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U S NAVY RESPONSE TO U S EPA REGION III ADDITIONAL COMMENTS TO DRAFT SAMPLING AND ANALYSIS PLAN SITE 7 EXPANDED REMEDIAL INVESTIGATION NWS YORKTOWN VA
5/14/2012
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May 14, 2012

Mr. Moshood Oduwole
Federal Facility Remediation (3HS11)
USEPA Region 3
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

Subject: Response to Additional Comments received April 20, 2012 on the Draft Sampling and Analysis Plan, Site 7 Expanded Remedial Investigation, NWS Yorktown, Yorktown, Virginia

Dear Mr. Oduwole,

This letter is in response to the additional comments received from USEPA on April 20, 2012 for the subject document. Responses also reflect the discussions during the February 22nd and 23rd, 2012 Naval Weapons Station Yorktown Partnering Team meeting. Comments are presented below followed by responses in italics.

1. A brief review of the 1998 ROD, the 1998 Round 2 RI, and the 1993 Round 1 RI reports indicated the following:

   - The size of Site 7 has changed from an approximately 300 foot long and 0.7 acre drainage area adjacent to wetlands and along a small tributary to Felgates Creek (in the Round 1 RI, Round 2 RI and the 1998 ROD) to a much larger area (approximately 20.5 acres [1500 feet by 600 feet]) including the area of the earlier Site 7 (Figure 1 in the responses to comments).

   - The ROD indicates approximately 800 cubic yards of soil and sediment were removed in 1996 and the removal area was cleaned up to levels appropriate for commercial/industrial use. There is no mention of the cleanup of this area being protective of ecological receptors.

   - Some of the data from both Rounds of RI sampling involved surface soil (Rd 1: two samples, Rd 2: four samples), and sediment (Rd 1: four samples, Rd 2: four samples) within the unnamed tributary and up to five sediment samples within Felgates Creek. These data are approximately 14 to 20 years old and from a surface soil perspective do not cover the area currently contained within the Site 7 Study Area boundary (Figure 1 in the responses to comments).

   - The Round 2 RI ecological risk assessment (Section 7.8.3) noted that 11 inorganic chemicals had maximum concentrations exceeding background and ecological screening values and ten inorganic chemicals that had mean concentrations exceeding background

and ecological screening values. This information indicates that inorganics may be present at Site 7 at concentrations that will likely present risk to ecological receptors. Because the buildings and conveyer belts no longer exist at Site 7, the data collected in this SAP will need to show that all areas within the Study Area boundary do not currently present risk to ecological receptors.

The information from these three documents suggests the selection of sample locations shown on Figure 1 in the responses to comments is too limited.

Response: A bulleted list of responses is provided below which corresponds to the respective bulleted comment provided above, followed by a summary of the proposed sampling approach:

- *Information from the three documents referenced is primarily focused on Site 7 as it is defined by the FFA, "Site 7 – Plant 3 Explosives-Contaminated Wastewater Discharge Area." This area consists of the 300 foot long drainage area identified in Bullet 1 above. The site boundary has been expanded to encompass the footprint of the former Plant 3 (and is consistent with the Study Area Shown in the ROD and Round 2 RI) because the purpose of this investigation is to confirm no releases have occurred beneath the former Plant 3 buildings (which could not be accessed during previous investigations) and evaluate potential site risks.*

- *As indicated in the 1998 ROD on Section 2.6.2 – Site 7 (Page 2-46 & 2-47), Section 2.6.3 – Site 7 Drainage Area (Page 2-50), and Section 3.1 - Overview (Page 3-1), no additional action is necessary for the protection of ecological receptors. Additionally, both the 2002 and 2007 Five-Year Reviews (Baker, 2002 and CH2M HILL, 2007, respectively) document that the remedy for soil and sediment is protective of human health and the environment.*

- *The Navy acknowledges that the data from the Round 1 and Round 2 RI is 14 to 20 years old. This historical sampling data has been used to support the current sampling approach. Historical data will not be used as part of the risk evaluation. Additional soil samples are proposed from the current Site 7 investigation area to evaluate current site conditions, determine the nature and extent of any potential releases, and evaluate potential site risks.*

