APPENDIX B

Tables

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Table 6: NOAEL to LOAEL Range for Various Ecological Receptors

COPC	Ecological Risk Level Soil Concentration Range (mg/kg)													
	Meadow Vole		Short-Tailed Shrew		Killdeer		American Kestrel		Red Fox		Plants		Soil Invertebrates	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	NOAEL
PCP	1.844	18.44	9.793	97.93	2,550	5,101	2,429	4,859	1,463	14,629	**0.3**[1]	**3.0**[1]	1.6[3]	16[3]
Aluminum	221	2,212	**3.497**	**34.97**	1,471	14,710	4,098	40,977	$1.0x10^6$	$1.0x10^7$	5[2]	50[2]	NF	
Antimony	4.312	43.12	**0.063**	**0.634**	63,584	$6.4x10^5$	$1.8x10^5$	$1.8x10^6$	607	6074	0.5[1]	5[1]	NF	
Arsenic	6.391	63.91	**0.228**	**2.28**	32.9	98.9	91.88	276	3,874	38,741	1.12[2]	11.2[2]	6.8[3]	68[3]
Iron	2,051	20,513	**32.44**	**324**	1,341	13,414	3,728	37,282	$6.1x10^5$	$6.1x10^6$	NF		753[3]	7,533[3]
Lead	7.062	70.62	**0.894**	**8.94**	58.66	587	719	7,191	43,493	$4.4x10^5$	20[2]	50[2]	100[3]	500[3]
Thallium	0.863	8.63	**0.013**	**0.134**	4.694	46.94	13.02	130	113	1,132	0.1[1]	1[1]	NF	
Zinc	234	2,342	29.03	290	27.08	271	70.53	705	$7.1x10^5$	$7.1x10^6$	**10**[2]	**25**[2]	97[3]	136[3]
TCDD	**$1x10^{-5}$**	**$1x10^{-4}$**	**$1x10^{-5}$**	**$1x10^{-4}$**	NA		NA		NA		NF		NF	
HMWPAHs	**1.28**	**12.8**	3.264	32.64	51.01	510	48.85	489	488	4,876	NF		26[4]	260[4]

Note: Bolded values were used on Table 2-2.

LOAEL - Lowest Observed Adverse Effect Level
NOAEL - No Observed Adverse Effect Level
NA - Not Applicable
NF - Not Found in References
TCDD - 2,3,7,8-Tetrachlorodibenzo-p-dioxin
HMWPAHs - High Molecular Weight Polynuclear Aromatic Hydrocarbons

Sources:
1 Preliminary Remediation Goals for Ecological Endpoints. Prepared for the U.S. Department of Energy (DOE) by Lockheed Martin Energy Systems, Inc. (LMES). ES/ER/TM-162/R2. August 1997
2 Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plans: 1997 Revision. Prepared for the U.S. DOE by LMES. ES/ER/TM-85/R3. November 1997
3 Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision. Prepared for the U.S. DOE by LMES. ES/ER/TM-126/R2.
4 Sverdrup, Line E.; et.al. 2002. Relative Sensitivity of Three Terrestrial Invertebrate Tests to Polycyclic Aromatic Compounds. Environmental Toxicology and Chemistry. 21(9); 1927-1933.

TABLE 7
Applicable or Relevant and Appropriate Requirements (ARARs) And To Be Considered Material for the Selected Remedy
Atlantic Wood Industries, Inc. Superfund Site
November 2007 Record of Decision

ARAR or TBC	Legal Citation	Classification	Summary of Requirement	Further Detail Regarding ARARs in the Context of the Selected Remedy
Rivers and Harbors Act, Section 10	33 U.S.C. § 403	Applicable	Activities that could impede navigation are prohibited unless authorized by Congress or permitted by the United States Army Corps of Engineers (USACE). Prohibits alteration of any port, harbor or other navigable waterway, especially by excavation or filling, without the approval of the USACE.	The sheet pile wall(s) shall not be constructed beyond the bulkhead lines that have been established by the USACE for the Southern Branch of the Elizabeth River. No pier installed in order for the remedy to be implemented shall extend beyond the limits designated by the USACE. Adequate lighting shall be installed at the sheet pile wall(s) or pier to make the their presence known from a reasonable distance on the river. No permit will be obtained.
Clean Water Act Regulations	40 CFR 230--Section 404(b)(1) Guidelines for specification of Disposal sites for dredged or fill material	Applicable	Regulates the discharge of dredged fill materials into navigable waters of the U.S. at specified disposal sites. Any proposed discharge must avoid, to the fullest extent practicable, adverse effects, especially on aquatic ecosystems.	This ROD contains the rationale for the need to fill waters of the United States - in order to provide overall protection of human health and the environment in a manner not inconsistent with the NCP. Prior to actual filling operations (when sediment is consolidated behind the sheet pile wall(s), the sheet pile interlocks shall be sealed. Steps shall be considered in the remedial design, and taken during remedial action as appropriate to protect the Elizabeth River outside the sediment containment system from the migration of contaminants or sediment from the consolidation area.

