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ST JULIENS CREEK
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TECHNICAL MEMORANDUM SURFACE SOILD, SEDIMENT, AND GROUNDWATER PRGS
ST JULIENS CREEK ANNEX VA
1/28/2002
CH2M HILL

Surface Soil, Sediment, and Groundwater PRGs for St. Juliens Creek Annex, Chesapeake, Virginia

PREPARED FOR: Dawn Hayes/LANTDIV

PREPARED BY: Stacin Martin/CH2M HILL

COPIES: Todd Richardson/USEPA Region III
Devlin Harris/VDEQ
Bill Friedmann/CH2M HILL
Donna Caldwell/CH2M HILL
Jeff Harlow/PWC NWSY

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PRG Approach

This technical memorandum summarizes the proposed preliminary remediation goals (PRGs) determined for surface soils, sediments, and groundwater at IR Sites 3, 5, and 6, St. Juliens Creek Annex, Chesapeake, Virginia. The PRGs will be used as a tool to determine the extent of removal of soils and sediment at Sites 3, 5 and 6. Initial PRGs were determined for constituents that pose a risk to both human health and ecological receptors. Because several of the compounds identified as posing a risk are also naturally present at the site, surface soil background upper tolerance levels (UTLs) were compared to the initial PRGs to determine a final PRG for each constituent of concern.

Surface Soils and Sediments

Human health initial PRGs were determined by "back-calculating" concentrations that would no longer pose a risk for the risk drivers identified in the Human Health Risk Assessment (HHRA) presented in the *Draft Remedial Investigation/Human Health Risk Assessment/Ecological Risk Assessment (RI) Report* (CH2M HILL, December 2001). For ecological risks identified in the Baseline Ecological Risk Assessment (BERA) as presented in the RI, the initial PRGs were based on ecological screening criteria. Initial and final surface soil PRGs are presented on Tables 1 through 5 and initial and final sediment PRGs are presented on Tables 6 and 7. Figures 1 through 3 present the distribution of PRG exceedances in surface soils and Figure 4 presents the distribution of PRG exceedances in sediments at Sites 3, 5, and 6.

Groundwater

Groundwater PRGs were determined by evaluating and comparing the background upper confidence limits (UCLs), maximum contaminant levels (MCLs), Virginia groundwater standards (VGWS), and USEPA Region III risk based concentrations (RBCs). The current MCLs were proposed as the final PRGs for those analytes with assigned MCLs. In cases where there was no assigned MCL the background UCL or higher of the VGWS and tap water RBC is proposed. Table 8 lists the final PRGs and Figure 5 shows the distribution of PRG exceedances.

Initial Surface Soil and Sediment Human Health PRGs

Human health initial PRGs were developed for Sites 3 and 5/6 groundwater, soil, and sediment. PRGs were calculated for scenarios (i.e. residential) with carcinogenic risks exceeding 10^{-4} or noncarcinogenic hazards exceeding 1. PRGs were calculated for individual constituents with carcinogenic risks exceeding 10^{-6} or noncarcinogenic hazards exceeding 0.1 for the scenarios that exceed the above criteria. The exposure parameters identified in the HHRA were used to calculate the PRGs.

The target noncarcinogenic hazard quotient (HQ) for the initial applicable PRGs for each constituent was determined based on the number of constituents that result in an effect to the same target (i.e. nervous system). The target HQ for each constituent was chosen so that the total hazard to the receptor would be below 1. Therefore, if two constituents effect the same target, the target noncarcinogenic hazard for those constituents would be 0.5. The target carcinogenic risk level for the initial PRGs were selected based on the number of carcinogenic constituents, and chosen so that the total carcinogenic risk to a receptor would be below 10^{-4}.

The initial PRGs for the child resident, which are based on a target noncarcinogenic hazard, are lower than the adult/child lifetime PRGs which are based on a target carcinogenic risk. This is true for all detected constituents except arsenic, for the target risk of 10^{-5}. Because the other three carcinogenic constituents (i.e., beryllium, cadmium, and chromium) do not contribute appreciably to the carcinogenic risk associated with exposure to soil, it is appropriate to base the arsenic adult/child lifetime resident initial PRG on a carcinogenic risk of 1×10^{-4}. The arsenic initial PRG based on this risk is more conservative than the child initial PRG based on noncarcinogenic hazard, and therefore, the initial PRG based on the adult/child lifetime resident would be used as the applicable initial PRG for arsenic.

Initial Surface Soil and Sediment Ecological PRGs

Initial PRGs for constituents that pose a potential ecological risk are based simply on the ecological screening criteria used in the BERA, therefore, initial PRGs are the medium-specific screening values presented in Table 8-3 of the RI.

Final Surface Soil and Sediment PRGs

Initial PRGs for constituents in soil that may pose a risk to human health or ecological receptors were compared to base-wide background upper tolerance levels identified in the *Final Background Investigation Report* (CH2M HILL, October 2001). There is currently no base-wide background data for sediment that are applicable to the upland ditches adjacent

to the sites. Additionally, it is believed that these upland drainages, which are vegetated with grasses and predominantly dry throughout the year, are chemically and physically more reflective of soils than sediment. Therefore, to further assess initial PRGs in sediment at the sites, initial sediment PRGs were compared to background soil sample UTLs.

In cases where the background UTL exceeded the ecological and human health initial PRG, the UTL was proposed as the final PRG. For constituents that pose a potential risk to human health and ecological receptors, the lesser value between the ecological and human health initial PRG was proposed as the final PRG when both values exceeded the background UTL. If either the ecological or human health initial PRG exceeded the background UTL, the initial PRG was proposed as the final PRG.

Summary of PRGs

Site 3 Surface Soil

Preliminary remediation goals were determined for 13 SVOCs, one pesticide, and 12 metals detected in surface soils at Site 3. Table 9 lists detected analytes that exceeded PRGs and Figure 1 shows the locations of PRG exceedances. The background UTL value was determined to be the criteria to serve as a final PRG for all of the analytes with the exception of four metals. The initial ecological PRG value was used as the final PRG for the four metals where the initial PRG exceeded the background UTL.

Ten SVOCs, one pesticide, and nine metals had PRGs that were exceeded at one or more locations in surface soils at Site 3 (SS04, SS05, SS06, SS07, SS09, SS12, SS13, SS15, SS16, and SS17). The PRGs were exceeded at eight locations. The PRG for vanadium (70 ug/Kg) was exceeded by less than 10% at SS06 (76.6 ug/Kg) and SS13 (71.6 ug/Kg). Vanadium was the only analyte whose PRG was exceeded at SS06 and SS12, at levels just above the PRG (defined by the background UTL). Because vanadium only slightly exceeded the background UTL (final PRG), soil removal from these locations are not warranted.

Sites 5 and 6 Surface Soils

Two soil types exist at Sites 5 and 6, Dredge Fill and Munden-Tetotum. Dredge Fill is present at both sites while Munden-Tetotum soils are present only on the western side of Site 5. The differing chemical nature, and therefore, background concentration UTLs, require that final PRGs be developed for samples in each soil type.

Munden-Tetotum

Preliminary remediation goals were determined for 13 SVOCs, two pesticides, and 14 metals detected in Munden-Tetotum type surface soils. Table 10 lists detected analytes that exceeded PRGs and Figure 2 shows the locations of PRG exceedances. The background UTLs were proposed as the final PRGs for 12 analytes and the initial ecological PRGs were proposed as the final PRGs for the remaining 17 analytes.

The PRGs for 10 SVOCs, two pesticides, and 10 metals were significantly exceeded in the Munden-Tetotum surface soils at Sites 5 and 6. One or more PRGs were exceeded at SS09, SS30, SS31, and SS32.

Dredge Fill

Preliminary remediation goals were determined for 13 SVOCs, two pesticides, and 14 metals detected in Dredge Fill type soils. Table 11 lists detected analytes that exceeded PRGs and Figure 3 shows the locations of PRG exceedances. The Background UTLs were proposed as the final PRGs for all of the SVOCs and nine of fourteen metals. The initial ecological PRGs were proposed as the final PRGs for the two pesticides and five metals.

The PRGs for two pesticides and 13 metals were exceeded in the Dredge Fill surface soils. No SVOC PRGs were exceeded in the Dredge Fill surface soils. Twenty-five locations (SS01-SS05, SS07, SS10-SS15, SS17, SS19-SS24, SS27-SS29, and SS33-SS35) had analyte concentrations that significantly exceeded their corresponding PRGs.

Sites 3, 5, and 6 Sediment

The predominant soil type drained by the upland ditches from which sediment samples were collected was Dredge Fill. Only one sediment sample (SJS05-SD06) was collected from an upland ditch that receives runoff from Bohicket soils. The final PRG proposed for areas drained by Bohicket soils are discussed separate from the remainder of the site samples. Site 3 sediment PRG exceedances are listed in Table 12 and Site 5 and 6 sediment PRG exceedances are listed on Table 13. Sites 3, 5, and 6 sediment PRG exceedances are shown on Figure 4.

Bohicket

The background UTLs are proposed as the final PRGs for three of the four metals PRG exceedances (barium, copper, and lead) at sample location SJS05-SD06. The initial ecological PRG value is proposed as the final PRG for zinc, which was also exceeded at SJ05-SD06.

Dredge Fill

The initial ecological PRG is proposed as the final PRG for one SVOC, two pesticides, and four metals. The background UTL was proposed as the final PRG for five pesticides and seven metals. The initial human health PRGs are proposed as the final PRG for the two remaining metals PRGs (antimony and thallium).

The final PRGs for one SVOC, seven pesticides, and 13 metals were exceeded at one or more locations at Sites 3, 5, and 6. One or more final PRGs were significantly exceeded at SD02-SD04 and SD06-SD07 at Site 3. The final PRG for 4-4'-DDE (9 ug/Kg) was exceeded at SJS03-SD01 by 1 ug/Kg, this is the only exceedance at this location. One or more final PRGs were significantly exceeded at the Sites 5 and 6 locations SD01-SD06.

Sites 3, 5, and 6 Yorktown Aquifer Groundwater

Site 3

The MCLs for chloroform, arsenic, and thallium are proposed as final PRGs for the Yorktown Aquifer groundwater at Site 3, and the tap water RBC is proposed as the final PRG for manganese. No PRGs were exceeded during the most recent sampling round (May 1999), but the final PRG for thallium (2 ug/L) was exceeded in the July 1997 sample from SJS03-GW1D (2.7J ug/L). Table 14 highlight the PRG exceedences and Figure 5 illustrates the locations for PRG exceedence.

Sites 5 and 6

The MCLs for chloroform, antimony, and arsenic are proposed as the final PRGs for the Yorktown Aquifer groundwater at Sites 5 and 6. The background UCL is proposed as the final PRG for iron and the tap water RBC is proposed as the final PRG for manganese for Yorktown Aquifer groundwater at Sites 5 and 6.

There are no PRG exceedances in samples from the most recent round of Yorktown Aquifer groundwater samples (May 1999) at Sites 5 and 6. A sample collected during July 1997 (SJ05-GW2D) had an iron concentration (4,420K ug/L) exceeding the proposed final PRG (2,035 ug/L). Table 15 lists the PRGs and exceedances in the Yorktown Aquifer groundwater at Sites 5 and 6 and Figure 5 shows the sample locations and PRG exceedances.

Additional Considerations for PRG Development and Removal Action

In addition to the process for developing the PRGs and the use of soil background UTLs for the development of PRGs for sediment in upland ditches, other considerations for the SJCA partnering team for the development of final PRGs and removal include:

- Determining if select compounds (i.e. subset of metals) which would be used as 'indicators' that clean up has been achieved.
- Determine if surface debris identified in the June/July 2001 waste delineation requires removal (Figure 6).
- Defining the limits of removal for single sample locations, or "hot spots".
- Approach for developing the PRGs for groundwater (default to MCLs).

Table 1
Surface Soil PRGs
Site 3
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical Name	Detection Frequency	Ecological Screening Value	Dredge Fill Background	Initial ECO PRG	Initial HHRA PRG	Final PRG	Criteria
Semi-volatile Organic Compounds (UG/KG)							
Anthracene	8 - 18	100	462	462	No Risk	462	Background
Benzo(a)anthracene	16 - 18	100	2,027	2,027	No Risk	2,027	Background
Benzo(a)pyrene	16 - 18	100	1,785	1,785	No Risk	1,785	Background
Benzo(b)fluoranthene	17 - 18	100	3,197	3,197	No Risk	3,197	Background
Benzo(g,h,i)perylene	15 - 18	100	1,655	1,655	No Risk	1,655	Background
Benzo(k)fluoranthene	15 - 18	100	2,038	2,038	No Risk	2,038	Background
Chrysene	17 - 18	100	3,487	3,487	No Risk	3,487	Background
Dibenz(a,h)anthracene	2 - 18	100	714	714	No Risk	714	Background
Fluoranthene	16 - 18	100	2,766	2,766	No Risk	2,766	Background
Indeno(1,2,3-cd)pyrene	15 - 18	100	1,829	1,829	No Risk	1,829	Background
Naphthalene	5 - 18	100	485	485	No Risk	485	Background
Phenanthrene	11 - 18	100	913	913	No Risk	913	Background
Pyrene	17 - 18	100	2,590	2,590	No Risk	2,590	Background
Pesticide/Polychlorinated Biphenyls (UG/KG)							
Endosulfan I	1 - 18	NSV	2.8	2.8	No Risk	2.8	Background
Total Metals (MG/KG)							
Aluminum	18 - 18	50	22,786	22,786	36,000	22,786	Background
Antimony	4 - 18	5.0	1.47	5.0	26	5.0	Eco Value
Arsenic	18 - 18	60	24	60	22	60	Eco Value
Chromium	18 - 18	0.4	45	45	No Risk	45	Background
Copper	18 - 18	50.0	58	58	1500	58	Background
Iron	18 - 18	200.0	45,805	45,805	21000	45,805	Background
Lead	18 - 18	50.0	147	147	No Risk	147	Background
Manganese	18 - 18	330	198	330	710	330	Eco Value
Mercury	16 - 18	0.1	1.3	1.3	No Risk	1.3	Background
Thallium	3 - 18	1	ND	1	5.4	1	Eco Value
Vanadium	18 - 18	2.0	70	70	280	70	Background
Zinc	18 - 18	50.0	137	137	No Risk	137	Background
Uncertainties[1]							
Volatile Organic Compounds (UG/KG)							
Acetone	7 - 18						
Chloromethane	1 - 18						
Semi-volatile Organic Compounds (UG/KG)							
2-Methylnaphthalene	1 - 18						
Carbazole	4 - 18						
Dibenzofuran	3 - 18						
bis(2-Ethylhexyl)phthalate	2 - 18						