- *Additional sampling is proposed to determine if potential unacceptable human health and/or ecological risks exist at the site. The proposed samples will be analyzed for the referenced inorganic chemicals.*

The Navy has revised the proposed sampling approach presented in the February 9, 2012 Response to Comments. The total number of discrete soil sample locations has been increased from the previously submitted 28 sample locations (56 samples) to 31 sample locations (62 samples) and adjusted the locations of some samples to adequately evaluate the site. The revised sample locations are presented in Figure 1 (attached) and a detailed explanation for each sample location is provided in the attached Table. The proposed sample locations are positioned to best determine where potential releases may have occurred and where contaminant accumulation is most likely. The proposed number of

samples and sample locations is sufficient to evaluate potential releases and potential human health and ecological risks at the site.

2. The response to comment 1 refers to Figure 1 which shows the proposed soil sampling locations along with other features of this site. A review of this figure has raised the following concerns:

   - Specific reasons for selecting the sample locations need to be included in the text (the information contained in Table 1 is not sufficient).
   - Sample locations 1, 6, 10, 23, and 24 appear to be some distance away from any of the former buildings or conveyor belts. Specific reasons are needed to support the locations of these samples.
   - Sample location 9 is in the upgradient end of the removed soil area, which according to Figure 1, extended into the wetlands of a tributary to Felgates Creek. Again, specific reasons are needed to support this one discrete sample location.
   - Because the removal area (a part of the area known as Site 7 in the 1998 ROD) was only shown to be protective of human health (e.g., commercial/industrial), this area needs to be appropriately sampled to demonstrate that it currently is, or is not, sufficiently protective of ecological receptors.
   - Areas draining to all drop inlet structures (approximately 26-see Figure 1) need to be sampled.
   - Areas downgradient of all outfall structures (approximately 6-see Figure 1) need to be sampled.
   - The report will need to document that all existing drop inlet structures are tied into an identified outlet structure.

   Generally, the limited supporting information in this expanded RI SAP about discrete sample locations leads to uncertainty about the number and location of samples. In reference to soil samples, the upland portion of this site, within the drainage boundaries, is approximately 13 acres. The placement of 25 discrete soil samples in 13 acres is not reasonable for quantifying contaminant concentrations or for assessing ecological risk. USEPA believes that composite sampling, as recommended in the December 15, 2011 comment letter is a better approach at this site.

   Response: A bulleted list of responses is provided below which corresponds to the respective bulleted comment provided above, followed by:

   - *The specific reasoning for the proposed sampling locations has been updated and is provided in the attached table. This table contains information identifying the most likely potential release points and contaminant accumulation areas based on site history and surface topography. The information in this table will be included within the text of the UFP-SAP.*
   - *The sample locations have been revised. Upgradient soil sample locations have been removed. Please see the response to Comment 1 and Figure 1 (attached).*

- *Please see the attached table for the specific reasoning for placement of the referenced removed soil area sample (current sample number 14 on Figure 1). The single discrete sample location at the upgradient edge of the drainage area will evaluate surface runoff entering into the drainage area.*

- *Please see bullet 2 of the response to Comment 1. Ecological risk was summarized as part of the 1998 ROD and no further action (beyond the completed pilot study) was necessary for the protection of ecological receptors. Additionally, both the 2002 and 2007 Five-Year Reviews (Baker, 2002 and CH2M HILL, 2007, respectively) document that the remedy for soil and sediment is protective of human health and the environment. Thus, no additional sampling in this area is necessary.*

- *The proposed sampling approach will evaluate the most likely release locations and locations of contaminant accumulation based on surface topography. The Navy also agrees to collect sediment samples from each outfall location as shown on Figure 1 (attached). A field visit has confirmed that the majority of drop inlets identified on the figure (from the base Stormwater Pollution Prevention Plan [SWPPP]) were removed or buried during building demolition and are, therefore, inaccessible. Sampling of each drop inlet location is not warranted, as each potential source area and each outfall will be evaluated.*