ARAR or TBC	Legal Citation	Classification	Summary of Requirement	Further Detail Regarding ARARs in the Context of the Selected Remedy
Virginia Water Protection Permit Regulation	9 VAC 25-210 -10 Definitions -45 Wetland Delineation -110B Water quality standards and state requirements -110C Toxic pollutants -110E Best Management Practices -116A thru C and F Compensation (substantive provisions only)	Applicable	Regulates dredging, filling, or discharging of pollutants to surface waters. Also regulates activities conducted in wetlands.	Applicable to any dredging, capping, or thin-layer sand placement, as well as, any discharge to the Southern Branch of the Elizabeth River. The substantive requirements of the permitting regulations shall be met, however the permit itself is not required. The 1987 USACE Wetland Delineation manual shall be used to delineate wetlands. The selected remedy shall have no net loss of wetlands acreage. The selected remedy requires creation of new wetlands, of equivalent acreage and function, to mitigate those lost The remedial design shall include the substantive requirements of 210-116F
Protection of Wetlands	40 C.F.R. Part 6, Appendix A (Executive Order No. 11990)	Applicable	Sets forth EPA policy for carrying out provisions of Executive Order 11990 (Protection of Wetlands) which requires actions to avoid adverse effects, minimize potential harm, and restore and preserve natural and beneficial values.	Applicable since disposal of sediments will, and the construction of the soil cover may, destroy both tidal and non-tidal wetlands. The wetlands must be destroyed in order to protect human health and the environment. The same acreage of the same type of wetlands will be created on the site to mitigate the loss.

ARAR or TBC	Legal Citation	Classification	Summary of Requirement	Further Detail Regarding ARARs in the Context of the Selected Remedy
VMRC Wetlands Mitigation Compensation Policy Fisheries and Habitat of the Tidal Waters; Wetlands	4VAC20-390 -10 Definitions -40 Specific criteria. -50A Compensation guidelines -50B.5 Replace lost functional values and minimum of 1:1 ratio -50B.7 -50B.9 -50B.11 Va. Code Ann. § 28.2-1300 Definitions	Applicable	In order for a proposal to be authorized to destroy wetlands and compensate for same in some prescribed manner, the three criteria listed below must be met. If the proposal cannot meet one or more of these criteria, the activity shall be denied, or must occur in areas apart from the wetlands. Should it satisfy all three criteria, however, compensation for the wetlands lost is required. Since the proposed activity should stand on its own merits in the permit approval process, compensation should not be used to justify permit issuance. 1. All reasonable mitigative actions, including alternate siting, which would eliminate or minimize wetlands loss or disturbance shall be incorporated in the proposal. 2. The proposal shall clearly be water-dependent in nature. 3. The proposal shall demonstrate clearly its need to be in the wetlands and its overwhelming public and private benefits.	In order to address the high levels of contamination in the Elizabeth River, including DNAPL, and thus provide overall protection to human health and the environment, tidal wetlands must be destroyed as part of the selected remedy. Therefore alternate siting of the cleanup is not possible. Since the contamination is in the water, this project is water dependent. Without destroying the wetland, the cleanup can not take place. Due to, at a minimum, the contamination, EPA does not consider the tidal wetlands that must be destroyed to be wetlands of primary ecological significance. Compensation for the lost tidal wetlands will take place on-site, which is the preferred location. The new tidal wetland shall replace the lost functional value and have a 1:1 ratio of acreage lost to acreage created. All reasonable steps shall be taken to avoid or minimize any adverse environmental effects associated with the compensation activities themselves. The type of plant community used in the new tidal wetlands shall have a demonstrated history of successful establishment. Any tidal non-vegetated wetlands destroyed shall be treated on an equal basis with vegetated wetlands with regard to compensation and mitigation, unless site-specific information indicates one is more valuable than the other.
Fisheries and Habitat of the Tidal Waters; Submerged Lands	Va. Code Ann. § 28.2-1209 Maintenance or removal of structures erected upon or over state-owned subaqueous bottoms.	Applicable	Any person constructing or erecting any structure upon or over state-owned subaqueous bottoms, or their grantees or assignees for value, shall be responsible for the maintenance or removal of the structure upon its abandonment or its falling into a state of disrepair.	The selected remedy includes O&M requirements to ensure the sheet pile wall(s) remain effective at containing contamination. Any pier that must be built to implement the remedy (e.g., if a pier is needed to allow AWI water access during implementation), shall be removed at the end of the cleanup, unless maintenance of the structure is assumed by another party.

