by the 1-year 6-hour storm event;" however, a reference to the source of this data is not provided. For clarity, *revise this section to provide a reference to the source of this data.*	The text has been revised to include the appropriate reference for this information.

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Specific 10	Pg. 4-1, Sec. 4.2	This section indicates that future modifications to the treatment system may include granular activated carbon (GAC); however, it is not clear why this modification is not part of the existing alternatives. Since GAC as part of the treatment train will likely reduce mercury effluent concentration, it is not clear why it is not proposed as part of the FFS alternatives. *Revise this section to clarity why GAC is not part of the treatment train, or alternatively include GAC as part of the treatment train*.	All action alternatives in this FFS are designed such that effluent polishing using GAC can be added in the future if needed. GAC is considered as a potential future add-on for each alternative, if needed, rather than a stand-alone alternative based on the conceptual design screening which determined that precipitation/coagulation technology would be preferable and to promote a fair comparison of the alternatives. The FFS has been revised to better clarify this rationale.
Specific 11	Pg. 5-20, Sec. 5.3.2.1	Section 5.3.2.1 states that all sub-alternatives would be effective in the long term; however, it is unclear which sub-alternative is considered to be the most effective in the long-term overall. Given that Alternative 2c has the highest water capture and mercury removal rates, it appears that this sub-alternative is the most effective in the long-term as the magnitude of remaining risk will be the lowest overall as a result of its implementation. It is recommended that the discussion of long-term effectiveness be revised to include a ranking of each sub-alternative with respect to how each meets the factors associated with the long-term effectiveness criterion. Table 5.2, Comparative Analysis of Alternatives, should be similarly revised. *Revise the FFS accordingly*.	Section 5.3.2.1 and Table 5.2 have been revised to better describe the alternatives with respect to long-term effectiveness. All action alternatives utilize the same unit processes for treatment, and differ only with respect to treatment capacity and stormwater storage capacity, differences in long-term effectiveness are relatively minor. This water treatment system may be decommissioned in the future following completion of other response actions. While the actual water treatment facility may or may not be a component of the final remedy, mercury would be permanently removed from UEFPC surface water during treatment operations.
Specific 12	Pg. 5-21, Sec. 5.3.2.4	Section 5.3.2.4 states that all sub-alternatives would be technically feasible to implement; however, it is unclear which sub-alternative is considered to be the most easily implemented. Given that Alternatives 2a and 2b appear to include less complex treatment systems, it appears that these alternatives would be more easily	Section 5.3.2.4 and Table 5.2 have been revised to better differentiate the alternatives with respect to implementability. All action alternatives utilize the same unit processes for

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		implemented than Alternative 2c. It is recommended that the discussion of implementability be revised to include a ranking of each sub-alternative with respect to how each meets the factors associated with the implementability criterion. Table 5.2, Comparative Analysis of Alternatives, should be similarly revised. *Revise the FFS accordingly*.	treatment and differ only with respect to treatment capacity and stormwater storage capacity. Further, all action alternatives utilize only established and readily available treatment technologies, use readily available equipment and materials, and use standard construction equipment and techniques. Therefore, differences in implementability among the alternatives are relatively minor.
Specific 13	Pg. 5-24, Table 5.2	According to Section 5.3.2.2, Reduction of Toxicity, Mobility, and Volume Through Treatment, Alternative 2c would provide the greatest reduction in toxicity, mobility, and volume; however, this is not reflected in Table 5.2. *Revise Table 5.2 to state that Alternative 2c would provide the greatest reduction in toxicity, mobility, and volume compared to that of the other sub-alternatives.*	Section 5.3.2.2 and Table 5.2 have been revised to better differentiate the alternatives with respect to reduction of toxicity, mobility and volume through treatment. Since all action alternatives utilize the same unit processes for treatment, and differ only with respect to treatment capacity and stormwater storage capacity, differences in reduction of toxicity, mobility and volume through treatment among the alternatives are relatively minor.
Specific 14	Pg. A-10, Table A.1	Table A.1 on page A-10 contains the following statement: "[*The most stringent applicable AWQC for mercury – a recreational organisms-only criterion of 51 ng/L – was waived under the UEFPC Phase I ROD and an interim risk-based goal of 200 ng/L was set.]" Please remove this text from the table, and add it to the descriptive text in Section A.1.1 under "Surface Water" on page A-4. Further, please add the following text of the end of this quoted language: The AWQC criteria was waived in the Phase I Interim ROD because that Interim ROD included surface water remediation as part of the scope in a phased approach to evaluating the nature and extent of contamination, to determining*	The suggested revisions have been incorporated with minor modification. DOE agrees that the TDEC AWQC standard for mercury is an ARAR that ultimately must be attained by the remedial action program in UEFPC. No new waivers of ARARs are requested in this FFS. The OF200 water treatment facility, if selected and constructed, would be designed to reduce mercury to meet the AWQC standard of