1 - Listed as COPCs, but have no associated screening of background values
NSV - No screening value
ND- Not detected in background

Table 2
Munden-Tetotum Surface Soil PRGs
Sites 5 and 6
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical Name	Detection Frequency	Ecological Screening Value	Munden - Tetotum Background	Initial Eco PRG	Initial HHRA PRG	Final PRG	Criteria
Semi-volatile Organic Compounds (UG/KG)							
Acenaphthylene	0 - 4	100	95	100	No Risk	100	Eco Value
Anthracene	0 - 4	100	91	100	No Risk	100	Eco Value
Benzo(a)anthracene	3 - 4	100	6.9	100	No Risk	100	Eco Value
Benzo(a)pyrene	3 - 4	100	91	100	No Risk	100	Eco Value
Benzo(b)fluoranthene	4 - 4	100	91	100	No Risk	100	Eco Value
Benzo(g,h,i)perylene	4 - 4	100	91	100	No Risk	100	Eco Value
Benzo(k)fluoranthene	2 - 4	100	91	100	No Risk	100	Eco Value
Chrysene	4 - 4	100	102	102	No Risk	102	Background
Dibenz(a,h)anthracene	0 - 4	100	91	100	No Risk	100	Eco Value
Fluoranthene	4 - 4	100	103	103	No Risk	103	Background
Indeno(1,2,3-cd)pyrene	4 - 4	100	91	100	No Risk	100	Eco Value
Phenanthrene	3 - 4	100	91	100	No Risk	100	Eco Value
Pyrene	4 - 4	100	125	125	No Risk	125	Background
Pesticide/Polychlorinated Biphenyls (UG/KG)							
4,4'-DDE	4 - 4	100	532	532	No Risk	532	Background
4,4'-DDT	4 - 4	100	237	237	No Risk	237	Background
Total Metals (MG/KG)							
Aluminum	4 - 4	50	7,669	7,669	36,000	7,669	Background
Antimony	2 - 4	5	0.7	5	26	5	Eco Value
Arsenic	4 - 4	60	5.7	60	22	60	Eco Value
Barium	4 - 4	500	40	500	5,400	500	Eco Value
Chromium	4 - 4	0.4	7	7	79	7	Background
Copper	4 - 4	50	17.1	50	1,500	50	Eco Value
Cyanide	0 - 1	0.1	ND	0.1	No Risk	0.1	Eco Value
Iron	4 - 4	200	3,669	3,669	21,000	3,669	Background
Lead	4 - 4	50	61	61	No Risk	61	Background
Manganese	4 - 4	330	42	330	710	330	Eco Value
Mercury	4 - 4	0.1	0.3	0.3	No Risk	0.3	Background
Thallium	1 - 4	1	ND	1	5.4	1	Background
Vanadium	4 - 4	2	26.6	26.6	280	26.6	Background
Zinc	4 - 4	50	38	50	No Risk	50	Eco Value
Uncertainties[1]							
Volatile Organic Compounds (UG/KG)							
2-Butanone	1 - 4						
Acetone	3 - 4						
Semi-volatile Organic Compounds (UG/KG)							
2,4-Dinitrotoluene	0 - 4						
2,6-Dinitrotoluene	0 - 4						
2-Methylnaphthalene	0 - 4						
Carbazole	0 - 4						
bis(2-Ethylhexyl)phthalate	0 - 4						

1 - Listed as COPCs, but have no associated screening or background values
ND- Not detected in background

Table 3
Dredge-Fill Surface Soil PRGs
Sites 5 and 6
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical Name	Detection Frequency	Ecological Screening Value	Dredge Fill Background	Initial Eco PRG	Initial HHRA PRG	Final PRG	Criteria
Semi-volatile Organic Compounds (UG/KG)							
Acenaphthylene	1 - 30	100	246	246	No Risk	246	Background
Anthracene	6 - 30	100	462	462	No Risk	462	Background
Benzo(a)anthracene	23 - 30	100	2,027	2,027	No Risk	2,027	Background
Benzo(a)pyrene	20 - 30	100	1,785	1,785	No Risk	1,785	Background
Benzo(b)fluoranthene	24 - 30	100	3,197	3,197	No Risk	3,197	Background
Benzo(g,h,i)perylene	19 - 30	100	1,655	1,655	No Risk	1,655	Background
Benzo(k)fluoranthene	19 - 30	100	2,038	2,038	No Risk	2,038	Background
Chrysene	24 - 30	100	3,487	3,487	No Risk	3,487	Background
Dibenz(a,h)anthracene	5 - 30	100	714	714	No Risk	714	Background
Fluoranthene	23 - 30	100	2,766	2,766	No Risk	2,766	Background
Indeno(1,2,3-cd)pyrene	19 - 30	100	1,829	1,829	No Risk	1,829	Background
Phenanthrene	16 - 30	100	913	913	No Risk	913	Background
Pyrene	23 - 30	100	2,590	2,590	No Risk	2,590	Background
Pesticide/Polychlorinated Biphenyls (UG/KG)							
4,4'-DDE	28 - 30	100	9	100	No Risk	100	Eco Value
4,4'-DDT	25 - 30	100	21	100	No Risk	100	Eco Value
Total Metals (MG/KG)							
Aluminum	30 - 30	50	22,786	22,786	36,000	22,786	Background
Antimony	14 - 27	5	1.47	5	26	5	Eco Value
Arsenic	30 - 30	60	24	60	22	60	Eco Value
Barium	30 - 30	500	98	500	5,400	500	Background
Chromium	30 - 30	0.4	45	45	79	45	Background
Copper	30 - 30	50	58	58	1,500	58	Background
Cyanide	7 - 27	0.1	ND	0.1	No Risk	0.1	Eco Value
Iron	30 - 30	200	45,805	45,805	21,000	45,805	Background
Lead	30 - 30	50	147	147	No Risk	147	Background
Manganese	30 - 30	330	198	330	710	330	Eco Value
Mercury	29 - 29	0.1	1.3	1.3	No Risk	1.3	Background
Thallium	7 - 30	1	NV	1	5.4	1	Eco Value
Vanadium	23 - 30	2	70	70	280	70	Background
Zinc	23 - 30	50	137	137	No Risk	137	Background
Uncertainties[1]							
Volatile Organic Compounds (UG/KG)							
2-Butanone	1 - 29						
Acetone	8 - 29						
Semi-volatile Organic Compounds (UG/KG)							
2,4-Dinitrotoluene	7 - 30						
2,6-Dinitrotoluene	1 - 30						
2-Methylnaphthalene	1 - 30						
Carbazole	3 - 30						
bis(2-Ethylhexyl)phthalate	4 - 30						

1 - Listed as COPCs, but have no associated screening or background values
ND - Not detected in background

Table 4
Bohicket Surface Soil PRGs
Sites 5 and 6
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical Name	Detection Frequency	Ecological Screening Value	Bohicket Background	Proposed Eco PRG	Criteria	HHRA PRG	Final PRG	Criteria
Semi-volatile Organic Compounds (UG/KG)								
Acenaphthylene	0 - 1	100	292	292	Background	No Risk	292	Background
Anthracene	0 - 1	100	332	332	Background	No Risk	332	Background
Benzo(a)anthracene	0 - 1	100	749	749	Background	No Risk	749	Background
Benzo(a)pyrene	0 - 1	100	732	732	Background	No Risk	732	Background
Benzo(b)fluoranthene	0 - 1	100	825	825	Background	No Risk	825	Background
Benzo(g,h,i)perylene	0 - 1	100	501	501	Background	No Risk	501	Background
Benzo(k)fluoranthene	0 - 1	100	467	467	Background	No Risk	467	Background
Chrysene	0 - 1	100	986	986	Background	No Risk	986	Background
Dibenz(a,h)anthracene	0 - 1	100	292	292	Background	No Risk	292	Background
Fluoranthene	0 - 1	100	2,500	2,500	Background	No Risk	2,500	Background
Indeno(1,2,3-cd)pyrene	0 - 1	100	472	472	Background	No Risk	472	Background
Phenanthrene	0 - 1	100	376	376	Background	No Risk	376	Background
Pyrene	0 - 1	100	1,905	1,905	Background	No Risk	1,905	Background
Pesticide/Polychlorinated Biphenyls (UG/KG)								
4,4'-DDE	0 - 1	100	269	269	Background	No Risk	269	Background
4,4'-DDT	0 - 1	100	34	100	Eco Value	No Risk	100	Eco Value
Total Metals (MG/KG)								
Aluminum	1 - 1	50	30,002	30,002	Background	36,000	30,002	Background
Antimony	0 - 1	5	2.4	5	Background	26	5	Background
Arsenic	1 - 1	60	21	60	Background	22	60	Background
Barium	1 - 1	500	83	500	Eco Value	5,400	500	Eco Value
Chromium	1 - 1	0.4	53	53	Background	79	53	Background
Copper	1 - 1	50	81	81	Background	1,500	81	Background
Cyanide	0 - 1	0.06	ND	0.1	Eco Value	No Risk	0.1	Eco Value
Iron	1 - 1	200	50,142	50,142	Background	21,000	50,142	Background
Lead	1 - 1	50	198	198	Background	No Risk	198	Background
Manganese	1 - 1	330	345	345	Background	710	345	Background
Mercury	1 - 1	0.1	0.6	0.6	Background	No Risk	0.6	Background
Thallium	0 - 1	1	ND	1	Eco Value	5.4	1	HHRA Value
Vanadium	1 - 1	2	72	72	Background	280	72	Background
Zinc	1 - 1	50	372	372	Background	No Risk	372	Background
Uncertainties[1]								
Volatile Organic Compounds (UG/KG)								
2-Butanone	0 - 1							
Acetone	0 - 1							
Semi-volatile Organic Compounds (UG/KG)								
2,4-Dinitrotoluene	0 - 1							
2,6-Dinitrotoluene	0 - 1							
2-Methylnaphthalene	0 - 1							
Carbazole	0 - 1							
bis(2-Ethylhexyl)phthalate	0 - 1							

1 - Listed as COPCs, but have no associated screening or background values
ND- Not detected in background

Table 5
Sediment PRGs
Site 3
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical Name	Detection Frequency	Ecological Screening Value	Dredge Fill Background	Initial ECO PRG	Initial HHRA PRG	Final PRG	Criteria
Semi-volatile Organic Compounds (UG/KG)							
Acenaphthylene	2 - 7	44	246	246	No Risk	246	Background
Anthracene	2 - 7	85.3	462	462	No Risk	462	Background
Benzo(a)anthracene	5 - 7	261	2027	2,027	No Risk	2,027	Background
Benzo(a)pyrene	4 - 7	430	1785	1,785	No Risk	1,785	Background
Benzo(k)fluoranthene	4 - 7	240	2038	2,038	No Risk	2,038	Background
Butylbenzylphthalate	1 - 7	63	ND	63	No Risk	63	Eco Value
Chrysene	5 - 7	384	3487	3,487	No Risk	3,487	Background
Dibenz(a,h)anthracene	1 - 7	63	714	714	No Risk	714	Background
Diethylphthalate	4 - 7	200	ND	200	No Risk	200	Eco Value
Naphthalene	1 - 7	160	485	485	No Risk	485	Background
Phenanthrene	2 - 7	240	913	913	No Risk	913	Background
Pesticide/Polychlorinated Biphenyls (UG/KG)							
4,4'-DDD	5 - 7	16	5.3	5.3	No Risk	16.0	Eco Value
4,4'-DDE	7 - 7	2	9	9	No Risk	9	Background
4,4'-DDT	5 - 7	2	21	21	No Risk	21	Background
Aroclor-1260	2 - 7	23	ND	23	No Risk	23	Eco Value
Dieldrin	2 - 7	0.7	5.3	5.3	No Risk	5.3	Background
alpha-Chlordane	1 - 7	0.5	2.8	2.8	No Risk	2.8	Background
gamma-Chlordane	1 - 7	0.5	2.8	2.8	No Risk	2.8	Background
Total Metals (MG/KG)							
Aluminum	7 - 7	18,000	22,786	22,786	36,000	22,786	Background
Antimony	2 - 7	150	1.47	1.47	16	16	HHRA Value
Arsenic	7 - 7	8.2	24	24	31	24	Background
Barium	7 - 7	48	98	98	22	98	Background
Copper	7 - 7	34	58	58	1,500	58	Background
Cyanide	1 - 7	0.1	ND	0.1	No Risk	0.1	Eco Value
Iron	7 - 7	188,400	45,805	45,805	45,000	45,805	Background
Lead	7 - 7	47	147	147	No Risk	147	Background
Manganese	7 - 7	260	198	198	710	260	Eco Value
Mercury	6 - 7	0.15	1.3	1.3	No Risk	1.3	Background
Nickel	6 - 7	20.9	19	20.9	No Risk	20.9	Eco Value
Vanadium	7 - 7	57.0	70	70.0	280	70.0	Background
Zinc	7 - 7	150	137	150	No Risk	150	Eco Value
Uncertainties[1]							
Volatile Organic Compounds (UG/KG)							
Acetone	2 - 7						
Carbon disulfide	1 - 7						
Chloroform	1 - 7						
Methylene chloride	2 - 7						
Toluene	1 - 7						

1 - Listed as COPCs, but have no associated screening or background values
ND- Not detected in Background