ARAR or TBC	Legal Citation	Classification	Summary of Requirement	Further Detail Regarding ARARs in the Context of the Selected Remedy
Virginia Water Protection (VWP) General Permit for Impacts from Development Activities Regulation	9 VAC 25-690 Part I -10 Definitions -100 VWP general permit (substantive provisions only) -100C.4-9, 11, 14, 16 -100F -100G.2, 3, 4, and 5 -100H.1 and 2 Part II -100A.6, 8, 9, 13, 15, 16, 17, 19, and 20 -100C Part III -100B	Applicable	Establishes VWP General Permit Number WP4 which governs impacts related to construction and maintenance of development activities. This permit authorizes permanent or temporary impacts of up to two acres of non-tidal wetlands or open water and up to 1,500 linear feet of non-tidal stream bed. This regulation applies to small projects that do not impact tidal waters and operates in lieu of the more complex permitting requirements of 9 VAC 25-210.	Substantive requirements shall be carried out for the wetland mitigation and stormwater management system. Among many other requirements, contains erosion and sediment control requirements. All fill material used in wetland mitigation, the stormwater management system, and the thin-layer capping in the Elizabeth River, shall be clean and free of contaminants in toxic concentrations or amounts in accordance with all applicable laws and regulations.
Fisheries and Habitat of the Tidal Waters	Va. Code Ann. §28.2-100 Definitions	Applicable	Defines what part of Virginia is the "Tidewater" area.	The site is in the Tidewater area and, as such, is subject to Virginia's Coastal Zone Management Program.
Continuation of the Virginia Coastal Zone Management Act	Commonwealth of Virginia, Office of the Governor, Executive Order 21 (2006)	Applicable	The Executive Order establishes Virginia's Coastal Zone Management Program and contains the policy goals of the program..	Each law of the program is already contained elsewhere in this ARAR table. Therefore, by meeting the other ARARs, EPA has determined that the selected remedy is consistent with Virginia's Coastal Zone Management Program.
Coastal Zone Management Act of 1972; Coastal Zone Act Reauthorization Amendments of 1990	16 U.S.C. § 1453 Definitions 16 U.S.C.§ 1456(c)(1)(A) Consistency of Federal Activities with State Management Programs 15 C.F.R. Part 930.11 Definitions 930.31 thru 930.34	Applicable	Requires that Federal agencies conducting or supporting activities directly affecting the coastal zone, conduct or support those activities in a manner that is consistent with the approved appropriate State coastal zone management program.	By complying with the other State ARARs in this table, EPA has determined that the selected remedy is consistent to the maximum extent practicable with Virginia's Coastal Zone Management Program.

ARAR or TBC	Legal Citation	Classification	Summary of Requirement	Further Detail Regarding ARARs in the Context of the Selected Remedy
Clean Water Act Regulations-- NPDES Permitting Requirements for Discharge of Treatment System Effluent	40 CFR 122.44(k) (BMPs) and 122.45, 125 (substantive provisions only), 129.2 to 129.7	Applicable Relevant and Appropriate	Defines allowable concentrations in effluent.	Applicable to any end-of-pipe discharge from a ground water treatment plant, whether temporary during construction or permanent. Relevant and Appropriate to the passive discharge of ground water from the sheet pile wall(s). If passive discharge of ground water from the sheet pile wall(s) does not meet the substantive requirements of the regulations, the system shall be upgraded to include treatment agents in the sand gates. If the system still can meet the requirements, the weep holes in the sheet pile wall(s) shall be sealed and an active recovery and treatment shall be constructed.
Virginia Pollutant Discharge Elimination System (VPDES) Permit Regulation	9 VAC 25-31 -10 Definitions -40 Exclusions -50 Prohibitions -190(E) and (M) Conditions applicable to all permits -200C.1 Waterworks operator requirements -220A, B, D, and E Establishing limitations, standards, and other permit conditions -230 Calculating VPDES Permit Conditions	Applicable Relevant and Appropriate	Regulates discharges, including monitoring requirements and effluent discharge limitations for point sources. Defines allowable concentrations of contaminants to be discharged	Applicable to any end-of-pipe discharge from a ground water treatment plant, whether temporary during construction or permanent Relevant and Appropriate to the passive discharge of ground water from the sheet pile wall(s). If passive discharge of ground water from the sheet pile wall(s) does not meet the substantive requirements of the regulations, the system shall be upgraded to include treatment agents in the sand gates. If the system still can meet the requirements, the weep holes in the sheet pile wall(s) shall be sealed and an active recovery and treatment shall be constructed.
Virginia Pollutant Abatement (VPA) Permit Regulation	9 VAC 25-32 -10 Definitions -30A Requirements and Prohibitions -80C, D, and J Conditions Applicable to all VPA Permits -100 Establish limitations and other VPA conditions -190 Operator requirements	Applicable	Regulates any discharge of pollutants adjacent to State waters (including ground water). All pollutant management activities covered under a VPA permit shall maintain no point source discharge of pollutants to surface waters except in the case of a storm event greater than the 25-year, 24-hour storm.	Any temporary or permanent ground water treatment plant and stormwater management system shall comply the substantive requirements. No permit is required.