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		the risks, and to selecting and implementing remedial actions of all media at Y-12 (UEFPC). At the time that the Phase I IROD was signed, DOE and the regulators waived the surface water quality chemical-specific 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 IROD. This FFS documents one of those actions that is intended to capture and treat mercury sources at Y-12.	51 ng/L in the treated effluent. The interim waiver previously approved in the Phase I ROD for the AWQC in-stream standard for mercury would not be affected and would remain in effect.
Specific 15	Pg. A-7, A.1.3	Please add the following description to Section A.1.3 under "Water Treatment": *This supplemental action seeks to evaluate an additional "discrete phase" to those that have been and will be implemented within the scope of the Phase I IROD. As described in the Remedial Action Objectives (Section 2.2), the actions evaluated in this FFS are intended to capture, treat and discharge waters that flow through certain areas covered by the Phase I ROD and to "pick up" mercury-contaminated soil and sediment. Because this water will be treated to remove the mercury prior to discharge waters into UEFPC, the requirements that are applicable to discharges of treatment system effluent into waters of the United States are applicable to this action and will not be waived. Meeting these applicable action-specific requirements are consistent with and will assist in meeting the in-stream chemical-specific AWQCs in the final Record of Decision for UEFPC.*	The suggested revisions have been incorporated with minor modification. DOE agrees that the TDEC AWQC standard for mercury is an ARAR that ultimately must be attained by the remedial action program in UEFPC. No new waivers of ARARs are requested in this FFS. The interim waiver previously approved in the Phase I ROD for the AWQC in-stream standard for mercury would not be affected and would remain in effect.
Specific 16	Pg. A-18, Table A.3	*Please add the following action-specific requirements to the ARARs table* (Table A.3). To the degree that they overlap with already cited state requirements that are not more stringent than the federal requirement, it is acceptable (as has been done in this document) to include the federal and state citation in the same row.	Table A.3 has been revised to incorporate the suggested additions as appropriate. Specifically, the citation of 40 CFR 122.44 has been added (first two entries suggested in this comment). Other suggested entries are considered by DOE to be administrative requirements or do not exist in the current CFR (40 CFR 125.100 and 125.104) and have not been added. Consistent with OSWER 9234.2-05/FS, "if a State is authorized to implement a program in lieu of a

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			Federal agency, State laws arising out of that program constitute ARARs instead of the Federal authorizing legislation", DOE holds that the current ARAR citations are consistent with TDEC Water Quality Control Act requirements.

REVIEW COMMENT AND RESOLUTION MATRIX

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General Comments		
-	Evaluation of effectiveness of Outfall 200 treatment must include measuring concentrations of total mercury (total and dissolved) and methyl mercury (total and dissolved) at influent, effluent, and plant bypass during a range of stormflow and dry weather events, sufficient to establish a statistically significant data set.	DOE agrees that comprehensive monitoring will be needed to evaluate performance. Additional discussion of monitoring requirements has been added to the FFS and Proposed Plan. Additional details of the performance monitoring requirements will be specified in the ROD Amendment and post-ROD documentation.
-	Outfall 200 Mercury Treatment Plant (OF200 MTP) was discussed by FFA Parties Environmental Program Counsel (EPC) on October 23, 2014. During that discussion, TDEC referenced Focused Feasibility Study (FFS) Figure 3.4, "Strategic Schedule for Mercury Cleanup at Y-12" and noted Beta 4 Complex D&D begins about FY2020/2021 during the OF200 MTP Assessment of Operations and Attainment of Goals. TDEC questions the schedule and noted the proposed remedial design and remedial action objectives are not sufficient to prevent mercury release during West End Mercury Area (WEMA) D&D and the schedule does not include time to secure funding and upgrade the OF200 MTP, as necessary, to prevent mercury release during WEMA D&D. Ms. Susan Cange, Acting Oak Ridge EM Manager, responded for DOE that D&D of WEMA is not scheduled to begin for another 10 years and that the goal is to build something that is modular and scalable, and could be modified in the future to address the large flux of mercury from WEMA D&D. Ms. Cange stated that the OF200 MTP was never intended to be a stand-alone remedy and the schedule is misleading since there will be one or two years of deactivation to prepare the buildings for D&D. Ms. Cange also stated that the schedule for WEMA D&D would be pushed back because DOE cannot perform OF200 MTP upgrade and D&D at the same time. Ms. Laura Wilkerson further stated that DOE has not yet	Figure 3.4 was excerpted from the *Strategic Plan for Mercury Remediation at the Y-12 National Security Complex*, DOE/OR/01-2605&D2, and was included in the D1 FFS only to illustrate the fact that the new water treatment facility at Outfall 200, if selected and constructed, would be only one component of the comprehensive remedial action program for mercury at Y-12. The schedule of activities is subject to change over time due to funding constraints and other factors. However, DOE agrees that the new OF200 water treatment facility, if selected, should be operating in compliance with its design standards prior to the WEMA D&D actions. The FFS and Proposed Plan have been revised to better clarify the potential benefit of the OF200 water treatment facility in the future WEMA D&D actions. While the future WEMA D&D actions will include comprehensive contamination control