Table 6
Dredge-Fill Sediment PRGs
Sites 5 and 6
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical Name	Detection Frequency	Ecological Screening Value	Dredge-Fill Background	Initial Eco PRG	Initial HHRA PRG	Final PRG	Criteria
Semi-volatile Organic Compounds (UG/KG)							
Acenaphthene	1 - 6	16	592	592	No Risk	592	Background
Acenaphthylene	1 - 6	44	246	246	No Risk	246	Background
Anthracene	2 - 6	85.3	462	462	No Risk	462	Background
Benzo(a)anthracene	3 - 6	261	2,027	2,027	No Risk	2,027	Background
Benzo(k)fluoranthene	2 - 6	240	2,038	2,038	No Risk	2,038	Background
Dibenz(a,h)anthracene	1 - 6	63.4	714	714	No Risk	714	Background
Diethylphthalate	1 - 6	200	ND	200	No Risk	200	Eco Value
Fluorene	1 - 6	19	602	602	No Risk	602	Background
Phenanthrene	2 - 6	240	913	913	No Risk	913	Background
Pesticide/Polychlorinated Biphenyls (UG/KG)							
4,4'-DDD	4 - 6	16	5.3	5.3	No Risk	16.0	Eco Value
4,4'-DDE	6 - 6	2.2	9	9	No Risk	9	Background
4,4'-DDT	6 - 6	1.58	21	21	No Risk	21	Background
Dieldrin	1 - 6	0.720	5.3	5.3	No Risk	5.3	Background
Endrin aldehyde	1 - 6	NSV	5.4	5.4	No Risk	5.4	Background
Total Metals (MG/KG)							
Aluminum	6 - 6	18,000	22,786	22,786	36,000	22,786	Background
Antimony	2 - 6	150	1.47	150	26	26.0	HHRA Value
Arsenic	5 - 6	8.2	24	57	22	24	Background
Barium	6 - 6	48	98	98	5,400	98	Background
Cobalt	5 - 6	10	13	13	No Risk	13	Background
Copper	6 - 6	34	58	58	1,500	58	Background
Cyanide	2 - 6	0.1	ND	0.1	No Risk	0.1	Eco Value
Iron	6 - 6	188,400	45,805	45,805	21,000	45,805	Background
Lead	6 - 6	46.7	147	147	No Risk	147	Background
Manganese	6 - 6	260	198	198	710	260	Eco Value
Mercury	6 - 6	0.15	1.3	1.3	No Risk	1.3	Background
Thallium	1 - 6	NSV	ND	NSV	5.4	5.4	HHRA Value
Vanadium	6 - 6	57	70	70	280	70	Background
Zinc	6 - 6	150	137	137	No Risk	150	Eco Value
Uncertainties[1]							
Total Metals (MG/KG)							
Beryllium	6 - 6	NSV	1		No Risk		
Volatile Organic Compounds (UG/KG)							
2-Butanone	1 - 6						
Acetone	3 - 6						
Carbon disulfide	1 - 6						
Chloroform	1 - 6						
Methylene chloride	2 - 6						
Semi-volatile Organic Compounds (UG/KG)							
2,4-Dinitrotoluene	2 - 6						

1 - Listed as COPCs, but have no associated screening or background values
NSV - No screening value
ND- Not detected in background

Table 7
Bohicket Sediment PRGs
Sites 5 and 6
St. Juliens Creek Annex
Chesapeake, Virginia

Chemical Name	Detection Frequency	Ecological Screening Value	Bohicket Background	Initial Eco PRG	Initial HHRA PRG	Final PRG	Criteria
Semi-volatile Organic Compounds (UG/KG)							
Acenaphthene		16	292	292	No Risk	292	Background
Acenaphthylene		44	292	292	No Risk	292	Background
Anthracene		85.3	332	332	No Risk	332	Background
Benzo(a)anthracene	1 - 1	261	749	749	No Risk	749	Background
Benzo(k)fluoranthene	1 - 1	240	467	467	No Risk	467	Background
Dibenz(a,h)anthracene	1 - 1	63.4	292	292	No Risk	292	Background
Diethylphthalate		200	NS	200	No Risk	200	Eco Value
Fluorene		19	292	292	No Risk	292	Background
Phenanthrene	1 - 1	240	376	376	No Risk	376	Background
Pesticide/Polychlorinated Biphenyls (UG/KG)							
4,4'-DDD	1 - 1	16	308	308	No Risk	308	Background
4,4'-DDE	0 - 1	2.2	269	269	No Risk	269	Background
4,4'-DDT	0 - 1	1.58	34	34	No Risk	34	Background
Dieldrin	0 - 1	0.720	14	14	No Risk	14	Background
Endrin aldehyde	0 - 1	NSV	15	15	No Risk	15	Background
Total Metals (MG/KG)							
Aluminum	1 - 1	18,000	30,002	30,002	36,000	30,002	Background
Antimony	1 - 1	150	2.4	2.4	26	26.0	HHRA Value
Arsenic	1 - 1	8.2	21	21	22	21	Background
Barium	1 - 1	48	83	83	5,400	83	Background
Beryllium	1 - 1	NSV	2	2	No Risk	2	Background
Cobalt	1 - 1	10	30	30	No Risk	30	Background
Copper	1 - 1	34	81	81	1,500	81	Background
Cyanide	0 - 1	0.1	ND	0.1	NSV	0.1	Eco Value
Iron	1 - 1	188,400	50,142	50,142	21,000	50,142	Background
Lead	1 - 1	46.7	198	198	No Risk	198	Background
Manganese	1 - 1	260	345	345	710	345	Background
Mercury	1 - 1	0.15	0.6	0.6	No Risk	0.6	Background
Thallium	0 - 1	NSV	ND	NSV	5.4	5.4	HHRA Value
Vanadium	1 - 1	57	72	72	280	72	Background
Zinc	1 - 1	150	372	372	No Risk	372	Background
Uncertainties[1]							
Volatile Organic Compounds (UG/KG)							
2-Butanone	1 - 1						
Acetone	0 - 1						
Carbon disulfide	1 - 1						
Chloroform	0 - 1						
Methylene chloride	0 - 1						
Semi-volatile Organic Compounds (UG/KG)							
2,4-Dinitrotoluene							

1 - Listed as COPCs, but have no associated screening or background values
NSV - No screening value
ND- not detected in background

Table 8
Yorktown Aquifer Groundwater PRGs
Site 3, 5, and 6
St. Juliens Creek Annex
Chesapeake, Virginia

Site 3 Groundwater

Chemical Name	Detection Frequency	VGWS	MCL	Tap RBC	Yorktown Aquifer Background	HHRA PRG	Final PRG	Criteria
Volatile Organic Compounds (UG/L)								
Chloroform	2 - 6	-	80	0.15	1	0.1	80	MCL
Total Metals (UG/L)								
Arsenic	1 - 6	50	50	0.045	1	0.00045	50	MCL
Manganese	6 - 6	50	-	730	271	0.31	730	Tap RBC
Thallium	1 - 6	-	2	2.6	1.6	0.0011	2	MCL

VGWS - Virginia Groundwater Standard
MCL - Maximum Contaminant Level

Site 5/6 Groundwater

Chemical Name	Detection Frequency	VGWS	MCL	Tap RBC	Yorktown Aquifer Background UCL	HHRA PRG	Final PRG	Criteria
Volatile Organic Compounds (UG/L)								
Chloroform	2 - 7	-	80	0.15	1	0.26	80	MCL
Total Metals (UG/L)								
Antimony	2 - 6	-	6	15	ND	0.0061	6	MCL
Arsenic	1 - 7	50	50	0.045	1	0.00045	50	MCL
Iron	6 - 7	300	-	11,000	2035	9.3	2035	Background
Manganese	5 - 7	50	-	730	271	0.31	730	Tap RBC

ND - Not detected in background
MCL- Maximum contaminant level
SDWR- Secondary Drinking Water Regulations
VGWS- Virginia Groundwater Standard
UCL- upper confidence limit

Table 9
Surface Soil PRG Exceedances
Site 3
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID Sample ID Sample Date	Detection Frequency	Final PRG	Criteria	SJS3-SS01 SJS03-SS01-000 06/24/97	SJS3-SS02 SJS03-SS02-000 06/24/97	SJS3-SS03 SJS03-SS03-000 06/24/97	SJS3-SS04 SJS03-SS04-000 06/24/97	SJS3-SS05 SJS03-SS05-000 06/24/97	SJS3-SS06[2] SJS03-SS06-000 06/24/97	SJS3-SS07 SJS03-SS07-000 06/24/97	SJS3-SS08 SJS03-SS08-000 04/20/99	SJS3-SS09 SJS03-SS09-000 04/20/99	SJS3-SS10 SJS03-SS10-000 04/20/99	SJS3-SS11 SJS03-SS11-000 04/20/99	SJS3-SS12[2] SJS03-SS12-000 04/20/99	SJS3-SS13 SJS03-SS13-000 04/20/99	SJS3-SS14 SJS03-SS14-000 04/20/99	SJS3-SS15 SJS03-SS15-000 04/20/99	SJS3-SS16 SJS03-SS16-000 04/20/99	SJS3-SS17 SJS03-SS17-000 04/20/99	SJS3-SS18[2] SJS03-SS18-000 04/20/99
Chemical Name																					
Semi-volatile Organic Compounds (UG/KG)																					
Anthracene	8 - 18	462	Background	340 UJ	340 U	65 J	43 J	57 J	120 J	83 J	480 UJ	1,000 J	550 UJ	520 UJ	440 UJ	630 UJ	130 J	440 UJ	430 UJ	150 J	430 UJ
Benzo(a)anthracene	16 - 18	2,027	Background	340 UJ	36 J	370	120 J	200 J	390 J	350 J	480 UJ	4,000 J	75 J	220 J	90 J	160 J	580 J	190 J	150 J	1,400 J	200 J
Benzo(a)pyrene	16 - 18	1,785	Background	340 UJ	38 J	320 J	180 J	200 J	350 J	350 J	480 UJ	4,100 J	74 J	260 J	210 J	220 J	560 J	170 J	150 J	1,500 J	200 J
Benzo(b)fluoranthene	17 - 18	3,197	Background	50 J	62 J	670	550	850	1,500	1,200	480 UJ	6,500 J	210 J	510 J	590	470 J	1,300 J	300 J	310 J	2,100 J	300 J
Benzo(g,h,i)perylene	15 - 18	1,655	Background	340 UJ	340 U	130 J	170 J	190 J	340 J	220 J	480 UJ	2,600 J	98 J	250 J	300 J	260 J	560 J	88 J	130 J	1,100 J	110 J
Benzo(k)fluoranthene	15 - 18	2,038	Background	340 UJ	340 U	270 J	170 J	350 J	420	460	480 UJ	2,000 J	61 J	190 J	140 J	160 J	490 J	90 J	110 J	770 J	120 J
Chrysene	17 - 18	3,487	Background	68 J	41 J	460	280 J	420 J	690	730	480 UJ	3,600 J	140 J	430 J	200 J	330 J	1,200 J	200 J	200 J	1,400 J	220 J
Dibenz(a,h)anthracene	2 - 18	714	Background	340 UJ	340 U	360 U	360 U	430 U	410 U	380 U	480 UJ	550 UJ	550 UJ	520 UJ	440 UJ	630 UJ	210 J	440 UJ	430 UJ	290 J	430 UJ
Fluoranthene	16 - 18	2,766	Background	340 UJ	63 J	610	270 J	310 J	640	550	480 UJ	4,100 J	83 J	230 J	87 J	200 J	440 J	300 J	160 J	2,000 J	300 J
Indeno(1,2,3-cd)pyrene	15 - 18	1,829	Background	340 UJ	340 U	180 J	180 J	260 J	440	250 J	480 UJ	2,300 J	92 J	230 J	260 J	240 J	530 J	84 J	130 J	980 J	110 J
Naphthalene	5 - 18	485	Background	340 UJ	340 U	130 J	360 U	430 U	69 J	53 J	480 UJ	98 J	550 UJ	520 UJ	440 UJ	630 UJ	470 UJ	440 UJ	180 J	550 UJ	430 UJ
Phenanthrene	11 - 18	913	Background	340 UJ	340 U	220 J	130 J	100 J	420 J	200 J	480 UJ	3,300 J	550 UJ	520 UJ	440 UJ	630 UJ	120 J	72 J	49 J	650 J	120 J
Pyrene	17 - 18	2,590	Background	110 J	54 J	440 J	200 J	200 J	560 J	370 J	480 UJ	3,500 J	74 J	230 J	110 J	180 J	450 J	200 J	170 J	1,900 J	260 J
Pesticide/Polychlorinated Biphenyls (UG/KG)																					
Endosulfan I	1 - 18	2.8	Background	1.7 U	1.7 U	1.9 UJ	1.9 U	2.2 UJ	2.1 UJ	2 U	2.40 UJ	2.70 UJ	2.80 UJ	2.60 UJ	3.80 J	3.10 UJ	2.30 UJ	2.20 UJ	2.20 UJ	2.70 UJ	2.20 UJ
Total Metals (MG/KG)																					
Aluminum	18 - 18	22,786	Background	6,700	3,310	4,550	9,320	21,400	17,800	14,000	6,390	11,300	18,100	13,100	9,300	18,400	11,100	3,390 J	3,520	7,360	7,290
Antimony	4 - 18	5.0	Eco Value	0.38 UL	0.38 UL	0.54 B	1.4 B	0.65 B	0.81 B	1.4 B	0.650 UL	35.9 L	0.800 UL	0.820 UL	2.5 J	0.800 UL	0.710 UL	162	0.560 UL	32.2 L	0.560 UL
Arsenic	18 - 18	60	Eco Value	1.3 J	2.2	4.2 L	8.3 L	13.9 L	13.3 L	13.1 L	3	59.6	19.6	21	14.8	18.9	18.1	10.4	3.60	66.1	7.40
Chromium	18 - 18	45	Background	6.4	6.8	9.9	24.1	42.1	33.9	30.2	10.4	124	40.9	33.7	26.6	42.6	28.2	14.3	25.3	87.3	15.4
Copper	18 - 18	58	Background	10.3	5.3	17.1	89.4	60.9	37.7	125	10.3	1,010	35.7	41.1	402	45.8	28.2	104	30.4	888	32.7
Iron	18 - 18	45,805	Background	12,700	3,440	9,650	21,900	31,600	34,000	15,600	6,110	108,000	43,800	38,000	23,000	37,200	34,300	61,800	8,000	126,000	15,800
Lead	18 - 18	147	Background	6.7 J	11.4 J	37.5 J	226 J	147 J	107 J	240 J	27.1	2,070	58.1	87.5	255	118	56.9	307 J	250	1,870	70.7 J
Manganese	18 - 18	330	Eco Value	274	16	114	246	119	143	119	29.8	922	153	106	326	169	84.2	208	25.5	935	169
Mercury	16 - 18	1.3	Background	0.04 U	0.05 U	0.18	0.22	0.6	0.55	0.54	0.0400 J	0.630	0.510	0.530	0.320	0.790	0.560	0.0900 J	0.180	0.710	0.410
Thallium	3 - 18	1	Eco Value	0.38 U	0.38 U	0.69 J	1.8 J	2.5	2.2 B	1.1 B	0.770 U	1 U	0.940 U	0.970 U	0.780 U	0.950 U	0.850 U	0.740 U	0.670 U	0.870 U	0.660 U
Vanadium	18 - 18	70	Background	30.7	7.9 J	23.5	31.5	79.8	76.6	79.4	16.1	63.4	50.2	55.3	32.2	71.6	41	19.8	14.8	44.2	27.3
Zinc	18 - 18	137	Background	57	15.5	64.6 L	460 L	94.6 L	94.5 L	253 L	29.6	3,760	98.4	66.3	406	115	53.6	724	39.5	3,640	88.4
Uncertainties[1]																					
Volatile Organic Compounds (UG/KG)																					
Acetone	7 - 18			5 B	6 B	21 B	6 B	4 B	77 B	69 B	19	18 J	60 J	210 J	44 J	46 J	23	13 U	13 UJ	16 UJ	13 UJ
Chloromethane	1 - 18			10 U	10 U	11 U	11 U	12 U	12 UJ	12 U	4 J	16 UJ	16 UJ	16 UJ	13 UJ	19 UJ	14 U	13 U	13 UJ	16 UJ	13 UJ
Semi-volatile Organic Compounds (UG/KG)																					
2-Methylnaphthalene	1 - 18			340 UJ	340 U	360 U	360 U	430 U	410 U	380 U	480 UJ	85 J	550 UJ	520 UJ	440 UJ	630 UJ	470 UJ	440 UJ	430 UJ	550 UJ	430 UJ
Carbazole	4 - 18			340 UJ	340 U	360 U	45 J	430 U	130 J	380 U	480 UJ	370 J	550 UJ	520 UJ	440 UJ	630 UJ	470 UJ	440 UJ	430 UJ	63 J	430 UJ
Dibenzofuran	3 - 18			340 UJ	340 U	38 J	360 U	430 U	58 J	380 U	480 UJ	150 J	550 UJ	520 UJ	440 UJ	630 UJ	470 UJ	440 UJ	430 UJ	550 UJ	430 UJ
bis(2-Ethylhexyl)phthalate	2 - 18			96 B	340 U	70 B	490 B	66 B	100 B	67 B	480 UJ	550 UJ	550 UJ	520 UJ	440 UJ	630 UJ	470 UJ	76 J	430 UJ	580 J	430 UJ

