**ADDENDUM TO THE CORRECTIVE ACTION PLAN
FOR UNDERGROUND STORAGE TANKS 1219-U, 1222-U,
2082-U, 2068-U AT THE RUST GARAGE FACILITY,
BUILDINGS 9720-15 AND 9754-1**

**OAK RIDGE Y-12 PLANT
OAK RIDGE, TENNESSEE
FACILITY ID #0-010117**

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**Environmental Management Department
Health, Safety, Environment,
and Accountability Organization**

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LIST OF ACRONYMS

BTEX	benzene, toluene, ethylbenzene, xylenes
BTX	benzene, toluene, xylene
CAP	Corrective Action Plan
CAR	Corrective Action Report
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DOE	Department of Energy
GRA	General Response Action
HTI	high-temperature incineration
LTTD	low-temperature thermal desorption
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
O&M	operation and maintenance
ORR	Oak Ridge Reservation
OVD	organic vapor detector
POTW	Publicly Owned Treatment Works
QA/QC	quality assurance/quality control
RCRA	Resource Conservation and Recovery Act
TCLP	Toxicity Characteristic Leaching Procedure
TDEC	Tennessee Department of Environment and Conservation
TPH	total petroleum hydrocarbons
TSD	treatment, storage, or disposal
UST	underground storage tank
VOCs	volatile organic compounds

INTRODUCTION

This document represents an addendum to the Corrective Action Plan (document number Y/SUB/92-99928C/1) for underground storage tanks 1219-U, 1222-U, 2082-U, and 2068-U located at Buildings 9720-15 and 9754-1, Oak Ridge Y-12 Plant, Oak Ridge, Tennessee. The site of the four noted underground storage tanks is commonly referred to as the "Rust Garage Facility" and will be so referenced in this document hereafter. The original Corrective Action Plan (CAP) for the Rust Garage Facility was submitted to the Tennessee Department of Environment and Conservation (TDEC) for review in May of 1992.

This addendum to the Rust Garage Facility CAP only applies to the "Corrective Actions Considered" (Chapter 7.0), "Corrective Actions Chosen" (Chapter 8.0), "Treatment Evaluation" (Chapter 9.0), "Proposed Implementation Schedule" (Chapter 10.0), and "Monitoring and Reporting" (Chapter 11.0) sections of the original CAP. All other chapters which comprise the original CAP remain unchanged and in effect. Applicable changes to Chapters 7.0, 8.0, 10.0, and 11.0 of the original CAP are presented in the remaining sections of this addendum. Chapter 9.0 of the original CAP is eliminated.

A combination of corrective action process options for remediation of contaminated soils at the subject site was proposed in the original Rust Garage Facility CAP. The approach involved excavation of the soils from the impacted areas of the subject site, on-site solid phase bioremediation of soil contaminants using a biological treatment bed, and final disposal of the treated soils in place at the treatment bed site. The remediation of contaminated groundwater at the subject site would be addressed by the Y-12 Plant Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) program under which corrective actions would be addressed as part of remedial actions for the S-3 Ponds groundwater plume.

During the time period after submission of the original CAP for the Rust Garage Facility, Y-12 Plant Underground Storage Tank (UST) Program personnel continued to evaluate improvements that would optimize resources and expedite the activities schedule presented in the original CAP. With regard to the biological treatment bed facility that was to be constructed for contaminated soil remediation, it was determined that there was a shortage of available and usable land space for the treatment bed facility (requiring 10 to 11 acres for construction) at the Y-12 Plant that was not already committed for other future projects. Also, due to the fact that the treatment bed facility would be classified as a waste treatment site, the Y-12 Plant National Environmental Policy Act (NEPA) group determined that an Environmental Assessment would be required for siting of the facility which would require a minimum of two years to complete.

Based on the determinations noted above, several revisions to the original corrective action process options for remediation of contaminated soils at the Rust Garage Facility are proposed. The revised approach for soil remediation will involve excavation of the soils from the impacted areas of the subject site, on-site thermal desorption of soil contaminants using a portable desorption unit, and final disposition of the treated soils by backfilling into the subject site excavations. The land space required for the thermal desorption unit is approximately 1.0 to 1.5 acres that is available at the Y-12 Plant, and does not require the performance of a NEPA Environmental Assessment because the unit is portable. Use of a thermal desorption unit will also decrease the total time required to complete soil remediation compared to solid-phase bioremediation. Thermal desorption technology was evaluated as part of the original Rust Garage Facility CAP and was selected as one of the top three technologies selected for soil remediation.

Corrective actions with regard to groundwater have been evaluated for the Rust Garage Facility. Based on this evaluation, remediation of groundwater under the Y-12 Plant CERCLA Program is proposed for the facility. Additional justification for the groundwater corrective action

chosen, and information regarding integration of UST and CERCLA requirements, are discussed within this addendum.

7.0 CORRECTIVE ACTIONS CONSIDERED

This section describes the screening of remedial technologies and the development of the top three corrective action options for soil remediation at the Rust Garage Facility. The identification and screening of technologies initially establishes a wide range of process options for consideration. Corrective action objectives are established and based on the preferred remediation actions. A screening process on the basis of established criteria is conducted for the soil media. Process options that are not applicable to petroleum contamination are eliminated. Using this method, the field of potential process options can be narrowed down to the most feasible and reliable technologies. The process options are assembled and developed into potential corrective action options. The potential corrective action options are further evaluated on the basis of effectiveness, implementability, and cost to arrive at the selection of the top three corrective action options for consideration.

7.1 IDENTIFICATION OF POTENTIAL CORRECTIVE ACTION OPTIONS

7.1.1 Corrective Action Objectives

According to the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) the primary objectives should be:

- Select remedies that are protective of human health and the environment.
- Select remedies that maintain protection over time.
- Select remedies that minimize untreated wastes.
- Remedies that employ treatment must be given preference.
- Treatment must be appropriate for contaminants that comprise the principle threat at the site.
- Engineering controls are only appropriate for low-level threats when treatment is impractical.
- Institutional controls are only to be used alone to mitigate short-term impacts.
- Institutional controls can be used to supplement engineering controls for long-term waste management.
- Innovative technologies are only to be considered when there is significant reason to believe that they will work "as well" as other proven technologies.
- Groundwater should be returned to its beneficial use within a reasonable time frame.

Another objective to consider is that offsite transport and disposal is a least favored option.

7.1.2 General Response Actions

General Response Actions (GRAs) represent the universe of technologies that have the potential to provide for or contribute to contaminant remediation. GRAs include no action/institutional actions, containment actions, removal/extraction actions, collection/control actions, treatment actions, and storage/disposal/discharge actions.

7.1.2.1 No Action/Institutional Actions

This response involves no action being taken to implement remedial technologies to reduce the hazard potential to human or ecological receptors. If no action is taken, the contaminants may eventually flush to nearby creeks and streams. Natural biodegradation, dilution, or volatilization could also take place. Because available data are limited, it is not possible to accurately predict how long these natural processes would take; therefore, the

potential impact on human health and the environment cannot be assessed. Although insufficient data exist, over time the area impacted by contamination will continue to increase, but the effective concentration of the contaminants will be reduced through dilution. Since total petroleum hydrocarbons (TPH) are the main contaminants present, volatilization will only have a small effect on contaminant reduction. Since this response does not meet the corrective action objective, the no action option will not be considered further.

Use of institutional actions as a means to protect human health and the environment when implemented with other remedial actions may also be considered. Institutional actions could involve the use of access restrictions through deed restrictions, physical barriers, and security personnel. Other actions may involve developing an alternate water supply at the remediation sites that have contaminated groundwater. Institutional actions may also include environmental monitoring of air, surface water, groundwater, soil, sediments, etc. to ensure that contaminants are not migrating offsite where they could impact public health and environmental receptors.

7.1.2.2 Containment Actions

Containment actions may include capping areas containing contaminated soil, or using subsurface barriers to minimize the movement of contaminated groundwater. Capping could be used to minimize the transport of contaminated surface material to the atmosphere or the infiltration/percolation of surface water/groundwater through the contaminated soil matrix. Subsurface barriers, either vertical or horizontal, can be used to minimize the transport of contaminants through the soil or sediments by infiltration or percolation.

7.1.2.3 Removal/Extraction Actions

The removal/extraction of the source or contaminated materials is achieved through soil/sediment excavation, bulk removal, injection/extraction techniques, demolition, or decontamination. Earth moving equipment can be used to excavate and exhume contaminated materials. Equipment can also be used to remove contaminated solid waste (drums and debris) from the grounds, structures, or waste piles. Extraction wells can be used to extract contaminated groundwater. Injection wells can be used to enhance the groundwater flow to extraction wells. Wrecking equipment can be used to demolish structures and buildings. Decontamination techniques can be used to decontaminate structures and solid surfaces.

7.1.2.4 Collection/Control Actions

Collection/control can involve surface controls, collection and storage systems, emission control, vapor collection, and sediment control. These remedial actions can reduce the mobility of the contaminants and can be used to retain contaminated waste streams for subsequent treatment. Collection/control technologies could also be used to collect and control the residuals from the treatment of contaminated wastes.

7.1.2.5 Treatment Actions

Treatment involves the use of in situ or ex situ physical, chemical, biological, thermal, and dewatering technologies to reduce or eliminate the toxicity, volume, or mobility of the contaminants of concern.

Physical technologies can be generally used on wastes to reduce the volume of the contaminated materials by physical separation techniques and segregation. Stabilization and solidification techniques can be used in situ or following removal. Soil washing, air stripping, soil flushing, land aeration, and adsorption/absorption are all physical processes.

Chemical technologies can be used to alter the chemical structure of the waste constituents to produce a waste residue that is less hazardous than the original waste. Chemical processes can also separate the contaminants from solid waste media through chemical extraction or leaching techniques to reduce the volume or mobility of the contaminants. Chemical solidification, stabilization, and fixation techniques can be used to form a bond with the waste material, resulting in solids or stable materials that are resistant to leaching of contaminants.

Biological technologies are used mainly for degradation of organically contaminated media. Several well-developed biological technologies exist for the treatment of aqueous waste streams contaminated at various levels with nonhalogenated organics and some halogenated organics. Contaminated sludges and soils can be treated by solid-phase and slurry-phase processes. These processes have been developed and used to treat a wide range of contaminants such as pesticides, diesel fuel, gasoline, fuel oil, creosote, pentachlorophenol, and halogenated volatile organics.

Thermal treatment is a term associated with the use of elevated temperatures as the principal means of destroying, detoxifying, or physically stabilizing hazardous wastes. There are several thermal processing options such as incineration, infrared heating, wet air oxidation, pyrolysis, thermal desorption, and vitrification.

In Situ treatment involves various physical, chemical, biological, and thermal techniques to treat source contamination in place.

Dewatering techniques are mainly used on aqueous waste streams as a means to separate nonsoluble contaminants.

7.1.2.6 Storage/Disposal/Discharge Actions

Temporary storage could reduce the mobility of the waste materials by isolating the contaminants from further transport and minimizing the potential for short-term exposure of the population and impacts to the environment. Temporary storage action would involve the use of an engineered structure, existing or newly constructed, to contain the waste materials. This option is only considered as an interim action until a permanent treatment and/or disposal methodology is implemented.

Disposal involves the permanent and final placement of the waste materials in a manner that protects human health and the environment. Untreated waste can be disposed of onsite in an engineered facility, offsite in an approved and licensed disposal facility, or in a regulated landfill. Treated waste and concentrated wastes from treatment processes can be disposed in a similar manner.

Discharge involves the permanent and final placement of an aqueous waste stream in a manner that protects human health and the environment. Treated liquid waste can be discharged onsite to surface waters or injected into the ground. Offsite discharge can involve deep well injection, piping to a river/stream offsite, or discharge to the local Publicly Owned Treatment Works (POTW).

7.1.3 Initial Screening Criteria

The purpose of the initial screening process is to review and evaluate technologies and eliminate those inappropriate for site contaminants or site conditions at the Y-12 Plant Rust Garage Facility. This screening process is designed to eliminate actions that do not provide a permanent means to prevent or minimize the release of contaminants, or that cannot be implemented as a result of conditions at the site. The technologies and options reviewed as part

of the screening process represent those currently being employed on a regular and successful basis at other petroleum-contaminated sites. Technologies that are untested or in the early stages of development are not reviewed.

The criteria used in the initial screening process are as follows:

- the applicability of a general response action to the affected media,
- the compatibility of a remedial technology with the contaminant of concern,
- the applicability of a remedial technology to the contaminant fate,
- the long-term durability of a process option,
- the volume and character of wastes generated by a process option,
- the management of a process option in a reasonable period of time, and
- the control of a process option over potential unknown or outside influences.

7.1.4 Initial Screening of Technologies and Process Options

The hierarchy of responses, technologies, and options for the initial screening of the soil contaminants is shown in Table 7-1. This table is formatted (as a flow chart) so that, for each general response action, different remedial technology types and various process options are presented. A brief description of each option is provided along with comments concerning elimination or selection for subsequent evaluation. The screening of remedial technologies is based on the characterization of contaminants identified at a given site. In the case of the Rust Garage Facility, remedial technologies were evaluated based on their abilities to remediate soil materials contaminated by TPH.

7.1.4.1 No Action/Institutional Actions

The remedial technologies screened for institutional actions included access restrictions and monitoring. Access restrictions include site security and deed restrictions. The only process option included within monitoring is soil sampling.

Site security involves the use of fences, berms, and signs surrounding the site to help prevent unauthorized access to the site. Security personnel can be used for controlling authorized access to the site. However, this process alone does not remedy the contaminant, and since site security is already in place at this location of the Y-12 Plant, this process option is not applicable.

Deed restrictions can be applied for the properties in the area of influence to require permits for digging, building, or any activity that can disturb the soils. However, this process alone does not remedy the contaminant, and since the contamination is confined to U.S. Department of Energy (DOE)-owned property, this process option is not applicable.

Monitoring of soils involves taking confirmatory samples in the area before and after remediation. This process option is required by the Tennessee Department of Environment and Conservation (TDEC); therefore, it is applicable.

7.1.4.2 Containment Actions

The remedial technologies screened for containment actions included capping, vertical barriers, and horizontal barriers. Capping includes clay, asphalt, concrete, geosynthetic, and multilayered materials. Vertical barriers include slurry walls, grout curtains, sheet piles, and vibrating beams. Horizontal barriers include grout injection, block displacement, liners, and ground freezing.

**Table 7-1. Initial Screening of Technologies and Process Options for
Rust Garage Facility Soil Remediation**

Groundwater General Response Action	Remedial Technology	Process Options	Description	Screening Comments
<div>7-5</div> <div> <div>No-Action/ Institutional Actions</div> <div> <div>Containment</div> </div> </div>	<div>Access Restrictions</div>	<div>Site Security</div> <div>Deed Restrictions</div>	<p>Fences, signs surrounding sites.</p> <p>Deeds for property in the area of influence could include restriction on wells.</p>	<p>Not applicable: regulatory required remedial action necessary.</p> <p>Not applicable: regulatory required remedial action necessary.</p>
	Monitoring	Soil Sampling	Ongoing monitoring of soil before, during, and after site remediation.	Applicable. Required by TDEC.
	Capping	Clay, Asphalt, Concrete, Geosynthetic, Multilayered	Various cap construction materials installed over contaminated areas.	Not applicable: capping could minimize or eliminate the infiltration of the contaminants in the soil to the groundwater; however, the groundwater is already contaminated and capping does not reduce or eliminate the movement of groundwater contamination.
	Vertical Barriers	Slurry Walls, Grout Curtains, Sheet Piles, Vibrating Beam	Various methods may be used to construct vertical barriers to minimize or prevent migration of contaminants in soil to groundwater.	Not applicable: source movement within the vadose zone is minimized.
	Horizontal Barriers	Grout Injection, Block Displacement, Liners, Ground Freezing	Various methods may be used to construct horizontal barriers below contaminated areas to minimize or prevent migration of contaminants in soil to groundwater.	Not applicable: source movement within the vadose zone is minimal.

Indicates the technologies and processes eliminated from consideration.

Table 7-1. (continued)

General Response Action	Remedial Technology	Process Options	Description	Screening Comments
Removal/ Extraction	Excavation	Earth Moving Equipment	Conventional earth moving equipment such as bulldozers, hoes, loaders, etc. used to unearth soils.	Potentially applicable.
	Enhanced Removal	Vapor/Vacuum Extraction	Placement of arrays of soil gas extraction wells w/subsequent pumping to encourage partitioning of volatile constituents into mobilized soil gas stream. Volatiles are removed from gas through condensation or activated carbon.	Not applicable: potential influence of S-3 Pond & low permeability of site soils hinders process effectiveness.
Collection/ Control	Surface Controls	Grading, dikes, berms, etc.	Division systems for controlling surface water runoff and runoff.	Potentially applicable if soil excavation is required.
Treatment	Biological	Windrow Composting	Compost material is stacked into elongated pile and aerated by turning (open) or by injecting air (static). Nutrients and microbes can also be added.	Not applicable: the process requires the addition of highly biodegradable material (i.e., wood chips, chopped hay, etc.) to facilitate the biodegradation. The increase in volume of material to treat would make it more difficult to manage and control.
		Slurry-Phase Biodegradation	Soil is treated in a large mobile bioreactor where nutrients and biomass are added and mixed to an aqueous slurry.	Not applicable: requires extensive residual treatment and due to the large volume of soil there would be an extended treatment period.
		Solid-Phase Biodegradation	Soil is processed in an above ground treatment bed where nutrients and microbial inoculum are added.	Potentially applicable.

Indicates the technologies and processes eliminated from consideration.

Table 7-1. (continued)

General Response Action	Remedial Technology	Process Options	Description	Screening Comments
Treatment (cont.)	Chemical	Chemical Processes	Refer to description under in situ treatment.	Not applicable.
	Thermal	Thermal Desorption	Moderate temperature (200-600°F) vaporization using rotary drums or pug mill to separate VOCs and TPH from the soil media.	Potentially applicable.
		Incineration	High-temperature incineration (1400-3000 ° F) using rotary kilns, multiple hearth furnaces, or fluidized beds to destroy all organic contaminants in the soil.	Potentially applicable, but very energy intensive and can be cost intensive.
	Physical	Steam Stripping/ Vacuum Extraction	Steam stripping coupled with simultaneous vacuuming and internal recycling to remove volatile gasoline products from soil.	Not applicable: VOCs are not primary contaminant of concern.
		Cement Solidification	Solidification of excavated soil using various cements and silicate-based mixtures as solidifying agents. The resulting solids are very resistant to leaching.	Not applicable: possibility of high organic content preventing waste solidification.

Indicates the technologies and processes eliminated from consideration.

Table 7-1. (continued)

General Response Action	Remedial Technology	Process Options	Description	Screening Comments
<div>7-8</div> <div>Treatment (cont.)</div>	<div>Physical (cont.)</div>	<div>Surface Micro-encapsulation</div>	Physical microencapsulation of wastes in an organic binder or resin.	Not applicable for contaminants of concern.
		<div>Thermoplastic Solidification</div>	Sealing of waste in asphalt bitument, paraffin, or polyethylene matrix.	Not applicable: creates additional waste volume.
		<div>Air Sparging</div>	Mass transfer process in which dissolved volatile contaminants are transferred from soil to vapor phase (gas) by a physical means.	Not applicable: low permeability of site soils hinders process effectiveness.
		<div>Land Aeration</div>	Spreading of soil on land surface to facilitate natural degradation & volatilization of VOCs.	Not applicable: VOCs are not primary contaminant of concern.
		<div>Soil Washing</div>	Highly aggressive series of solid waste washing phases to leach contaminants.	Potentially applicable; the process produces a secondary waste stream that requires further treatment.
		<div>Soil Screening</div>	Soil is processed through mechanical separators to separate out or concentrate the contaminants.	Not applicable for the contaminants of concern, but potentially applicable in combination with other treatment processes.

Indicates the technologies and processes eliminated from consideration.

Table 7-1. (continued)

General Response Action	Remedial Technology	Process Options	Description	Screening Comments
<div>7-9</div> <div>Treatment (cont.)</div>	<div>In Situ Treatment</div>	<div>Grouting</div>	Solidify soil matrix through pressure injection grouting.	Not applicable: potential for cracking and high grout permeation coefficients in unconsolidated sediments.
		<div>Radio Frequency Heating</div>	Uses a system of electrodes to heat soil and volatilize trapped hydrocarbons so they may escape for treatment.	Not applicable: unproven technology.
		<div>Vitrification</div>	Fusing of soils and contaminants into a glass-like form.	Not applicable: inability to verify performance and potential influence of S-3 Pond. Not applicable for contaminants of concern.
		<div>Soil Flushing</div>	Contaminants are washed from soils by injection of water in area of contamination and removed by pumping.	Not applicable: potential influence of S-3 Pond and contaminant of concern. Also, generates large amount of contaminated wastewater requiring additional treatment.

Indicates the technologies and processes eliminated from consideration.