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	worked out how releases will be controlled during WEMA D&D and will not know until the contractor is on board. Ms. Cange concluded that the OF200 MTP establishes a trajectory to reduce mercury in water and to allow DOE to better prepare to put in place control measures for D&D. Please update the FFS and Proposed Plan to include the process, schedule and commitment to upgrade the OF200 MTP prior to WEMA D&D.	measures and best management practices to minimize any release of contaminants during these response actions, the OF200 water treatment facility could provide an additional level of protection against potential contaminant releases to UEFPC. However, this source has not been specifically evaluated in the conceptual design for the treatment system, but would be evaluated during the planning for these future WEMA projects as additional characterization data become available. The modular design of the water treatment system would facilitate any changes that might be needed for additional COCs.
-	There have also been discussions in the team meetings and the EPC that several additional options should be evaluated. Please add these options and assure that all evaluated options have a far, balanced, and rigorous evaluation. For example, current option evaluations do not evaluate effectiveness of each option in assisting with implementing controls to eliminate release of mercury during WEMA D&D.	An additional alternative has been included to better capture the range of potential treatment and storage capabilities. Additional discussion of the effectiveness of the water treatment system constructed under each of the action alternatives for reducing potential releases from future WEMA D&D actions has been added. However, this source has not been specifically evaluated in the design of the treatment system.
-	The FFS Remedial Action Objectives include a cleanup standard for treatment and has no standard for what bypasses the treatment system. If DOE's current best evaluated option remains the selected alternative after reevaluation of alternatives, the proposed mercury treatment plant captures 95% UCL of base flow and some initial or first flush of small storms may be treated. Other storm flows would bypass. The amount of storm water capture and treatment should be a data driven decision and it is recognized that additional data is needed to base an informed decision of	Regardless of the treatment system design alternative ultimately selected, some degree of stormwater bypass will be required – that is, it would be cost prohibitive to design for the maximum possible storm event, even if such an entity could be defined. DOE agrees with TDEC's comment that data are needed to define the

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	the volume of storm water or portion of the hydrograph/pollute-graph needing capture and treatment to control mercury release during WEMA D&D. To assist in this determination and planning for actions to control mercury release during WEMA D&D, TDEC recommends that a combination of controls and capture and treatment sufficient to prevent release of mercury to Upper East Fork Poplar Creek be in place prior to WEMA D&D so that the combined OF200 MTP effluent and bypass be no greater than the ambient water quality criteria (51 ng/L).	optimal treatment capacity and storage capacity parameters. Results from the pre-design studies have provided additional data for this purpose, which are now incorporated in the FFS and Proposed Plan. The OF200 water treatment facility would be designed to reduce mercury concentrations in the treated effluent to meet the AWQC standard of 51 ng/L. While the OF200 water treatment facility would provide additional protection against potential contaminant releases to UEFPC from future WEMA D&D actions, this source has not been specifically evaluated in the conceptual design for the treatment system.
-	For the OF200 MTP, it is recognized that the ambient water quality criteria for mercury in surface water is 51 ng/L. Review of the DOE conceptual design document indicates the design should achieve the ambient water quality criteria. TDEC therefore will concur with DOE to build and test the concept design and to optimize the design to achieve greater reduction of mercury than in the concept design. However, prior to D&D of WEMA, TDEC expects a combined OF200 MTP effluent and bypass numerical standard. As DOE committed in the October 23, 2014 EPC discussion to upgrade the OF200 MTP, if needed, to control mercury release, TDEC expects the treatment plant will be upgraded, as needed, to achieve the combined treatment plant effluent and bypass numerical standard prior to WEMA D&D.	DOE agrees that the AWQC in-stream standard for mercury of 51 ng/L is an ARAR that should be attained by the comprehensive remedial action program for UEFPC. The OF200 water treatment facility would be designed to reduce mercury concentrations in the treated effluent to meet this standard. The interim waiver previously approved in the Phase I ROD for the AWQC in-stream standard for mercury would not be affected and would remain in effect. DOE agrees that the new OF200 water treatment facility, if selected, should be operating in compliance with its design standards prior to the WEMA D&D actions.