Shaded values exceed the Final PRG

1 - Listed as COPCs, but have no associated screening of background values

2 - Duplicate collected at this location - higher value between the two samples is given

U - Analyte not detected
NA - Not analyzed for
NSV - No screening value
NV - No value
NR - No risk

B - Analyte not detected above associated blank
J - Value is estimated
L - Value may be biased low
R - Unreliable result

Table 10
Munden-Tetotum Surface Soil PRG Exceedances
Sites 5 and 6
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID Sample ID Sample Date	Detection Frequency	Final PRG	Criteria	SJS5-SS09 SJS05-SS09-000 06/26/97	SJS5-SS30 SJS05-SS30-000 04/19/99	SJS5-SS31 SJS05-SS31-000 04/19/99	SJS5-SS32 SJS05-SS32-000 04/19/99
Chemical Name							
Semi-volatile Organic Compounds (UG/KG)							
Acenaphthylene	0 - 4	100	Eco Value	370 U	430 UJ	340 UJ	350 UJ
Anthracene	0 - 4	100	Eco Value	370 U	430 UJ	340 UJ	350 UJ
Benzo(a)anthracene	3 - 4	100	Eco Value	400	220 J	340 UJ	48 J
Benzo(a)pyrene	3 - 4	100	Eco Value	340 J	180 J	340 UJ	50 J
Benzo(b)fluoranthene	4 - 4	100	Eco Value	1,100	490 J	77 J	110 J
Benzo(g,h,i)perylene	4 - 4	100	Eco Value	230 J	240 J	70 J	52 J
Benzo(k)fluoranthene	2 - 4	100	Eco Value	330 J	140 J	340 UJ	350 UJ
Chrysene	4 - 4	102	Background	610	320 J	45 J	73 J
Dibenz(a,h)anthracene	0 - 4	100	Eco Value	370 U	430 UJ	340 UJ	350 UJ
Fluoranthene	4 - 4	103	Background	500	330 J	57 J	96 J
Indeno(1,2,3-cd)pyrene	4 - 4	100	Eco Value	260 J	210 J	46 J	49 J
Phenanthrene	3 - 4	100	Eco Value	79 J	100 J	340 UJ	38 J
Pyrene	4 - 4	125	Background	1,200	230 J	52 J	68 J
Pesticide/Polychlorinated Biphenyls (UG/KG)							
4,4'-DDE	4 - 4	532	Background	2,200	250 J	15 J	1,300 J
4,4'-DDT	4 - 4	237	Background	1,200	16 J	25 J	3,100 J
Total Metals (MG/KG)							
Aluminum	4 - 4	7,669	Background	10,300	14,500	4,990	7,640
Antimony	2 - 4	5	Eco Value	0.51 L	0.670 UL	0.520 UL	0.780 L
Arsenic	4 - 4	60	Eco Value	111 K	11.1	9.60	61.6
Barium	4 - 4	500	Eco Value	89	115	63.4	74.6
Chromium	4 - 4	7	Background	16.5	28	12.4	11.2
Copper	4 - 4	50	Eco Value	27.3	63.1	26.4	25.1
Cyanide	0 - 1	0.1	Eco Value	0.55 U	NA	NA	NA
Iron	4 - 4	3,669	Background	14,600	25,700	9,850	10,400
Lead	4 - 4	61	Background	83.2	92.3	53.4	59.1
Manganese	4 - 4	330	Eco Value	73.8 K	153	102	43.7
Mercury	4 - 4	0.3	Background	0.21 L	0.320	0.0500	0.140
Thallium	1 - 4	1	Background	1.3 J	0.800 U	0.620 U	0.640 U
Vanadium	4 - 4	26.6	Background	37	46.3	22.7	29
Zinc	4 - 4	50	Eco Value	123	174	126	107
Uncertainties[1]							
Volatile Organic Compounds (UG/KG)							
2-Butanone	1 - 4			28	13 UJ	10 U	11 U
Acetone	3 - 4			18 J	55 J	29	11 U
Semi-volatile Organic Compounds (UG/KG)							
2,4-Dinitrotoluene	0 - 4			370 U	430 UJ	340 UJ	350 UJ
2,6-Dinitrotoluene	0 - 4			370 U	430 UJ	340 UJ	350 UJ
2-Methylnaphthalene	0 - 4			370 U	430 UJ	340 UJ	350 UJ
Carbazole	0 - 4			370 U	430 UJ	340 UJ	350 UJ
bis(2-Ethylhexyl)phthalate	0 - 4			130 B	430 UJ	37 B	350 UJ

Shaded values exceed the Final PRG

1 - Listed as COPCs, but have no associated screening or background values

B - Analyte not detected above associated blank
J - Value is estimated
K - Value may be biased high
L - Value may be biased low

R - Unreliable result
U - Analyte not detected
NR - No risk
NA - Not analyzed for
NV - No value

Table 11
Dredge-Fill Surface Soil PRG Exceedances
Sites 5 and 6
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID Sample ID Sample Date	Detection Frequency	Final PRG	Criteria	SJS5-SS01 SJS05-SS01-000 06/24/97	SJS5-SS02 SJS05-SS02-000 06/26/97	SJS5-SS03 SJS05-SS03-000 06/26/97	SJS5-SS04 SJS05-SS04-000 06/26/97	SJS5-SS05 SJS05-SS05-000 06/26/97	SJS5-SS06 SJS05-SS06-000 06/26/97	SJS5-SS07[2] SJS05-SS07-000 06/26/97	SJS5-SS08 SJS05-SS08-000 06/26/97	SJS5-SS10 SJS05-SS10-000 04/21/99	SJS5-SS11 SJS05-SS11-000 04/21/99	SJS5-SS12 SJS05-SS12-000 04/22/99	SJS5-SS13 SJS05-SS13-000 04/21/99	SJS5-SS14 SJS05-SS14-000 04/22/99	SJS5-SS15 SJS05-SS15-000 04/21/99	SJS5-SS16 SJS05-SS16-000 04/22/99	SJS5-SS17 SJS05-SS17-000 04/22/99	SJS5-SS19 SJS05-SS19-000 04/22/99
Chemical Name																				
Semi-volatile Organic Compounds (UG/KG)																				
Acenaphthylene	1 - 30	246	Background	350 U	47 J	2,000 U	350 U	360 U	35 J	44 J	330 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	460 UJ
Anthracene	6 - 30	462	Background	54 J	370 U	2,000 U	51 J	360 U	330 U	49 J	330 U	420 UJ	79 J	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	460 UJ
Benzo(a)anthracene	23 - 30	2,027	Background	390	180 J	810 J	330 J	95 J	220 J	230 J	37 J	420 UJ	380 J	540 UJ	51 J	530 UJ	420 UJ	110 J	170 J	56 J
Benzo(a)pyrene	20 - 30	1,785	Background	390	140 J	480 J	290 J	73 J	120 J	190 J	330 U	420 UJ	290 J	540 UJ	67 J	530 UJ	420 UJ	73 J	130 J	460 UJ
Benzo(b)fluoranthene	24 - 30	3,197	Background	700	570	1,900 J	480	300 J	560	490	92 J	420 UJ	650 J	540 UJ	110 J	530 UJ	420 UJ	160 J	260 J	74 J
Benzo(g,h,i)perylene	19 - 30	1,655	Background	270 J	120 J	350 J	160 J	66 J	77 J	120 J	330 U	420 UJ	250 J	540 UJ	60 J	530 UJ	420 UJ	72 J	110 J	460 UJ
Benzo(k)fluoranthene	19 - 30	2,038	Background	140 J	200 J	700 J	220 J	76 J	150 J	200 J	330 U	420 UJ	250 J	540 UJ	48 J	530 UJ	420 UJ	54 J	89 J	460 UJ
Chrysene	24 - 30	3,487	Background	390	340 J	1,100 J	370	160 J	450	330 J	56 J	420 UJ	410 J	540 UJ	49 J	530 UJ	420 UJ	160 J	180 J	62 J
Dibenz(a,h)anthracene	5 - 30	714	Background	350 U	370 U	2,000 U	61 J	360 U	330 U	360 U	330 U	420 UJ	80 J	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	460 UJ
Fluoranthene	23 - 30	2,766	Background	520	260 J	2,000 J	470	130 J	790	350 J	63 J	420 UJ	660 J	540 UJ	57 J	530 UJ	420 UJ	180 J	230 J	84 J
Indeno(1,2,3-cd)pyrene	19 - 30	1,829	Background	270 J	160 J	540 J	170 J	81 J	110 J	150 J	35 J	420 UJ	250 J	540 UJ	43 J	530 UJ	420 UJ	69 J	110 J	460 UJ
Phenanthrene	16 - 30	913	Background	270 J	70 J	260 J	330 J	57 J	230 J	250 J	330 U	420 UJ	340 J	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	53 J	460 UJ
Pyrene	23 - 30	2,590	Background	510	220 J	730 J	610	130 J	560	420	81 J	420 UJ	540 J	540 UJ	43 J	530 UJ	420 UJ	110 J	150 J	76 J
Pesticide/Polychlorinated Biphenyls (UG/KG)																				
4,4'-DDE	28 - 30	100	Eco Value	400	180	220	39	94	3.3 U	210	3.8 J	13 J	230 J	1.40 J	1,500 J	3.30 J	3.10 J	18 J	49 J	4.5 UJ
4,4'-DDT	25 - 30	100	Eco Value	110	600	250	13 J	44 J	3.3 U	50	3.3 U	5.70 J	42 J	4.90 J	340 J	3.70 J	2.60 J	2.20 J	7 J	4.5 UJ
Total Metals (MG/KG)																				
Aluminum	30 - 30	22,786	Background	5,880	12,300	20,200	4,760	8,880	5,270	8,490	5,020	5,750	12,500	8,490	8,500	10,700	1,510	5,560	3,690	4,970
Antimony	14 - 27	5	Eco Value	35 4 B	NA	NA	0.6 L	1.1 L	NA	0.98 L	0.6 L	7.80 J	8.10 J	0.740 U	0.600 U	0.810 J	0.630 U	0.5 U	2.60 J	10.8 J
Arsenic	30 - 30	60	Eco Value	14.6 L	13.3 K	22.7 K	3.8 K	29.3 K	2 K	19.6 K	2.6 K	9.10	152	17.9	7.60	17 2	0.960 J	5.30	10.6	6.30
Barium	30 - 30	500	Background	1,040	64.7	268	120	349	35 J	397	43.5	2,850	5,970	153	85.3	441	9.10 J	142	88.3	1,220
Chromium	30 - 30	45	Background	74.6	34.8	37.1	10.6	18.7	4.6	20	6.8	25.3	13.7	19.1	19.6	19.9	2.5	18.1	11.1	867
Copper	30 - 30	58	Background	6,470	43.6	89.2	50.2	113	17.1	114	23.5	350	377	46.5	18.5	92.2	4.20 J	37.6	86.7	132
Cyanide	7 - 27	0.1	Eco Value	0.53 U	0.57 U	1.45 J	0.51 U	0.6	0.5 U	0.56 U	0.49 U	0.239 U	0.256 U	0.380 U	0.201 U	0.320 U	0.329	0.170 U	0.300 U	0.240 U
Iron	30 - 30	45,805	Background	120,000	32,400	31,500	9,900	14,900	12,800	15,200	10,200	17,400	16,000	23,600	17,700	21,300	1,730	13,400	13,200	10,000
Lead	30 - 30	147	Background	7,210 J	85.6	822	127	818	33.5	899	37.6	2,590	275	228	69.7	817	10.4	98.7	61.5	4,740
Manganese	30 - 30	330	Eco Value	852	63.4 K	122 K	142 K	293 K	289 K	208 K	236 K	264	175	79.6	99.6	73.1	32.2	39.6	58.2	370
Mercury	29 - 29	1.3	Background	0.44	0.25 L	0.42 L	0.17 L	0.98 L	NA	0.93 L	0.08 L	0.120	0.130	0.140	0.170	0.200	0.0500	0.150	0.25	0.160
Thallium	7 - 30	1	Eco Value	5.3	2.1 J	2.9	0.64 J	0.83 J	0.37 U	1.4 J	0.45 J	0.670 U	0.75 U	0.880 U	0.720 U	0.830 U	0.75 U	0.600 U	0.890 U	0.700 U
Vanadium	23 - 30	70	Background	23.6	55.7	52.5	28.6	24.9	12.7	27.7	12.7	19	19.9	29.5	39.8	33.3	6.30 J	23.4	33.2	33.8
Zinc	23 - 30	137	Background	6,490 L	77.8	132	180	242	83.9	318	126	969	831	79.4	76.5	95.2	20	47.6	525	1,290
Uncertainties[1]																				
Volatile Organic Compounds (UG/KG)																				
2-Butanone	1 - 29			11 UJ	11 U	11 U	10 U	11 U	210	11 U	10 U	13 U	12 U	16 U	12 U	16 U	10 U	13 U	15 U	14 U
Acetone	8 - 29			11 UJ	11 U	12 J	10 U	14 J	28	11 U	11 J	13 U	12 U	16 U	12 U	62	10 U	13 U	15 U	14 U
Semi-volatile Organic Compounds (UG/KG)																				
2,4-Dinitrotoluene	7 - 30			580	370 U	3,200	180 J	340 J	330 U	280 J	330 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	460 UJ
2,6-Dinitrotoluene	1 - 30			39 J	370 U	2,000 U	350 U	360 U	330 U	360 U	330 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	460 UJ
2-Methylnaphthalene	1 - 30			42 J	370 U	2,000 U	350 U	360 U	330 U	360 U	330 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	460 UJ
Carbazole	3 - 30			40 J	370 U	2,000 U	350 U	360 U	61 J	360 U	330 U	420 UJ	420 UJ	540 UJ	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	460 UJ
bis(2-Ethylhexyl)phthalate	4 - 30			69 B	56 B	2,000 U	80 B	63 B	1,200 B	86 B	140 B	420 UJ	420 UJ	180 J	400 UJ	530 UJ	420 UJ	440 UJ	490 UJ	460 UJ