Table 7-1. (continued)

General Response Action	Remedial Technology	Process Options	Description	Screening Comments
<p>Treatment (cont.)</p>	<p>In Situ Treatment (cont.)</p>	<p>Biological Processes</p> <p>Chemical Processes</p> <p>Chemical Stabilization/Chemical Fixation</p>	<p>Add nutrients and possibly enzymes and microorganisms to enhance the ability of naturally occurring organisms to degrade the organic contaminants.</p> <p>Includes a variety of processes such as chemical oxidation, reduction, neutralization, precipitation, chelation, soil aeration, solvent flushing, etc. All processes involve a form of chemical addition to mitigate the contaminants in the soil.</p> <p>Stabilization/solidification of soils containing hazardous substances through the use of chemicals which form organic polymers with the wastes.</p>	<p>Not applicable: potential unknown influence of S-3 Pond on performance of process.</p> <p>Not applicable: variety of chemical constituents requiring mitigation under uncontrolled conditions. Also creates unmanageable waste products.</p> <p>Not applicable: possibility that high organic content may prevent waste solidification.</p>

Indicates the technologies and processes eliminated from consideration.

Table 7-1. (continued)

General Response Action	Remedial Technology	Process Options	Description	Screening Comments
Disposal	Onsite Disposal	Controlled Landfill	Transport treated and/or untreated soils to onsite sanitary landfill for disposal.	Potentially applicable if contaminants are within acceptance criteria.
		Backfill in Excavated Area	Return treated soil to site excavation for use as backfill material.	Potentially applicable depending on use of onsite treatment process.
		Uncontrolled Disposal	Onsite disposal of fully remediated or clean soils without restrictions.	Potentially applicable.
	Offsite Disposal *	Controlled Landfill	Transport untreated soils to offsite controlled landfill for disposal.	Potentially applicable if contaminants are within acceptance criteria and moratorium is lifted..
		Uncontrolled Disposal	Transport fully remediated or clean soils to an offsite location without restrictions.	Potentially applicable, if moratorium is lifted.
	Offsite Treatment/Disposal	RCRA/TSCA Permitted TSD Facility	Involves transportation of contaminated soil to offsite RCRA/TSCA permitted TSD facility for treatment such as solidification, incineration, etc.	Not applicable. Only applicable to hazardous waste generated by onsite treatment.

* Not currently applicable due to offsite waste disposal moratorium.

Indicates the technologies and processes eliminated from consideration.

Various methods may be used to construct caps to minimize or prevent migration of contaminants within the soil to the groundwater. However, the contaminant has already infiltrated down to the water table, and capping does not reduce or eliminate the movement of previously contaminated groundwater. Therefore, process options are not applicable.

Various methods may be used to construct vertical and horizontal barriers to minimize or prevent migration of contaminants within the soil to the groundwater. However, the contaminant has already reached the groundwater; therefore, these process options are not applicable.

7.1.4.3 Removal/Extraction Actions

The remedial technologies screened for removal/extraction actions included soil excavation and enhanced removal.

Excavation of soil can be conducted using conventional earth moving equipment such as bulldozers, backhoes, loaders, etc. to remove the soil from the ground for treatment and/or disposal. This process option is a common practice and is potentially applicable if ex situ treatment/disposal or direct disposal corrective actions are chosen.

The enhanced removal technique of vapor/vacuum extraction uses a series of injection/extraction wells to remove soil vapors so that contaminants can be separated and treated. Since this process extracts not only soil vapors, but potentially groundwater vapors, this process is not applicable due to the influence of the former S-3 Ponds.

7.1.4.4 Collection/Control Actions

The remedial technologies screened for collection/control actions only included surface controls. Surface controls involve diversion systems such as grading, dikes, and berms for controlling surface water runoff and runoff. Surface water is not a medium of interest; however, surface control techniques would have to be implemented for soil excavation and certain site preparation needs. Therefore, this process option is retained for further consideration in combination with excavation.

7.1.4.5 Treatment Actions

The initial screening for treatment actions included biological, chemical, thermal, physical, and in situ remedial technologies.

Biological process options screened involved windrow composting, slurry-phase biodegradation, and solid-phase biodegradation. These processes have been demonstrated effective for treating soil contaminated with petroleum products.

Windrow composting involves adding highly biodegradable material, such as wood chips and chopped hay, to the excavated soil and stacking the compost material into elongated piles. Open windrows are aerated by turning and static windrows are aerated by injecting air through piping placed in the piles. This process option was considered not applicable because the volume of material at the subject site would be increased and become more difficult to manage and control.

Slurry-phase bioremediation involves mixing the soil into an aqueous slurry inside a mobile bioreactor where nutrients and biomass are added to degrade the contaminant. This process option was considered not applicable because the process is limited by the volume of

waste it can treat over a period of time. The process generates additional volumes of waste, and the process could involve extensive residual treatment.

Solid-phase bioremediation involves placing the contaminated soil in an aboveground, lined bed where nutrients and microbial inocula are added to facilitate the biodegradation process. This process option is considered technically feasible; therefore, it is potentially applicable.

Chemical process options can include a variety of processes such as chemical oxidation, reduction, neutralization, precipitation, chelation, solvent flushing, and others. All processes involve the addition of chemicals to mitigate the contaminants in the soil. All the chemical process options were considered not applicable because of the variety of chemical constituent residuals requiring further treatment under uncontrolled conditions and because these processes create additional waste which makes them more difficult to manage.

Thermal process options screened included low-temperature thermal desorption and incineration. These processes have been demonstrated effective for treating petroleum contaminated soils.

Low-temperature thermal desorption (LTTD) is a process that uses moderate heat (200-600°F) to vaporize organic contaminants in soil. LTTD systems are physical separation processes and are not designed to destroy the organic contaminants. This process option is considered technically feasible; therefore, it is potentially applicable.

High-temperature incineration (HTI) is a process that uses high temperatures (1400-3000°F) in devices such as rotary kilns, multiple hearth furnaces, or fluidized beds to destroy all organic contaminants in the soil. This process option is very energy intensive and can be cost intensive; however, it is considered technically feasible; therefore, it is potentially applicable.

Physical process options screened included steam stripping/vacuum extraction, cement solidification, surface micro-encapsulation, thermoplastic solidification, air stripping, land aeration, soil washing, and soil screening.

Steam stripping/vacuum extraction involves steam stripping coupled with simultaneous vacuuming and internal recycling to remove volatile gasoline products from soil. Volatile organic compounds (VOCs) are not the primary contaminant of concern.

Cement solidification, surface microencapsulation, and thermoplastic solidification involve the solidification or sealing of excavated soil using various cements, resin, organic binders, asphalt, and silicate-based mixtures as solidifying agents. The resulting solids are very resistant to leaching. Since these processes involve an increase in the volume of waste and are possibly influenced by the organic contents that may prevent complete solidification, these process options are considered not applicable for the contaminants of concern.

Air sparging is a mass transfer process in which dissolved VOCs are transferred from soil to vapor phase (gas) by physical means. Since VOCs are not the primary contaminants of concern, this process option is considered not applicable.

Land aeration involves the spreading of soil on land surface to facilitate natural degradation and volatilization of organic compounds. Generally, the primary aeration treatment mechanism is volatilization. Since the principle contaminant of concern (TPH) is primarily semi-volatile, treatment would be a relatively slow process. Therefore, this process option is considered not applicable.

Soil washing involves a highly aggressive series of solid waste washing phases to leach contaminants. This process option is potentially applicable; however, the residual waste stream may require additional treatment.

Soil screening involves processing soil through mechanical size separators to separate out or concentrate contaminants associated with a particular particle size. There is no evidence that petroleum contamination adheres to any particular particle size, and the contaminated soils at Rust Garage are fairly uniformly distributed clay particles; therefore, this process option is not considered applicable. However, mechanical screening may be used as a pretreatment step for other processes.

In situ process options screened included grouting, radio frequency heating, vitrification, soil flushing, biological processes, and chemical processes. All of these process options were considered not applicable, primarily because of the potential influence of the S-3 Pond contaminants and the generation of additional waste streams.

7.1.4.6 Disposal

Disposal techniques screened included onsite disposal, offsite disposal, and offsite treatment/disposal. Onsite disposal process options screened included controlled landfill, backfill in excavated areas, and uncontrolled disposal. Offsite disposal process options included controlled and uncontrolled disposal. The only offsite treatment/disposal option screened involved a Resource Conservation and Recovery Act (RCRA)/Toxic Substances Control Act (TSCA) permitted treatment, storage, or disposal (TSD) facility.

Onsite or offsite disposal at a controlled landfill involves transport to a regulated landfill site of treated or untreated soils that meet the disposal acceptance criteria. Uncontrolled disposal at an onsite or offsite location involves the disposal of uncontaminated or fully remediated soils without restrictions. All process options are technically feasible, depending on the treatment process selected, if any, and the level of contamination; however, since a current moratorium exists for offsite transport of waste from the Y-12 Plant, the offsite controlled landfill is the least preferred method.

The onsite disposal process option of backfill in excavated areas involves returning treated soil to the site of excavation for use as backfill material. The time to treat the soil limits how fast the excavated site can be backfilled with the treated material. Since the excavation site would require immediate backfilling, this process option is dependent on the availability of an onsite treatment option running concurrently with excavation.

The offsite treatment/disposal process option of using a RCRA/TSCA permitted TSD facility involves transportation of contaminated soil to an offsite RCRA TSD facility for treatment such as solidification, incineration, etc. This process option is considered not applicable since the contaminants at the Rust Garage Facility are not currently classified as hazardous waste.

7.1.5 Development of Corrective Action Options

This section describes the development of corrective action options from the process options that passed the initial screening evaluation for soil remediation. The remaining technology options for the general response actions are combined to form potential soil corrective action options for evaluation in Section 7.2.1. The general response actions retained for further evaluation include removal extraction, treatment, and disposal. Conventional excavation equipment would be used to remove contaminated soil for treatment and/or disposal. The treatment options include: thermal (incineration and thermal desorption), physical (soil

washing), and biological (solid-phase bioremediation). Disposal includes onsite and offsite options for treated soil and residuals from treatment. The remaining technology options are briefly discussed below.

7.1.5.1 Removal/Extraction

Preliminary studies indicate any type of in situ treatment would follow a preferential path through the soil matrix. All of the remaining process options involve soil removal prior to treatment. The removal action for all potential corrective action options would involve the removal of the source of contamination by soil excavation methods. Conventional excavation equipment would be used for the removal of the contaminated soil at the site. The Rust Garage Facility is an active maintenance and garage area, and includes buildings and utilities within close proximity of the contaminated area. Smaller equipment or manual-excavation techniques may be implemented when required for this option. Certain institutional actions, such as soil monitoring and surface controls, are considered part of this technology option. Implementation of this action is the same for all six of the treatment options. In addition, the asphalt pavement and gravel base will be excavated to obtain access to the contaminated soil and will require disposal at a suitable disposal facility.

7.1.5.2 Treatment (Thermal, Physical, and Biological)

The treatment options most applicable for corrective action are thermal desorption, incineration, soil washing, and solid-phase bioremediation. Each of these four process options requires that the contaminated soils be excavated from impacted areas before treatment. The thermal desorption method volatilizes the petroleum contaminants by heating the excavated soils to temperatures usually between 200° to 600°F using a mobile unit. Incineration involves the thermal decomposition of organic constituents by cracking and oxidation reactions at very high temperatures, usually between 1400° and 3000°F. In the soil washing method, the excavated soils are washed repeatedly with water to remove contaminants. The solid phase bioremediation treatment method consists of excavating contaminated soils and transporting them to a prepared site for treatment with the introduction of nutrients and microorganisms.

Although each of the active treatment methods (thermal desorption, incineration, and soil washing) would remediate the contaminated soils, each would produce a waste product requiring controlled disposal or secondary treatment prior to disposal. Thermal desorption would produce waste soil that could be used as fill material or landfill cover. The volume of this material would be slightly less than that of the originally excavated soil. The inorganic constituents of the contaminated soil would be the only portion of the material remaining after incineration. These inorganics are collected as bottom ash from the combustion chamber or fly ash particulate suspended in the combustion gas stream. The bottom ash waste is usually stabilized and disposed of in a controlled landfill or used as cover material for a landfill. Soil washing would produce large quantities of wastewater requiring secondary treatment equipment. The petroleum contamination is associated with the fine clay particles that leave the process as a condensed waste stream. This condensed waste stream requires additional treatment, and the clay particles make up the majority of the soil located at the Rust Garage Facility. The passive biological treatment method should not produce any secondary wastes and treated soils could remain at the treatment site.

7.1.5.3 Disposal (Onsite or Offsite)

Disposal includes the onsite and offsite options of controlled and uncontrolled disposal. For controlled disposal at a sanitary landfill, TDEC requires that the treated waste Toxicity Characteristic Leaching Procedure (TCLP) extract for benzene and TPH not exceed 0.5 ppm and 10.0 ppm, respectively (TDEC, 1990). Landfill capacity limitations and potential institutional

factors may limit the use of onsite disposal. The current moratorium against the offsite transportation of low-level waste from the Oak Ridge Reservation (ORR) restricts the use of offsite disposal. Due to the historical use of the west end of the Y-12 Plant for waste disposal staging and/or transport, there is a possibility of radiological contamination and prudence in waste disposal is implied.

Controlled disposal involves the disposal of treated or untreated soil meeting the acceptance criteria at a sanitary landfill. The treated soil residuals from the incineration process (ash) are only considered suitable for controlled disposal as monofill material. Treated soils from the thermal desorption process are considered suitable for disposal at a sanitary landfill as cover material. After additional treatment, the concentrated waste fraction of the soil washing process can be considered for controlled disposal as cover material at a sanitary landfill.

Uncontrolled disposal involves using the treated material with suitable characteristics as clean fill or for direct land application. Soil treated by thermal desorption is only considered suitable as clean fill; however, if the soil is mixed with organics and/or fertilizers it can be made suitable for direct land application. The uncontaminated fraction of the soil washing process can also be considered for uncontrolled disposal as fill material. Bioremediated soils are considered suitable for direct land application.

There is no confirmation that contaminated soils at the Rust Garage Facility site meet the definition of a RCRA hazardous waste. If some of the soils are determined to meet the definition of RCRA hazardous waste, the disposal options will be revised to include the RCRA regulatory requirements. As a contingency measure, soils found to be classified as RCRA hazardous waste will be segregated from nonhazardous soils and properly stored prior to final disposal (yet to be determined).

7.1.5.4 Potential Corrective Action Options

Contaminated soil excavation with direct disposal of all excavated soil is not considered a viable corrective action option and will not be considered further. However, excavation, treatment, and disposal combine into potential corrective action options. The potential corrective action options include:

- excavation, onsite thermal treatment (incineration or thermal desorption), and onsite/offsite controlled/uncontrolled disposal;
- excavation, onsite active physical treatment (soil washing), and onsite/offsite controlled landfill disposal; and
- excavation, onsite biological treatment (solid-phase), and onsite uncontrolled disposal.

7.2 Selection of Corrective Actions

This section presents an evaluation of the potential corrective action options based on their effectiveness, implementability, and cost. The options are evaluated in relation to the volumes of waste material and site-specific constraints. Table 7-2 provides a summary of the evaluation of the remaining process options for the Rust Garage Facility contaminated soil.

Table 7-2. Evaluation of the Selected Process Options for Soil Remediation

General Response Action	Remedial Technology	Process Options	Effectiveness	Implementability	Cost
<div>7-17</div> <div>Removal</div>	Excavation	Soil Excavation Equipment	Moderate to high; would remove source but would create large waste volume requiring treatment/disposal.	Readily implementable.	Moderate; no O&M.
	Thermal Treatment	Incineration	Moderate to high; would destroy source but creates waste volume requiring disposal.	Implementable, but requires treatability study to define specific operational requirements.	High; no O&M.
Treatment		Thermal Desorption	Moderate to high; would destroy source of contaminant.	Readily implementable, but requires treatability study to define specific operational requirements.	Moderate to high; no O&M.
	Physical	Soil Washing	Low to moderate; would remove source but may generate large quantities of wastewater requiring disposal. Addition of surfactants will be required for removal of contaminants.	Implementable, but requires treatability study to define specific operational requirements and definition of chemical additions needed.	Moderate; moderate O&M.
		Land Aeration	Moderate to high; volatilization, biodegradation, and oxidation combine for effective destruction.	Readily implementable.	Low; moderate O&M.
	Biological	Solid Phase Biodegradation	Moderate; biodegradation breaks down hydrocarbon contaminants to CO ₂ and H ₂ O, eliminating source.	Mostly implementable; requires extensive treatability testing to determine operational requirements, i.e., addition of nutrients, oxygen source, pH adjustment, microbes, etc.	Low; very low to moderate O&M.
		Slurry Phase Biodegradation	Moderate to high; would remove source by complete degradation of hydrocarbon contaminants to CO ₂ and H ₂ O, but may require additional treatment of residual wastewater.	Implementable; requires treatability study to define operational requirements, i.e., addition of nutrients, oxygen source, pH adjustment, microbes, etc.	Moderate; low O&M.

Table 7-2. (continued)

General Response Action	<div data-bbox="1889 860 2048 958" style="border: 1px solid black; padding: 5px; text-align: center;">Disposal</div>			
Remedial Technology	<div data-bbox="1638 1031 1797 1112" style="border: 1px solid black; padding: 5px; text-align: center;">Onsite disposal</div> <div data-bbox="1638 673 1797 755" style="border: 1px solid black; padding: 5px; text-align: center;">Offsite disposal</div>			
Process Options	<div data-bbox="1375 1185 1561 1258" style="border: 1px solid black; padding: 5px; text-align: center;">Controlled landfill</div> <div data-bbox="1375 1031 1561 1112" style="border: 1px solid black; padding: 5px; text-align: center;">Backfill in Excavated Area</div> <div data-bbox="1375 876 1561 950" style="border: 1px solid black; padding: 5px; text-align: center;">Uncontrolled</div> <div data-bbox="1375 738 1561 820" style="border: 1px solid black; padding: 5px; text-align: center;">Controlled landfill</div> <div data-bbox="1375 600 1561 682" style="border: 1px solid black; padding: 5px; text-align: center;">Uncontrolled</div>			
Effectiveness	<div data-bbox="906 1185 1343 1258">High; would be used for disposal of untreated soil and residuals from treatment; limited institutional factors.</div> <div data-bbox="906 1031 1343 1112">High; would be used for disposal of untreated soil and residuals from treatment; limited institutional factors.</div> <div data-bbox="906 876 1343 950">High; would be used for disposal of non-hazardous treatment residuals; limited institutional factors.</div> <div data-bbox="906 738 1343 820">High; would be used for disposal of untreated soil and residuals from treatment; significant institutional factors.</div> <div data-bbox="906 600 1343 682">High; would be used for disposal of non-hazardous treatment residuals; significant institutional factors.</div>			
Implementability	<div data-bbox="611 1242 851 1258">Readily implementable.</div> <div data-bbox="611 1079 851 1096">Readily implementable.</div> <div data-bbox="611 917 851 933">Readily implementable.</div> <div data-bbox="469 755 851 836">Readily implementable, if moratorium on offsite shipments is no longer in effect.</div> <div data-bbox="611 673 851 690">Readily implementable.</div>			
Cost	<div data-bbox="218 1242 404 1258">Moderate to high.</div> <div data-bbox="338 1079 404 1096">Low.</div> <div data-bbox="218 917 404 933">Low to moderate.</div> <div data-bbox="338 803 404 820">High.</div> <div data-bbox="218 673 404 690">Moderate to high</div>			

7.2.1 Evaluation Criteria

7.2.1.1 Effectiveness

The identified corrective action options are evaluated to ensure they effectively protect human health and the environment and to satisfy the corrective action objectives identified for the media of interest. The ability and effectiveness of each technology option to reduce the contaminant concentrations or exposure levels or to sufficiently recover contaminated media for subsequent treatment are evaluated. The performance evaluation of a particular corrective action process involves a technical evaluation of the ability of the option to achieve the corrective action objectives.

The performance evaluation also necessitates determining how effective and reliable the technology option would be with respect to the contaminants and conditions at the site. Reliability is a major consideration in determining effectiveness due to the operation and maintenance (O&M) requirements of most technology options and the importance of protecting public health and the environment during remediation activities. The long-term management of residual contamination and/or untreated waste reduces the effectiveness of a technology; therefore, the duration of long-term management is evaluated as part of the technology's effectiveness.

7.2.1.2 Implementability

The implementability evaluation criteria include both technical and administrative considerations. Technical feasibility involves the availability and constructability of the technology option and the construction and implementation time frame. Implementation time and the period for beneficial results to be realized are critical to protecting public health and the environment.

The administrative considerations of implementability include: the ability to obtain the necessary approvals from regulatory agencies; availability of TSD facilities and associated capacities; and availability of necessary equipment and skilled workers to implement the technology.

7.2.1.3 Cost

Relative capital costs and O&M costs are used rather than detailed estimates. The complexity of the technology option will determine the detail required for the cost estimates. The cost analysis is based on engineering judgment, available vendor quotes, and costs reported from similar corrective actions implemented at other UST sites.

7.2.2 Evaluation of Corrective Actions

The general response actions and remedial technologies evaluated in this section include: Removal/Extraction, Thermal Treatment, Physical Treatment, Biological Treatment, and Disposal. The criteria described in Section 7.2.1 were used to evaluate the remedial technologies within each of the general response actions remaining after the initial screening. The purpose of this evaluation is to identify the most effective, implementable, and cost-effective process options for attaining the Rust Garage Facility corrective action objectives for soil remediation.

7.2.2.1 Removal/Extraction

The removal action by soil excavation methods would effectively eliminate the source of contamination from the site but would generate a large volume of waste requiring treatment

and/or disposal. Short-term considerations of worker safety and environmental impacts due to dust and potential surface runoff would be considered by developing and implementing a Health and Safety Plan for the excavation activities (including dust control activities) and by including surface water runoff/runoff control in the corrective action design.