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Remedial Action Objectives	1. Capture base flow and stormwater runoff within WEMA to mitigate uncontrolled discharges of Hg (and other hazardous substances) into UEFPC. Capture the portion of stormwater runoff from WEMA that maximizes mercury flux reduction, to the greatest extent reasonable (e.g., it is expected that the initial storm flow period for all storm events represents the most significant mercury flux). 2. Store captured wastewater with a sufficient capacity to minimize mercury flux by-pass of the treatment unit under peak stormwater conditions. 3. Treat collected wastewater using best available treatment (BAT) technology prior to discharge into UEFPC. 4. Discharge treated effluent in compliance with ARARs (including 51ppt Hg effluent limit based upon AWQC) and at levels that are protective of the receiving water. It is TDEC's position that the Standard of Performance should be a treated effluent attaining 51 ng/L Total Mercury. The justification of this is that during base flow, the treated effluent becomes the entire stream flow and must meet TN Water Quality Criteria (WQC). The WQC for waters classified as Recreation – Organisms Only for mercury is 51 ng/L, established in 1999 based on EPA recommended national WQC. An effluent concentration of 51 ng/L is required as a Standard of Performance, defined by the TN Water Quality Control Act, and as interpreted in published WQC, stating: *The criteria and standards provide that all discharges of sewage, industrial waste, and other wastes shall receive he 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 (T.C.A. §§ 69-3-101, et seq.).*	DOE appreciates these detailed suggestions for revision of the RAOs. The RAO discussion in the FFS and Proposed Plan have been revised to incorporate the greater specificity suggested by this comment. The revisions to the RAOs proposed in this comment have been incorporated with minor modifications to reflect the recent dispute resolution agreement. Regarding suggested RAO #5, results from the pre-design studies for stormwater diversion and non-stormwater diversion did not identify significant opportunities for diversions that would significantly impact the treatment system design, so this suggested RAO may not be appropriate. Regarding suggested sub-watershed RAO #6, DOE prefers to include discussion of this topic in the text rather than in the list of RAOs. The OF200 water treatment facility would provide benefits for reducing potential contaminant releases from future D&D and remedial actions at WEMA, but this source has not been specifically evaluated in the conceptual design of the treatment facility to date, but would be evaluated during the planning for these future actions as additional characterization data become available.

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	Attainment of 51 ng/L total mercury daily maximum effluent limit is feasible, based on bench tests for treatability in DOE's Conceptual Design Report. Appendix H, Water Chemistry Evaluation and Modeling, concluded that attainment of AWQC was feasible through the design and routine operational adjustments. 5. Divert inflow of water into WEMA to minimize the amount of captured water requiring treatment before discharge. 6. Prevent the potential for increased contaminant releases to UEFPC during subsequent response action in the WEMA (e.g., Building D&D, Principal Threat Sources, Contaminated Soil).	
Specific Comments on the Focused Feasibility Study		
Page ix, Exec. Summary, 2nd ¶, 2nd sentence	Instead of stating "surface water remains above desirable levels", DOE should be more specific regarding surface water goals and standards.	The FFS has been revised to describe surface water goals with greater specificity throughout the document.
Page 1-7, Sec. 1.2, Soils/ Geology/ Hydrogeology	"The groundwater-surface water connections provide a route for mass transfer of contaminants from shallow groundwater to UEFPC and vice-versa." How is the project going to deal with this connection and is Mercury observed in the shallow groundwater?	The water treatment system evaluated under this interim action would deal with shallow groundwater only after its discharge to UEFPC. The stated connection is part of the site conceptual model, but is not specifically addressed by this interim action. Groundwater remediation is deferred to a future decision. The text has been revised to clarify these issues.
Page 1-15, Sec. 1.1.5, Integrated Mercury Strategy for Y-	"Completion of early action to reduce mercury releases from Y-12 from the average value of 18 grams per day measured over the last 7years at Station 17." Eighteen g/day roughly equates to 6570 g/y at Station 17. Now, there seems to be a lot of missing mercury between OF200 and Station 17. Sections 4.2.1, 4.2.2, and 4.2.3	This comment correctly observes the considerable uncertainty in mercury flux estimates. The text has been revised to better reflect such uncertainties in the mass/flux balance. The mercury flux modeling