ARAR or TBC	Legal Citation	Classification	Summary of Requirement	Further Detail Regarding ARARs in the Context of the Selected Remedy
Protection of Floodplains	40 C.F.R. Part 6, Appendix A (Executive Order No. 11988)	Applicable	Sets forth EPA policy for carrying out provisions of Executive Order 11988 (Floodplain Management), which requires actions to avoid adverse effects, minimize potential harm, and restore and preserve natural and beneficial values.	Applicable since most of the AWI facility is within the 100-year floodplain. The sediment disposal and the soil cover will raise the elevation of the facility such that most may not be in the floodplain. This will provide protection for the soil cover from large floods, but does decrease the area of the floodplain by approximately 50 acres. The cover shall be designed to prevent its construction from causing any additional flooding of adjacent properties. There will be some mitigation of the loss of floodplain by the wetland creation at the site.
VPDES General Permit Regulation for Discharges of Storm Water from Construction Activities	4 VAC 50-60 -10 Definitions -50 General -60 Water Quality -70 Stream Channel Erosion -80 Flooding -310 Prohibitions -380.B.1.a Stormwater management system design issues -430.M.1 and 3 Bypass	Applicable	Establishes minimum acceptable technical criteria after earth-moving activities to control non-point-source pollution, localized flooding, and stream channel erosion. Inhibits the deterioration of existing waters and waterways by requiring that post-development stormwater runoff characteristics, including both water quality and quantity, be maintained, to the extent practicable, equal to or better than the pre-development runoff characteristics. Includes Section 430 for substantive requirements only and does not include administrative permitting requirements or document submissions.	The stormwater management system shall comply with these ARARs. Only substantive requirements shall be met and no permit shall be required.
City of Portsmouth Chesapeake Bay Preservation Area Ordinance	Chapter 9.1 Chesapeake Bay Preservation Area District Overlay Sec. 9.1-7 Required Conditions Sec. 9.1-10 Performance Standards	Applicable	Ordinance designates Chesapeake Bay Preservation Areas and requires that land-disturbing activities involving 2,500 sq. feet or more are undertaken in accordance with approved plan to minimize erosion and sedimentation potential, reduce land application of nutrients and toxics, and maximize rainwater infiltration.	The site is located within the Chesapeake Bay Preservation Area and will involve land-disturbing activities. Provisions apply in substance only.

ARAR or TBC	Legal Citation	Classification	Summary of Requirement	Further Detail Regarding ARARs in the Context of the Selected Remedy
VA Chesapeake Bay Preservation Area Designation and Management Regulations	9 VAC 10-20 -120 General performance criteria (for land development) -130 Development Criteria for Resource Protection Areas	Relevant and Appropriate	Provides direction to local governments regarding development in the Chesapeake Bay Preservation Area. Land development is subject to limitations regarding land-disturbing activities, removal of vegetation, use of impervious cover, erosion and sediment control, stormwater management, and other aspects of land use that may have effects on water quality.	The site is located in a Chesapeake Bay Preservation Area. Activities on land shall comply with the substantive requirements. No permit is required. Compliance with any administrative requirements is not required.
Virginia Erosion and Sediment Control Regulations	4 VAC 50-30 -10 Definitions -40 Minimum Standards -60 Maintenance and Inspections	Applicable	Establishes minimum standards for the control of soil erosion, sediment deposition, and runoff, and requires that an erosion and sediment control plan be implemented and maintained for land-disturbing activity.	Construction of the remedy will involve land-disturbing activities which shall comply with the ARARs.
City of Portsmouth Erosion and Sediment Control Ordinance	Chapter 11 Erosion and Sediment Control, Excavation Sec. 11-2. Definitions. Sec. 11-3(a). Erosion and sediment control program.	Applicable	Ordinance adopts the Virginia Erosion and Sediment Control Regulations and references the *Virginia Erosion and Sediment Control Handbook*, Virginia Department of Conservation and Natural Resources, 1992.	Construction of the remedy will involve land-disturbing activities which shall comply with the ARARs.
City of Portsmouth Stormwater Management Ordinance	Chapter 31.1 Stormwater Management Sec. 31.1-1 Definitions Sec. 31.1-3 Pollution of the Stormwater System	Applicable	Ordinance prohibits unpermitted discharge into stormwater system. Requires compliance with direction to cease discharge if notice is issued from the City to the entity responsible for the discharge.	Will need to be complied with if any stormwater discharge occurs to surface water. Only substantive requirements shall be met and no permit shall be required.
Virginia Ambient Air Quality Standards	9 VAC 5-30 -10 General -60 Ambient air quality standard for PM10 -65 Ambient air quality standard for PM2.5 -80 Ambient air quality standard for lead	Applicable	Ambient air quality standards are required to assure that ambient concentrations of air pollutants are consistent with established criteria.	Sets standards for control of dust generated during the remedial action.