- *The Navy agrees to collect a sediment sample from each downgradient outfall location as shown on Figure 1 (attached) and summarized on the attached table. The outfall identified as "Outfall NR-006" is no longer evident and received runoff from areas upgradient of the building activities. However, a soil sample has been placed in the vicinity of this outfall location (sample 29; attached Figure 1). A sample will not be collected from "Outfall NR-017", as there are no drainage features that connect Site 7 to this drainage feature.*

- *Drop inlets were either removed or buried during the demolition activities and are no longer accessible. The locations of the drop inlets (and associated piping) and outfalls provided on the figure were obtained from the Base SWPPP. All features that discharge to outfalls will be assessed through the sampling of the outfall locations. Surface runoff from potential source areas via drainage ditches and/or overland flow will be assessed though the soil samples proposed in the attached table.*

The 31 proposed soil sample locations shown in Figure 1 and detailed in the attached table are adequate to evaluate potential releases and assess potential site-related risks. The collection of the proposed discrete samples will provide sufficient data to conduct a quantitative risk assessment without the need for composite samples.

3. Comment 3 stated that the collection of sediment, seep and pore water samples should be collected independent of the results of the soil and groundwater samples. The RTC states that if soil and groundwater indicate a potential for risk, scoping of sediment, surface water, pore water, and seep sample locations will be performed. Sampling of sediment is needed regardless of what is found in the soil and groundwater as this sampling only represents current migration pathways. While the loading plant was active many of these migration pathways were likely complete, including migration through the numerous outfall pipes identified during the site visit on March 10, 2011. It is unclear whether any historical

sediment sampling has been performed in the vicinity of the numerous outfalls and seeps that were identified. In addition, the limited data collected in the previous RIs do not support this decision. The primary issues about the previous data are that the data are old (14 to 20 years) and the size of Site 7 is significantly larger now than it was in the Round 1 and 2 RIs. The number of proposed discrete sample locations is too limited. In addition, the response to comment 9 indicates that the CERCLA source identified at Site 7 was the discharge to the downgradient wetland and Felgates Creek. This statement also supports the need to sample the wetland and aquatic habitats (including pore water and seeps) at the same time as the soils and groundwater to ensure they do not present risk to ecological receptors.

Response: The At a minimum, 8 surface water and 8 additional sediment samples (in addition to the 4 outfall samples) will be collected from Felgates Creek or its tributaries, not including the sediment samples to be collected from the discharge of each of the downgradient outfall locations (approximately 4). The locations of the creek/tributary samples will be discussed and selected with input from ecological technical support. However, as discussed in the response to the Original Comment 3, soil and groundwater data should be considered in the placement of surface water and sediment samples in the creek/tributary and associated wetlands. Therefore, soil, outfall samples, and groundwater samples will be collected first. Surface water and additional sediment sampling will be performed following review of the soil and groundwater data to support the number and locations of these samples. Pore water and seep (if present) sampling will only be performed if groundwater results indicate a potential risk to ecological receptors from this pathway. If pore water and seep sampling is determined to be necessary, an additional round of groundwater samples will be collected at the time of the pore water and seep sampling, which will occur concurrent with surface water and sediment sampling in the creek/tributary system.

4. The response to comment 7 indicates a detected PAH location was removed during the 1998 removal action. This would suggest that PAHs are site contaminants and they were at concentrations potentially posing risk to ecological receptors. As such, PAHs need to be included in the analyses performed on the proposed sampling for this expanded RI. If there is a compelling reason not to include PAHs, the necessary documentation and explanation must be provided. In addition, the data from the previous RIs indicated the material (soils/sediment) removed from Site 7 was treated in the Bio-cell at Site 22 (Helicopter Pad) and that the treatment was effective for explosives but not inorganics, which also had high concentrations. Part of the currently proposed sampling will need to address whether, or not, the previous removal action was adequate in terms of addressing risk to ecological receptors. The Round 2 RI indicates that treated soils from the Bio-cell would be used for backfill. Therefore, the Navy needs to show how these treated soils were used and that they do not currently present risk to ecological receptors.