Conventional construction equipment would be used for excavating the contaminated soil at the site and, therefore, this action is readily implementable. The Rust Garage Facility is an active maintenance and garage area, and includes buildings and utilities within close proximity of the contaminated area requiring excavation. The limited available space may impact the use of larger conventional excavation equipment in some areas and, therefore, may slow down the removal action. Excavation is required for all of the remaining treatment process options. The capital costs for the excavation action are moderate with no O&M costs.

7.2.2.2 Thermal Treatment (Incineration)

Incineration involves the thermal destruction of organic constituents by cracking and oxidation reactions at high temperature. The organic components of the contaminated soil are converted into carbon dioxide and water. The inorganic constituents of the contaminated soil would not be destroyed by incineration and would exit the incinerator as either bottom ash from the combustion chamber or fly ash particulates from the baghouse or scrubber. The bottom ash waste is usually stabilized with water, for workability, and landfill disposed. Air pollution control systems are used to remove volatile organics and other hazardous air pollutants from the effluent gas stream. The waste stream generated by the air pollution control system may also require an additional treatment operation prior to disposal.

A major consideration in evaluating the effectiveness of incineration is based on the thermal conductivity and heating value of the waste. The inability of the contaminated soil to transfer heat and maintain combustion requires the addition of an auxiliary fuel in order to obtain the necessary performance standards for destruction of organics. High concentrations of water in the contaminated soil would also detract from the operational effectiveness of incineration.

The treated soil would be considered for disposal as monofill material at a landfill. This option provides for the removal of the contaminant source and, therefore, provides for the overall protection of human health and the environment. The performance of this particular corrective action process has been proven successful at a number of similar sites and is considered to be reliable overall.

The time frame for completion of this action is considered acceptable because of the limited volume of contaminated soil to be removed and the proven performance of this treatment process. Incineration has been proven effective and reliable at hazardous waste sites and similar UST sites.

Incineration of petroleum contaminated soils has not been previously implemented at the ORR. Administrative and regulatory considerations may impact the implementability of this option due to potential permit requirements and/or environmental impact evaluations. There are numerous vendors with the necessary equipment and skilled workers to implement this technology. There would be no long-term management of residual contamination and/or untreated waste due to the complete removal of the contaminants. Capital costs would be high with no O&M.

7.2.2.3 Thermal Treatment (Thermal Desorption)

Thermal desorption involves the separation of organic contaminants by heating soils from 200°F to 600°F. This option would physically separate the organic contaminants from the contaminated soil. Dust particles and organic contaminants exit the heating unit as exhaust gas. The dust particles are collected in a baghouse or scrubber. The organic compounds are incinerated in an afterburner or adsorbed by an activated carbon filter. The soil would be considered as fill material or as cover material for disposal at a landfill. This option provides for the removal of the contaminant source and, therefore, provides for the overall protection of human health and the environment.

The time frame for completion of this action is considered acceptable because of the limited volume of contaminated soil to be removed and the proven performance of this treatment process. Thermal desorption has been proven effective and reliable at similar underground storage tank (UST) sites. This technology has not been previously implemented at ORR.

Administrative and regulatory considerations may impact the implementability of this option due to potential permit requirements and/or environmental impact evaluations. There are numerous vendors available with the necessary equipment and skilled workers to implement this technology. There would be no long-term management of residual contamination and/or untreated waste due to the removal of the contaminants and subsequent disposal. Capital costs would be moderate to high with no O&M.

7.2.2.4 Physical Treatment (Soil Washing)

Soil washing involves the repeated washing of contaminated soils with water to remove the contaminants of concern. Certain surfactants or chemical addition may be required to facilitate adequate removal of the petroleum hydrocarbons. Large volumes of wastewater would be generated and would require additional onsite equipment for treatment prior to disposal or discharge.

The soil washing process would separate the contaminants and provide for a reduction in contaminated soil volume. Additional treatment operations would be required to degrade or stabilize the concentrated contaminated soil. In addition, soil washing is difficult to implement effectively in clayey soils, which is the major component of the soil matrix at the Rust Garage Facility. This technology has not been previously implemented at ORR.

Administrative and regulatory considerations may impact the implementability of this option due to potential permit requirements and/or environmental impact evaluations. There would be long-term management of residual contamination from the treatment process. There are vendors available with the necessary equipment and skilled workers to implement this technology. Soil washing has been proven effective and reliable for separation of petroleum hydrocarbons at similar UST sites. Capital costs would be moderate with moderate O&M.

7.2.2.5 Biological Treatment (Solid Phase Bioremediation)

Biological treatment of the excavated contaminated soil would involve the aerobic degradation by a solid phase bioremediation process. A bioaugmentation (addition of microorganisms) biological treatment process involves excavating the contaminated soil and transporting it to a designated location for biological treatment. The soils would be treated in biological cells constructed for the volume of soil excavated. Aeration and nutrient addition systems would supply nutrients, oxygen, water, and microbes as needed during the operation of the process.

Biological treatment removes the source of contamination by biological decomposition of the petroleum contaminants below action levels. This option would satisfy the corrective action objectives identified for the soil. This technology has not been previously implemented at ORR.

Administrative and regulatory considerations may impact the implementability of this option due to potential permit requirements and/or environmental impact evaluations. There would be no long-term management of residual contamination from the treatment process due to the decomposition of the contaminants of concern. There are vendors available with the necessary equipment and skilled workers to implement this technology. Bioremediation has been proven effective and reliable for destruction of petroleum hydrocarbons at similar sites. Capital costs would be low with very low to moderate O&M.

7.2.2.6 Disposal (Onsite/Offsite)

Disposal actions involve the preparation and transport of treated (treatment residual) and untreated waste. For disposal at a controlled landfill, TDEC requires that the treated waste TCLP extract for benzene and TPH not exceed 0.5 ppm and 10.0 ppm, respectively. Untreated waste is excavated soil that will not be treated. Treated soils with suitable physical characteristics are considered for uncontrolled disposal by direct land application or as fill material. The waste materials are not considered to meet the definition of a RCRA hazardous waste. If the treated or untreated wastes are determined by the waste characterization study to be classified as RCRA hazardous waste, the disposal options will include disposal per RCRA regulatory requirements. The high effectiveness of all disposal options ensures the protection of human health and the environment.

Options for disposal include onsite and offsite options for treated and untreated soils. Onsite options for disposal are less costly than those for offsite due to lower transportation and disposal costs. Onsite controlled landfill costs are moderate to high and onsite uncontrolled land disposal costs are low to moderate. Disposal in the subject site excavation (if practical) provides the lowest cost option. Landfill capacity limitations and potential institutional factors may limit the use of onsite disposal. Currently, a ban exists prohibiting the offsite transport of wastes from ORR; therefore, offsite disposal is not a preferred disposal option. Offsite controlled landfill costs are high and offsite uncontrolled land disposal costs are moderate to high.

7.2.3 Summary Of Top Three Selected Corrective Action Options

The three corrective action options considered to be best for the specific petroleum contaminants at the Rust Garage Facility involve a combination of removal, treatment, and disposal general response actions. All of the corrective actions considered involve excavation of the contaminated soil prior to treatment. The treatment technologies are thermal desorption, solid-phase bioremediation, and soil washing.

Table 7-3 outlines specific requirements of the treatment technology associated with each of the selected corrective action options. The thermal desorption treatment technique is expected to result in a treated waste suitable for disposal at the Y-12 Centralized Landfill facility. Solid-phase bioremediation is expected to allow unrestricted disposal, preferably with the treated soil remaining at the treatment site. The soil washing technique will generate two different waste streams requiring separate disposal.

7.2.3.1 Advantages and Disadvantages

Since the excavation technique will be the same regardless of the chosen treatment technology, the following discussion only addresses the advantages and disadvantages of the

**Table 7-3. Technology Specific Requirements of Top Three
Corrective Action Options**

Requirement	Thermal Desorption	Soil Washing	Bioremediation
Water	20-100 gpm	200 gpm	0-20gpm
Power	480 V 600 AMP	150 KWH	120V
Fuel	Propane	None	None
Area (footprint)	150' x 130' or less	150' x 200'	140,000 ft ²
Area (laydown)	Soil Pile	Incl. in footprint	None
% Efficiency	99.9%	Variable	99%
Personnel Needs	4 - 5	4 - 5	0 - 5
Local Personnel	70%	90%	90%
Equipment Needed	Yes	Yes	No
Time of Treatment	2-3 months	3 months	3-8 months
Treatability Study	Yes	Yes	Yes
Cost \$/yd ³	\$30-100	\$53-66	\$25-50
Secondary Waste Stream	No	Yes	No

This information was obtained by phone interview with technology vendors between March 17 and March 20, 1992.

treatment technology and the final disposal requirement. The descriptions below are summarized in Table 7-4.

NOTE: Vendors of the remaining options were contacted and questioned using a standard list of requirements. The advantages and disadvantages were determined from the answers to these questions.

Thermal Desorption. Thermal desorption involves the destruction of all organic contaminants by heating above 200°F. Thermal desorption physically separates volatile and some semivolatile contaminants from the contaminated soil. The thermal desorption process heats the contaminated media to between 200° and 600°F, driving off water and volatile contaminants. While there are several different types of combustors used in the process by different vendors, the main concept behind the technology is similar for them all. Soil is placed in the combustor where it is heated long enough to drive hydrocarbons from it. Dust from the exhaust is collected in a baghouse or scrubber and then joined with the treated waste stream. The hydrocarbons, in a vapor form, are either incinerated in a separate afterburner at a much higher temperature or are cooled to condense and reduce their volume and are adsorbed by carbon filters. The carbon filter air pollution control system generates a waste stream that requires additional treatment and/or disposal in a controlled landfill. Soil is separated as a clean product, and since the soil is still very hot and dusty, most systems water it for dust control, cooling, and to maintain soil workability. After confirmatory sampling, the soil is ready for use as fill material or landfill cover. The treated soil may be considered for uncontrolled disposal; however, the product from thermal desorption is considered a sterile product.

Mobile thermal desorption units capable of treating contaminated soil are commercially available for rental or purchase. Permitting and environmental impact considerations of this process, as well as site-specific considerations for mobilization, would have to be considered. A comprehensive treatability study would be conducted to define the operational parameters of this treatment option in relation to the contaminated soil. If the treatment is not meeting target concentrations, higher heat or longer exposure can be applied to complete the desorption. However, the clean-up efficiency of the process is very predictable at 99.9%. The volume requiring treatment could be treated in approximately 2-3 months. The only waste streams created are an air discharge that can be monitored and permitted and carbon filter canisters that must be disposed of, if they are used.

Thermal desorption requires that treatment equipment be brought onsite. The 150' x 130' area required for the equipment is the smallest area needed for any of the treatment options. This equipment does not require a great deal of room but runs the risk of radiological contamination. A concrete pad, or other suitable laydown area, is required to stockpile the soil before and after treatment. Personnel needs are 4 to 5 operators; 2 or 3 operators, or 70%, can be from the local work force. The equipment requires 480 volts at 600 amps of operating power, a substantial amount of propane fuel, and 20-100 gpm of water to re-hydrate and cool the soil after desorption. Thermal desorption costs are high at \$30-\$100/yd³.

Soil Washing. Soil washing is a water-based volume reduction process for treating contaminated soil after excavation. The objective of the process is to concentrate the contaminants into a smaller volume of material separate from the washed soil product. Soil washing can be used for contaminants associated with either fine size fraction of soil (silt, clay, and soil organic matter) or coarse fraction of soil (sand and gravel). The soil washing treatment process removes the contaminants from soils by dissolving or suspending the contaminants in the wash solution. The contaminated soil is mixed with water and subjected to an intensive mechanical scrubbing to remove the contaminants of concern with a water wash. This scrubbing action disintegrates soil particles, freeing contaminated fine particles from coarser sand and

**Table 7-4. Advantages and Disadvantages of Top Three
Corrective Action Options**

Technology	Advantages	Disadvantages
Thermal Desorption	<ul style="list-style-type: none"> • 2-3 months to complete • No waste streams created • 150' x 130' area required • Very predictable success 	<ul style="list-style-type: none"> • Equipment onsite • High cost (\$30-100/yd³) • Sterile soil after treatment • Requires power, water and fuel
Soil Washing	<ul style="list-style-type: none"> • 3 months to complete • Moderate cost (\$53-66/yd³) • 150' x 200' area required • Predictable success 	<ul style="list-style-type: none"> • Equipment onsite • Soil is semi-sterile after treatment • Additional waste stream created • Requires power and water
Solid-Phase Bioremediation	<ul style="list-style-type: none"> • No equipment onsite • Low cost (\$25-50/yd³) • Low utility requirements • Fertile soil after treatment • No waste streams created 	<ul style="list-style-type: none"> • 3-8 months to complete • 140,000 ft² area required • Results not predictable from treatability study

gravel. At this point the coarser particles are separated as cleaned product that is ready for uncontrolled disposal. Certain surfactants and/or chemical additions may be required to facilitate adequate removal of the petroleum hydrocarbons. Large volumes of wastewater would be generated and would require additional treatment prior to disposal or discharge. Gravity settlement of soils is used in the soil washing process to concentrate the soil contaminants in a smaller fraction of the volume (volume reduction). The concentrated portion of the waste stream, which makes up most of the soil, is expected to require further treatment. This treatment could be performed using thermal or bioremediation techniques at an offsite facility, or equipment could be brought onsite. After further treatment the concentrated soil could be ready for controlled disposal or uncontrolled disposal along with the washed product. The product of soil washing is sand and gravel, which will be relatively sterile and not suitable for plant growth. Mixing with organics can make this product a usable soil.

A comprehensive treatability study would have to be conducted to define the operational parameters of this treatment option in relation to the contaminated soil. For the volume to be treated at Rust Garage, soil washing could be completed in approximately 3 months. Its cost is competitive at \$53 to \$66/yd³; however, if secondary treatment is required, this cost could be much higher.

The equipment is mobile mounted and requires a relatively small area (150' x 200') to operate. This area requirement includes a laydown area for handling the soils. Operating the equipment requires 4 to 5 personnel with up to 90% from the local work force. Treatment time can be predicted closely, and the efficiency, which varies, can be estimated by a scale test. Soil washing requires equipment to be brought onsite, introducing the risk of radiological contamination. The equipment for soil washing has a substantial electrical power drain of 150 kilowatt-hours and requires 200 gpm of make-up water for the scrubbing process, but no additional fuel source.

Solid-Phase Bioremediation. Biological treatment of the excavated contaminated soil would involve aerobic degradation by a solid-phase bioremediation process. A bioaugmentation (addition of microorganisms) biological treatment process includes excavating the contaminated soil and transporting it to a designated location for biological treatment. The excavated soil is placed in a lined treatment bed or biological cell at a uniform depth where the bacteria and nutrients are applied. An aeration system to supply oxygen, and an aqueous nutrient addition system would be used. Aerobic biological degradation would provide for the complete destruction of the petroleum hydrocarbon contaminants upon completion of the treatment action. The remaining soil would be usable for uncontrolled disposal as fill material or for direct land application.

Aerobic bacteria are used to treat contaminants in solid-phase bioremediation. The end products of the biodegradation process are carbon dioxide, water, and bacterial biomass. The technology uses special strains of cultured bacteria and microorganisms naturally occurring in the soils and groundwater to break down the hydrocarbons. Solid-phase bioremediation is specifically tailored to site conditions. Soil conditions and contaminant types as well as treatment goals must be considered in decisions about what type of bacteria and nutrients to use, as well as with regard to the variables of pH, temperature, and dissolved oxygen.

A comprehensive treatability study would be conducted to define the operational parameters of this treatment option in relation to the contaminated soil. The type of microbe, nutrient levels, oxygen addition, and expected time frame would be defined.

The entire volume of soil treated by bioremediation would be eligible for uncontrolled disposal. The soil could be covered with topsoil and seeded where it was treated as a means of disposal. In any project on DOE properties in Oak Ridge there is a risk of radiological contamination to equipment. Solid-phase bioremediation does not require capital equipment to be brought onto the Y-12 reservation, eliminating risk of contamination. The process has a low utility requirement of 0 to 20 gpm of water and 120V electric power supply due to lack of large equipment needs. The area used for treatment will need to be periodically watered and tilled for aeration to create an ideal environment for the bacteria to break down the contamination. After the bacteria have broken down the contamination, they die; the soil is ready for uncontrolled disposal and may be fertile for growth. The process does not create additional waste streams while remediating the original contamination since collected leachate can be reapplied to the soil.

Solid-phase bioremediation is not totally predictable. The cost, and more importantly, the time required for treatment is not accurately known. The performance of the microorganisms is widely dependent on the soil conditions. Nutrients can be added to optimize their performance. Bioremediation is the slowest of the treatment options, requiring up to one year; however, most vendors indicate that the process could take as little as 2 months. For estimation purposes, the bioremediation process is expected to last 3 to 8 months. Bioremediation is the least expensive of the options at \$25-\$50/yd³. Personnel needs range from five during treatment bed preparation to zero during the passive degradation process, with an average of 90% from the local work force.

A large, relatively level area of 140,000 ft² is required to construct the perimeter berms, place the liner, and spread the soil in a layer that may need to be as thin as 1 ft. No laydown area is required; however, other small areas will be needed for leachate collection, soil screening, and nutrient addition storage/mixing. As mentioned previously, there is a shortage of usable and available space at the Y-12 facility, and the National Environmental Policy Act (NEPA) requirement for an Environmental Assessment will require approximately two years for completion.

7.2.3.2 Projected Remediation Periods

Estimates of treatment time required were obtained through telephone conversations with technology vendors. It is estimated that approximately 4,524 yd³ of soil will be excavated. Assuming a swell of 30% yields 5,881 yd³ of loose soil. Time frames were obtained based on preliminary information; actual remediation time is expected to vary. All technologies have a common excavation time period. It is assumed that one month of excavation takes place before treatment begins. Excavation should proceed faster than any of the remediation options and will be able to run concurrently with soil decontamination. Excavation should take approximately 2 months for all corrective actions considered. Table 7-5 contains a summary of projected remediation periods.

Thermal Desorption. The 5,881 yd³ of contaminated soil could be treated by thermal desorption in approximately 2 to 3 months. After treatment, it is expected to take approximately 1 month to dispose of the treated soils. The total remediation period is expected to last 4 to 5 months.

Soil Washing. Soil washing should take approximately 3 months. This does not include the additional treatment of the concentrated contamination, which could take an additional 2 to 3 months depending on the treatment alternative used. After treatment, it is expected to take approximately 1 month to dispose of the treated soils from both processes. The total remediation period is expected to last 6 to 7 months.

**Table 7-5. Projected Remediation Periods of Top Three
Corrective Action Options**

Treatment Technology	Excavation	Treatment	Disposal	Total Period
Thermal Desorption	1 month	2-3 months	1 month	3-4 months
Soil Washing	1 month	5-6 months	1 month	6-7 months
Solid Phase Bioremediation	1 month	3-8 months	1 month	4-9 months

Note: Approximately 1 month of excavation should take place before beginning treatment; the second month can run concurrently with treatment. Disposal could also take place concurrently with treatment; however, the total period is conservatively assumed as cumulative time.

Solid-Phase Bioremediation. Depending on climatic conditions, solid-phase bioremediation should take between 3 and 8 months. After treatment, it is expected that the soil could remain in place; therefore, the disposal period is null. Alternatively, decommissioning of the treatment cell, reapplication of the clean soil, and disposal of the liner should take less than 1 month. The total remediation period is expected to last 4 to 9 months.

8.0 CORRECTIVE ACTIONS CHOSEN

8.1 Soil Corrective Action

8.1.1 General Description of Soil Corrective Action

Based on an evaluation of all criteria associated with the corrective action options discussed in Section 7.2, a combination of process options is proposed for the Rust Garage Facility. The proposed approach would initially involve initial excavation of contaminated soils from the impacted areas of the facility as identified in Section 5.3 of the Environmental Assessment Report for the Rust Garage Facility. The excavated soil would then undergo thermal desorption treatment, which would physically separate organic compounds from the soil matrix. The organic compounds would either be incinerated in an afterburner unit or would be adsorbed by an activated carbon filter unit. The treated soils would finally be disposed by landfilling at a permitted Y-12 Plant facility, or used as fill material in the subject site excavation. A graphic illustration of the proposed corrective action is presented in Figure 8-1.

The corrective action approach proposed for the Rust Garage Facility offers several advantages over the other actions evaluated for the Corrective Action Plan. The proposed approach will result in removal of the facility TPH soil contamination source, human health and environmental concerns associated with implementation will be minimal, and the technical requirements associated with the approach will be manageable. The excavation and thermal desorption approach is also advantageous because the cleanup efficiency of this process is very predictable at 99.9%. Thermal desorption has been proven effective and reliable at similar UST sites.

8.1.2 Soil Remediation System Analysis

8.1.2.1 Soil Removal

Excavation

Contaminated soils identified in excess of the 500 ppm TDEC Closure Action Level for TPH at the Rust Garage Facility, and soils containing benzene, toluene, xylene (BTX) contamination in excess of 250 ppm, will be removed by excavation for the purpose of treatment and disposal. Delineation of soil contamination at the facility identified two areas of near-surface and subsurface contamination: a smaller area located at the former Building 9754-1 tank bay and a larger area extending south from Building 9720-15 (see Figure 5-10 of the Environmental Assessment Report).