ARAR or TBC	Legal Citation	Classification	Summary of Requirement	Further Detail Regarding ARARs in the Context of the Selected Remedy
Standard for Fugitive Dust/Emissions	9 VAC 5-50-90	Applicable	Regulates fugitive dust emissions from a construction site.	The remedy will generate fugitive dust.
Maximum Contaminant Level Goals (MCLGs)	40 C.F.R §§ 141.50 (organic contaminants) and 141.51 (inorganic contaminants)	Relevant and Appropriate	Non-enforceable health goals for public water supplies. The NCP requires that non-zero MCLGs shall be attained by remedial actions for ground water that is a current or potential source of drinking water, where the MCLGs are relevant and appropriate under the circumstances of the release.	Contaminant — MCLG (mg/l) Organics: Toluene . . . . . 1.0 Ethylbenzene . . . . . 0.7 Xylenes (total) . . . . . 10 Inorganics: Antimony . . . . . 0.006 Cadmium . . . . . 0.005 Chromium . . . . . 0.1 Copper . . . . . 1.3 Mercury 0.002
Maximum Contaminant Levels (MCLs)	40 C.F.R §§ 141.61 (organic contaminants) and 141.62 (inorganic contaminants) 40 C.F.R 141.80(c) (lead)	Relevant and Appropriate	Enforceable standards for public drinking water supply systems (with at least fifteen service connections or used by at least 25 persons). The NCP requires that MCLs, for those contaminants whose MCLG is zero, shall be attained by remedial actions for ground water that is a current or potential source of drinking water, where the MCLs are relevant and appropriate under the circumstances of the release. Note that the level for lead is an action level and not an MCL.	Organics: Benzene . . . . . 0.005 Pentachlorophenol . . . . . 0.001 2,4,5-Trichlorophenol . . . . . 0.05 Benzo(a)pyrene . . . . . 0.0002 2,3,7,8-TCDD (Dioxin) . . . . . 0.00000003 Inorganics: Arsenic . . . . . 0.010 Lead 0.015

ARAR or TBC	Legal Citation	Classification	Summary of Requirement	Further Detail Regarding ARARs in the Context of the Selected Remedy
Ground Water Quality Standards	9 VAC 25-280 -10 Definitions -20 Ground water standards; general requirements - 30 Anti-degradation policy for ground water - 40 Ground water standards applicable statewide - 60 Ground water criteria; general requirements - 70 Ground water criteria	To Be Considered	Numerical ground water quality criteria apply primarily to ground water constituents that occur naturally. Since natural ground water quality can vary greatly from area to area for these constituents, enforceable standards were not adopted. These criteria are intended to provide guidance in preventing ground water pollution. Ground water criteria are not mandatory.	Contaminant — Criteria (mg/l) Chromium . . . . . 0.05 Copper . . . . . 1.0 Iron . . . . . 0.3 Lead . . . . . 0.05 Manganese . . . . . 0.05 Mercury . . . . . 0.00005 Phenols . . . . . 0.001 Zinc 0.05
Hazardous Waste Management Regulations	9 VAC 20-60- -14 Definitions -17 Definitions -260.10 Definitions	Relevant and Appropriate	Regulatory definitions necessary to understand the regulatory standards	
Identification of Hazardous Waste	9 VAC 20-60-261.3, -261.20 thru 261.24 -261.30 thru 261.35 -261 Appendix I	Relevant and Appropriate	Specifies through testing or listing whether specific compounds are hazardous and at what concentration. Specifies testing methods.	Use to determine if wastes present or generated on-site are hazardous. Relevant for determining if ground water treatment residuals are hazardous.
Standards Applicable to Generators of Hazardous Waste	9 VAC 20-60-262.11 and -262.20 thru 262.42	Applicable	Regulations requiring characterization of any solid waste as either hazardous or solid waste. Regulations specifying the preparation of manifests and packaging, labeling, marking, and placarding for transporting hazardous waste off site for treatment, storage, or disposal These regulations also dictate allowed accumulation time, quantity, and satellite storage requirements and record keeping.	Required if it is determined that the site remedy leads to the generation of hazardous waste, such as spent carbon.