   Response: The response to Comment 7 indicates that there was a PAH detection that was not reproducible during subsequent sampling and was likely a laboratory contaminant issue. This suggests that PAHs are not site contaminants. As stated in the referenced text of the UFP-SAP, "due to the lack of a defined hotspot or source area, detected concentrations of SVOCs are unlikely to be site-related." Additionally, this location was removed as part of the pilot study. This information is provided within the text of the UFP-SAP as outlined in the

original response to Comment 7. Finally, the Yorktown Tier 1 Partnering Team agreed that, based upon a review of the available data, SVOCs were not a site-related contaminant and would not be evaluated. Therefore, it is unclear why additional explanation is requested to justify excluding PAHs from the proposed sampling.

Please see bullet 2 of the response to Comment 1 regarding ecological risk in the previous removal area. The statement that the Round 2 RI indicates the treated soils from the bio-cell would be used for backfill is unclear. A more specific reference to where in the Round 2 RI this is indicated is necessary in order to address this comment.

5. Comment 9 stated that it was unclear why only the footprint of the buildings needed to be investigated and not the areas surrounding the buildings. The RTC states that there is no documented release directly associated with the former buildings. However, in order to bring this site to closure, the Navy agrees that areas outside the extent of the footprint will be investigated. Information should be provided on how the buildings were demolished, specifically whether they were demolished to ensure that additional releases did not occur to the surrounding soil and/or runoff into adjacent creeks via the storm drain. Of particular concern would be any contaminants that could be washed from demolition debris and transported during heavy rain events (e.g., lead from chipped paint, explosive residue) into surrounding areas.

   Response: Information provided by the base indicates that all demolition activities performed at Site 7 were done in accordance with an approved work plan. The work plan provided detailed information on how decontamination of building material and equipment occurred and how they were sampled for explosive residues. Any materials which contained explosive residue were decontaminated in a controlled environment where rinse water was containerized, analyzed, and sent off-site for proper disposal. Any equipment that could not be properly decontaminated on site was containerized and shipped off site for proper decontamination and disposal. The proposed soil sampling (see the attached table and Figure 1) include sample locations designed to specifically evaluate possible runoff from the building footprints; these samples would account for potential releases both before and during building demolition.

6. Response to comment 12: The single sample location in the upgradient portion of the removal area is not sufficient to determine if current concentrations in soil pose a potential risk to ecological receptors. Based on a review of Figure 1 in the responses to comments, the removal area would need more than one sample in order to make this determination. Also, the variability that can exist between discrete soil samples does not support the use of a single sample to characterize contaminant concentrations in the removal area. Again, MIS may be appropriate and needs to be adequately investigated.

   Response: Please see bullets 3 and 4 in the response to Comment 2. Ecological risks were considered and previously evaluated as documented in the 1998 ROD. Additionally, both the 2002 and 2007 Five-Year Reviews (Baker, 2002 and CH2M HILL, 2007, respectively) document that the remedy for soil and sediment is protective of human health and the environment. The single discrete sample location at the upgradient edge of the drainage area (sample 14 on the attached Figure 1) will evaluate surface runoff entering into the drainage area.

7. Response to comment 15: The sources of the ecological screening values (formerly called Eco-SSLs) need to be identified.

   Response: The source of each ecological screening value included in Worksheet 15 has been provided in an appendix (Appendix E), which is attached and will be added to the SAP.

8. The response to comment 16 needs to clearly indicate if the upstream surface water and sediment sample was upstream of tidal/flood stage influence. Also, data collection occurred in 1993 and 1998. These data are old, indicating the need for current data (see previous comments).

   Response: Based on a review of the existing work plans and the RI, it cannot be determined if the upstream locations sampled in 1993 and 1998 represent the upper influence of flood tide in Felgates Creek. However, no upstream samples have been proposed in Felgates Creek as part of this UFP-SAP and, until additional site-specific surface water and sediment data are collected and evaluated from the area downgradient of Site 7, no sampling is proposed to determine upstream influence from the site. Further, background surface water and sediment samples collected from six locations in the Eastern Branch of Felgates Creek in December 2007 as part of the evaluations of Sites 4, 21, and 22, and Sites 8 and 34 (SSA-14), will be considered for use at Site 7. These samples have been previously applied to nearby Site 6, as well as Sites 1 and 3. No changes are recommended to the text.