Shaded values exceed the Final PRG

1 - Listed as COPCs, but have no associated screening or background values

2 - Duplicate collected at this location - higher value between the two samples is given

B - Analyte not detected above associated blank
J - Value is estimated
K - Value may be biased high
L - Value may be biased low

R - Unreliable result
U - Analyte not detected
NSV - No screening value
NR - No risk
NV - No value

Table 11
Dredge-Fill Surface Soil PRG Exceedances
Sites 5 and 6
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID Sample ID Sample Date	Detection Frequency	Final PRG	Criteria	SJS5-SS20 SJS05-SS20-000 04/22/99	SJS5-SS21 SJS05-SS21-000 04/22/99	SJS5-SS22 SJS05-SS22-000 04/22/99	SJS5-SS23 SJS05-SS23-000 04/22/99	SJS5-SS24 SJS05-SS24-000 04/22/99	SJS5-SS25 SJS05-SS25-000 04/22/99	SJS5-SS26 SJS05-SS26-000 04/22/99	SJS5-SS27[2] SJS05-SS27-000 04/22/99	SJS5-SS28 SJS05-SS28-000 04/22/99	SJS5-SS29[2] SJS05-SS29-000 05/23/99	SJS5-SS33 SJS05-SS33-000 04/22/99	SJS5-SS34 SJS05-SS34-000 04/22/99	SJS5-SS35 SJS05-SS35-000 04/22/99
Chemical Name																
Semi-volatile Organic Compounds (UG/KG)																
Acenaphthylene	1 - 30	246	Background	540 UJ	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	380 UJ	410 U	390 UJ	420 UJ	110 J
Anthracene	6 - 30	462	Background	540 UJ	530 UJ	430 UJ	710 UJ	740 U	340 UJ	63 J	370 UJ	380 UJ	410 U	390 UJ	420 UJ	140 J
Benzo(a)anthracene	23 - 30	2,027	Background	540 UJ	130 J	430 UJ	240 J	77 J	200 J	1,000 J	370 UJ	90 J	52 J	95 J	140 J	840 J
Benzo(a)pyrene	20 - 30	1,785	Background	540 UJ	130 J	430 UJ	140 J	740 U	230 J	1,200 J	370 UJ	84 J	47 J	110 J	130 J	760 J
Benzo(b)fluoranthene	24 - 30	3,197	Background	540 UJ	210 J	93 J	510 J	110 J	290 J	1,600 J	370 UJ	190 J	61 J	170 J	250 J	2,100 J
Benzo(g,h,i)perylene	19 - 30	1,655	Background	540 UJ	99 J	430 UJ	150 J	740 U	200 J	960 J	370 UJ	90 J	410 U	100 J	120 J	680 J
Benzo(k)fluoranthene	19 - 30	2,038	Background	540 UJ	92 J	430 UJ	250 J	740 U	120 J	480 J	370 UJ	62 J	410 U	64 J	74 J	580 J
Chrysene	24 - 30	3,487	Background	540 UJ	220 J	66 J	350 J	83 J	220 J	1,100 J	370 UJ	140 J	54 J	130 J	190 J	1,300 J
Dibenz(a,h)anthracene	5 - 30	714	Background	540 UJ	530 UJ	430 UJ	710 UJ	740 U	42 J	220 J	370 UJ	380 UJ	410 U	390 UJ	420 UJ	260 J
Fluoranthene	23 - 30	2,766	Background	540 UJ	160 J	430 UJ	320 J	110 J	290 J	1,400 J	370 UJ	130 J	99 J	140 J	180 J	1,200 J
Indeno(1,2,3-cd)pyrene	19 - 30	1,829	Background	540 UJ	95 J	430 UJ	170 J	740 U	150 J	760 J	370 UJ	86 J	410 U	390 UJ	110 J	680 J
Phenanthrene	16 - 30	913	Background	540 UJ	530 UJ	430 UJ	710 UJ	740 U	71 J	320 J	370 UJ	50 J	48 J	49 J	43 J	230 J
Pyrene	23 - 30	2,590	Background	540 UJ	120 J	430 UJ	240 J	76 J	260 J	1,300 J	370 UJ	87 J	77 J	120 J	170 J	840 J
Pesticide/Polychlorinated Biphenyls (UG/KG)																
4,4'-DDE	28 - 30	100	Eco Value	0.530 J	40 J	150 J	7.10 J	3.40 J	5.40 J	3.30 J	2.60 J	31 J	210 J	56 J	38 J	4,700 J
4,4'-DDT	25 - 30	100	Eco Value	5.30 UJ	12 J	36 J	13 J	7.40 UJ	9.40 J	4.5 J	2.5 J	56 J	33	55 J	60 J	3,100 J
Total Metals (MG/KG)																
Aluminum	30 - 30	22,786	Background	13,100	10,000	6,330	14,400	13,000	8,860	3,030	3,440	7,520	8,400	8,430	14,300	20,600
Antimony	14 - 27	5	Eco Value	0.820 U	1.90 J	1.40 J	1.80 J	1.20 U	0.460 UL	0.540 UL	0.520 UL	0.580 UL	5.30 J	2.60 L	0.580 UL	0.840 UL
Arsenic	30 - 30	60	Eco Value	8.80	12.8	7.80	24.4	10.6	1.60 J	1.10 J	0.840 J	9.30	20.1	14.7	14.2	17.8
Barium	30 - 30	500	Background	58.1 J	194	87.3	271	76.8 J	59.4	15.4 J	16.6 J	49.3	1,790	283	129	102
Chromium	30 - 30	45	Background	29.1	24.5	15.2	30.9	29.6	17.6	6	5.5	17.7	24.7	26.9	31.2	44.7
Copper	30 - 30	58	Background	27.3	47	28.1	106	65.7	16	5.10	6	20.5	242	182	34.7	40.5
Cyanide	7 - 27	0.1	Eco Value	0.310	0.370 U	0.190 U	0.350 U	0.660	0.210 U	0.190 U	0.27	0.280	0.24	0.170 U	0.25 U	0.350 U
Iron	30 - 30	45,805	Background	25,700	29,500	14,000	34,200	26,500	15,200	3,180	3,030	22,100	11,100	17,300	32,300	44,400
Lead	30 - 30	147	Background	74.4	187	105	524	117	70.2	29.7	55.5	49.3	303	377	250	223
Manganese	30 - 30	330	Eco Value	99.3	428	224	94.2	255	279 K	29.2 K	16 K	62.1 K	407	209 K	92.1 K	189 K
Mercury	29 - 29	1.3	Background	0.130	0.350	0.150	0.370	0.430	0.0400	0.0300 J	0.0400	0.25	0.140	1.10	0.290	0.600
Thallium	7 - 30	1	Eco Value	0.970 U	0.660 U	0.490 U	1.30 U	1.40 U	0.540 U	0.640 U	0.620 U	0.690 U	0.730 U	0.650 U	0.680 U	1 U
Vanadium	23 - 30	70	Background	49.3	44.3	29.1	62.1	51.9	34.1	8 J	10.1	25.8	27.9	31.8	42.3	69.1
Zinc	23 - 30	137	Background	91.2	256	156	93.3	117	78.2	46.2	34.6	47.6	2,040	364	70.1	127
Uncertainties[1]																
Volatile Organic Compounds (UG/KG)																
2-Butanone	1 - 29			16 U	16 U	13 U	21 U	22 U	10 U	10 U	11 U	11 U	NA	12 U	12 U	18 U
Acetone	8 - 29			16 U	16 U	13 U	21 U	22 U	10 U	9 J	13	11 U	NA	12 U	21	18 U
Semi-volatile Organic Compounds (UG/KG)																
2,4-Dinitrotoluene	7 - 30			540 UJ	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	380 UJ	410 U	140 J	43 J	610 UJ
2,6-Dinitrotoluene	1 - 30			540 UJ	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	380 UJ	410 U	390 UJ	420 UJ	610 UJ
2-Methylnaphthalene	1 - 30			540 UJ	530 UJ	430 UJ	710 UJ	740 U	340 UJ	340 UJ	370 UJ	380 UJ	410 U	390 UJ	420 UJ	610 UJ
Carbazole	3 - 30			540 UJ	530 UJ	430 UJ	710 UJ	740 U	340 UJ	69 J	370 UJ	380 UJ	410 U	390 UJ	420 UJ	610 UJ
bis(2-Ethylhexyl)phthalate	4 - 30			66 J	530 UJ	66 J	710 UJ	740 U	340 UJ	340 UJ	74 J	380 UJ	410 U	390 UJ	420 UJ	610 UJ

Shaded values exceed the Final PRG
1 - Listed as COPCs, but have no associated screening or background values
2 - Duplicate collected at this location - higher value between the two sample

B - Analyte not detected above associated blank
J - Value is estimated
K - Value may be biased high
L - Value may be biased low

R - Unreliable result
U - Analyte not detected
NSV - No screening value
NR - No risk
NV - No value

Table 12
Sediment PRG Exceedances
Site 3
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID Sample ID Sample Date	Detection Frequency	Final PRG	Criteria	SJS3-SD01 SJS03-SD01-000 07/14/97	SJS3-SD02[2] SJS03-SD02-000 07/15/97	SJS3-SD03 SJS03-SD03-000 07/14/97	SJS3-SD04 SJS03-SD04-001 04/16/99	SJS3-SD06 SJS03-SD06-000 06/26/97	SJS3-SD07 SJS03-SD07-001 04/15/99	SJS3-SD08[2] SJS03-SD08-001 04/15/99
Chemical Name										
Semi-volatile Organic Compounds (UG/KG)										
Acenaphthylene	2 - 7	246	Background	55 J	4,400 U	66 J	1,000 U	1,600 U	640 U	760 U
Anthracene	2 - 7	462	Background	39 J	4,400 U	56 J	1,000 U	1,600 U	640 U	760 U
Benzo(a)anthracene	5 - 7	2,027	Background	260 J	4,400 U	250 J	1,000 U	180 J	110 J	180 J
Benzo(a)pyrene	4 - 7	1,785	Background	140 J	4,400 U	220 J	1,000 U	1,600 U	86 J	170 J
Benzo(k)fluoranthene	4 - 7	2,038	Background	210 J	470 J	170 J	1,000 U	1,600 U	640 U	200 J
Butylbenzylphthalate	1 - 7	63	Eco Value	55 J	4,400 U	530 U	1,000 U	1,600 U	640 U	760 U
Chrysene	5 - 7	3,487	Background	420	4,400 U	270 J	1,000 U	240 J	120 J	370 J
Dibenz(a,h)anthracene	1 - 7	714	Background	350 U	4,400 U	66 J	1,000 U	1,600 U	640 U	760 U
Diethylphthalate	4 - 7	200	Eco Value	350 U	4,400 U	530 U	120 J	340 J	75 J	95 J
Naphthalene	1 - 7	485	Background	350 U	4,400 U	110 J	1,000 U	1,600 U	640 U	760 U
Phenanthrene	2 - 7	913	Background	76 J	4,400 U	120 J	1,000 U	1,600 U	640 U	760 U
Pesticide/Polychlorinated Biphenyls (UG/KG)										
4,4'-DDD	5 - 7	16.0	Eco Value	4.2	66	60	1.60 J	3.3 U	6.40 U	2.30 J
4,4'-DDE	7 - 7	9	Background	10	6.2 J	78 J	4.40 J	5.6	2.60 J	2.30 J
4,4'-DDT	5 - 7	21	Background	7.7	4.4 U	20	3.5 J	16 J	6.40 U	2.10 J
Aroclor-1260	2 - 7	23	Eco Value	35 U	150	53 U	100 U	64 J	64 U	76 U
Dieldrin	2 - 7	5.3	Background	3.5 U	13 J	5.3 U	10 U	6 J	6.40 U	7.60 U
alpha-Chlordane	1 - 7	2.8	Background	1.8 U	2.3 U	0.88 J	5.10 U	1.7 U	3.20 U	3.80 U
gamma-Chlordane	1 - 7	2.8	Background	1.8 U	3.3 J	2.7 U	5.10 U	1.7 U	3.20 U	3.80 U
Total Metals (MG/KG)										
Aluminum	7 - 7	22,786	Background	3,970	7,130	14,200	46,500	4,240	10,700	19,800
Antimony	2 - 7	16	HHRA Value	0.45 B	3.9 B	0.65 UL	1.10 U	2.4 L	0.820 U	173 J
Arsenic	7 - 7	24	Background	16.2	9.1	3.8	7.20	4.4	6.90 J	26.3 J
Barium	7 - 7	98	Background	18.6 J	300	25.8 J	30.3 J	96	126	80.1
Copper	7 - 7	58	Background	8.3	126	40.2	61.4	50.2	96.6	139 J
Cyanide	1 - 7	0.1	Eco Value	0.55 U	0.67 U	0.8 U	0.584 UL	0.54 U	0.410 UL	1.10 L
Iron	7 - 7	45,805	Background	4,580	18,700	18,200	61,500	8,310	12,000	91,000
Lead	7 - 7	147	Background	14.5	734	47.9	53.4	142	130 J	1,050 J
Manganese	7 - 7	260	Eco Value	15.7 K	257 K	51.5 K	367	158	155	237
Mercury	6 - 7	1.3	Background	0.05 U	0.27	0.24	0.130	0.15	0.230	0.590
Nickel	6 - 7	20.9	Eco Value	2.3 B	15.4	14	55.1	8.1	28.1	24.8
Vanadium	7 - 7	70.0	Background	12.1	32.6	31.4	39.2	26.9	33.7	41
Zinc	7 - 7	150	Eco Value	21.9	577	93.4	306	252 L	342	323
Uncertainties[1]										
Volatile Organic Compounds (UG/KG)										
Acetone	2 - 7			11 U	14 UJ	64 B	31 UJ	11 U	51 J	45 J
Carbon disulfide	1 - 7			11 U	14 UJ	24 UJ	31 U	11 U	19 U	4 J
Chloroform	1 - 7			11 U	14 UJ	24 UJ	4 J	11 U	19 U	23 U
Methylene chloride	2 - 7			40 B	110 J	66 B	8 B	100	2 B	3 B
Toluene	1 - 7			11 U	14 UJ	24 UJ	31 U	4 J	19 U	23 U