ARAR or TBC	Legal Citation	Classification	Summary of Requirement	Further Detail Regarding ARARs in the Context of the Selected Remedy
Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities	9 VAC 20-60-264, (incorporating 40 C.F.R. Section 264 into the state regulation) Subpart J-Tank Systems .14 Security .192 Design and installation of new tank systems or components .193 Containment and detection of releases .194 General operating conditions .195 Inspections .196 Response to leaks or spills .197 Closure and post-closure care .200 Air emissions Subpart N-Landfills .303(a)(2) .303(b) .310(a) .310(b)(1, 4, and 5) (does not include .117 to .120) Subpart EE-Hazardous Waste Munitions and Explosives Storage .1201 Design and operating standards .1202 Closure and post-closure care	Relevant and Appropriate	Regulations procedures to protect human health and the environment from a release of hazardous waste.	Subpart J would apply to any ground water treatment system because the PAH and PCP contamination would be a listed hazardous waste (the ground water itself would not, just the contamination in the ground water). This also means that any treatment residuals would be a listed hazardous waste. Subpart N includes requirements for regular inspections during the consolidation of the sediment; inspection of cover system during and immediately after construction; and standards for the design, construction, and maintenance of the cover system. Subpart EE would apply if there are any UXO found at the site.
Covers for Uncontrolled Hazardous Waste Sites	EPA/540/2-85/002, September 1985	TBC	Guidance for design of cover systems for uncontrolled hazardous waste sites.	To be considered in designing soil cover.

ARAR or TBC	Legal Citation	Classification	Summary of Requirement	Further Detail Regarding ARARs in the Context of the Selected Remedy
Design and Construction of RCRA/CERCLA Final Covers	EPA/625/4-91/025, May 1991	TBC	Guidance for design and construction of cover systems for hazardous waste sites.	To be considered in designing soil cover.
Reusing Superfund Sites: Commercial Use Where Waste Is Left in Place	EPA 540-K-01-008 OSWER 9230.0-100, February 2002	TBC	Guidance for commercial reuse of Superfund sites when waste is left on site.	To be considered in designing soil cover.
Endangered Species Definitions and Miscellaneous: In General	Va. Code Ann. §§ 29.1-563 and -564 4 VAC 15-20 -130 Endangered and Threatened Species; Adoption of Federal List; Additional Species Enumerated -140 Definitions	Applicable	Prohibits the taking of endangered species and provides listing of endangered species and definitions of actions which constitute taking.	Applicable if endangered species are found at the site. As of September 2007, resource agencies have not identified any endangered species.
Endangered Plant and Insect Species Act Rules and Regulations for the Enforcement of the Endangered Plant and Insect Species Act	Va. Code Ann. §§ 3.1-1021and -1023 2 VAC 5-320-10 Listing of Endangered and Threatened Plant and Insect Species	Applicable	Prohibits the taking of endangered plant and insect species.	Applicable if endangered plant or insect species are found at the site. As of September 2007, resource agencies have not identified any endangered species.

ARAR or TBC	Legal Citation	Classification	Summary of Requirement	Further Detail Regarding ARARs in the Context of the Selected Remedy
The Archaeological and Historical Preservation Act of 1974	16 U.S.C § 469	Applicable	Requirements relating to potential loss or destruction of significant scientific, historical, or archaeological data	Archeological and historical resources have not been identified to date. However, the installation of the physical barrier wall along the Southern Branch of the Elizabeth River has the potential for disturbing archeological resources. Further action shall be taken to identify resources and, if identified, action shall be taken to mitigate any adverse effects on those resources that would result from the cleanup. If resources are identified in other areas of the site (although no specific actions will be taken to locate), action will be taken to mitigate any adverse effects on those resources that would result from implementation of the remedial action.

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Table 8: Cost Estimate for Selected Remedy (Alternative 4)
Soil Cover, Partial DNAPL Consolidation and Containment, MNA/Ground Water Monitoring, Dredging with Consolidation Behind Enhanced Off-Shore Sheet Pile Wall, and Enhanced MNR