9. Response 17: The response to comment 17 ends with "No additional subsurface soil samples (greater than 24 inches) are proposed at this time." The response needs to describe the conditions (e.g., broken drain lines) that would cause additional subsurface soil samples to be collected. In addition, there is a reference to PALs supporting comparison with SSL criteria. In the response to comment 15, Eco-SSLs would be changed to Ecological Screening Value." Indicate if this means that PALs would be compared to ecological screening values. The text (or a table) needs to clearly list the ecological screening values and sources.

   Response: No additional subsurface soil samples (greater than 24 inches) are proposed for this investigation at this time. The results of the soil and groundwater sampling may be used by the Partnering Team to determine if deeper soil samples are necessary as part of a future investigation or remedy implementation (if necessary). PALs established for surface soils in Worksheet 15 includes a comparison of data to ecological screening values (ESVs). Please see the response to Comment 7 for the source of ecological screening values.

10. The Round 2 RI ecological risk assessment (Section 7.8.3) noted that 11 inorganic chemicals had maximum concentrations exceeding background and ecological screening values and 10 inorganic chemicals had mean concentrations exceeding background and ecological screening values. This information indicates that inorganics may be present at Site 7 at concentrations that will likely present risk to ecological receptors. Because the buildings and conveyer belts no longer exist at Site 7, the data will need to show that all areas within the Study Area boundary do not currently present risk to ecological receptors.

    Response: Please see response to Comments 1 and 2.

Please provide acceptance of these responses or additional comments by June 10, 2012. Please feel free to contact me should you have any additional questions.

Sincerely,

CH2M HILL

William J Friedmann Jr.

William J. Friedmann, Jr.
Activity Manager

cc: Mr. Wade Smith/VDEQ
Mr. James Gravette/NAVFAC Midlant
Mr. Adam Forshey/CH2M HILL
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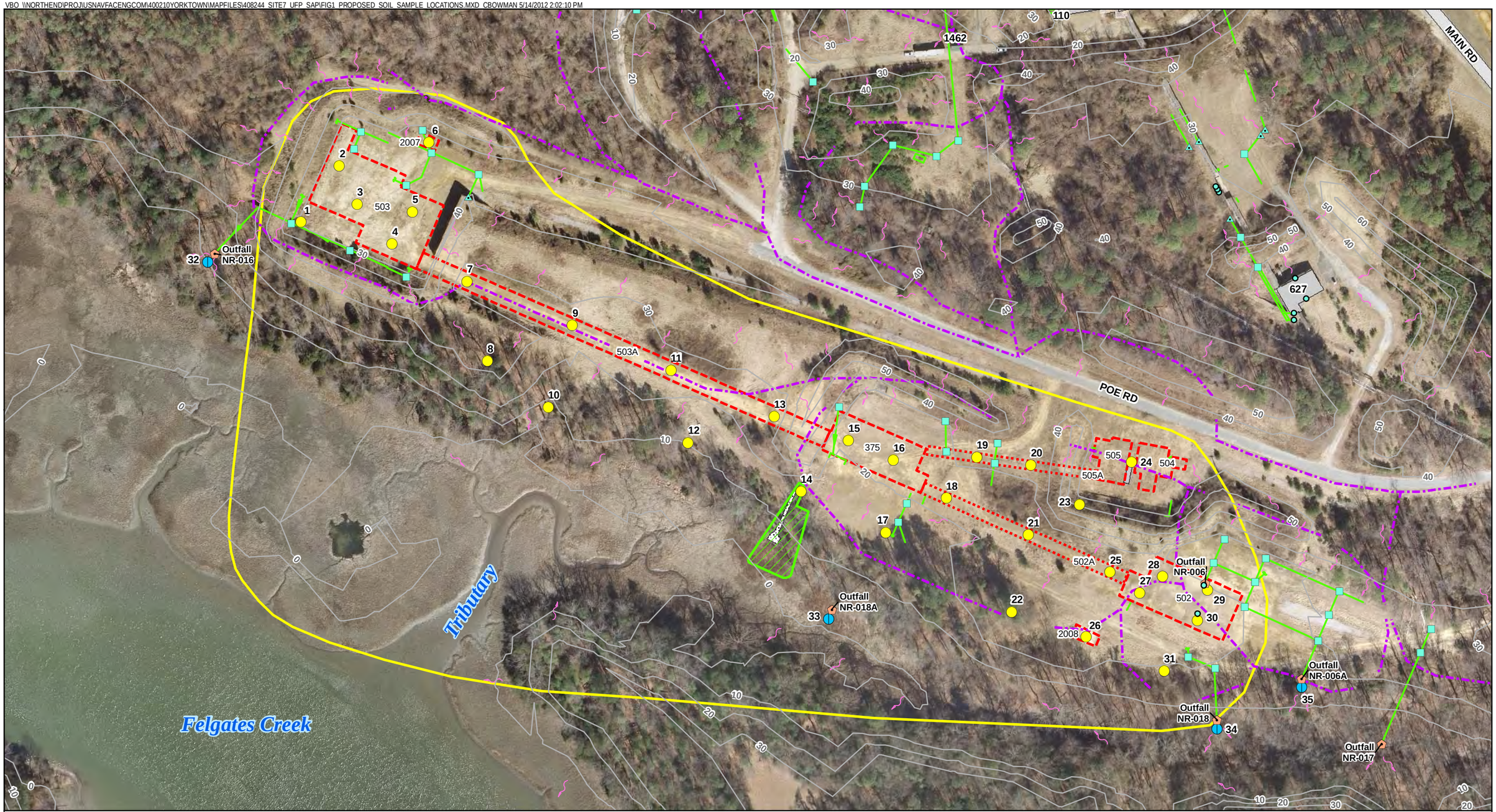