Excavation beyond these delineated contamination areas may be required if additional contaminated soils are encountered as indicated by soil screening and/or sampling conducted during the excavation activities. Conversely, excavation of the entire delineated contamination area may not be required if sections of this area are determined to contain contaminants below the applicable TDEC Closure Action Levels. Excavation of the delineated contamination areas will be conducted as a phased approach such that excavation of one section of each area will be completed prior to the beginning of excavation of the next section. This is necessary to minimize disruption of on-going activities at the Rust Garage Facility and to ensure that only contaminated soil exceeding closure action levels are removed. Soil excavation will not extend significantly below the local water table since soils in this area would be considered part of the Y-12 Plant groundwater operable unit.

EXCAVATION PHASE

TREATMENT PHASE

Martin Marietta Energy Systems, Inc.
Environmental Management Department

FIGURE 8-1

Soil Treatment Process Flow

Prior to excavation activities, the excavation site will need to be cleared of fencing, minor structures, aboveground utilities, etc. The dismantling, removal, or relocation of any fencing, utility, or structure will be conducted under the direction of Martin Marietta Energy Systems, Inc. personnel. Surface control measures will be implemented to control surface water runoff and runoff during excavation activities. Excavation of the contaminated soils will be accomplished using appropriate equipment provided by the Y-12 Plant Maintenance Department and/or a designated subcontractor. A large tracked excavator is planned to be used for the bulk of the excavation work due to the production capabilities and depth of excavation offered by this type of equipment. Utility lines will be protected during construction by preliminary location, bracing, and proper backfill upon refilling of excavations. If it is not possible to work around certain utilities, they will be either capped and removed, or re-routed, at the direction of Martin Marietta Energy Systems, Inc. personnel. Figure 2-3 presented in the Environmental Assessment Report shows approximate locations of suspected potable water, sanitary sewer, and storm drainage utilities in the planned areas of excavation.

Soil Screening

During the course of excavation activities, soil samples for field screening will be collected at multiple depth intervals between the surface and the water table. An average of one sample will be collected for every 250 ft² of excavated surface, and in any visibly contaminated areas of the excavation. A portion of each of the collected samples will be placed into an air-tight vial or sealable container and heated to a temperature of approximately 90 °C. A sample of the head space gas generated within the vial will then be extracted and analyzed using a portable gas chromatograph. An alternative that may be used in addition to head space analysis would involve field extraction of contaminants using a solvent and analysis of the extract using a portable gas chromatograph.

If the head space gas or extract derived from a soil sample is determined to contain greater than 500 ppm TPH, or 250 ppm BTX, excavation in the area from which the soil sample was collected will continue until field screening analyses are below these levels. Head space screening will be conducted in accordance with Method ESP-303-7, *Soil Gas Sampling* (ESH/SUB/87-2-706/1). Additionally, visual and odor observations may be used regarding the extent of soil excavation required when obvious contamination is encountered.

Zone of Influence

Figure 8-2 shows the areal extent of the contaminated soils proposed to undergo remediation. The larger contamination area is designated as Zone A and the smaller area as Zone B. A 2-ft buffer zone extending beyond the contaminated areas is assumed for excavation purposes. However, the entire area of Zone A or Zone B may not require excavation if field screening of soil samples indicate that sections of these zones are not contaminated in excess of closure action levels.

Excavation of Zone A is anticipated to encompass an areal extent measuring approximately 150 ft by 165 ft with excavation depths ranging from 6 ft to 13 ft below ground level. In the northern third of this excavation area, an average of the top 3 ft of soil is expected to be noncontaminated pavement, base stone, and soil. The upper 0.5 ft to 5.5 ft of topsoil, rock, and gravel in the central third of the excavation area, and the upper 1.0 ft to 4.5 ft of soil and gravel in the southernmost portion of the excavation area, is expected to be noncontaminated. The upper material removed from the excavation area may be stockpiled and used for backfill after completion of removal activities, or disposed of in the Y-12 Plant landfill.

All location information presented in this figure is based upon MMES engineering drawings, results of previous MMES investigations, and/or field determinations of feature and sampling locations. No representation or warranty, expressed or implied, is made as to the accuracy of the information or statements presented in this figure.

SCALE

1" = 50'

Legend

1010

Ground Surfa
with Elevation
Feet MSL

Sta. 0+00

Cross Section

Contour Line
Represented as

Identifier

Soil Contamination >500 ppm TPH

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Environmental Management Department

FIGURE 8-2

**Rust Garage Facility
Horizontal Zone of
Influence Map**

Excavation of Zone B is anticipated to encompass a basically rectangular area of approximately 75 ft by 65 ft within which soils would be removed to a depth of approximately 8.0 ft below ground level (Figure 8-2). The top 1.0 ft of this excavation consists of gravel used in the original tank removal to refill the excavation and is not expected to exceed TDEC Closure Action Levels. This material may be used as backfill material or disposed of in the Y-12 Plant landfill.

The volumes of both zone excavations were calculated using the average end area method. Figure 8-2 indicates where the sections were established for this method calculations, and Figure 8-3 shows the actual cross-sections for Zones A and B.

Within Zone A, some asphalt pavement, gravel base, and soil material is assumed to be noncontaminated. The estimated depth of noncontaminated material is 3.0 ft in the northernmost third of the excavation (sections 0+25 and 0+50), 0.5 to 5.5 ft in the central portion of the excavation (sections 0+75 and 1+00), and 1.0 to 4.5 ft in the southernmost portion of the excavation (sections 1+25 and 1+50). Because of seasonal variation of the local water table, the depth of contamination is assumed to extend approximately 1.0 ft below the water table level noted on the cross-sections presented in Figure 8-3. The volume of contaminated soil to be excavated is expected to be approximately 3,700 yd³ in place, or 4,850 yd³ assuming a 30% swell factor. Table 8-1 contains the average end area calculations used to determine the volume of the excavation for Zone A.

Within Zone B, the top 1.0 ft of the excavation is assumed to be noncontaminated gravel that was placed in the excavation during the original removal of the tanks previously located in the tank bay located in this zone. Because of seasonal variation of the local water table, the depth of contamination is assumed to extend approximately 1.0 ft below the water table level noted on the cross-sections presented in Figure 8-3. The volume of contaminated soil to be excavated is expected to be approximately 800 yd³ in place, or 1,050 yd³ assuming a 30% swell factor. Table 8-1 contains the average end area calculations used to determine the volume of the excavation for Zone B.

The total volume of contaminated soil to be excavated at the Rust Garage Facility is expected to be approximately 4,500 yd³ in place. Assuming 30% swell, the total volume of soil to be transported and treated is approximately 5,900 yd³. However, the extent of contamination at the facility is based on field hydrogeologic information and sample analyses data generated from previous site investigations. Therefore, the final volume of soil requiring excavation will be dictated by subsurface conditions encountered during the course of excavation activities, and the results of field screening of soil samples collected during these activities.

Confirmatory Sampling

Upon completion of contaminated soil removal from the impacted areas of the Rust Garage Facility, confirmatory soil samples will be collected from excavation areas to ensure that this phase of the overall facility remediation is complete. The actual number and locations of the confirmatory samples to be collected will be dependent on the final areal extent and depth of the excavations and thus, will not be determined until all excavation activities are complete. It is anticipated that a minimum of eight confirmatory samples within Zone A, and a minimum of four confirmatory samples within Zone B, will be collected from the perimeter of the excavations and sent for laboratory analysis. The actual number of confirmatory samples collected from the excavation will be sufficient to demonstrate that all soil contamination above applicable TDEC Closure Action Levels has been removed.

ZONE A

All location information presented in this figure is based upon MMES engineering drawings, results of previous MMES investigations, and/or field determinations of feature and sampling locations. No representation or warranty, expressed or implied, is made as to the accuracy of the information or statements presented in this figure.

Horiz. Scale: 1"=50'
Vert. Scale: 1"=10'

Legend

- Contamination Zone To Be Excavated
- Non-Contaminated

G:\93017R1\DWGS\5808-3 (1/14/93)

STA. 1+00

STA. 1+25

STA. 1+50

ZONE B

STA. 0+12.5

STA. 0+25

STA. 0+50

Water Table

Soil

Martin Marietta Energy Systems, Inc.
Environmental Management Department

FIGURE 8-3

Rust Garage Facility
Vertical Zone of
Influence Map

**Table 8-1. Volume Calculation for Contaminated Soil at the
Rust Garage Facility Based on Average End Area Method**

Zone A Station	X-Section Area (contam)	X-Section Area (noncontam)	Avg. End Area (contam)	Avg. End Area (noncontam)	Distance	Volume yd³ (contam)	Volume yd³ (noncontam)
0.0	0.0	0.0					
			325.0	120.0	25.0	300.9	111.1
25.0	650.0	240.0					
			739.5	257.5	25.0	684.7	238.4
50.0	829.0	275.0					
			949.5	297.5	25.0	879.2	275.5
75.0	1070.0	320.0					
			859.0	337.5	25.0	795.4	312.5
100.0	648.0	355.0					
			560.0	275.0	25.0	518.5	254.6
125.0	472.0	195.0					
			414.5	255.0	25.0	383.8	236.1
150.0	357.0	315.0					
			178.5	157.5	25.0	165.3	145.8
175.0	0.0	0.0					
Total Vol.						3727.8	1574.0
Zone B							
0.0	0.0	0.0					
			178.8	35.0	12.5	82.8	16.2
12.5	388.0	70.0					
			406.3	70.0	12.5	188.1	32.4
25.0	460.0	70.0					
			397.5	65.0	25.0	368.1	60.2
50.0	380.0	60.0					
			170.0	30.0	25.0	157.4	27.8
75.0	0.0	0.0					
Total Vol.						796.3	136.6
Zone A+B						4,524 yd³	1711 yd³
+30% Swell						5,881 yd³	2,224 yd³

A second type of confirmatory sampling to be conducted for this phase of the Rust Garage Facility remediation will involve collection of soil samples from excavated, noncontaminated material, which is segregated from soils designated for treatment. The purpose of this sampling will be to determine if the segregated material meets appropriate criteria for backfilling into the facility excavations or requires treatment via thermal desorption to reduce contaminant levels. The actual number of segregated material samples to be collected will be dependent on the final volume of material requiring disposal and, thus, will not be determined until all excavation activities are complete. However, a minimum of four composite samples, each comprised of four individual samples, will be collected from each 500 yd³ volume of segregated material requiring disposal.

All confirmatory soil sampling will be conducted in accordance with Method ESP-303-1, *Soil Sampling with a Spade and Scoop* (ESH/SUB/87-2-706/1). Samples collected will be handled and preserved in accordance with Method ESP-701, *Sample Preservation and Container Materials*, and ESP-800, *Packaging Environmental Samples for Transportation*. All of the equipment used for sample collection will be decontaminated in accordance Method ESP-900, *Cleaning and Decontaminating Sample Containers and Sampling Devices*. Each of the excavation and segregated material soil samples collected will undergo laboratory analysis to determine the content of total BTX and TPH in accordance with the methodologies presented in Table 8-2. The segregated material samples will also undergo laboratory analysis for extractable lead because it was found to be present in soil samples collected at the Rust Garage Facility during previous site investigations. Several of these investigation samples contained sufficient concentrations of lead such that the soils represented by these samples may possibly exhibit hazardous characteristics.

In addition to the confirmatory soil samples, a complete set of Quality Assurance/Quality Control (QA/QC) samples will also be collected for this phase of the Rust Garage Facility remediation. The QA/QC samples for the project will include duplicate soil samples to be collected along with the confirmatory samples, equipment rinsate samples to be collected on each day that sampling is conducted, and trip blank samples that will accompany each sample cooler transported to the analytical laboratory. The set of duplicate soil samples will represent no less than ten percent (10%) of the total number of confirmatory samples collected. Each of the QA/QC samples will undergo the same types of laboratory analyses as the confirmatory samples. All QA/QC activities and documentation will be performed in accordance with the current Y-12 Plant QA/QC program.

8.1.2.2 Soil Treatment

Thermal Desorption

The thermal desorption process will provide an ex situ means to physically separate volatile and some semivolatile contaminants from soil. The selected desorption unit will use either indirect or direct heat exchange to vaporize organic contaminants from soil. The thermal desorption process heats the contaminated media between 200° and 600°F, driving off water and organic contaminants. Air, combustion gas, or inert gas will serve as the transfer medium for the vaporized components. A baghouse or scrubber will collect the dust from the exhaust which is subsequently joined with the treated waste stream, or filtered out of the waste stream. Soil will be separated as a clean product and will be used as fill material in the Rust Garage Facility excavations, or landfilled at a permitted Y-12 Plant facility.

Contaminated soil material is removed from the Rust Garage Facility via excavation (as previously discussed) and delivered to the treatment unit. Typically, fill material objects (i.e., stones, brick, fragments, etc.) greater than 1.5 inches in size are removed from the contaminated soil material by mechanical screening prior to treatment. The soil material is then delivered by gravity to the desorber inlet, or conveyed by augers to a feed hopper.

Table 8-2. Analytical Methods Proposed for Analyses of Remediation Soil and Samples Collected at the Rust Garage Facility

Contaminant	Analytical Method	Method Number
Confirmatory:		
Volatile Organic Compounds (BTX)	Gas Chromatography/ Mass Spectroscopy	8240 ¹
Total Petroleum Hydrocarbons		
TPH-GRO/DRO	Gas Chromatography/ Mass Spectroscopy	EPA 8015- Modified ²
Lead	Toxicity Characteristic Leaching Procedure-Atomic Absorption Flame Graphite Furnace Technique	13113/7421 ³
Post-Treatment:		
Volatile Organic Compounds (BTX)	Gas Chromatography/ Mass Spectroscopy	8240 ¹
Total Petroleum Hydrocarbons		
TPH-GRO/DRO	Gas Chromatography/ Mass Spectroscopy	EPA 8015- Modified ²
Lead	Toxicity Characteristic Leaching Procedure-Atomic Absorption Flame Graphite Furnace Technique	13113/7421 ³
Waste Characterization:⁴		
Benzene	Toxicity Characteristic Leaching Procedure-Fourier Transform Infrared Spectrometry	13113/418.1 ⁵
Total Petroleum Hydrocarbons	Toxicity Characteristic Leaching Procedure-Fourier Transform Infrared Spectrometry	13113/418.1 ⁵

¹EPA, November 1986

²TDEC, January 1992

³EPA, March 1990

⁴Waste characterization only to occur if sanitary landfill disposal of soil is required.

⁵EPA, March 1983

Thermal desorption treatment units vary greatly in the design of their heating component. The heating component may be an indirectly fired rotary kiln, a single (or set of) internally heated screw auger(s), or a series of externally heated distillation chambers. The latter design uses annular augers to move the contaminated soil from one volatilization zone to the next. The contaminated soil is placed into contact with the heated surface, and organic components (including water) are driven off. Vaporized contaminants are removed from the heating unit using either an inert gas (such as nitrogen), which is injected in a countercurrent sweep stream, or by simply directing the hot gas stream from the unit.

The primary factors affecting performance in thermal desorption include the actual bed temperature and residence time. Control of these parameters in the desorption unit is provided through use of a series of increasing temperature zones, multiple passes of the soil through the desorber where the operating temperature is sequentially increased, separate compartments where the heat transfer fluid temperature is higher, or sequential processing into higher temperature zones.

Organics in the offgas are burned in an afterburner, collected on activated carbon, or are recovered in condensation equipment. The carbon filter air pollution system generates a waste stream that requires additional treatment and/or disposal in a controlled landfill. The selection of the gas treatment system will be based on an evaluation of the concentrations of contaminants, cleanup standards, and the economics of the offgas treatment system(s) employed.

Regulatory and administrative controls will be taken into consideration with the implementation of this process. An evaluation of potential permit requirements and environmental impacts will be necessary. There are numerous vendors available with the necessary equipment and personnel to implement this technology. A mobile unit would be set-up within the Y-12 Plant. There would be no long-term management of residual contamination and/or untreated waste due to the removal of the contaminants and subsequent disposal. Operating costs will be moderate to high ranging from \$30 to \$100/yd³.

The thermal desorption unit will be staged at an appropriate location within the Y-12 Plant site. A minimum area of 150 ft x 130 ft will be necessary to accommodate the equipment. A suitable laydown area will be required to stockpile soil before and after treatment. The laydown area will be used to stockpile contaminated soil upon its excavation from the Rust Garage Facility. Four to five operators will be needed to operate the equipment that requires 480 volts at 600 amps of operating power, a substantial amount of propane fuel, and 20 to 100 gpm of water to re-hydrate and cool the soil after desorption treatment.

The excavation equipment may be operated simultaneously with the thermal desorption treatment unit, or excavation activities may be conducted prior to treatment if procurement of the desorption unit is not completed at the beginning of soil excavation. Operated simultaneously, an excavation rate of approximately 20 yd³/hr would maximize the treatment production rate. This production rate is commensurate with the treatment rate of typical thermal desorption units. If excavation precedes treatment, soil material will be stockpiled during the course of excavation activities. Stockpiled material would be placed on plastic sheeting and covered to ensure that contamination of the storage site does not occur. Stockpiling of soil material would allow excavation activities to occur continuously through completion. A front end loader would then be used to place contaminated soils into the treatment unit from the soil stockpiles.

Post-Treatment Sampling

During the course of the thermal desorption soil treatment phase of the corrective action, post-treatment soil samples will be collected for laboratory analysis. These samples will be used to

monitor the effectiveness of petroleum contaminant removal within the thermal desorption unit. Remediation of the soils will be considered complete when the concentrations of total BTX and TPH have been reduced to levels less than or equal to 10.0 ppm and 100.0 ppm, respectively.

Samples will be collected from soil stockpiles created as treated soil material exits the thermal desorption unit. Initially, the total volume of each stockpile (in cubic yards) will be determined. The total volume number will then be divided by fifteen and the resulting number will be multiplied by two. This calculated value will represent the number of soil samples that must be collected from a given stockpile for field screening analysis. These samples will be collected from points that evenly distributed throughout the entire volume of the soil, and will be representative of the total soil volume rather than the total area occupied by a given soil stockpile. The collected samples will undergo field head space gas screening using an organic vapor detector (OVD) or field gas chromatograph. Based on the results of the field screening, a minimum of two of the collected samples exhibiting the highest field screening readings will be submitted for laboratory analyses. In the event that the volume of a treated soil stockpile exceeds 240 yd³, additional samples will be submitted for laboratory analyses in accordance with the requirements of the TDEC Technical Guidance Document - 005.

All post-treatment soil sampling will be conducted in accordance with Method ESP-303-1, *Soil Sampling with a Spade and Scoop*, or with a hand auger in accordance with Method ESP-303-2, *Soil Sampling with an Auger* (ESH/SUB/87-2-706/1). Samples collected will be handled and preserved in accordance with Method ESP-701, *Sample Preservation and Container Materials*, and ESP-800, *Packaging Environmental Samples for Transportation*. All of the equipment used for sample collection will be decontaminated in accordance with Method ESP-900, *Cleaning and Decontaminating Sample Containers and Sampling Devices*. Each of the post-treatment soil samples collected will undergo laboratory analysis to determine the content of total BTX, TPH, and extractable lead in accordance with the methodologies presented in Table 8-2. Extractable lead will be included in the analysis of the treated soil because it was found to be present in soil samples collected at the Rust Garage Facility during previous site investigations. Several of these samples contained sufficient concentrations of lead such that the soils represented by the samples may possibly exhibit hazardous characteristics.

In addition to the post-treatment soil samples, a complete set of QA/QC samples will also be collected for the post-treatment phase of the Rust Garage Facility remediation. The QA/QC samples for the project will include duplicate soil samples to be collected along with the post-treatment samples, equipment rinsate samples to be collected on each day that sampling is conducted, and trip blank samples that will accompany each sample cooler transported to the analytical laboratory. The set of duplicate soil samples will represent no less than ten percent (10%) of the total number of post-treatment samples collected. Each of the QA/QC samples will undergo the same types of laboratory analyses as the post-treatment samples. All QA/QC activities and documentation will be performed in accordance with the current Y-12 Plant QA/QC program.

8.1.2.3 Soil Disposal

Upon receipt of the analytical results for the treated soil stockpiles, this material will be transported back to the Rust Garage Facility for final disposal as backfill in the site excavations. In the event that the analytical results for any given soil stockpile indicate that the material contains contaminant levels in excess of TDEC Closure Action Levels (i.e., 10 ppm total BTX and 100 ppm TPH), the material will be re-introduced into the thermal desorption unit and treated for a second time. Treatment will continue until the contaminant levels within the material have been reduced to levels allowing for disposal as backfill at the Rust Garage Facility. Successful treatment of this material will be documented through re-sampling, which will be conducted in the same manner as the sampling of the original treated material.

It is anticipated that near-surface soil overburden at the Rust Garage Facility will be noncontaminated material. This material will be stockpiled near the site excavations upon removal and sampled in the same manner as that described for the treated soil stockpiles. Based on the analytical results for the overburden material, it will either be placed into the site excavations as backfill material, or will be sent to the thermal desorption unit for treatment prior to being used as backfill at the site.

Soil material containing lead contamination at sufficient concentrations to warrant a hazardous classification, may possibly be encountered during the implementation of this corrective action plan. Any such soils would be segregated from nonhazardous soils upon completion of thermal desorption treatment. Hazardous waste generated from remediation activities would require temporary storage, and would eventually be transported to an appropriate disposal or treatment facility. However, based on preliminary analytical results with regard to lead concentrations derived from previous site investigations at the Rust Garage Facility, the volume of potential hazardous waste is expected to be minimal, or may not be present at all.