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12	have paragraphs that discuss the performance modeling. The performance modeling suggests that about 6300 g/y, 7800 g/y, and 10500 g/y (depending on the method selected) of mercury will be removed from OF200. Based on the percentage removal efficiency, OF200 has approximately 12000 g/y of mercury flux. Please reconcile this mass flux balance.	and stormwater characterization pre-design studies have helped to refine our flux estimates at OF200. DOE will continue to evaluate the discrepancies identified in this comment and attempt to better reconcile the mass/flux balance to the extent practicable. However, revision of the conceptual site model is outside the scope of this FFS.
Page 1-21, Sec. 1.2.1.1, Nature and Extent of Contamination	"Important non-point sources of baseflow mercury identified in the RI include non-point inputs to the reach of stream between the termination of the north-south pipe (Outfall 200) and Outfall 109. More recent data indicate that this non-point source may have been partially associated with the scouring by the increased streamflow from the flow augmentation program, which was terminated in 2014." Is there data to confirm this since the augmentation water was shut off? Also, sudden changes in high energy storm water fluxes account for most erosional features along creeks. Has this been looked at?	The referenced statement has been revised throughout the document to more accurately reflect the uncertainty in this source of mercury flux, and clarify that any impacts from the termination of the flow augmentation program are not yet characterized.
Page 3-2, Sec. 3.1, Key Site Problems	First bullet. It would be good to show a site map with all the fluxes of mercury to see if they balance out or if there are other potential sources.	The scope of this FFS is limited to the mercury flux expressed in the WEMA storm sewer discharge at Outfall200. The conceptual site model (Fig. 1.6) provides a qualitative indication of the relative flux from various sources at the Y-12 site. Revision of the conceptual site model is outside the scope of this FFS.
Page 3-3, Sec. 3.1, Key Site Problems	"These studies and the operating experience from the BSWTS now suggest that construction of additional water treatment facilities to further reduce mercury releases to UEFPC surface water should be reevaluated." Please clarify in the context of OF200 treatment.	This text has been revised more clearly describe this rationale.
Page 3-22, Sec. 3.3.2, Alt. 2,	"…which may be partially attributed to increased erosion resulting from the flow augmentation program initiated in 1996, which was terminated in April 2014. With	The referenced text has been revised to more accurately reflect the uncertainty in this source of

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Water Treatment at Outfall 200	the termination of the flow augmentation program, discharge from the WEMA storm sewer system at Outfall 200 is expected to be the predominant source of mercury releases to UEFPC under baseflow conditions." There should be some data by now to confirm that statement. Please reference data for baseflow and stormflow conditions.	mercury flux, and clarify that any impacts from the termination of the flow augmentation program are not yet characterized.
Page 3-5, Table 3.1	This table should be deleted in its entirety and replaced with one that relates exactly to the scope of this water treatment FFS. There are superfluous listings in this table that do not relate to water treatment or even the secondary wastes from it. Screening out solid waste technologies now can only preclude later more informed decisions on UEFPC projects that will really deal with solid waste media.	Table 3.1 has been deleted and Section 3.2 has been revised to focus more narrowly on the limited scope of this interim action and to directly reference the technology screening conducted under the conceptual design report.
Specific Comments on the Proposed Plan		
Page 1, ¶ 1	"…mercury in UEFPC surface water remains above desirable levels." "Desirable" is not a regulatory term, but vague, undefined and subjective. "Clean Water Act Standards and CERCLA Risk Thresholds" would be better or similar regulatory language.	The Proposed Plan has been revised to describe surface water goals with greater specificity.
Page 3, First ¶, Right Side	"…Phase I ROD is not currently protective for ecological receptors…" It is not protective for ecological receptors or human receptors through ingestion pathways.	There currently is no unacceptable risk to human health via ingestion or any other pathway, due to the institutional controls in place to prevent fish ingestion.
Page 5, Site History	"Mercury contamination is widespread at the Y-12 site and has been identified in soil, sediment, surface water, groundwater, buildings, drains, and sumps. Mercury continues to be released into UEFPC from point (discrete) and non-point (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…" This description makes a case for stormwater diversion to aid in meeting the AWQC goals for EFPC.	DOE agrees that opportunities for stormwater diversion at UEFPC should be fully evaluated. Stormwater diversion studies conducted in support of the conceptual design of the proposed water treatment system at Outfall 200 did not identify opportunities for stormwater diversion that would significantly impact the facility design.