Shaded values exceed the Final PRG
1 - Listed as COPCs, but have no associated screening or background values
2 - Duplicate collected at this location - higher value between the two samples is given

B - Analyte not detected above associated blank
J - Value is estimated
K - Value may be biased high
L - Reported value may be biased low

U - Analyte not detected
NA - Not analyzed for
NR - No risk

Table 13
Dredge-Fill Sediment PRG Exceedances
Sites 5 and 6
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID Sample ID Sample Date	Detection Frequency	Final PRG	Criteria	SJS5-SD01 SJS05-SD01-000 07/14/97	SJS5-SD02 SJS05-SD02-000 07/14/97	SJS5-SD03 SJS05-SD03-000 06/26/97	SJS5-SD04 SJS05-SD04-001 04/15/99	SJS5-SD05 SJS05-SD05-001 04/22/99	SJS5-SD06[2] SJS05-SD06-001 04/22/99
Chemical Name									
Semi-volatile Organic Compounds (UG/KG)									
Acenaphthene	1 - 6	592	Background	510 U	65 J	3,600 U	630 UJ	570 UJ	580 UJ
Acenaphthylene	1 - 6	246	Background	140 J	620 U	3,600 U	630 UJ	570 UJ	580 UJ
Anthracene	2 - 6	462	Background	93 J	99 J	3,600 U	630 UJ	570 UJ	580 UJ
Benzo(a)anthracene	3 - 6	2,027	Background	600	300 J	3,600 U	630 UJ	570 UJ	69 J
Benzo(k)fluoranthene	2 - 6	2,038	Background	360 J	160 J	3,600 U	630 UJ	570 UJ	580 UJ
Dibenz(a,h)anthracene	1 - 6	714	Background	160 J	620 U	3,600 U	630 UJ	570 UJ	580 UJ
Diethylphthalate	1 - 6	200	Eco Value	510 U	620 U	720 J	630 UJ	570 UJ	580 UJ
Fluorene	1 - 6	602	Background	510 U	63 J	3,600 U	630 UJ	570 UJ	580 UJ
Phenanthrene	2 - 6	913	Background	180 J	520 J	3,600 U	630 UJ	570 UJ	580 UJ
Pesticide/Polychlorinated Biphenyls (UG/KG)									
4,4'-DDD	4 - 6	16.0	Eco Value	160	19	110	130 J	5.80 UJ	5.80 UJ
4,4'-DDE	6 - 6	9	Background	320	12	54	14 J	1.90 J	1.5 J
4,4'-DDT	6 - 6	21	Background	240	26 J	38	16 J	2.40 J	0.740 J
Dieldrin	1 - 6	5.3	Background	5.1 U	6.2 U	21	6.30 UJ	5.80 UJ	5.80 UJ
Endrin aldehyde	1 - 6	5.4	Background	5.1 U	8.9 J	7.1 U	6.30 UJ	5.80 UJ	5.80 UJ
Total Metals (MG/KG)									
Aluminum	6 - 6	22,786	Background	18,900	13,800	17,000	71.7	18,100	13,400
Antimony	2 - 6	26.0	HHRA Value	5.2 B	1.9 B	0.94 L	NA	0.850 U	1.5 J
Arsenic	5 - 6	24	Background	23.2	0.86 U	12.5	0.0500	11.9	14.8
Barium	6 - 6	98	Background	2,460	133	53.1 J	0.820	49.3 J	333
Cobalt	5 - 6	13	Background	46.8	4.3 J	3.29 U	0.01000 J	7.10 J	7.90 J
Copper	6 - 6	58	Background	258	39.7	39	0.540	23.3	91.1
Cyanide	2 - 6	0.1	Eco Value	0.8 U	1.1 J	1.1 U	0.540 L	0.310 U	0.350 U
Iron	6 - 6	45,805	Background	57,600	161,000	29,100	117	44,800	15,300
Lead	6 - 6	147	Background	377	302	115	1.10	169	278
Manganese	6 - 6	260	Eco Value	572 K	76 K	48.1	0.340	279	68.5
Mercury	6 - 6	1.3	Background	0.44	0.29	0.17 J	0.360	0.0800	0.410
Thallium	1 - 6	5.4	HHRA Value	0.63 U	5.7	0.82 U	NA	1 U	0.900 U
Vanadium	6 - 6	70	Background	63.8	42.2	37.7	0.220	46	33.3
Zinc	6 - 6	150	Eco Value	970	124	149 L	0.810	120	366
Uncertainties[1]									
Total Metals (MG/KG)									
Beryllium	6 - 6	NSV		3.5	0.74 J	2.4	0.01000	0.720 J	1.10 J
Volatile Organic Compounds (UG/KG)									
2-Butanone	1 - 6			15 UJ	17 U	21 U	19 U	17 U	14 J
Acetone	3 - 6			15 UJ	17 U	52	19 UJ	9 J	73
Carbon disulfide	1 - 6			15 UJ	17 U	21 U	19 U	17 U	7 J
Chloroform	1 - 6			15 UJ	3 J	21 U	19 U	17 U	18 U
Methylene chloride	2 - 6			37 B	100 B	69 B	11 B	3 J	3 J
Semi-volatile Organic Compounds (UG/KG)									
2,4-Dinitrotoluene	2 - 6			470 J	65 J	3,600 U	630 UJ	570 UJ	580 UJ

Shaded values exceed the Final PRG
1 - Listed as COPCs, but have no associated screening or background values
2 - Duplicate collected at this location - higher value between the two samples is given

B - Analyte not detected above associated blank
J - Value is estimated
K - Value may be biased high
L - Value may be biased low

U - Analyte not detected
NA - Not analyzed for
NSV - No screening value
NR - No risk
NV - No value

Table 14
Yorktown Aquifer Groundwater PRG Exceedances
Site 3
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	Detection Frequency	VGWS	MCL	Tap RBC	Yorktown Aquifer Background UCL	HHRA PRG	Final PRG	Criteria	SJS3-MW01D			SJS3-MW02D		
Sample ID									SJS03-GW1D-001	SJS03-GW1D-002	SJS03-GW1D-003	SJS03-GW2D-001	SJS03-GW2D-002	SJS03-GW2D-003
Sample Date									07/24/97	11/04/97	05/19/99	07/24/97	11/04/97	05/19/99
Chemical Name														
Volatile Organic Compounds (UG/L)														
Chloroform	2 - 6	-	80	0.15	1	0.1	80	MCL	0.4 J	1 U	1 U	0.3 J	1 U	1 U
Total Metals (UG/L)														
Arsenic	1 - 6	50	50	0.045	1	0.00045	50	MCL	3 U	3.2 U	4.20 J	3 U	3.2 U	2 U
Manganese	6 - 6	50	-	730	271	0.31	730	Tap RBC	91.3 L		110	291 L	354	612
Thallium	1 - 6	-	2	2.6	1.6	0.0011	2	MCL	2.7 J	2.5 B	3.20 UL	2 U	1.5 B	3.20 UL

***Thallium exceeded the groundwater MCL in sample MW06S (Columbia Aquifer) with a concentration of 6.6 ug/L, but duplicate sample was a non detect (3.2L ug/L)**

Shaded values exceed the Final PRG

Outlined values exceed the PRG in historical sample

VGWS - Virginia Groundwater Standard

MCL - Maximum Contaminant Level

B - Analyte not detected above associated blank
J - Value is estimated
L - Value may be biased low
U - Analyte not detected

UL - Not detected, quantitation limit is probably higher
NSV - No screening value

Table 15
Yorktown Aquifer
Groundwater PRG Exceedances
Sites 5 and 6
St. Juliens Creek Annex
Chesapeake, Virginia

Station ID	Detection Frequency	VGWS	MCL	Tap RBC	Yorktown Aquifer Background UCL	HHRA PRG	Final PRG	Criteria	SJS5-MW01D			SJS5-MW02D			SJS5-MW04D
Sample ID									SJS05-GW1D-001	SJS05-GW1D-002	SJS05-GW1D-003	SJS05-GW2D-001	SJS05-GW2D-002	SJS05-GW2D-003	SJS05-GW4D-001
Sample Date									07/24/97	11/06/97	05/19/99	07/30/97	11/04/97	05/23/99	05/19/99
Chemical Name															
Volatile Organic Compounds (UG/L)															
Chloroform	2 - 7	-	80	0.15	1	0.26	80	MCL	2	1 U	1 U	5	0.7 B	1 U	1.40 B
Total Metals (UG/L)															
Antimony	2 - 6	-	6	15	NV	0.0061	6	MCL	NA	1.7 U	2.70 U	3.1 J	1.7 U	3.20 J	2.70 U
Arsenic	1 - 7	50	50	0.045	1	0.00045	50	MCL	3 U	3.2 U	3 B	4.9 J	3.2 U	2 U	5.5 B
Iron	6 - 7	300	-	11,000	2035	9.3	2035	Background	1,460 J	109 B	337	4,420 K	1,150	1,120	325
Manganese	5 - 7	50	-	730	271	0.31	730	Tap RBC	30.7 B	14.4 B	52.4	142	178	192	118

Shaded values exceed the final PRG

Outlined value exceeded the PRG in historical sample

SDWR- Secondary Drinking Water Regulations
VGWS- Virginia Groundwater Standard
UCL- upper confidence limit
NO MCL Exceedences in Yorktown Aquifer

NA - Not analyzed
B - Analyte not detected above associated blank
J - Value is estimated
K - Value may be biased high
U - Analyte not detected

UL - Not detected, quantitation limit is probably higher
NV - No value

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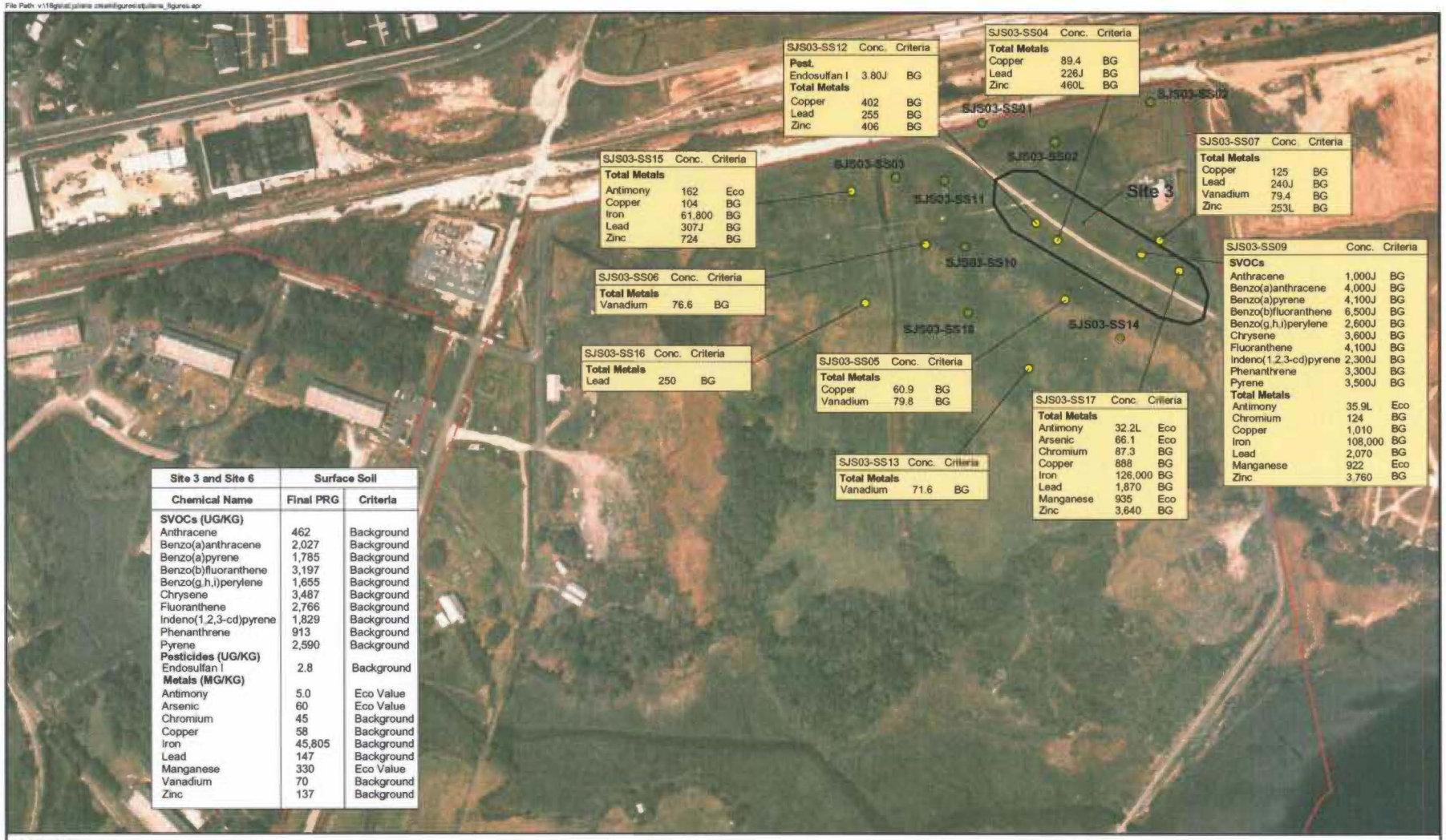

Site 3 and Site 6	Surface Soil	
Chemical Name	**Final PRG**	**Criteria**
SVOCs (UG/KG)		
Anthracene	462	Background
Benzo(a)anthracene	2,027	Background
Benzo(a)pyrene	1,785	Background
Benzo(b)fluoranthene	3,197	Background
Benzo(g,h,i)perylene	1,655	Background
Chrysene	3,487	Background
Fluoranthene	2,766	Background
Indeno(1,2,3-cd)pyrene	1,829	Background
Phenanthrene	913	Background
Pyrene	2,590	Background
Pesticides (UG/KG)		
Endosulfan I	2.8	Background
Metals (MG/KG)		
Antimony	5.0	Eco Value
Arsenic	60	Eco Value
Chromium	45	Background
Copper	58	Background
Iron	45,805	Background
Lead	147	Background
Manganese	330	Eco Value
Vanadium	70	Background
Zinc	137	Background

LEGEND

- Surface Soil Sample Locations
- Surface Soil Sample Locations Where PRGs Were Exceeded
- Activity Boundary
- IR Sites

Note: Metal concentrations are in mg/Kg.
SVOCs and Pest/PCB concentrations are in ug/Kg.
J - Value is estimated
L - Value may be biased low

BG - Background Screening Value
Eco - Ecological Screening Value

N

0 100 200 Feet

Figure 1
Surface Soil PRG Exceedances
Site 3
St. Juliens Creek Annex
Chesapeake, Virginia