Item	Quantity	Unit Cost	Units	Capital Cost	O&M Cost	
					Annual	Present Worth
(1) Soil Cover						
(a) Mobilization/Demobilization	1	$50,000	LS	$50,000		
(b) Soil Cover						
(1) vegetative layer (6 inches of topsoil and seeding)	47.1	$26,000	AC	$1,224,600		
(2) protective layer (12 inches of native soil)	47.1	$11,235	AC	$529,169		
(3) demarcation layer (geotextile layer)	47.1	$6,820	AC	$321,222		
(c) Erosion Control						
(1) site perimeter	8,500	$2	LF	$17,000		
(d) Long-term Cap Maintenance						
(1) mowing (1 per year for 30 years)	1	$2,000	YR		$2,000	$24,818
(2) inspections (1 per year for 30 years)	1	$2,000	YR		$2,000	$24,818
(3) repairs (1 per year for 30 years)	1	$10,000	YR		$10,000	$124,090
(4) reports (1 per year for 30 years)	1	$2,000	YR		$2,000	$24,818
Subtotal (1)				$2,141,991	$16,000	$198,545
(2) Excavation of West Side DNAPL						
(a) Excavate and transport to east side	7,200	$8	CY	$57,600		
(b) Backfill with imported fill	7,200	$12	CY	$86,400		
(c) Construction Dewatering						
(1) Tanks	1	$15,000	LS	$15,000		
(2) Dewatering Pump	1	$15,000	LS	$15,000		
(3) Slurry Wall (around DNAPL excavation areas)	1	$500,000	LS	$500,000		
(d) Unexploded Ordnance Avoidance						
(1) Mobilization	1	$4,187	LS	$4,187		
(2) Ordnance avoidance crew rate	90	$1,787	day	$160,830		
Subtotal (2)				$839,017		
(3) Ground Water Dewatering Treatment Plant						
(a) Temporary treatment building	1	$40,000	LS	$40,000		
(b) Influent Pump	1	$4,000	EA	$4,000		
(c) Pre-Treatment Filter	1	$15,000	EA	$15,000		
(d) Holding Tank (filter backwash water)	1	$15,000	EA	$15,000		
(e) Carbon Adsorption (2 units with media)	2	$20,000	EA	$40,000		
(f) Effluent Holding Tank	1	$25,000	EA	$25,000		
(g) Sludge Handling (from filter backwash)						
(1) sludge pump	1	$4,000	EA	$4,000		
(2) sludge holding tank	1	$8,000	EA	$8,000		
(3) filter press	1	$15,000	EA	$15,000		
(4) control panel	1	$5,000	EA	$5,000		
(h) Discharge Pump	1	$5,000	EA	$5,000		
(i) Transfer Pipe from Treatment Plant to River	500	$50	LF	$25,000		
(j) Installation and Incidentals (piping, electrical, HVAC)	1	$125,000	LS	$125,000		
(k) Operations	1	$50,000	LS	$50,000		
Subtotal (3)				$376,000		

Table 8: Cost Estimate for Selected Remedy (Alternative 4)
Soil Cover, Partial DNAPL Consolidation and Containment, MNA/Ground Water Monitoring, Dredging with Consolidation Behind Enhanced Off-Shore Sheet Pile Wall, and Enhanced MNR

Item	Quantity	Unit Cost	Units	Capital Cost	O&M Cost	
					Annual	Present Worth
(4) Long-term Ground Water and DNAPL Monitoring						
(a) Develop Sampling Plan	1	$20,000	LS	$20,000		
(b) Monitoring Well Installation	2	$15,000	EA	$30,000		
(c) Annually (20 wells, years 1 through 30)						
(1) sample collection	1	$18,000	event		$18,000	$223,363
(2) sample analysis	20	$500	EA		$10,000	$124,090
Subtotal (4)				$50,000	$28,000	$347,453
(5) Off-Shore Sheet Pile Wall						
(a) Install Sheet Piles approx. 200 ' (S) and 545' (N) off-shore	61,075	$70	SF	$4,275,250		
(b) Deadman/tiebacks	192	$360	EA	$68,940		
(c) On-shore portion of the wall	15,300	$57	SF	$872,100		
(d) Overflow weirs (sand)	96	$65	EA	$6,224		
(e) Riprap in front of wall	5,738	$40	TON	$229,520		
(f) Extend storm sewers in inlets	1	$40,000	LS	$40,000		
Subtotal (5)				$5,492,034		
(6) Dredging and Disposal Behind Bulkhead and On West Side						
(a.1) Dredging sediment > 100 ppm, continuing to 45 ppm	157,300	$30	CY	$4,719,000		
(a.1.5) Dredging of clay in Wyecoff Inlet (see Figure 31)	3,800	$30	CY	$114,000		
(a.2) Water treatment for dewatering (use cap cost from Sec 3)	1	$326,000	LS	$326,000		
(a.3) Dewatering ops costs using treatment sys	161,100	$2	CY	$322,200		
(b) Backfill and compact behind bulkeads	69,000	$10	CY	$690,000		
(c) Backfill excess material on west side	88,300	$14	CY	$1,236,200		
(d) Stabilization of 5' behind sheet pile wall	6,136	$60	CY	$368,160		
(e) Stabilization of upper 3' for load bearing surface	9,778	$60	CY	$586,680		
(f) Stabilization of 15% of material disposed on west side	13,245	$60	CY	$794,700		
(g) Treatability Study (Stabilization)	1	$25,000	LS	$25,000		
(h) Enhanced MNR (6 inches of sand)	5.6	$105,000	AC	$588,000		
(i) Enhanced MNR (6 inches of sand) - Estimated Navy Area	1.3	$105,000	AC	$131,250		
(j) Sand placement over exposed clay (1 foot of sand)	6.6	$210,000	AC	$1,386,000		
(k) Sand placement rest of dredge area to address residuals	6.6	$210,000	AC	$1,386,000		
(l) Dredging QA/QC (bathymetry)	1	$10,000	LS	$10,000		
Subtotal (6)				$12,683,190		
(7) River Monitoring						
Sediment						
(a) Project Planning and Organization	1	$ 1,400	LS		$ 1,400	$17,373
(b) Sampling Labor	1	$ 9,000	LS		$ 9,000	$111,681
(c) Sampling Equipment	1	$ 49,150	LS		$ 49,150	$609,904
(d) Sample Analysis and Data Validation (32 samples)	32	$ 500	LS		$ 16,000	$198,545
(e) Data Evaluation and Reporting	1	$ 16,800	LS		$ 16,800	$208,472