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Page 10, Flow Management	"However, this flow augmentation resulted in the unintended consequences of increased mobilization of mercury from contaminated UEFPC stream sediments, and was terminated in 2014." This conceptual model is a good case for stormwater diversion since most stream erosional features are due to rapid rise in high energy flowing water.	DOE agrees that opportunities for stormwater diversion at UEFPC should be fully evaluated. Stormwater diversion studies conducted in support of the conceptual design of the proposed water treatment system at Outfall 200 did not identify opportunities for stormwater diversion that would significantly impact the facility design.
Page 14, Summary of Site Contamination	DOE should include a discussion of potential releases during future remedial actions from both soil and D&D remedial actions. This discussion should include the need and benefit of having a mercury treatment facility to capture and remove mercury leaving the Y-12 property.	This section has been revised to include discussion of this topic. However, potential releases from the future WEMA actions have not yet been characterized and have not been evaluated in the conceptual design of the proposed water treatment facility. These future WEMA actions will include comprehensive contamination control measures and best management practices to minimize releases of contaminants to UEFPC.
Page 15, Conceptual Site Model	"Figure 4 shows the most recent version of the site conceptual model for mercury releases to UEFPC, from a conceptual model study conducted in 2008-2010 (ORNL 2011). This study found that the combined inputs from WEMA and other upstream areas (as measured at Outfall 200) now represents the most important source of mercury inputs to UEFPC surface water – i.e., this source now contributes up to 70-80% of the mercury flux at Station 17, particularly under low to average flow conditions, as opposed to an estimate of approximately 20% of the flux at Station 17 when the Phase I ROD was issued." The mercury flux numbers don't add up for each Outfall, sediment, Station 17, and the preliminary performance numbers from the conceptual design report.	Figure 4 depicts the current conceptual site model for UEFPC, as developed by ORNL through a conceptual model study conducted during 2008-2011, and includes the best information available at that time. This figure has been revised to indicate the termination of flow augmentation. However, more extensive revision of the CSM is outside the scope of this interim action.
Page 30, Table 2	DOE should show the differences in each alternative's ability to reduce mercury in the stream to achieve the final goal of 51 ng/L.	Table 2 has been revised to include available estimates of mercury removal to be achieved by

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		each alternative.
Page 34, Description of the Preferred Alternative	"This preferred alternative is designed for treatment of UEFPC surface water under baseflow conditions and up to the 95th percentile streamflow in UEFPC at Outfall 200." By ignoring the other inputs, this project is just designed to capture the WEMA area. It will be necessary to have this treatment system during the WEMA remediation, but it does not completely address the contamination leaving Y-12.	The OF200 water treatment facility would be designed specifically to reduce mercury releases from the WEMA storm sewer system, as expressed at the Outfall 200 discharge point. This system is not designed to address all contaminant sources at Y-12. As stated in the FFS and Proposed Plan, the OF200 water treatment facility is only one component of a larger multi-faceted remedial action program for mercury remediation at Y-12.
Page 38, Mercury-Use Building Demolition	The success of this treatment plant should not be a substitute for excellent water-borne and airborne contamination control at demolition projects. Contaminants might bypass the plant. Or, otherwise innocuous chemicals from projects may poison the treatment plant and cause outages.	DOE is in complete agreement with this comment. The proposed water treatment facility would not diminish comprehensive contamination control practices and best management practices during to minimize releases during future D&D activities.
Page 42, 2nd ¶, last sentence	DOE should revise the last sentence to: "Such modifications would be made through FFA-party agreement, to achieve both the goal of reducing mercury levels in UEFPC and meeting AWQC in UEFPC."	Text revised as requested and consistent with the recent inter-agency agreement. DOE agrees that response actions for UEFPC ultimately should achieve the AWQC in-stream standard for mercury of 51 ng/L, and the OF200 water treatment facility would be designed to reduce mercury to 51 ng/L in the treated effluent.
Page 42, Conclusion	The end of this section should include another table which clearly presents the remedial action objectives anticipated by the implementation of the preferred alternative. These objectives will ultimately be used to determine the effectiveness of the action.	The requested table summarizing the RAOs has been added to the RAO section, rather than in the Conclusions as suggested in this comment, for better flow.