8.2 Groundwater Corrective Action

8.2.1 Corrective Actions Considered

Three groundwater corrective actions were considered to be appropriate for remediation of the Rust Garage Facility. These three corrective actions were (1) remediation under the Y-12 Plant CERCLA Program, (2) pump and haul, and (3) closed-loop circulation. The CERCLA Program option would involve remediation of the groundwater contamination at the Rust Garage Facility as part of the larger remedial action to be implemented for the Y-12 Plant Groundwater Operable Unit (Upper East Fork Poplar Creek - Operable Unit 1). This corrective action is proposed for remediation of groundwater at the Rust Garage Facility.

The pump and haul option would involve the extraction of contaminated groundwater using existing monitoring wells and/or new extraction wells installed at the facility. The extracted groundwater would then be transported to a Y-12 Plant wastewater treatment facility where it would undergo treatment and disposal through a National Pollutant Discharge Elimination System (NPDES) permitted outfall. This corrective action option was eliminated from consideration because the extracted groundwater would contain other contaminants (including trace metals, radionuclides, nitrates) not related to the Rust Garage Facility petroleum groundwater contamination. Treatment of this mixed waste would be difficult and costly to accomplish.

The closed-loop circulation option would involve the extraction of groundwater from the downgradient side of the facility, treatment of the groundwater using portable systems at the surface, and re-injection of the treated groundwater at the upgradient side of the facility. The portable treatment systems would consist of an air stripping unit and an activated carbon adsorption unit. The closed-loop circulation at the facility would continue until groundwater contaminant levels were reduced to below applicable TDEC Closure Action Levels. This corrective action option was eliminated from consideration because the extracted groundwater would contain other contaminants (including trace metals, radionuclides, nitrates) not related to the Rust Garage Facility petroleum groundwater contamination. The portable treatment systems could also become radiologically contaminated during operation with the activated carbon becoming a secondary mixed waste. This action would result in the treatment of only petroleum product constituents rather than all of the groundwater contaminants present at the site.

Based on an evaluation of all criteria associated with the corrective action options discussed above, remediation under the Y-12 Plant CERCLA Program is proposed as the corrective action option for petroleum-contaminated groundwater at the Rust Garage Facility. This selection is based upon the fact that petroleum groundwater plume at the Rust Garage Facility is comingled with contaminants associated with the S-3 Ponds groundwater plume. The S-3 Ponds plume is located throughout the west end of the Y-12 Plant and encompasses the entire Rust Garage Facility as illustrated in Section 4.2.2 of the Environmental Assessment Report for the Rust Garage Facility.

Remediation of groundwater petroleum contamination at the Rust Garage Facility will be addressed as part of remedial actions under CERCLA for the Y-12 Plant Groundwater Operable Unit. Remediation of the facility groundwater as part of the groundwater operable unit corrective action, rather than a separate action, will be more technically feasible and cost effective because large-scale treatment of multiple contaminants will be employed. Groundwater monitoring of the existing wells at the Rust Garage Facility will be conducted during development of remedial action plans for the groundwater operable unit in order to document changes in the nature and/or extent of the petroleum groundwater plume at the facility. In the event that free-product is discovered during implementation of the soil corrective action proposed for the Rust Garage Facility, removal of the free-product will be conducted in accordance with the requirements of TDEC Rules 1200-1-15-.05 and 1200-1-15-.06, and will not be addressed by the Y-12 Plant CERCLA Program.

With the inclusion of the Oak Ridge Reservation on the CERCLA National Priorities List, a Federal Facilities Agreement has been negotiated (effective date of January 1, 1992) which provides for the TDEC, U.S. Environmental Protection Agency, and DOE to proceed with CERCLA as the lead regulatory requirement, with the Resource Conservation and Recovery Act as an applicable or relevant and appropriate requirement. In line with a CERCLA remedial strategy, the Groundwater Operable Unit (Operable Unit 1) has been established separately for the Upper East Fork Poplar Creek Hydrogeologic Regime. This approach is warranted because: (1) efforts to establish the horizontal and vertical extent of groundwater contaminant plumes from individual sites indicates that the plumes are significantly comingled, making assessment and potential remedial actions of individual plumes impractical and (2) the units share a common exit pathway from the hydrologic system which is best addressed by a comprehensive approach. Additional justification for the selection of groundwater remediation at the Rust Garage Facility as part of the Y-12 Plant CERCLA Program is presented below.

8.2.3 Description of the S-3 Ponds

The S-3 Ponds are located about 200 ft north of the headwaters of Bear Creek, near the topographic divide between Bear Creek and East Fork Poplar Creek. This site is part of the S-3 Waste Management Area which consists of the S-3 Ponds Hazardous Waste Disposal Unit, the S-2 Hazardous Waste Disposal Unit, the Interim Drum Yard, the Salvage Yard, the Rust Garage Facility, and four nonregulated solid waste management units. The locations of the various sites contained within the S-3 Waste Management Unit are presented in Figure 8-4.

The S-3 Ponds, built in 1951, consisted of four unlined impoundments covering an area of approximately 400 x 400 ft. Designed to maximize rates of evaporation and percolation, the ponds were approximately 17 ft deep and had a storage capacity of about 2.5 million gallons each. The original pond excavations penetrated weathered bedrock (residuum), but did not extend down to bedrock.

Waste products were discharged to the S-3 Ponds from 1951 to 1984 via tank trucks and an underground pipeline. They were primarily nitric acid, acid aluminum nitrate waste solutions, plating wastes, and miscellaneous liquid wastes associated with routine cleanup operations. Other

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Environmental Management Department

FIGURE 8-4

Components of the S-3 Waste-Management Area

wastes placed into the ponds included dilute acid, machine coolants, caustic solutions, biodegradation sludges, and concentrated nitric and other acids. During the mid-1950s, uranyl nitrate solutions containing small amounts of plutonium were disposed of at the ponds. Depleted uranium in nitric acid as well as technetium contained in raffinate and condensate may have entered the ponds during their operation.

8.2.4 Nature and Extent of Groundwater Contamination

The constituents of concern within groundwater in the Upper East Fork Poplar Creek Hydrogeologic Regime at the Y-12 Plant are trace metals, VOCs, nitrate, and radionuclides. The primary source of trace metals, nitrates, and radionuclides in the Upper East Fork Regime is the S-3 Ponds site, which is also the main source of these contaminants in the Bear Creek Regime. Although the S-3 site lies west of a shallow groundwater divide that now separates the Bear Creek Regime from the East Fork Regime, a mound in the water table present below the site during its operational period enabled contaminants to migrate east of the current divide. Since waste disposal activities ceased at the S-3 site, the mound in the water table gradually abated and is no longer present.

Results of quarterly sampling conducted during 1992, and reported in the Y-12 Plant 1993 Groundwater Quality Assessment for the Bear Creek Hydrogeologic Regime, indicated that five individual trace metals associated with the S-3 Ponds site exceeded maximum contaminant levels for drinking water. During the 1992 quarterly sampling an additional nine trace metals associated with the S-3 site, and two radionuclides (strontium and uranium), were found to exceed screening levels. The screening level values represented the maximum total concentration that would be expected in uncontaminated, unfiltered groundwater samples collected from monitoring wells located upgradient from waste management sites at the Y-12 Plant. Nitrate at the site was found to be present at an average concentration of 3757.4 mg/L, ranging up to a maximum concentration of 10955.0 mg/L. A summary of the contaminants associated with the S-3 Ponds site as indicated by the 1992 quarterly sampling, and the range/average concentration of these contaminants, is presented in Table 8-3.

Results of quarterly sampling conducted during 1993, which will be reported in the Y-12 Plant 1994 Groundwater Quality Assessment for the Upper East Fork Poplar Creek Hydrogeologic Regime, indicated that the six groundwater monitoring wells located at the Rust Garage Facility (Wells 505, 508, 631, 632, 633, and 634) were contaminated with trace metals, radionuclides, and nitrates associated with the S-3 Ponds site (Figure 8-5). Average barium and chromium concentrations were found to exceed maximum contaminant levels at the facility while average cobalt, manganese, and strontium concentrations were found to exceed screening levels. At least one groundwater sample collected at the facility was found to contain aluminum, iron, zinc, and uranium concentrations in excess of screening levels. Nitrate at the facility was found to be present at an average concentration of 1144.4 mg/L, ranging up to a maximum concentration of 5501.0 mg/L. A summary of the contaminants found to be present in the Rust Garage Facility monitoring wells as indicated by the 1993 quarterly sampling, and the range/average concentration of these contaminants, is presented in Table 8-4.

Based on the known presence of S-3 Ponds contaminants throughout the western portion of the Upper East Fork Regime, and the detection of a majority of these contaminants within the Rust Garage Facility monitoring wells, it is apparent that the S-3 groundwater plume encompasses the Rust Garage Facility site. Due to the comingling of S-3 contaminants with the petroleum contaminants originating at the Rust Garage Facility, separation of the petroleum contaminants for the purpose of groundwater remediation is not possible. Therefore, the best alternative with regard to remediation of contaminated groundwater at the facility would be a single remedial action under

Table 8-3. Summary of S-3 Ponds Groundwater Quality Results Derived from 1992 Quarterly Groundwater Sampling at the Y-12 Plant

<u>Contaminant</u>	<u>MCL</u> ¹	<u>Min/Max</u> ²	<u>Average</u> ³
Barium	1.0	4.8/340.0	105.4
Cadmium	0.01	0.035/2.8	1.25
Chromium	0.05	0.24/0.28	0.26
Lead	0.05	0.067/0.067	0.067
Mercury	0.002	0.053/0.11	0.09
<u>Contaminant</u>	<u>SL</u> ⁴	<u>Min/Max</u>	<u>Average</u>
Aluminum	8.3	680.0/800.0	730.0
Beryllium	0.0066	0.036/0.078	0.06
Boron	1.1	1.4/2.1	1.7
Cobalt	0.012	0.51/1.9	1.3
Copper	0.44	0.46/1.4	0.92
Iron	13.91	14.0/14.0	14.0
Manganese	2.4	18.0/220.0	114.7
Nickel	0.18	15.0/20.0	17.7
Zinc	0.14	0.17/4.0	1.8
Strontium	0.88	11.0/320.0	100.6
Uranium	0.01	0.37/36.0	7.7
Nitrate Nitrogen	NA	11.0/10955.0	3757.4

¹MCL - Maximum Contaminant Limit (mg/L).

²Min/Max - minimum and maximum concentrations (mg/L) detected in quarterly groundwater samples collected during 1992 from the S-3 Ponds area.

³Average - calculated average of all concentrations (mg/L) detected in quarterly groundwater samples collected during 1992 from the S-3 Ponds area.

⁴SL - Screening Level (m/L). Value represents the maximum total concentration that would be expected in uncontaminated, unfiltered groundwater samples collected from monitoring wells located upgradient from waste management sites at the Y-12 Plant.

**Table 8-4. Summary of Rust Garage Facility Groundwater Quality Results
Derived from 1993 Quarterly Groundwater Sampling at the Y-12 Plant**

<u>Contaminant</u>	<u>MCL</u> ¹	<u>Min/Max</u> ²	<u>Average</u> ³	<u>Wells Contaminated</u>
Barium	1.0	0.063/33.0	4.45	505, 508, 631, 632, 633, 634
Cadmium	0.01	0.0056/0.0063	0.0059	505
Chromium	0.05	0.019/0.48	0.14	505, 632
Lead	0.05	ND ⁴	ND	NA ⁵
Mercury	0.002	0.00022/0.00023	0.000225	508, 631
<u>Contaminant</u>	<u>SL</u> ⁶	<u>Min/Max</u>	<u>Average</u>	<u>Wells Contaminated</u>
Aluminum	8.3	0.056/11.0	2.74	505, 508, 631, 632, 633, 634
Beryllium	0.0066	0.00043/0.0042	0.0013	505, 508, 631, 632, 634
Boron	1.1	0.025/0.22	0.060	505, 508, 631, 632, 633, 634
Cobalt	0.012	0.0074/0.22	0.073	505, 508, 631, 632, 634
Copper	0.44	0.0051/0.011	0.0076	505, 508, 631, 632
Iron	13.91	0.040/14.0	3.05	505, 508, 631, 632, 633, 634
Manganese	2.4	0.37/11.0	3.92	505, 508, 631, 632, 633, 634
Nickel	0.18	0.019/0.12	0.05	505, 508, 631, 632, 634
Zinc	0.14	0.018/0.15	0.062	505, 508, 631, 632, 633, 634
Strontium	0.88	0.011/15.0	2.10	505, 508, 631, 632, 633, 634
Uranium	0.01	0.002/0.012	0.006	505, 633
Nitrate Nitrogen	NA	1.0/5501.0	1144.4	505, 631, 632, 633

¹MCL - Maximum Contaminant Limit (mg/L).

²Min/Max - minimum and maximum concentrations (mg/L) detected in quarterly groundwater samples collected during 1993 from the Rust Garage Facility.

³Average - calculated average of all concentrations (mg/L) detected in quarterly groundwater samples collected during 1993 from the Rust Garage Facility.

⁴ND - contaminant not detected in quarterly groundwater samples collected during 1993 from the Rust Garage Facility.

⁵NA - not applicable.

⁶SL - Screening Level (mg/L). Value represents the maximum total concentration that would be expected in uncontaminated, unfiltered groundwater samples collected from monitoring wells located upgradient from waste management sites at the Y-12 Plant.

future CERCLA activities for the Y-12 Plant groundwater operable unit, which would address all of the types of groundwater contaminants present at the Rust Garage Facility.

8.2.5 Integration of UST and CERCLA Requirements

UST requirements will be integrated into the Y-12 Plant CERCLA Program with regard to remediation of groundwater at the Rust Garage Facility. This integration will include the following: (1) inclusion of all applicable UST parameters as applicable or relevant and appropriate requirements in CERCLA characterization and sampling activities and (2) inclusion of all applicable UST parameters in the risk assessment performed for Operable Unit 1. In the event that remediation of groundwater is determined to be appropriate, all applicable petroleum contaminants will be taken into consideration during the evaluation and selection of treatment technologies. The TDEC DOE-Oversight Office (UST personnel) will be apprised of CERCLA developments, including participation in meetings and/or review of documents applicable to Operable Unit 1.

9.0 PROPOSED IMPLEMENTATION SCHEDULE

This section presents the schedule proposed for the activities and reporting associated with implementation of the chosen soil corrective actions for the Rust Garage Facility. A general schedule for the CERCLA remedial actions involving the Y-12 Plant Groundwater Operable Unit which includes the Rust Garage Facility is also presented.

9.1 Soil Corrective Action Schedule

The proposed schedule for soil corrective actions at the Rust Garage Facility is as follows:

<u>Activity</u>	<u>Target Date</u>
Issue Original CAP	May 1992
Issue CAP Addendum	January 1994
TDEC Approval of CAP Addendum	pending....
Issue Bid Specifications for Excavation and Treatment Activities	Within 90 days of CAP Addendum approval
Begin Excavation Preparation	Within 30 days of contract award
Issue First Monthly Report on Progress and Field Screening/Sampling Results	Within 45 days of excavation start
Begin Soil Treatment	Within 45 days of contract award
Issue Second and Third Monthly Reports on Progress and Field Screening/Sampling Results	Within 30 days and 60 days of the first monthly report
Issue Quarterly Reports on Progress and Soil Treatment Sampling Results	Within 90 days of third monthly report and every 90 days for subsequent quarterly reports as long as soil remediation activities are in progress
Issue final Corrective Action Report (CAR)	Within 90 days of the completion of all soil remediation activities and receipt of all sampling analysis results

9.2 Groundwater Corrective Action Schedule

The current schedule for the CERCLA remedial actions involving the Y-12 Plant Groundwater Operable Unit (OU 1), including the Rust Garage Facility, is presented in Appendix A of this addendum.

10.0 MONITORING AND REPORTING

10.1 Soil Corrective Action

10.1.1 Monthly and Quarterly Reports

Monthly progress reports for the first three (3) month period during which soil corrective actions are implemented at the Rust Garage Facility will be completed and sent to the appropriate TDEC offices, detailing applicable information required by the Corrective Action Plan Guidelines. These reports will be submitted by the fifteenth (15th) day of each subsequent month within the initial three month reporting period.

Quarterly progress reports regarding soil corrective actions will be submitted after the initial three month reporting period. These reports will be submitted within fifteen (15) days of the end of each reporting quarter and will continue for the duration of the soil corrective action process. At a minimum, the monthly and quarterly reports will contain the following information:

- General description of the progress or completion of soil corrective action activities to date.
- Analytical results for field screening and confirmatory soil samples collected during the course of excavation activities.
- Analytical results for post-treatment soil samples collected during the course of thermal desorption treatment.
- General description of any problems encountered with the soil corrective action systems since the previous reporting period and the actions undertaken to resolve these problems.

10.1.2 Corrective Action Report

A CAR for the Rust Garage Facility will be prepared upon completion of all soil remediation activities. This report will include the following information:

- Description of excavation activities conducted at the site and confirmatory soil sampling performed within excavation areas.
- Description of the thermal desorption treatment system used for remediation of petroleum contaminated soil.
- Description of all disposal actions regarding treated soil.
- Analytical results reported for confirmatory and post-treatment soil samples collected during the course of remediation.
- Conclusions regarding the effectiveness of all soil corrective actions implemented at the site.

10.2 Groundwater Corrective Actions

Quarterly sampling for various groundwater contaminants, including petroleum product constituents, will be conducted by the Y-12 Plant from the monitoring wells located at the Rust Garage Facility. Results and interpretations related to this sampling will be reported annually in the Y-12 Plant Groundwater Quality Assessment for the Upper East Fork Poplar Creek Hydrogeologic

Regime. Reports concerning the progress of CERCLA groundwater remedial actions at the Rust Garage Facility will be issued by the Y-12 Plant Environmental Restoration Program. The TDEC DOE-Oversight Office will be sent copies of all reports pertaining to groundwater monitoring and CERCLA actions at the Rust Garage Facility by the program or organization responsible for the development of these reports. The Y-12 Plant UST Program will not be responsible for the performance of monitoring, or reporting on remediation progress, with regard to groundwater at the Rust Garage Facility.

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Appendix A
CERCLA Schedule for the Y-12 Plant
Groundwater Operable Unit (OU1)

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UPPER EAST FORK POPLAR CREEK - 001

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-COMPLETED MILESTONE
-PLANNED MILESTONE

ID	DESCRIPTION	DUR	START	FINISH	PART I
Y103010E01	RIP - PREPARE RI PLAN GROUNDWATER (COM)	152	04JAN94	10AUG94	01
Y103010E02	RIP - PREL SCOPING GROUNDWATER (RADIANT)	392	04JAN94	27JUL95	02
Y103010E04	RIP - PREPARE RI PLAN GROUNDWATER (MMES)	152	04JAN94	10AUG94	49
Y103010E07	RIP - TECHNICAL REVIEW GROUNDWATER (COM)	15	11AUG94	31AUG94	01
Y103010E10	RIP - TECHNICAL REVIEW GROUNDWATER (MMES)	15	11AUG94	31AUG94	49
Y103010E13	RIP - INCORP REVIEW COMMENTS GWATER- COM	20	01SEP94	29SEP94	01
Y103010E16	RIP - INCORP REVIEW COMMENTS GWATER-MMES	20	01SEP94	29SEP94	49
Y103010E19	RIP- DRAFT RIP TO DOE GROUNDWATER	0		29SEP94	
Y103010E22	RIP - DOE-OR REVIEW GROUNDWATER	20	30SEP94	27OCT94	
Y103010E25	RIP - DOE-HQ REVIEW GROUNDWATER	21	28OCT94	29NOV94	
Y103010E28	RIP - DOE COMMENTS TO MMES GROUNDWATER	0		29NOV94	
Y103010E31	RIP - INCORP DOE COMMENTS GWATER (COM)	20	30NOV94	29DEC94	01
Y103010E34	RIP - INCORP DOE COMMENTS GWATER (MMES)	20	30NOV94	29DEC94	49
Y103010E37	RIP - CLEARANCE GROUNDWATER	10	30DEC94	13JAN95	
Y103010E40	RIP - TRANSMITTAL TO EPA/TDEC GWATER	5	15JAN95	20JAN95	49
Y103010E43	RIP DOE SUBMIT TO EPA/TDEC GROUNDWATER	0		20JAN95	
Y103010E46	RIP - EPA/TDEC REVIEW GROUNDWATER	65	23JAN95	25APR95	
Y103010E49	RIP - RECEIVE EPA/TDEC COMMENTS GWATER	0		25APR95	
Y103010E52	RIP INCORP EPA/TDEC COMMENTS GWATER- COM	43	26APR95	26JUN95	01
Y103010E55	RIP INCORP EPA/TDEC COMMENTS GWATER-MMES	43	26APR95	26JUN95	49
Y103010E58	RIP - DOE FINAL TO EPA/TDEC GROUNDWATER	0		26JUN95	
Y103010E61	RIP - EPA/TDEC REVIEW & APPROVAL GWATER	21	27JUN95	27JUL95	49


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UPPER EAST FORK POPLAR CREEK - 001

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-COMPLETED MILESTONE
-PLANNED MILESTONE