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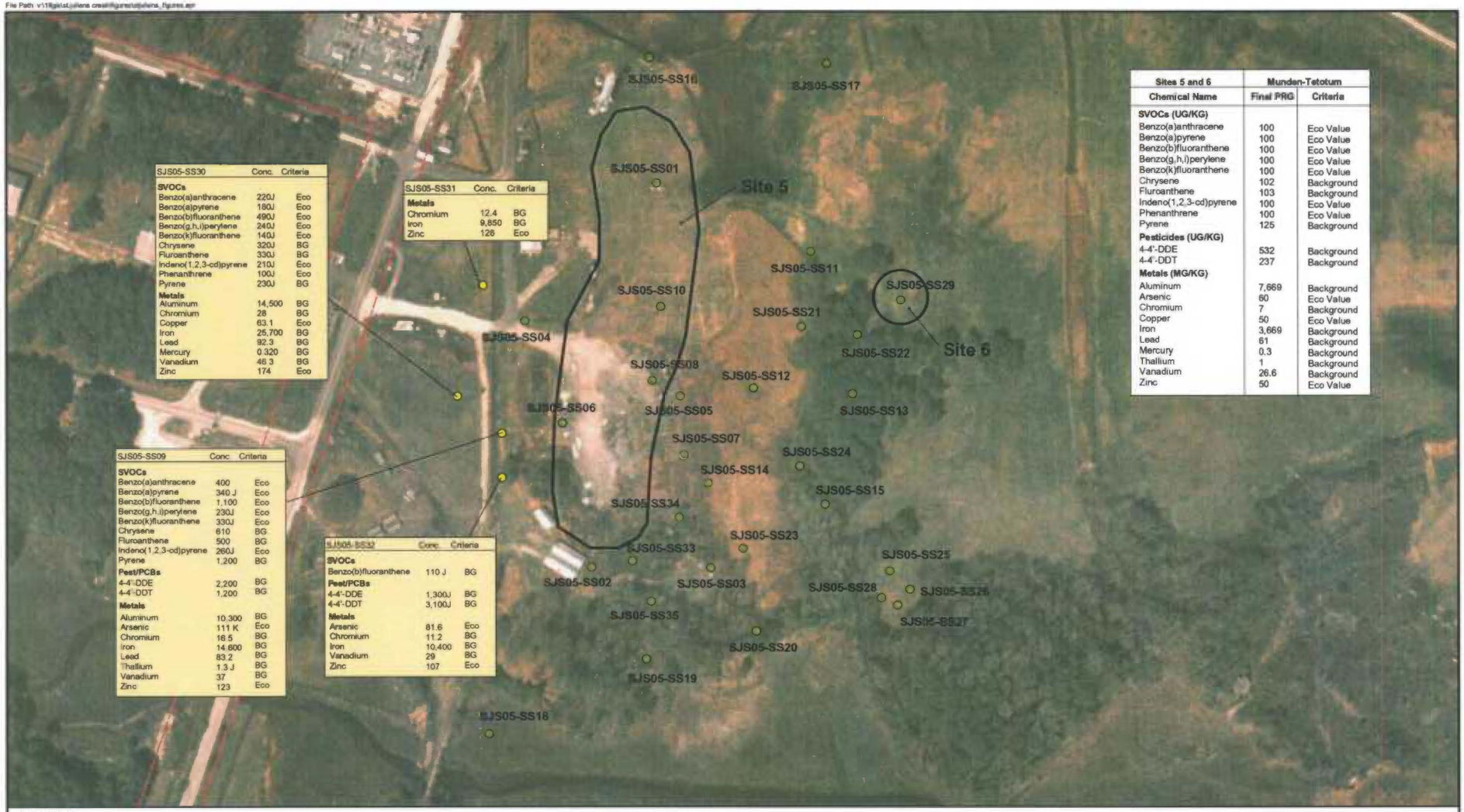

SJS05-SS30	Conc.	Criteria
SVOCs		
Benzo(a)anthracene	220J	Eco
Benzo(a)pyrene	180J	Eco
Benzo(b)fluoranthene	490J	Eco
Benzo(g,h,i)perylene	240J	Eco
Benzo(k)fluoranthene	140J	Eco
Chrysene	320J	BG
Fluroanthene	330J	BG
Indeno(1,2,3-cd)pyrene	210J	Eco
Phenanthrene	100J	Eco
Pyrene	230J	BG
Metals		
Aluminum	14,500	BG
Chromium	28	BG
Copper	63.1	Eco
Iron	25,700	BG
Lead	92.3	BG
Mercury	0.320	BG
Vanadium	46.3	BG
Zinc	174	Eco

SJS05-SS31	Conc.	Criteria
Metals		
Chromium	12.4	BG
Iron	9,850	BG
Zinc	126	Eco

SJS05-SS09	Conc.	Criteria
SVOCs		
Benzo(a)anthracene	400	Eco
Benzo(a)pyrene	340 J	Eco
Benzo(b)fluoranthene	1,100	Eco
Benzo(g,h,i)perylene	230J	Eco
Benzo(k)fluoranthene	330J	Eco
Chrysene	610	BG
Fluroanthene	500	BG
Indeno(1,2,3-cd)pyrene	260J	Eco
Pyrene	1,200	BG
Pest/PCBs		
4-4'-DDE	2,200	BG
4-4'-DDT	1,200	BG
Metals		
Aluminum	10,300	BG
Arsenic	111 K	Eco
Chromium	16.5	BG
Iron	14,600	BG
Lead	83.2	BG
Thallium	1.3 J	BG
Vanadium	37	BG
Zinc	123	Eco

SJS05-SS32	Conc.	Criteria
SVOCs		
Benzo(b)fluoranthene	110 J	BG
Pest/PCBs		
4-4'-DDE	1,300J	BG
4-4'-DDT	3,100J	BG
Metals		
Arsenic	81.6	Eco
Chromium	11.2	BG
Iron	10,400	BG
Vanadium	29	BG
Zinc	107	Eco

Sites 5 and 6	Munden-Tetotum	
Chemical Name	**Final PRG**	**Criteria**
SVOCs (UG/KG)		
Benzo(a)anthracene	100	Eco Value
Benzo(a)pyrene	100	Eco Value
Benzo(b)fluoranthene	100	Eco Value
Benzo(g,h,i)perylene	100	Eco Value
Benzo(k)fluoranthene	100	Eco Value
Chrysene	102	Background
Fluroanthene	103	Background
Indeno(1,2,3-cd)pyrene	100	Eco Value
Phenanthrene	100	Eco Value
Pyrene	125	Background
Pesticides (UG/KG)		
4-4'-DDE	532	Background
4-4'-DDT	237	Background
Metals (MG/KG)		
Aluminum	7,669	Background
Arsenic	60	Eco Value
Chromium	7	Background
Copper	50	Eco Value
Iron	3,669	Background
Lead	61	Background
Mercury	0.3	Background
Thallium	1	Background
Vanadium	26.6	Background
Zinc	50	Eco Value

LEGEND

- Surface Soil Sample Locations
- Surface Soil Sample Locations Where PRGs Were Exceeded
- Activity Boundary
- IR Sites

Note: Metal concentrations are in mg/Kg.
SVOCs and Pest/PCB concentrations are in ug/Kg.
J - Value is estimated
K - Value may be biased high

BG - Background Screening Value
Eco - Ecological Screening Value

N

0 90 180 Feet

Figure 2
Munden-Tetotum Surface Soil PRG Exceedances
Sites 5 and 6
St. Juliens Creek Annex
Chesapeake, Virginia

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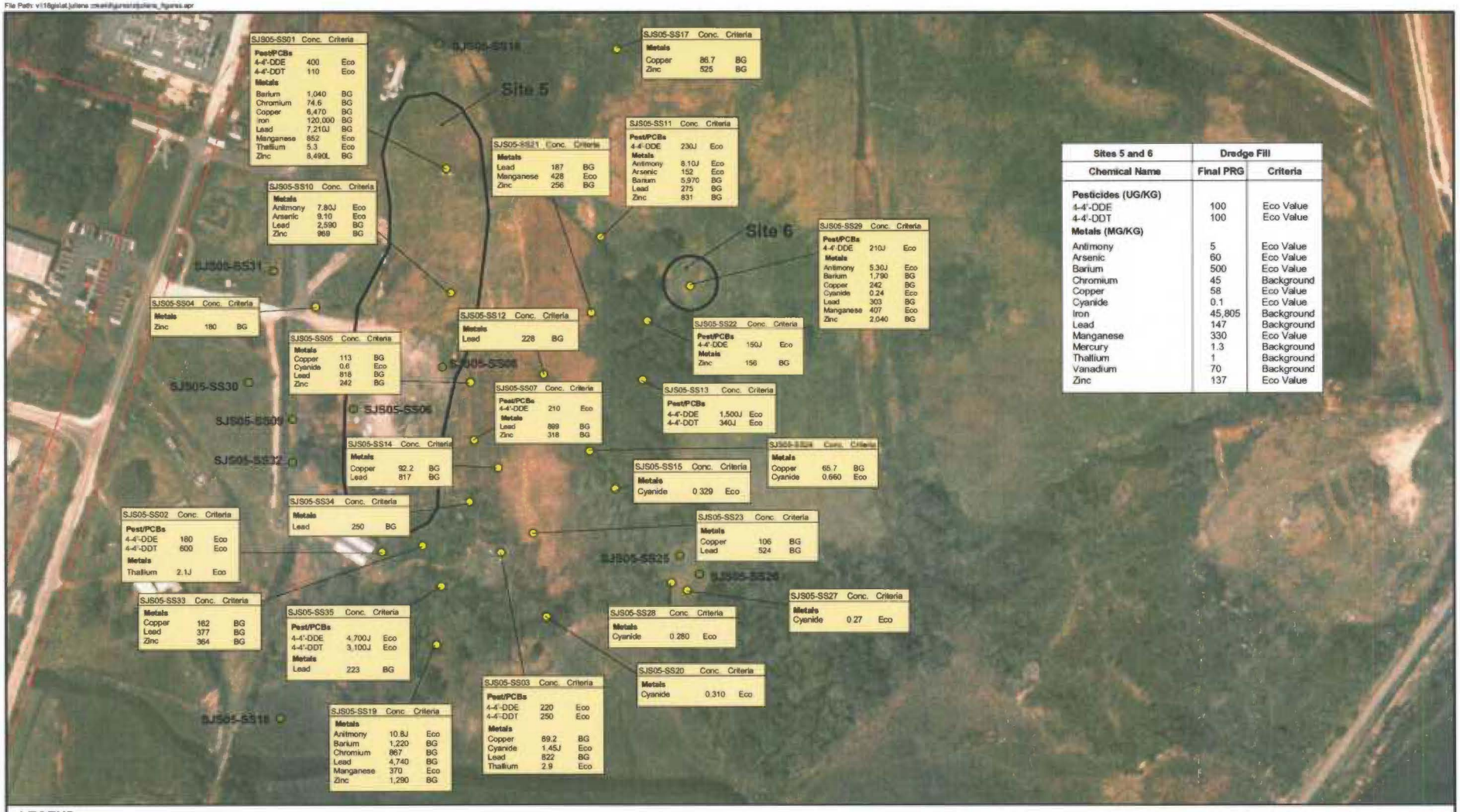

Sites 5 and 6	Dredge Fill	
Chemical Name	**Final PRG**	**Criteria**
Pesticides (UG/KG)		
4-4'-DDE	100	Eco Value
4-4'-DDT	100	Eco Value
Metals (MG/KG)		
Antimony	5	Eco Value
Arsenic	60	Eco Value
Barium	500	Eco Value
Chromium	45	Background
Copper	58	Eco Value
Cyanide	0.1	Eco Value
Iron	45,805	Background
Lead	147	Background
Manganese	330	Eco Value
Mercury	1.3	Background
Thallium	1	Background
Vanadium	70	Background
Zinc	137	Eco Value

LEGEND

- Surface Soil Sample Locations
- Surface Soil Sample Locations Where PRGs Were Exceeded
- Activity Boundary
- IR Sites

Note: Metal concentrations are in mg/Kg.
SVOCs and Pest/PCB concentrations are in ug/Kg.
J - Value is estimated
K - Value may be biased high

BG - Background Screening Value
Eco - Ecological Screening Value

N

0 90 180 Feet

Figure 3
Dredge-Fill Surface Soil PRG Exceedances
Sites 5 and 6
St. Juliens Creek Annex
Chesapeake, Virginia

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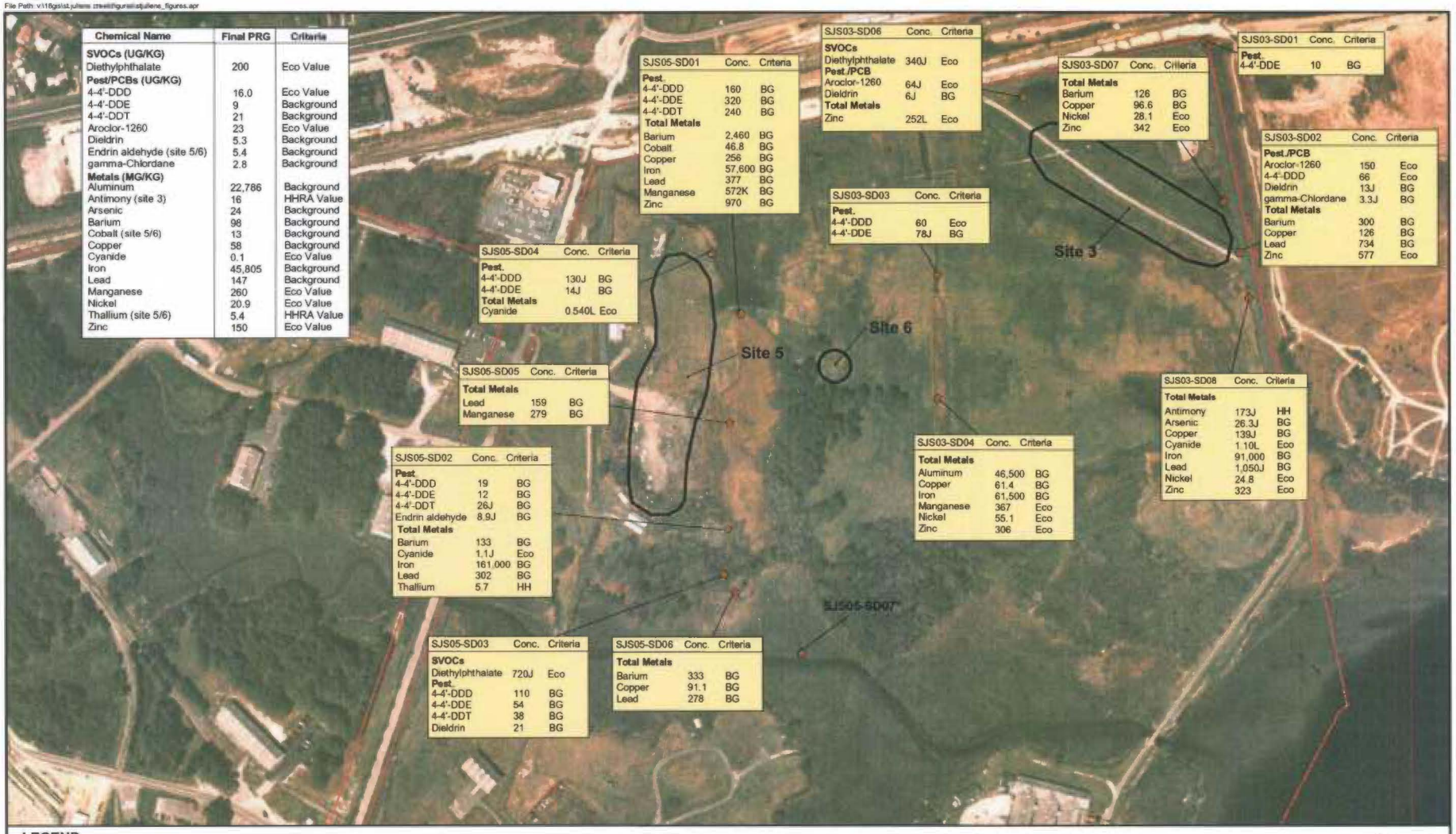