Table 8: Cost Estimate for Selected Remedy (Alternative 4)
Soil Cover, Partial DNAPL Consolidation and Containment, MNA/Ground Water Monitoring, Dredging with Consolidation Behind Enhanced Off-Shore Sheet Pile Wall, and Enhanced MNR

Item	Quantity	Unit Cost	Units	Capital Cost	O&M Cost	
					Annual	Present Worth
Biota (annually years 1 through 4)						
(f) Caged bivalve study and collection of crabs	1	$ 71,000	LS		$ 71,000	$240,492
(g) Statistical and risk analysis	1	$ 41,000	LS		$ 41,000	$138,876
Biota (every 5 years - years 5 through 30)						
(h) Caged bivalve study and collection of crabs	1	$ 71,000	LS			$153,218
(i) Statistical and risk analysis	1	$ 41,000	LS			$88,478
Subtotal (7)					$204,350	$1,767,039
(8) Stormwater Management & Wetland Mitigation						
(a) Detention Basins						
(1) Excavation/Hauling	12,000	$5	CY	$63,120		
(2) Geotechnical Material	8,000	$2	SY	$16,000		
(3) Grading	70,000	$1	SF	$70,000		
(4) Backfill	1,000	$3	CY	$2,610		
(5) Seeding	70	$65	MSF	$4,550		
(6) Flow Control Structures	2	$10,000	LS	$20,000		
(b) Drainage Swales						
(1) Clearing / Grubbing	3	$4,700	AC	$12,220		
(2) Excavation	1,400	$5	CY	$7,364		
(3) Grading	4,500	$2	SF	$9,000		
(4) Seeding	123	$65	MSF	$7,995		
(c) Tidal Wetland Mitigation (assume 1 acre)						
(1) Excavation/Hauling	11,300	$5	CY	$56,500		
(2) Backfill	2,400	$3	CY	$7,200		
(3) Grading	43,560	$1	SF	$43,560		
(4) Plantings	1	$50,000	LS	$50,000		
Subtotal (8)				$370,119		
(9) Institutional Controls						
(a) Deed Restrictions	1	$25,000	LS	$25,000		
(b) 5-Year Review Reporting (every 5 years for 30 years)	6	$150,000	EA		$30,000	$323,700
Subtotal (9)				$25,000	$30,000	$323,700
CONSTRUCTION SUBTOTAL				$21,977,350		
Contractor Submittals, H&S, and Construction QA/QC	5% of Construction Subtotal			$1,098,868		
Contractor Overhead	10% of Construction Subtotal			$2,197,735		
Contractor Profit	10% of Construction Subtotal			$2,197,735		
Contingency	20% of Construction Subtotal			$4,395,470		
CONSTRUCTION TOTAL				$31,867,158		
Project Management	10% of Construction Total			$3,186,716		
Engineering	10% of Construction Total			$3,186,716		
Resident Engineering/Inspection	10% of Construction Total			$3,186,716		
TOTAL CAPITAL COSTS				$41,427,305		
OPERATION & MAINTENANCE SUBTOTAL					$278,350	$2,636,736

Table 8: Cost Estimate for Selected Remedy (Alternative 4)
Soil Cover, Partial DNAPL Consolidation and Containment, MNA/Ground Water Monitoring, Dredging with Consolidation Behind Enhanced Off-Shore Sheet Pile Wall, and Enhanced MNR

Item	Quantity	Unit Cost	Units	Capital Cost	O&M Cost	
					Annual	Present Worth
O&M Project Management and Support	10% of O&M Subtotal				$27,835	$345,406
O&M Contingency	15% of O&M Subtotal				$41,753	$518,108
TOTAL ESTIMATED COSTS				$41,427,305	$347,938	$3,500,251

NET PRESENT WORTH OF COSTS	$44,927,556