ID	DESCRIPTION	DUR	START	FINISH	PARTI
Y103010E64	RIP - APPROVED BY EPA/TDEC GROUNDWATER	0	27JUL95	01	
Y103010F01	RI FIELD ACTIVITIES GWATER ACT #1 (CDM)	415	30SEP96	28MAY98	01
Y103010F04	FIELD ACT - GROUNDWATER ACT # 2 (CDM)	417	29MAY98	26JAN00	01
Y103010F07	FIELD ACT - PREL SCOPING - (RADIAM)	1248	30SEP96	26SEP01	02
Y103010F10	FIELD ACT GROUNDWATER ACT # 3 - (CDM)	416	31JAN00	26SEP01	01
Y103010F40	SOM FIELD ACT/BID & AMARO (CDM 94 WORK)	100	13SEP93	04FEB94	
Y103010F50	RI - FIELD ACTIVITIES GROUNDWATER (MMES)	1248	30SEP96	26SEP01	49
Y103010G01	RIR - PREPARE RI REPORT GROUNDWATER- CDM	258	28FEB02	11MAR03	01
Y103010G02	RIR - PREL SCOPING GROUNDWATER - RADIAM	498	28FEB02	25FEB04	02
Y103010G04	RIR - PREPARE RI REPORT GROUNDWATER-MMES	258	28FEB02	11MAR03	49
Y103010G07	RIR REPORT TECH REVIEW GROUNDWATER- CDM	15	12MAR03	01APR03	01
Y103010G10	RIR REPORT TECH REVIEW GROUNDWATER -MMES	15	12MAR03	01APR03	49
Y103010G13	RIR INCORP REVIEW COMMENTS GWATER (CDM)	20	02APR03	30APR03	01
Y103010G16	RIR INCORP REVIEW COMMENTS GWATER (MMES)	20	02APR03	30APR03	49
Y103010G19	RIR - DRAFT RIR TO DOE GROUNDWATER	0	30APR03		
Y103010G22	RIR - DOE-OR REVIEW GROUNDWATER	20	01MAY03	29MAY03	
Y103010G25	RIR - DOE-HQ REVIEW GROUNDWATER	21	30MAY03	27JUN03	
Y103010G28	RIR - DOE COMMENTS TO MMES GROUNDWATER	0	27JUN03		
Y103010G31	RIR INCORP DOE COMMENTS GWATER (CDM)	20	30JUN03	29JUL03	01
Y103010G34	RIR INCORP DOE COMMENTS GWATER (MMES)	20	30JUN03	29JUL03	49
Y103010G37	RIR - CLEARANCE GROUNDWATER	10	30JUL03	12AUG03	
Y103010G40	RIR - TRANSMITTAL TO EPA/TDEC GWATER	5	13AUG03	19AUG03	49

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- - PLANNED MILESTONE

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Y103010643	RIR - DOE SUBMIT TO EPA/TDEC GROUNDWTR	0		19AUG03	
Y103010646	RIR - EPA/TDEC REVIEW GROUNDWATER	65	20AUG03	19NOV03	
Y103010649	RIR - RECEIVE EPA/TDEC COMMENTS GWATER	0		19NOV03	
Y103010652	RIR INCRP EPA/TDEC COMMENTS GWATER- CDM	43	20NOV03	26JAN04	01
Y103010655	RIR INCRP EPA/TDEC COMMENTS GWATER-MWES	43	20NOV03	26JAN04	49
Y103010658	RIR - DOE FINAL TO EPA/TDEC GWATER	0		26JAN04	
Y103010661	RIR - EPA/TDEC REVIEW & APPROVAL GWATER	21	27JAN04	25FEB04	01
Y103010664	RIR - APPROVED BY EPA/TDEC GROUNDWATER	0		25FEB04	49
Y103010690	FS - PREPARE FS/EA REPORT GWATER-RADIAN	363	09FEB16	21JUL17	02
Y103010694	FS - PREPARE FS REPORT GWATER - MWES	363	09FEB16	21JUL17	49
Y103010697	FS - TECHNICAL REVIEW GROUNDWATER-RADIAN	15	24JUL17	11AUG17	02
Y103010690	FS - TECHNICAL REVIEW GROUNDWATER - MWES	15	24JUL17	11AUG17	49
Y103010693	FS INCRP REVIEW COMMENTS GWATER-RADIAN	20	14AUG17	11SEP17	02
Y103010696	FS INCRP REVIEW COMMENTS GWATER - MWES	20	14AUG17	11SEP17	49
Y103010699	FS - DRAFT FS TO DOE GROUNDWATER	0		11SEP17	
Y103010622	FS - DOE-OR REVIEW GROUNDWATER	20	12SEP17	09OCT17	
Y103010625	FS - DOE-HQ REVIEW GROUNDWATER	21	10OCT17	07NOV17	
Y103010628	FS - DOE COMMENTS TO MWES GROUNDWATER	0		07NOV17	
Y103010631	FS - INCRP DOE COMMENTS GWATER - RADIAN	20	08NOV17	07DEC17	02
Y103010634	FS - INCRP DOE COMMENTS GWATER - MWES	20	08NOV17	07DEC17	49
Y103010637	FS - CLEARANCE GROUNDWATER	10	08DEC17	21DEC17	
Y103010640	FS - TRANSMITTAL TO EPA/TDEC GROUNDWATER	5	22DEC17	02JAN18	49

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P000 0000: 01NOV93
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UPPER EAST FORK POPLAR CREEK - 001

Legend

- - IN PROGRESS/COMPLETE
- - PLANNED
- - COMPLETED MILESTONE
- - PLANNED MILESTONE

ID	DESCRIPTION	DUR	START	FINISH	PARTI
Y103010R43	FS - DOE SUBMIT TO EPA/TDEC GROUNDWATER	0	02JAN18		
Y103010R46	FS - EPA/TDEC REVIEW GROUNDWATER	65	03JAN18	04APR18	
Y103010R49	FS - RECEIVE EPA/TDEC COMMON GROUNDWATER	0	04APR18		
Y103010R52	FS INCORP EPA/TDEC COMMON WATER - RADIAN	43	05APR18	06JUN18	02
Y103010R55	FS INCORP EPA/TDEC COMMENTS GNATER- MWES	43	05APR18	06JUN18	
Y103010R58	FS - DOE FINAL TO EPA/TDEC GROUNDWATER	0	06JUN18		
Y103010R61	FS - EPA/TDEC REVIEW & APPROVAL GNATER	21	07JUN18	09JUL18	49
Y103010R64	FS- APPROVED BY EPA/TDEC GROUNDWATER	0	09JUL18		02
Y103010V01	PP - PREPARE PROPOSED PLAN GNATER-RADIAN	113	10JUL18	18DEC18	02
Y103010V04	PP - PREPARE PROPOSED PLAN GNATER - MWES	113	10JUL18	18DEC18	49
Y103010V07	PP - TECHNICAL REVIEW GROUNDWATER-RADIAN	15	19DEC18	11JAN19	02
Y103010V10	PP - TECHNICAL REVIEW GROUNDWATER- MWES	15	19DEC18	11JAN19	49
Y103010V13	PP INCORP REVIEW COMMENTS GNATER -RADIAN	20	14JAN19	08FEB19	02
Y103010V16	PP - INCORP REVIEW COMMENTS GNATER -MWES	20	14JAN19	08FEB19	49
Y103010V19	PP - DRAFT PP TO DOE GROUNDWATER	0	08FEB19		
Y103010V22	PP - DOE-OR REVIEW GROUNDWATER	20	11FEB19	11MAR19	
Y103010V25	PP - DOE-HQ REVIEW GROUNDWATER	21	12MAR19	09APR19	
Y103010V28	PP - DOE COMMENTS TO MWES GROUNDWATER	0	09APR19		
Y103010V31	PP - INCORP DOE COMMENTS GNATER - RADIAN	20	10APR19	08MAY19	02
Y103010V34	PP - INCORP DOE COMMENTS GNATER - MWES	20	10APR19	08MAY19	49
Y103010V37	PP - CLEARANCE GROUNDWATER	10	09MAY19	22MAY19	
Y103010V40	PP - TRANSMITTAL TO EPA/TDEC GNATER	5	23MAY19	29MAY19	49

UPPER EAST FORK POPLAR CREEK - 0U1

Legend

- -IN PROGRESS/COMPLETE
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- -COMPLETED MILESTONE
- -PLANNED MILESTONE

ID	DESCRIPTION	DUR	START	FINISH	PARTI
Y103010V43	PP - DOE SUBMIT TO EPA/TDEC GROUNDWATER	0		29MAY19	
Y103010V46	PP - EPA/TDEC REVIEW GROUNDWATER	65	30MAY19	02SEP19	
Y103010V49	PP - RECEIVE EPA/TDEC COMMEN GROUNDWATER	0		02SEP19	
Y103010V52	PP INCORP EPA/TDEC COMME GNATER - RADIAN	43	03SEP19	01NOV19	02
Y103010V55	PP INCORP EPA/TDEC COMME GNATER - MMES	43	03SEP19	01NOV19	49
Y103010V58	PP - DOE FINAL TO EPA/TDEC GROUNDWATER	0		01NOV19	
Y103010V61	PP - EPA/TDEC REVIEW & APPROVAL GNATER	21	04NOV19	04DEC19	
Y103010V64	PP - APPROVED BY EPA/TDEC GROUNDWATER	0		04DEC19	
A Y103010V67	PP - PUBLIC COMMENTS GROUNDWATER	20	05DEC19	06JAN20	
Y103010V70	PP - COMPLETE PUBLIC COMMENT GROUNDWATER	0		06JAN20	49
Y103010V73	COMPLETE PUBLIC COMMENT ON PP GRD WATER	0		06JAN20	49
Y103010W01	ROD - PREPARE ROD GROUNDWATER - RADIAN	75	07JAN20	20APR20	02
Y103010W04	ROD - PREPARE ROD GROUNDWATER - MMES	75	07JAN20	20APR20	49
Y103010W07	ROD - TECHNICAL REVIEW GWATER - RADIAN	15	21APR20	11MAY20	02
Y103010W10	ROD - TECHNICAL REVIEW GROUNDWATER -MMES	15	21APR20	11MAY20	49
Y103010W13	ROD INCORP REVIEW COMMENTS GWATER-RADIAN	20	12MAY20	08JUN20	02
Y103010W16	ROD INCORP REVIEW COMMENTS GWATER - MMES	20	12MAY20	08JUN20	49
Y103010W19	ROD - DRAFT ROD TO DOE GROUNDWATER	0		08JUN20	
Y103010W22	ROD - DOE-OR REVIEW GROUNDWATER	20	09JUN20	06JUL20	
Y103010W25	ROD - DOE-HQ REVIEW GROUNDWATER	45	07JUL20	07SEP20	
Y103010W28	ROD - DOE COMMENTS TO MMES GROUNDWATER	0		07SEP20	
Y103010W31	ROD INCORP DOE COMMENTS GWATER - RADIAN	20	08SEP20	05OCT20	02

UPPER EAST FORK POPLAR CREEK - 001

-IN PROGRESS/COMPLETE
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-COMPLETED MILESTONE
-PLANNED MILESTONE

ID	DESCRIPTION	DUR	START	FINISH	PART I
Y103010W34	ROD INCRP DOE COMMENTS GWATER - MMES	20	08SEP20	05OCT20	49
Y103010W37	ROD - CLEARANCE GROUNDWATER	10	06OCT20	19OCT20	
Y103010W40	ROD - TRANSMITTAL TO EPA/TDEC GWATER	5	20OCT20	26OCT20	49
Y103010W43	ROD - DOE SUBMIT TO EPA/TDEC GROUNDWATER	0		26OCT20	
Y103010W46	ROD - EPA/TDEC REVIEW GROUNDWATER	43	27OCT20	24DEC20	
Y103010W49	ROD RECEIVE EPA/TDEC COMMENT GROUNDWATER	0		24DEC20	
Y103010W52	ROD INCRP EPA/TDEC COMME GWATER -RADIAN	21	25DEC20	22JAN21	02
Y103010W55	ROD INCRP EPA/TDEC COMME GWATER - MMES	21	25DEC20	22JAN21	49
Y103010W58	ROD - DOE FINAL TO EPA/TDEC GROUNDWATER	0		22JAN21	
Y103010W61	ROD - EPA/TDEC REVIEW & APPROVAL GNATER	21	25JAN21	22FEB21	49
Y103010W64	ROD - APPROVED BY EPA/TDEC GROUNDWATER	0		22FEB21	02
Y103012F01	RI - SITE PREP STORM SEWER (CDM)	61	15JUN93	10SEP93	01
Y103012F05	RI SITE PREP SSEWER PREL SCOPING-RADIAN	61	15JUN93	10SEP93	02
Y103012F10	RI - SITE PREP STORM SEWER (MMES)	61	15JUN93	10SEP93	49
Y103012F50	RI - FIELD ACTIVITIES SSEWER - (MMES)	481	12JUL93	30JUN95	49
Y103012F55	RI - FIELD ACT STORM SEWER - (CDM)	481	12JUL93	30JUN95	01
Y103012F60	RI FIELD ACT SSEWER PREL SCOPNG - RADIAN	481	12JUL93	30JUN95	02
Y103012F70	SITE CHARATERIZATION SSEWER (MMES)	64	01JUN95	31AUG95	49
Y103012F75	SITE CHARATERIZATION SSEWER (CDM)	64	01JUN95	31AUG95	01
Y103012F80	SITE CHARACT SSEWER PREL SCOPING -RADIAN	64	01JUN95	31AUG95	02
Y103013E01	RIP - PREPARE RI PLAN STORM SEWER (CDM)	153	01AUG95	11MAR96	01
Y103013E02	RIP - PREL SCOPING STORM SEWER (RADIAN)	393	01AUG95	25FEB97	02

UPPER EAST FORK POPLAR CREEK - 0U1

Legend

- -IN PROGRESS/COMPLETE
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- -COMPLETED MILESTONE
- -PLANNED MILESTONE

ID	DESCRIPTION	DUR	START	FINISH	PARTI
Y103013E04	RIP - PREPARE RI PLAN STORM SEWER (MMES)	153	01AUG95	11MAR96	49
Y103013E07	RIP - TECHNICAL REVIEW STORM SEWER - CDM	15	12MAR96	01APR96	01
Y103013E10	RIP - TECHNICAL REVIEW STORM SEWER -MMES	15	12MAR96	01APR96	49
Y103013E13	RIP INCCRP REVIEW COMMENTS SSEWER (CDM)	20	02APR96	30APR96	01
Y103013E16	RIP INCCRP REVIEW COMMENTS SSEWER (MMES)	20	02APR96	30APR96	49
Y103013E19	RIP - DRAFT RIP TO DOE PH 2 STORM SEWER	0		30APR96	
Y103013E22	RIP - DOE-OR REVIEW STORM SEWER	20	01MAY96	29MAY96	
Y103013E25	RIP - DOE-HQ REVIEW STORM SEWER	21	30MAY96	27JUN96	
Y103013E28	RIP DOE COMMENTS TO MMES PH 2 SSEWER	0		27JUN96	
Y103013E31	RIP INCCRP DOE COMMENTS SSEWER (CDM)	20	28JUN96	29JUL96	01
Y103013E34	RIP INCCRP DOE COMMENTS SSEWER (MMES)	20	28JUN96	29JUL96	49
Y103013E37	RIP - CLEARANCE STORM SEWER	10	30JUL96	12AUG96	
Y103013E40	RIP - TRANSMITTAL TO EPA/TDEC SSEWER	5	13AUG96	19AUG96	49
Y103013E43	RIP - DOE SUBMIT TO EPA/TDEC PH 2 SSEWER	0		19AUG96	
Y103013E46	RIP - EPA/TDEC REVIEW STORM SEWER	65	20AUG96	19NOV96	
Y103013E49	RIP RECEIVE EPA/TDEC COMMENT PH 2 SSEWER	0		19NOV96	
Y103013E52	RIP INCCRP EPA/TDEC COMMENTS SSEWER- CDM	43	20NOV96	24JAN97	01
Y103013E55	RIP INCCRP EPA/TDEC COMMENTS SSEWER-MMES	43	20NOV96	24JAN97	49
Y103013E58	RIP - DOE FINAL TO EPA/TDEC PH 2 SSEWER	0		24JAN97	
Y103013E61	RIP - EPA/TDEC REVIEW & APPROVAL SSEWER	21	27JAN97	25FEB97	49
Y103013E64	RIP - APPROVED BY EPA/TDEC PH 2 SSEWER	0		25FEB97	01
Y103013F10	RI - SITE PREPARATION STORM SEWER (CDM)	101	02FEB96	26JUN96	01

UPPER EAST FORK POPLAR CREEK - OU1

-IN PROGRESS/COMPLETE
-PLANNED
-COMPLETED MILESTONE
-PLANNED MILESTONE

ID	DESCRIPTION	DUR	START	FINISH	PARTI
Y103013F15	RI - SITE PREPARATION STORM SEWER (MMES)	101	02FEB96	26JUN96	49
Y103013F20	RI SITE PPREP-PREL SCOPING SSEWER-RADIAN	101	02FEB96	26JUN96	02
Y103013F50	RI - FIELD ACTIVITIES STROM SEWER - CDM	541	31JUL96	28SEP98	01
Y103013F55	RI - FIELD ACTIVITIES STORM SEWER - MMES	541	31JUL96	28SEP98	49
Y103013F60	RI FIELD ACT-PREL SCOPING SSEWER -RADIAN	541	31JUL96	28SEP98	02
Y103013601	RIR - PREPARE RI REPORT SSEWER (CDM)	137	29SEP98	16APR99	01
Y103013602	RI REPORT-PREL SCOPING SSEWER - RADIAN	377	29SEP98	31MAR00	02
Y103013604	RIR - PREPARE RI REPORT SSEWER - (MMES)	137	29SEP98	16APR99	49
Y103013607	RIR - REPORT TECH REVIEW SSEWER (CDM)	15	19APR99	07MAY99	01
Y103013610	RIR - REPORT TECH REVIEW SSEWER (MMES)	15	19APR99	07MAY99	49
Y103013613	RIR - INCORP REVIEW COMMENTS SSEWER- CDM	20	10MAY99	07JUN99	01
Y103013616	RIR INCORP REVIEW COMMENTS SSEWER (MMES)	20	10MAY99	07JUN99	49
Y103013619	RIR - DRAFT RIR TO DOE PH 2 STORM SEWER	0		07JUN99	
Y103013622	RIR - DOE-QR REVIEW STORM SEWER	20	08JUN99	07JUL99	
Y103013625	RIR - DOE-HQ REVIEW STORM SEWER	21	08JUL99	05AUG99	
Y103013628	RIR - DOE COMMENTS TO MMES PH 2 SSEWER	0		05AUG99	
Y103013631	RIR - INCORP DOE COMMENTS SSEWER (CDM)	20	06AUG99	02SEP99	01
Y103013634	RIR - INCORP DOE COMMENTS SSEWER (MMES)	20	06AUG99	02SEP99	49
Y103013637	RIR - CLEARANCE STORM SEWER	10	03SEP99	17SEP99	
Y103013640	RIR - TRANSMITTAL TO EPA/TDEC SSEWER	5	20SEP99	24SEP99	49
Y103013643	RIR - DOE SUBMIT TO EPA/TDEC PH 2 SSEWER	0		24SEP99	
Y103013646	RIR - EPA/TDEC REVIEW STORM SEWER	65	27SEP99	30DEC99	

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Time: 08:30:05
Plot Date: 20DEC93
Data Date: 01NOV93
Page: 9
Report: MQDBAR
Project: UEMSOU10
OPEN PLAN (tm) MMES
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UPPER EAST FORK POPLAR CREEK - 0U1

Legend

-IN PROGRESS/COMPLETE
-PLANNED
-COMPLETED MILESTONE
-PLANNED MILESTONE

ID	DESCRIPTION	DUR	START	FINISH	PARTI
Y103013649	RIR RECEIVE EPA/TDEC COMMENT PH 2 SSEWER	0		30DEC99	
Y103013652	RIR INCORP EPA/TDEC COMMENTS SSEWER- CDM	43	31DEC99	02MAR00	01
Y103013655	RIR INCORP EPA/TDEC COMMENTS SSEWER-MMES	43	31DEC99	02MAR00	49
Y103013658	RIR - DOE FINAL TO EPA/TDEC PH 2 SSEWER	0		02MAR00	
Y103013661	RIR EPA/TDEC REVIEW & APPROVAL SSEWER	21	03MAR00	31MAR00	49
Y103013664	RIR - APPROVED BY EPA/TDEC PH 2 SSEWER	0		31MAR00	01
Y103013R01	FS - PREPARE FS/EA REPORT SSEWER-RADIAN	362	03APR00	12SEP01	02
Y103013R04	FS - PREPARE FS REPORT STORM SEWER-MMES	362	03APR00	12SEP01	49
Y103013R07	FS - TECHNICAL REVIEW STORM SEWER-RADIAN	15	13SEP01	03OCT01	02
Y103013R10	FS - TECHNICAL REVIEW STORM SEWER-MMES	15	13SEP01	03OCT01	49
Y103013R13	FS INCORP REVIEW COMMENTS SSEWER-RADIAN	20	04OCT01	31OCT01	02
Y103013R16	FS INCORP REVIEW COMMENTS SSEWER-MMES	20	04OCT01	31OCT01	49
Y103013R19	FS - DRAFT FS TO DOE PH 2 STORM SEWER	0		31OCT01	
Y103013R22	FS - DOE-OR REVIEW STORM SEWER	20	01NOV01	30NOV01	
Y103013R25	FS - DOE-HQ REVIEW STORM SEWER	21	03DEC01	03JAN02	
Y103013R28	FS DOE COMMENTS TO MMES PH 2 STORM SEWER	0		03JAN02	
Y103013R31	FS INCORP DOE COMMENT STORM SEWER-RADIAN	20	04JAN02	31JAN02	02
Y103013R34	FS INCORP DOE COMMENT STORM SEWER-MMES	20	04JAN02	31JAN02	49
Y103013R37	FS - CLEARANCE STORM SEWER	10	01FEB02	14FEB02	
Y103013R40	FS - TRANSMITTAL TO EPA/TDEC STORM SEWER	5	15FEB02	22FEB02	49
Y103013R43	FS - DOE SUBMIT TO EPA/TDEC PH 2 SSEWER	0		22FEB02	
Y103013R46	FS - EPA/TDEC REVIEW STORM SEWER	65	25FEB02	28MAY02	