Chemical Name	Final PRG	Criteria
SVOCs (UG/KG)		
Diethylphthalate	200	Eco Value
Pest/PCBs (UG/KG)		
4-4'-DDD	16.0	Eco Value
4-4'-DDE	9	Background
4-4'-DDT	21	Background
Aroclor-1260	23	Eco Value
Dieldrin	5.3	Background
Endrin aldehyde (site 5/6)	5.4	Background
gamma-Chlordane	2.8	Background
Metals (MG/KG)		
Aluminum	22,786	Background
Antimony (site 3)	16	HHRA Value
Arsenic	24	Background
Barium	98	Background
Cobalt (site 5/6)	13	Background
Copper	58	Background
Cyanide	0.1	Eco Value
Iron	45,805	Background
Lead	147	Background
Manganese	260	Eco Value
Nickel	20.9	Eco Value
Thallium (site 5/6)	5.4	HHRA Value
Zinc	150	Eco Value

SJS05-SD01	Conc.	Criteria
Pest.		
4-4'-DDD	160	BG
4-4'-DDE	320	BG
4-4'-DDT	240	BG
Total Metals		
Barium	2,460	BG
Cobalt	46.8	BG
Copper	256	BG
Iron	57,600	BG
Lead	377	BG
Manganese	572K	BG
Zinc	970	BG

SJS03-SD06	Conc.	Criteria
SVOCs		
Diethylphthalate	340J	Eco
Pest./PCB		
Aroclor-1260	64J	Eco
Dieldrin	6J	BG
Total Metals		
Zinc	252L	Eco

SJS03-SD07	Conc.	Criteria
Total Metals		
Barium	126	BG
Copper	96.6	BG
Nickel	28.1	Eco
Zinc	342	Eco

SJS03-SD01	Conc.	Criteria
Pest.		
4-4'-DDE	10	BG

SJS03-SD02	Conc.	Criteria
Pest./PCB		
Aroclor-1260	150	Eco
4-4'-DDD	66	Eco
Dieldrin	13J	BG
gamma-Chlordane	3.3J	BG
Total Metals		
Barium	300	BG
Copper	126	BG
Lead	734	BG
Zinc	577	Eco

SJS03-SD03	Conc.	Criteria
Pest.		
4-4'-DDD	60	Eco
4-4'-DDE	78J	BG

SJS05-SD04	Conc.	Criteria
Pest.		
4-4'-DDD	130J	BG
4-4'-DDE	14J	BG
Total Metals		
Cyanide	0.540L	Eco

SJS05-SD05	Conc.	Criteria
Total Metals		
Lead	159	BG
Manganese	279	BG

SJS03-SD08	Conc.	Criteria
Total Metals		
Antimony	173J	HH
Arsenic	26.3J	BG
Copper	139J	BG
Cyanide	1.10L	Eco
Iron	91,000	BG
Lead	1,050J	BG
Nickel	24.8	Eco
Zinc	323	Eco

SJS03-SD04	Conc.	Criteria
Total Metals		
Aluminum	46,500	BG
Copper	61.4	BG
Iron	61,500	BG
Manganese	367	Eco
Nickel	55.1	Eco
Zinc	306	Eco

SJS05-SD02	Conc.	Criteria
Pest.		
4-4'-DDD	19	BG
4-4'-DDE	12	BG
4-4'-DDT	26J	BG
Endrin aldehyde	8.9J	BG
Total Metals		
Barium	133	BG
Cyanide	1.1J	Eco
Iron	161,000	BG
Lead	302	BG
Thallium	5.7	HH

SJS05-SD03	Conc.	Criteria
SVOCs		
Diethylphthalate	720J	Eco
Pest.		
4-4'-DDD	110	BG
4-4'-DDE	54	BG
4-4'-DDT	38	BG
Dieldrin	21	BG

SJS05-SD06	Conc.	Criteria
Total Metals		
Barium	333	BG
Copper	91.1	BG
Lead	278	BG

LEGEND

- Sediment Sample Locations
- Activity Boundary
- IR Sites

Note: Metal concentrations are in mg/Kg.
SVOCs and Pest/PCB concentrations are in ug/Kg.
J - Value is estimated
K - Value may be biased high
L - Value may be biased low
* - SJS05-SD07 was screened using Bohicket Values

BG - Background Screening Value
Eco - Ecological Screening Value
HH - Human Health Screening Value

N

0 200 400 Feet

Figure 4
Sediment PRG Exceedances
Sites 3,5 and 6
St. Juliens Creek Annex
Chesapeake, Virginia

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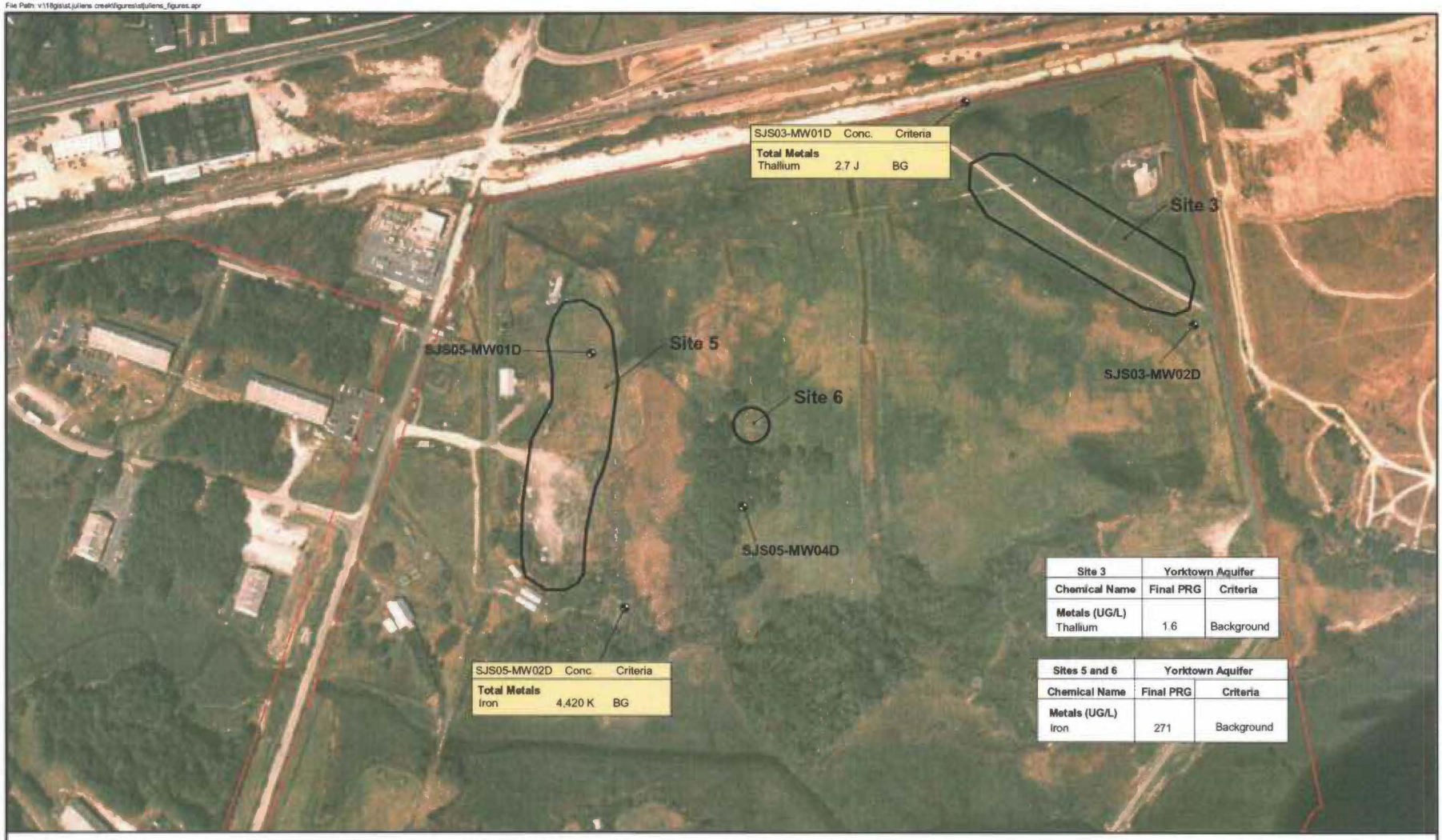

Site 3	Yorktown Aquifer	
Chemical Name	Final PRG	Criteria
Metals (UG/L)		
Thallium	1.6	Background

Sites 5 and 6	Yorktown Aquifer	
Chemical Name	Final PRG	Criteria
Metals (UG/L)		
Iron	271	Background

LEGEND

- Monitoring Well Locations
- Activity Boundary
- IR Sites

Note: Metal concentrations are in ug/L.
J - Value is estimated
K - Value may be biased high

BG - Background Screening Value
Concentrations are from July 1997.

N

0 100 200 Feet

Figure 5
Yorktown Aquifer Groundwater PRG Exceedances
Sites 3,5 and 6
St. Juliens Creek Annex
Chesapeake, Virginia

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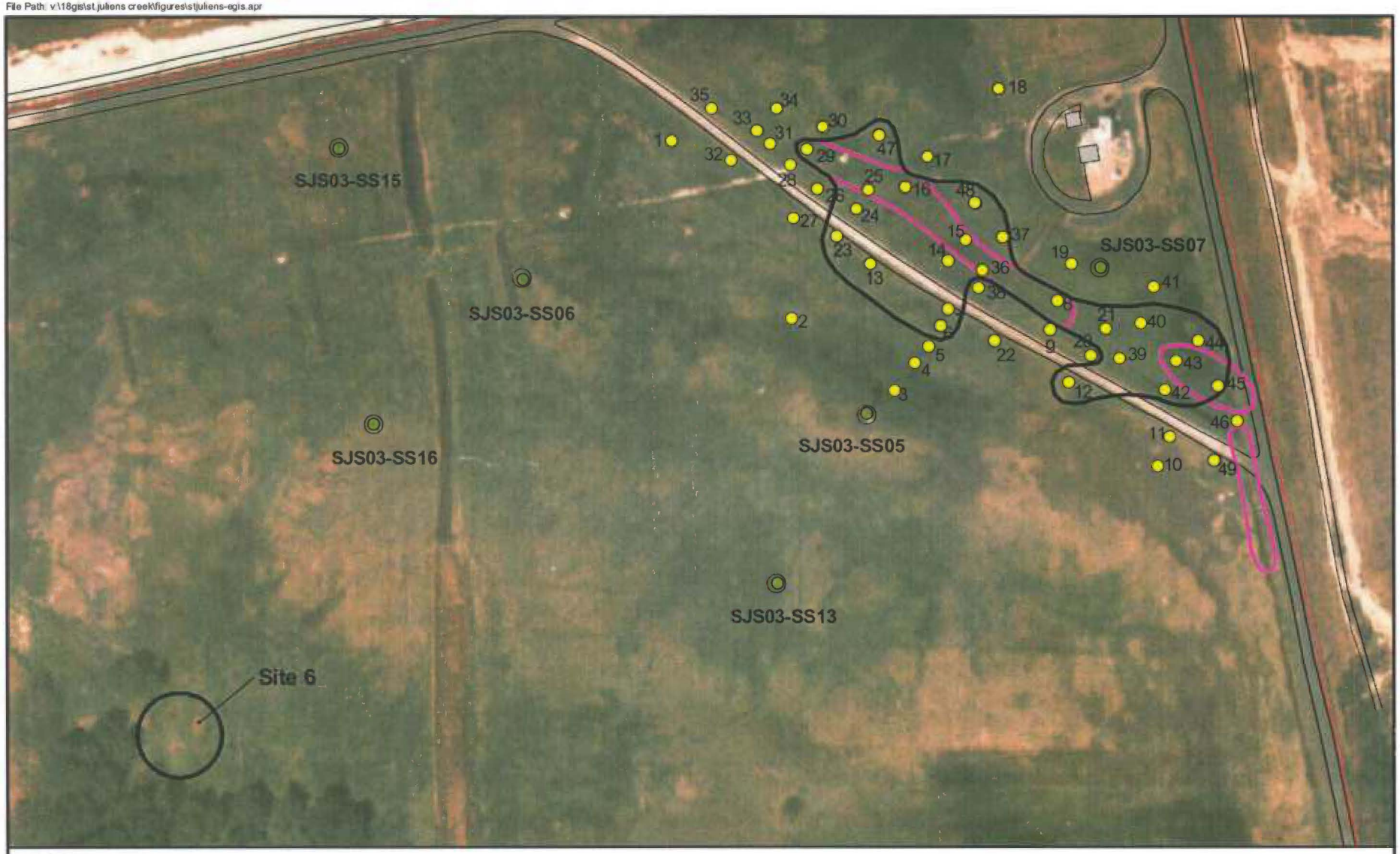

LEGEND

- Test Pit
- Hot Spot (10 foot diameter and 3 foot excavation)
- Extent of Burnt / Stained Soils (3 foot excavation)
- Extent of Surface Debris (1 foot excavation)

N

0 90 180 Feet

Figure 6
Exent of Waste
Sites 3 and 6
St. Juliens Creek Annex
Chesapeake, Virginia

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