UPPER EAST FORK POPLAR CREEK - 0U1

Legend

- -IN PROGRESS/COMPLETE
- -PLANNED
- -COMPLETED MILESTONE
- -PLANNED MILESTONE

ID	DESCRIPTION	DUR	START	FINISH	PARTI
Y103013R49	FS RECEIVE EPA/TDEC COMMENT PH 2 SSEWER	0	28MAY02		
Y103013R52	FS INCORP EPA/TDEC COMMENT SSEWER-RADIAN	43	29MAY02	30JUL02	02
Y103013R55	FS INCORP EPA/TDEC COMMENT SSEWER-MNES	43	29MAY02	30JUL02	49
Y103013R58	FS - DOE FINAL TO EPA/TDEC PH 2 SSEWER	0	30JUL02		
Y103013R61	FS EPA/TDEC REVIEW & APPROVAL STORMSEWER	21	31JUL02	28AUG02	49
Y103013R64	FS - APPROVED BY EPA/TDEC PH 2 SSEWER	0	28AUG02		02
Y103013T01	IPP - PREPARE INT P PLAN SSEWER-RADIAN	104	29AUG02	29JAN03	02
Y103013T04	IPP - PREPARE INT P PLAN SSEWER-MNES	104	29AUG02	29JAN03	49
Y103013T07	IPP - TECHNICAL REVIEW SSEWER - RADIAN	15	30JAN03	20FEB03	02
Y103013T10	IPP - TECHNICAL REVIEW STORM SEWER- MNES	15	30JAN03	20FEB03	49
Y103013T13	IPP INCORP REVIEW COMMENTS SSEWER-RADIAN	20	21FEB03	20MAR03	02
Y103013T16	IPP INCORP REVIEW COMMENTS SSEWER - MNES	20	21FEB03	20MAR03	49
Y103013T19	IPP - DRAFT IPP TO DOE PH 2 STORM SEWER	0	20MAR03		
Y103013T22	IPP - DOE-OR REVIEW STORM SEWER	20	21MAR03	18APR03	
Y103013T25	IPP - DOE-HQ REVIEW STORM SEWER	21	21APR03	19MAY03	
Y103013T28	IPP - DOE COMMENTS TO MNES PH 2 SSEWER	0	19MAY03		
Y103013T31	IPP INCORP DOE COMMENTS SSEWER - RADIAN	20	20MAY03	17JUN03	02
Y103013T34	IPP INCORP DOE COMMENTS SSEWER - MNES	20	20MAY03	17JUN03	49
Y103013T37	IPP - CLEARANCE STORM SEWER	10	18JUN03	01JUL03	
Y103013T40	IPP - TRANSMITTAL TO EPA/TDEC SSEWER	5	02JUL03	10JUL03	49
Y103013T43	IPP - DOE SUBMIT TO EPA/TDEC PH 2 SSEWER	0	10JUL03		
Y103013T46	IPP - EPA/TDEC REVIEW STORM SEWER	65	11JUL03	10OCT03	

UPPER EAST FORK POPLAR CREEK - 0U1

Legend

- -IN PROGRESS/COMPLETE
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- -COMPLETED MILESTONE
- -PLANNED MILESTONE

ID	DESCRIPTION	DUR	START	FINISH	PARTI
Y103013T49	IPP RECEIVE EPA/TDEC COMMENT PH 2 SSEWER	0		10OCT03	
Y103013T52	IPP INCORP EPA/TDEC COMME SSEWER -RADIAN	43	13OCT03	12DEC03	02
Y103013T55	IPP INCORP EPA/TDEC COMMENTS SSEWER-MNES	43	13OCT03	12DEC03	49
Y103013T58	IPP - DOE FINAL TO EPA/TDEC PH 2 SSEWER	0		12DEC03	
Y103013T61	IPP - EPA/TDEC REVIEW & APPROVAL SSEWER	21	15DEC03	15JAN04	
Y103013T64	IPP - APPROVED BY EPA/TDEC PH 2 SSEWER	0		15JAN04	
Y103013T67	IPP - PUBLIC COMMENTS STORM SEWER	30	16JAN04	27FEB04	
Y103013T70	IPP - COMPLETE PUBLIC COMMEN PH 2 SSEWER	0		27FEB04	49
Y103013T73	COMPLETE PUBLIC COMMENT ON IPP SSEWER	0		27FEB04	02
Y103013U01	IROD - PREPARE IROD STORM SEWER - RADIAR	90	01MAR04	08JUL04	02
Y103013U04	IROD - PREPARE IROD STORM SEWER - MNES	90	01MAR04	08JUL04	49
Y103013U07	IROD - TECHNICAL REVIEW SSEWER - RADIAN	15	09JUL04	29JUL04	02
Y103013U10	IROD - TECHINTCAL REVIEW SSEWER - MNES	15	09JUL04	29JUL04	49
Y103013U13	IROD INCORP REVIEW COMME SSEWER - RADIAN	20	30JUL04	26AUG04	02
Y103013U16	IROD INCORP REVIEW COMME SSEWER - MNES	20	30JUL04	26AUG04	49
Y103013U19	IROD DRAFT IROD TO DOE PH 2 STORM SEWER	0		26AUG04	
Y103013U22	IROD - DOE-OR REVIEW STORM SEWER	20	27AUG04	24SEP04	
Y103013U25	IROD - DOE-HQ REVIEW STORM SEWER	21	27SEP04	25OCT04	
Y103013U28	IROD - DOE COMMENTS TO MNES PH 2 SSEWER	0		25OCT04	
Y103013U31	IROD INCORP DOE COMME SSEWER - RADIAN	20	26OCT04	22NOV04	02
Y103013U34	IROD INCORP DOE COMMENT STORM SEWER-MNES	20	26OCT04	22NOV04	49
Y103013U37	IROD - CLEARANCE STORM SEWER	10	25NOV04	08DEC04	

A-12

UPPER EAST FORK POPLAR CREEK - 001

-IN PROGRESS/COMPLETE
-PLANNED
-COMPLETED MILESTONE
-PLANNED MILESTONE

ID	DESCRIPTION	DUR	START	FINISH	PARTI
Y103013U40	IROD - TRANSMITTAL TO EPA/TDEC SSEWER	5	09DEC04	15DEC04	49
Y103013U43	IROD - DOE SUBMIT TO EPA/TDE PH 2 SSEWER	0		15DEC04	
Y103013U46	IROD - EPA/TDEC REVIEW STORM SEWER	43	16DEC04	16FEB05	
Y103013U49	IROD RECEIVE EPA/TDEC COMME PH 2 SSEWER	0		16FEB05	
Y103013U52	IROD INCORP EPA/TDEC COMME SSEWER-RADIAN	21	17FEB05	17MAR05	02
Y103013U55	IROD INCORP EPA/TDEC COMME SSEWER - NMES	21	17FEB05	17MAR05	49
Y103013U58	IROD - DOE FINAL TO EPA/TDEC PH 2 SSEWER	0		17MAR05	
Y103013U61	IROD EPA/TDEC REVIEW & APPROVAL SSEWER	21	18MAR05	18APR05	49
Y103013U64	IROD - APPROVED BY EPA/TDEC PH 2 SSEWER	0		18APR05	02
Y10301AB00	DU1 NMES A-E SUPPORT BIOREMEDIATION	815	22FEB22	07APR25	48
Y10301AB01	RDPMP PREPARE RDPMP GWATER BIOREM-AE I/II	400	22FEB22	04SEP23	18
Y10301AB04	RDPMP PREPARE RDPMP GWATER BIOREM - NMES	400	22FEB22	04SEP23	48
Y10301AB07	RDPMP TECHNICAL REVIEW GWATER BIO-AE I/II	15	05SEP23	25SEP23	18
Y10301AB10	RDPMP TECHNICAL REVIEW GWATER BIOREM-NMES	15	05SEP23	25SEP23	48
Y10301AB13	RDPMP INCORP REVIEW COMMENTS GWATERBIO-AE	20	26SEP23	23OCT23	18
Y10301AB16	RDPMP INCORP REVIEW COMME GWATER BIO-NMES	20	26SEP23	23OCT23	48
Y10301AB19	RDPMP - DRAFT RDPMP TO DOE GWATER BIOREM	0		23OCT23	
Y10301AB22	RDPMP - DOE-OR REVIEW GROUNDWATER BIORM	20	24OCT23	20NOV23	
Y10301AB25	RDPMP - DOE-HQ REVIEW GROUNDWATER BIOREM	21	21NOV23	19DEC23	
Y10301AB28	RDPMP - DOE COMMENTS TO NMES GWATER BIORE	0		19DEC23	
Y10301AB31	RDPMP INCORP DOE COMME GWATER BIO-AE I/II	20	20DEC23	16JAN24	18
Y10301AB34	RDPMP INCORP DOE COMME GWATER BIOREM-NMES	20	20DEC23	16JAN24	48

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UPPER EAST FORK POPLAR CREEK - 001

Legend

-IN PROGRESS/COMPLETE
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-PLANNED MILESTONE

ID	DESCRIPTION	DUR	START	FINISH	PARTI
Y10301AB37	ROMP - CLEARANCE GROUNDWATER BIOREMED	10	17JAN24	30JAN24	
Y10301AB40	ROMP TRANSMITTAL TO EPA/TDEC GWATER BIOR	5	31JAN24	06FEB24	48
Y10301AB43	ROMP - DOE SUBMIT TO EPA/TDE GRONTR BIO	0		06FEB24	
Y10301AB46	ROMP EPA/TDEC REVIEW GROUNDWATER BIOREM	65	07FEB24	07MAY24	
Y10301AB49	ROMP - RECEIVE EPA/TDEC COMM GRONTR BIO	0		07MAY24	
Y10301AB52	ROMP INCORP EPA/TDEC COMME GWATER BIO-AE	43	08MAY24	05JUL24	18
Y10301AB55	ROMP INCORP EPA/TDEC COMM GWTR BIO-MNES	43	08MAY24	05JUL24	48
Y10301AB58	ROMP - DOE FINAL TO EPA/TDEC GRONTR BIO	0		05JUL24	
Y10301AB61	ROMP EPA/TDEC REVIEW/APPROVAL GWATER BIO	21	08JUL24	05AUG24	48
Y10301AB64	ROMP - APPROVED BY EPA/TDEC GRONTR BIO	0		05AUG24	18
Y10301AC01	RDR PREPARE RD REPORT GWATER BIO-AE I/II	400	14JUN22	25DEC23	18
Y10301AC04	RDR PREPARE RD REPORT GWATER BIO-MNES	400	14JUN22	25DEC23	48
Y10301AC07	RDR TECHNICAL REVIEW GWATER BIO-AE I/II	15	26DEC23	15JAN24	18
Y10301AC10	RDR TECHNICAL REVIEW GWATER BIOREM-MNES	15	26DEC23	15JAN24	48
Y10301AC13	RDR INCORP REVIEW COMMENTS GWATER BIO-AE	20	16JAN24	12FEB24	18
Y10301AC16	RDR INCORP REVIEW COMME GWATER BIO-MNES	20	16JAN24	12FEB24	48
Y10301AC19	RDR - DRAFT RDR TO DOE GRONTR BIO	0		12FEB24	
Y10301AC22	RDR DOE-OR REVIEW GWATER BIOREMEDIATION	20	13FEB24	11MAR24	
Y10301AC25	RDR DOE-HQ REVIEW GWATER BIOREMEDIATION	21	12MAR24	09APR24	
Y10301AC28	RDR - DOE COMMENTS TO MNES GRONTR BIO	0		09APR24	
Y10301AC31	RDR INCORP DOE COMME GWATER BIOR-AE I/II	20	10APR24	07MAY24	18
Y10301AC34	RDR INCORP DOE COMMENTS GWATER BIO-MNES	20	10APR24	07MAY24	48

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UPPER EAST FORK POPLAR CREEK - 00U1

Legend

- - IN PROGRESS/COMPLETE
- ▨ - PLANNED
- ◆ - COMPLETED MILESTONE
- ◇ - PLANNED MILESTONE

ID	DESCRIPTION	DJR	START	FINISH	PART
Y10301AC37	FOR CLEARANCE GROUNDWATER BIOREMEDIATION	10	08MAY24	21MAY24	
Y10301AC40	FOR TRANSMITTAL TO EPA/TDEC GWATER BIORE	5	22MAY24	28MAY24	48
Y10301AC43	FOR - DOE SUBMIT TO EPA/TDEC GROWTR BIO	0		28MAY24	
Y10301AC46	FOR EPA/TDEC REVIEW GWATER BIOREMEDI	65	29MAY24	27AUG24	
Y10301AC49	FOR - RECEIVE EPA/TDEC COMME GROWTR BIO	0		27AUG24	
Y10301AC52	FOR INCCRP EPA/TDEC COMME GWATER BIO-AE	43	28AUG24	25OCT24	18
Y10301AC55	FOR INCCRP EPA/TDEC COMM GWATER BIO-MNES	43	28AUG24	25OCT24	48
Y10301AC58	FOR - DOE FINAL TO EPA/TDEC GROWTR BIO	0		25OCT24	
Y10301AC61	FOR EPA/TDEC REVIEW/APPROVAL GWATER BIO	21	28OCT24	25NOV24	48
Y10301AC64	FOR - APPROVED BY EPA/TDEC GROWTR BIO	0		25NOV24	18
Y10301AD01	RAMP PREPARE RAMP GWATER BIOREM-AE I/II	400	06SEP22	18MAR24	18
Y10301AD04	RAMP PREPARE RA WORKPLAN GWATER BIO-MNES	400	06SEP22	18MAR24	48
Y10301AD07	RAMP TECHNICAL REVIEW GWATER BIO-AE I/II	15	19MAR24	08APR24	18
Y10301AD10	RAMP TECHNICAL REVIEW GWATER BIOREM-MNES	15	19MAR24	08APR24	48
Y10301AD13	RAMP INCCRP REVIEW COMM GWATER BIOREM-AE	20	09APR24	06MAY24	18
Y10301AD16	RAMP INCCRP REVIEW COMM GWATER BIOREM-MNES	20	09APR24	06MAY24	48
Y10301AD19	RAMP - DRAFT RAMP TO DOE GROWTR BIO	0		06MAY24	
Y10301AD22	RAMP DOE-OR REVIEW GWATER BIOREMEDIATION	20	07MAY24	03JUN24	
Y10301AD25	RAMP DOE-HQ REVIEW GWATER BIOREMEDIATION	21	04JUN24	02JUL24	
Y10301AD28	RAMP - DOE COMMENTS TO MNES GROWTR BIO	0		02JUL24	
Y10301AD31	RAMP INCCRP DOE COMM GWATER BIOREM-AE I/II	20	03JUL24	30JUL24	18
Y10301AD34	RAMP INCCRP DOE COMM GWATER BIOREM-MNES	20	03JUL24	30JUL24	48

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UPPER EAST FORK POPLAR CREEK - OU1

Legend
 ■ - IN PROGRESS/COMPLETE
 ▨ - PLANNED
 ◆ - COMPLETED MILESTONE
 ◇ - PLANNED MILESTONE

ID	DESCRIPTION	DUR	START	FINISH	PARTI
Y10301AD37	RAMP CLEARANCE GWATER BIOREMEDIATION	10	31JUL24	13AUG24	
Y10301AD40	RAMP TRANSMITTAL TO EPA/TDEC GWATER BIO	5	14AUG24	20AUG24	48
Y10301AD43	RAMP - DOE SUBMIT TO EPA/TDEC GROWTR BIO	0	0	20AUG24	
Y10301AD46	RAMP EPA/TDEC REVIEW GWATER BIO	65	21AUG24	19NOV24	
Y10301AD49	RAMP - RECEIVE EPA/TDEC COMM GROWTR BIO	0	0	19NOV24	
Y10301AD52	RAMP INCORP EPA/TDEC COMM GWATER BIO-AE	43	20NOV24	17JAN25	18
Y10301AD55	RAMP INCORP EPA/TDEC COMM GNTR BIO-MMES	43	20NOV24	17JAN25	48
Y10301AD58	RAMP - DOE FINAL TO EPA/TDEC GROWTR BIO	0	0	17JAN25	
Y10301AD61	RAMP EPA/TDEC REVIEW/APPROVAL GWATER BIO	21	20JAN25	17FEB25	48
Y10301AD64	RAMP - APPROVED BY EPA/TDEC GROWTR BIO	0	0	17FEB25	18
Y10301AM10	RA INTEGRATION TREAT F -MMES PROJECT SER	1402	19MAR04	16OCT09	49
Y10301AM15	RA INTEGRATION TREATMENT F -AE TITLE III	897	19MAR06	09OCT09	19
Y10301AM20	RA INTEGRATION TREAT F -MMES TITLE III	897	19MAR06	09OCT09	13
Y10301AP02	GEOPHYSICS/BIOREMEDIATION - CONTRACTOR	1300	22FEB22	15FEB27	54
Y10301AP03	OPERATIONS-BIOREMEDIATION-MMES FIELD MAINT	1300	16FEB27	09FEB32	41
Y10301B800	OU1 MMES A-E SUPPORT - FILTER BARRIER	555	22FEB22	08APR24	48
Y10301B801	PUMP PREPARE PUMP FILTER BARRIER-AE I/II	140	22FEB22	05SEP22	18
Y10301B804	PUMP PREPARE PUMP FILTER BARRIER-MMES	140	22FEB22	05SEP22	48
Y10301B807	PUMP TECHNICAL REVIEW FILTER BAR-AE I/II	15	06SEP22	26SEP22	18
Y10301B810	PUMP TECHNICAL REVIEW FILTER BARR-MMES	15	06SEP22	26SEP22	48
Y10301B813	PUMP INCORP REVIEW COMMENTS FILTER B-AE	20	27SEP22	24OCT22	18
Y10301B816	PUMP INCORP REVIEW COMM FILTER BARR-MMES	20	27SEP22	24OCT22	48

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UPPER EAST FORK POPLAR CREEK - 001

Legend

-IN PROGRESS/COMPLETE
-PLANNED
-COMPLETED MILESTONE
-PLANNED MILESTONE

ID	DESCRIPTION	DUR	START	FINISH	PARTI
Y103018819	RMP - DRAFT RMP TO DOE FILTER BARRIER	0	24OCT22		
Y103018822	RMP DOE-OR REVIEW FILTER BARRIER	20	25OCT22	21NOV22	
Y103018825	RMP DOE-HQ REVIEW FILTER BARRIER	21	22NOV22	20DEC22	
Y103018828	RMP DOE COMMENTS TO MMS FILTER BARRIER	0	20DEC22		
Y103018831	RMP INCORP DOE COMMENTS FILTER BARR-AE	20	21DEC22	17JAN23	18
Y103018834	RMP INCORP DOE COMMENT FILTER BARR-MMS	20	21DEC22	17JAN23	48
Y103018837	RMP - CLEARANCE FILTER BARRIER	10	18JAN23	31JAN23	
Y103018840	RMP TRANSMITTAL TO EPA/TDEC FILTER BARR	5	01FEB23	07FEB23	48
Y103018843	RMP DOE SUBMIT TO EPA/TDEC FILTER BARR	0	07FEB23		
Y103018846	RMP - EPA/TDEC REVIEW FILTER BARRIER	65	08FEB23	09MAY23	
Y103018849	RMP RECEIVE EPA/TDEC COM FILTER BARRIER	0	09MAY23		
Y103018852	RMP INCORP EPA/TDEC COMM FILTER BARR-AE	43	10MAY23	07JUL23	18
Y103018855	RMP INCORP EPA/TDEC COMM FILTER BA-MMS	43	10MAY23	07JUL23	48
Y103018858	RMP - DOE FINAL TO EPA/TDEC GROWTH FLT	0	07JUL23		
Y103018861	RMP - EPA/TDEC REVIEW & APPROVAL	21	10JUL23	07AUG23	48
Y103018864	RMP - APPROVED BY EPA/TDEC GROWTH FLT B	0	07AUG23		18
Y103018C01	RDR - PREPARE RD REPORT (AE I/II)	140	14JUN22	26DEC22	18
Y103018C04	RDR - PREPARE RD REPORT (MMS)	140	14JUN22	26DEC22	48
Y103018C07	RDR - TECHNICAL REVIEW (AE I/II)	15	27DEC22	16JAN23	18
Y103018C10	RDR - TECHNICAL REVIEW (MMS)	15	27DEC22	16JAN23	48
Y103018C13	RDR - INCORP REVIEW COMMENTS (AE)	20	17JAN23	13FEB23	18
Y103018C16	RDR - INCORP REVIEW COMMENTS (MMS)	20	17JAN23	13FEB23	48

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UPPER EAST FORK POPLAR CREEK - 001

Legend

-IN PROGRESS/COMPLETE
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-PLANNED MILESTONE

ID	DESCRIPTION	DUR	START	FINISH	PARTI
Y10301BC19	RDR - DRAFT RDR TO DOE GROWTR FLT BARR	0	13FEB23		
Y10301BC22	RDR - DOE-OR REVIEW	20	14FEB23	13MAR23	
Y10301BC25	RDR - DOE-HQ REVIEW	21	14MAR23	11APR23	
Y10301BC28	RDR - DOE COMMENTS TO NMES GROWTR FLT B	0	11APR23		
Y10301BC31	RDR - INCORP DOE COMMENTS (AE I/II)	20	12APR23	09MAY23	18
Y10301BC34	RDR - INCORP DOE COMMENTS (NMES)	20	12APR23	09MAY23	48
Y10301BC37	RDR - CLEARANCE	10	10MAY23	23MAY23	
Y10301BC40	RDR - TRANSMITTAL TO EPA/TDEC	5	24MAY23	30MAY23	48
Y10301BC43	RDR - DOE SUBMIT TO EPA/TDEC GROWTR FLT	0	30MAY23		
Y10301BC46	RDR - EPA/TDEC REVIEW	65	31MAY23	29AUG23	
Y10301BC49	RDR - RECEIVE EPA/TDEC COMME	0	29AUG23		
Y10301BC52	RDR - INCORP EPA/TDEC COMMENTS (AE)	43	30AUG23	27OCT23	18
Y10301BC55	RDR - INCORP EPA/TDEC COMMENTS (NMES)	43	30AUG23	27OCT23	48
Y10301BC58	RDR - DOE FINAL TO EPA/TDEC GROWTR FLT	0	27OCT23		
Y10301BC61	RDR - EPA/TDEC REVIEW & APPROVAL	21	30OCT23	27NOV23	48
Y10301BC64	RDR - APPROVED BY EPA/TDEC GROWTR FLT B	0	27NOV23		
Y10301BD01	RAMP - PREPARE RA WORKPLAN (AE I/II)	140	06SEP22	20MAR23	18
Y10301BD04	RAMP - PREPARE RA WORKPLAN (NMES)	140	06SEP22	20MAR23	48
Y10301BD07	RAMP - TECHNICAL REVIEW (AE I/II)	15	21MAR23	10APR23	18
Y10301BD10	RAMP - TECHNICAL REVIEW (NMES)	15	21MAR23	10APR23	48
Y10301BD13	RAMP - INCORP REVIEW COMMENTS (AE)	20	11APR23	08MAY23	18
Y10301BD16	RAMP - INCORP REVIEW COMMENTS (NMES)	20	11APR23	08MAY23	48

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Legend

-IN PROGRESS/COMPLETE
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-PLANNED MILESTONE

ID	DESCRIPTION	DUR	START	FINISH	PARTI
Y10301B019	RAMP - DRAFT RAMP TO DOE GROWTR FLT BA	0	08MAY23		
Y10301B022	RAMP - DOE-OR REVIEW	20	09MAY23	05JUN23	
Y10301B025	RAMP - DOE-HQ REVIEW	21	06JUN23	04JUL23	
Y10301B028	RAMP - DOE COMMENTS TO MNES GROWTR FLT	0	04JUL23		
Y10301B031	RAMP - INCORP DOE COMMENTS (AE I/II)	20	05JUL23	01AUG23	18
Y10301B034	RAMP - INCORP DOE COMMENTS (MNES)	20	05JUL23	01AUG23	48
Y10301B037	RAMP - CLEARANCE	10	02AUG23	15AUG23	
Y10301B040	RAMP - TRANSMITTAL TO EPA/TDEC	5	16AUG23	22AUG23	48
Y10301B043	RAMP - DOE SUBMIT TO EPA/TDE GROWTR FLT	0	22AUG23		
Y10301B046	RAMP - EPA/TDEC REVIEW	65	23AUG23	21NOV23	
Y10301B049	RAMP - RECEIVE EPA/TDEC COMM GROWTR FLT	0	21NOV23		
Y10301B052	RAMP - INCORP EPA/TDEC COMMENTS (AE)	43	22NOV23	19JAN24	18
Y10301B055	RAMP - INCORP EPA/TDEC COMMENTS (MNES)	43	22NOV23	19JAN24	48
Y10301B058	RAMP - DOE FINAL TO EPA/TDEC GROWTR FLT	0	19JAN24		
Y10301B061	RAMP - EPA/TDEC REVIEW & APPROVAL	21	22JAN24	19FEB24	48
Y10301B064	RAMP - APPROVED BY EPA/TDEC GROWTR FLT	0	19FEB24		18
Y10301B070	RA - CONST BID & AWARD (FILTER BARRIER)	0	02SEP24		
Y10301B010	RA INTEGRATION GWATER BIOREMED-MNES PROJ	1300	22FEB22	15FEB27	49
Y10301B015	RA INTERATION GWATER BIOREMED - A-E III	1300	22FEB22	15FEB27	19
Y10301B020	RA INTEGRATION GWATER BIOREM - MNES III	1300	22FEB22	15FEB27	13
Y10301BP00	FP CONSTR - FILTER BARRIER	1300	22FEB22	15FEB27	51
Y10301BP01	PCR - PREPARE POST CONSTR REPORT (AE III)	1060	22FEB22	16MAR26	19

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UPPER EAST FORK POPLAR CREEK - 001

Legend

-IN PROGRESS/COMPLETE
-PLANNED
-COMPLETED MILESTONE
-PLANNED MILESTONE

ID	DESCRIPTION	DUR	START	FINISH	PARTI
Y10301BP02	CONSTR MENT - FILTER BARRIER	1300	22FEB22	15FEB27	66
Y10301BP03	CONSTR MENT - FILTER BARRIER	1300	22FEB22	15FEB27	67
Y10301BP04	PCR - PREPARE POST CONSTR REPORT (MNES)	1060	22FEB22	16MAR26	48
Y10301BP06	PCR - START PHY CONST PH 2 TREAT FAC	0	21FEB22		
Y10301BP07	PCR - TECHNICAL REVIEW (AE III)	15	17MAR26	06APR26	18
Y10301BP10	PCR - TECHNICAL REVIEW (MNES)	15	17MAR26	06APR26	48
Y10301BP13	PCR - INCORP REVIEW COMMENTS (AE)	20	07APR26	04MAY26	18
Y10301BP16	PCR - INCORP REVIEW COMMENTS (MNES)	20	07APR26	04MAY26	48
Y10301BP19	PCR - DRAFT PCR TO DOE GROWTR FLT BARR	0	04MAY26		
Y10301BP22	PCR - DOE-OR REVIEW	20	05MAY26	01JUN26	
Y10301BP25	PCR - DOE-HQ REVIEW	21	02JUN26	30JUN26	
Y10301BP28	PCR - DOE COMMENTS TO MNES GROWTR FLT B	0	30JUN26		
Y10301BP31	PCR - INCORP DOE COMMENTS (AE III)	20	01JUL26	28JUL26	18
Y10301BP34	PCR - INCORP DOE COMMENTS (MNES)	20	01JUL26	28JUL26	48
Y10301BP37	PCR - CLEARANCE	10	29JUL26	11AUG26	
Y10301BP40	PCR - TRANSMITTAL TO EPA/TDEC	5	12AUG26	18AUG26	
Y10301BP43	PCR - DOE SUBMIT TO EPA/TDEC GROWTR FLT	0	18AUG26		
Y10301BP46	PCR - EPA/TDEC REVIEW	65	19AUG26	17NOV26	
Y10301BP49	PCR - RECEIVE EPA/TDEC COMME GROWTR FLT	0	17NOV26		
Y10301BP52	PCR - INCORP EPA/TDEC COMMENTS (AE)	43	18NOV26	15JAN27	18
Y10301BP55	PCR - INCORP EPA/TDEC COMMENTS (MNES)	43	18NOV26	15JAN27	48
Y10301BP58	PCR - DOE FINAL TO EPA/TDEC GROWTR FLT B	0	15JAN27		

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UPPER EAST FORK POPLAR CREEK - 001

Legend

-IN PROGRESS/COMPLETE
-PLANNED
-COMPLETED MILESTONE
-PLANNED MILESTONE

ID	DESCRIPTION	DUR	START	FINISH	PARTI
Y10301BP61	PCR - EPA/TDEC REVIEW & APPROVAL	21	18JAN27	15FEB27	48
Y10301BP64	PCR - APPROVED BY EPA/TDEC GRDWR FLT B	0		15FEB27	18
Y10301CB00	MNES A-E SUPT - Y12 TREATMENT FACILITY	534	15MAR04	28APR06	48
Y10301CB01	RDP PREPARE RDP -TREATMENT FAC-AE I/II	120	15MAR04	02SEP04	18
Y10301CB02	A-E SUPPORT - TREATMENT FACILITY - MNES	534	15MAR04	28APR06	48
Y10301CB04	RDP PREPARE RDP - TREATMENT FAC - MNES	120	15MAR04	02SEP04	48
Y10301CB07	RDP TECHNICAL REVIEW -TREAT FAC-AE I/II	15	03SEP04	24SEP04	18
Y10301CB10	RDP TECHNICAL REVIEW-TREATMENT FAC-MNES	15	03SEP04	24SEP04	48
Y10301CB13	RDP INCORP REVIEW COMMENTS-TREAT FAC-AE	20	27SEP04	22OCT04	18
Y10301CB16	RDP INCORP REVIEW COMMENT-TREAT F-MNES	20	27SEP04	22OCT04	48
Y10301CB19	RDP - DRAFT RDP TO DOE PH2 TREAT FAC	0		22OCT04	
Y10301CB22	RDP DOE-OR REVIEW - TREATMENT FACILITY	20	25OCT04	19NOV04	
Y10301CB25	RDP DOE-HQ REVIEW - TREATMENT FACILITY	21	22NOV04	22DEC04	
Y10301CB28	RDP DOE COMMENTS TO MNES PH2 TREAT FAC	0		22DEC04	
Y10301CB31	RDP INCORP DOE COMMENTS - TREAT FAC -AE	20	23DEC04	20JAN05	18
Y10301CB34	RDP INCORP DOE COMMENTS -TREAT FAC-MNES	20	23DEC04	20JAN05	48
Y10301CB37	RDP - CLEARANCE - TREATMENT FACILITY	10	21JAN05	03FEB05	
Y10301CB40	RDP TRANSMITTAL TO EPA/TDEC-TREAT FAC	5	04FEB05	10FEB05	48
Y10301CB43	RDP DOE SUBMIT TO EPA/TDE PH2 TREAT FAC	0		10FEB05	
Y10301CB46	RDP EPA/TDEC REVIEW - TREATMENT FAC	65	11FEB05	16MAY05	
Y10301CB49	RDP RECEIVE EPA/TDEC COMM PH2 TREAT FAC	0		16MAY05	
Y10301CB52	RDP INCORP EPA/TDEC COMMENTS-TREAT F-AE	43	17MAY05	19JUL05	18

UPPER EAST FORK POPLAR CREEK - 001

Legend

- -IN PROGRESS/COMPLETE
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- -PLANNED MILESTONE

ID	DESCRIPTION	DUR	START	FINISH	PART I
Y10301C855	RDWP INCORP EPA/TDEC COMME -TREAT F-MNES	43	17MAY05	19JUL05	48
Y10301C858	RDWP DOE FINAL TO EPA/TDEC PH2 TREAT FAC	0		19JUL05	
Y10301C861	RDWP EPA/TDEC REVIEW & APPROVAL -TREAT F	21	20JUL05	17AUG05	48
Y10301C864	RDWP APPROVED BY EPA/TDEC PH2 TREAT FAC	0		17AUG05	18
Y10301CC01	RDR PREPARE RD REPORT -TREAT FAC-AE I/II	120	09JUL04	28DEC04	18
Y10301CC04	RDR PREPARE RD REPORT-TREATMENT FAC-MNES	120	09JUL04	28DEC04	48
Y10301CC07	RDR TECHNICAL REVIEW -TREAT FAC -AE I/II	15	29DEC04	19JAN05	18
Y10301CC10	RDR TECHNICAL REVIEW -TREATMENT FAC-MNES	15	29DEC04	19JAN05	48
Y10301CC13	RDR INCORP REVIEW COMME-TREATMENT FAC-AE	20	20JAN05	17FEB05	18
Y10301CC16	RDR INCORP REVIEW COMMENT-TREAT FAC-MNES	20	20JAN05	17FEB05	48
Y10301CC19	RDR DRAFT RDR TO DOE PH2 TREATMENT FAC	0		17FEB05	
Y10301CC22	RDR - DOE-OR REVIEW - TREATMENT FACILITY	20	18FEB05	17MAR05	
Y10301CC25	RDR - DOE-HQ REVIEW - TREATMENT FACILITY	21	18MAR05	18APR05	
Y10301CC28	RDR DOE COMMENTS TO MNES PH2 - TREAT FAC	0		18APR05	
Y10301CC31	RDR INCORP DOE COMMENTS -TREAT F-AE I/II	20	19APR05	16MAY05	18
Y10301CC34	RDR INCORP DOE COMMENTS -TREAT FAC -MNES	20	19APR05	16MAY05	48
Y10301CC36	RDR - CLEARANCE - TREATMENT FACILITY	10	17MAY05	31MAY05	
Y10301CC40	RDR TRANSMITTAL TO EPA/TDEC - TREAT FAC	5	01JUN05	07JUN05	
Y10301CC43	RDR DOE SUBMIT TO EPA/TDEC PH2 TREAT FAC	0		07JUN05	
Y10301CC46	RDR EPA/TDEC REVIEW - TREATMENT FACILITY	65	08JUN05	09SEP05	
Y10301CC49	RDR RECEIVE EPA/TDEC COMME PH2 TREAT FAC	0		09SEP05	
Y10301CC52	RDR INCORP EPA/TDEC COMMENTS -TREAT F-AE	43	12SEP05	09NOV05	18

UPPER EAST FORK POPLAR CREEK - 001

Legend

- -IN PROGRESS/COMPLETE
- -PLANNED
- -COMPLETED MILESTONE
- -PLANNED MILESTONE

ID	DESCRIPTION	DUR	START	FINISH	PARTI
Y10301CC55	RDR INCRP EPA/TDEC COMME-TREAT FAC-MNES	43	12SEP05	09NOV05	48
Y10301CC58	RDR DOE FINAL TO EPA/TDEC PH2 TREAT FAC	0		09NOV05	
Y10301CC61	RDR EPA/TDEC REVIEW & APPROVAL-TREAT FAC	21	10NOV05	12DEC05	48
Y10301CC64	RDR APPROVED BY EPA/TDEC PH2 - TREAT FAC	0		12DEC05	18
Y10301CD01	RAMP PREPARE RA WORKPLAN -TREAT FAC -AE	120	04OCT04	24MAR05	18
Y10301CD04	RAMP PREPARE RA WORKPLAN -TREAT FAC-MNES	120	04OCT04	24MAR05	48
Y10301CD07	RAMP TECHNICAL REVIEW -TREAT FAC-AE I/II	15	25MAR05	15APR05	18
Y10301CD10	RAMP TECHNICAL REVIEW-TREATMENT FAC-MNES	15	25MAR05	15APR05	48
Y10301CD13	RAMP INCORP REVIEW COMMENTS -TREAT F -AE	20	18APR05	13MAY05	18
Y10301CD16	RAMP INCORP REVIEW COMME -TREAT FAC-MNES	20	18APR05	13MAY05	48
Y10301CD19	RAMP DRAFT RAMP TO DOE PH2 TREATMENT FAC	0		13MAY05	
Y10301CD22	RAMP DOE-OR REVIEW - TREATMENT FACILITY	20	16MAY05	13JUN05	
Y10301CD25	RAMP DOE-HQ REVIEW - TREATMENT FACILITY	21	14JUN05	14JUL05	
Y10301CD28	RAMP DOE COMMENTS TO MNES PH2 TREAT FAC	0		14JUL05	
Y10301CD31	RAMP INCORP DOE COMMENTS -TREAT FAC -AE	20	15JUL05	11AUG05	18
Y10301CD34	RAMP INCORP DOE COMMENTS -TREAT FAC-MNES	20	15JUL05	11AUG05	48
Y10301CD37	RAMP - CLEARANCE - TREATMENT FACILTLY	10	12AUG05	25AUG05	
Y10301CD40	RAMP TRANSMITTAL TO EPA/TDEC-TREAT FAC	5	26AUG05	01SEP05	48
Y10301CD43	RAMP DOE SUBMIT TO EPA/TDE PH2 TREAT FAC	0		01SEP05	
Y10301CD46	RAMP EPA/TDEC REVIEW TREATMENT FACILITY	65	02SEP05	06DEC05	
Y10301CD49	RAMP RECEIVE EPA/TDEC COM PH2 TREAT FAC	0		06DEC05	
Y10301CD52	RAMP INCORP EPA/TDEC COMME -TREAT FAC-AE	43	07DEC05	08FEB06	18

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UPPER EAST FORK POPLAR CREEK - 001

Legend

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- -PLANNED MILESTONE

ID	DESCRIPTION	DUR	START	FINISH	PARTI
Y10301CD55	RAMP INCRP EPA/TDEC COMME -TREAT F-MNES	43	07DEC05	08FEB06	48
Y10301CD58	RAMP DOE FINAL TO EPA/TDEC PH2 TREAT FAC	0		08FEB06	
Y10301CD61	RAMP EPA/TDEC REVIEW & APPROVAL -TREAT F	21	09FEB06	10MAR06	48
Y10301CD64	RAMP APPROVED BY EPA/TDEC PH2 TREAT FAC	0		10MAR06	18
Y10301CM10	RA INTEGRATION FILTER BARRIER-MNES PROJ	1300	22FEB22	15FEB27	49
Y10301CM15	RA INTEGRATION FILTER BARRIER-AE III	1300	22FEB22	15FEB27	19
Y10301CM20	RA INTEGRATION FILTER BARRIER-MNES III	1300	22FEB22	15FEB27	13
Y10301CP00	CONSTRUCTION MGT - TREATMENT FACILITY	1155	01MAY06	10DEC10	67
Y10301CP01	PCR PREPARE POST CONSTR REPORT - AE III	1868	01MAY06	17OCT13	18
Y10301CP02	FP CONST - Y-12 TREATMENT FACILITY	709	11DEC06	09OCT09	51
Y10301CP03	CONSTRUCTION MGT - TREATMENT FACILITY	709	11DEC06	09OCT09	66
Y10301CP04	PCR PREPARE POST CONSTR REPORT - MNES	1868	01MAY06	17OCT13	48
Y10301CP05	OPERATIONS - Y-12 TREATMENT FACILITY	1245	12OCT09	03OCT14	41
Y10301CP06	PCR - START PHY CONST-TREATMENT FACILITY	0		08DEC06	
Y10301CP07	PCR TECHNICAL REVIEW -TREATMENT F-AE III	15	18OCT13	07NOV13	18
Y10301CP10	PCR - TECHNICAL REVIEW -TREATMENT F-MNES	15	18OCT13	07NOV13	48
Y10301CP13	PCR INCRP REVIEW COMMENTS -TREAT F - AE	20	08NOV13	09DEC13	18
Y10301CP16	PCR INCRP REVIEW COMMENTS -TREAT F-MNES	20	08NOV13	09DEC13	48
Y10301CP19	PCR DRAFT PCR TO DOE PH 2 TREATMENT FAC	0		09DEC13	
Y10301CP22	PCR - DOE-OR REVIEW - TREATMENT FACILITY	20	10DEC13	09JAN14	
Y10301CP25	PCR - DOE-HQ REVIEW - TREATMENT FACILITY	21	10JAN14	07FEB14	
Y10301CP28	PCR - DOE COMMENTS TO MNES PH 2 TREAT F	0		07FEB14	

UPPER EAST FORK POPLAR CREEK - 001

Legend

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ID	DESCRIPTION	DUR	START	FINISH	PARTI
Y10301CP31	PCR - INCORP DOE COMMENTS(AE III)	20	10FEB14	10MAR14	18
Y10301CP34	PCR - INCORP DOE COMMENTS(MMES)	20	10FEB14	10MAR14	48
Y10301CP37	PCR - CLEARANCE	10	11MAR14	24MAR14	
Y10301CP40	PCR - TRANSMITTAL TO EPA/TDEC	5	25MAR14	31MAR14	
Y10301CP43	PCR - DOE SUBMIT TO EPA/TDEC PH2 TR FAC	0		31MAR14	
Y10301CP46	PCR - EPA/TDEC REVIEW	65	01APR14	02JUL14	
Y10301CP49	PCR - RECEIVE EPA/TDEC COMME PH 2 TR FAC	0		02JUL14	
Y10301CP52	PCR - INCORP EPA/TDEC COMMENTS(AE)	43	07JUL14	03SEP14	18
Y10301CP55	PCR - INCORP EPA/TDEC COMMENTS(MMES)	43	07JUL14	03SEP14	48
Y10301CP58	PCR - DOE FINAL TO EPA/TDEC PH 2 TR FAC	0		03SEP14	
Y10301CP61	PCR - EPA/TDEC REVIEW & APPROVAL	21	04SEP14	03OCT14	48
Y10301CP64	PCR - APPROVED BY EPA/TDEC PH 2 TR FAC	0		03OCT14	18

**DATE
FILMED**

5/17/94

END