Legend

- Proposed Soil Sample Location
- Proposed Outfall Sample Location
- Building Drain
- Culvert
- Drop Inlet
- Outfall
- Drainage Boundary
- Storm Sewer
- Elevation Contour (10 ft interval)
- Overland Flow
- Study Area
- Former Buildings
- Rip Rap Area
- Site 7 Removal Area (1996)

N W E S

0 150 300 Feet

Note:
A minimum of 8 surface water and 8 additional sediment samples will be collected to evaluate Felgates Creek or its tributaries. The locations of the creek/tributary samples will be selected by the Team based upon soil and groundwater data. Drop inlet locations identified in the figure are from the base Storm Water Pollution Prevention Plan. During a recent site inspection, no drop inlet boxes were observed. The drop inlets may have been removed or covered as part of the building demolition.

Figure 1
Site 7 Proposed Soil Sample Locations
Naval Weapons Station Yorktown
Yorktown, Virginia

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Sample Number	Rationale for Sample Location
1	Evaluate surface runoff and soil deposition that may have occurred during plant operation or as a result of building demoliton from the upgrading former Building 503.
2 through 5	Evaluate soil characteristics beneath former Building 503. No floor drains were located within this building and there was no known release associated with this area; therefore, 4 discrete sample locations are recommended to confirm no release has occurred.
6	Evaluate soil characteristics beneath former Building 2007. No floor drains were located within this building and there was no known release associated with this area; therefore, 1 discrete sample location is recommended to confirm no release has occurred.
7, 9, 11, and 13	Evaluate soil characteristics beneath the footprint of the former conveyor belt 503A located between Building 375 and Building 503. It is unknown if a relase has occurred; therefore, 4 discrete sample locations are recommended within the former conveyor belt area. The two edge samples (Sample 7 and Sample 9) will be biased toward the respective buildings because it is believed to be most likely to to have received contamination based on historical operation of the conveyor system.
8, 10, and 12	Evaluate surface runoff and soil deposition that may have occurred during plant operation or as a result of building demolition from the upgradient former Building 503 and 503A conveyor belt area to the south (toward the wetlands). These samples will be placed in low lying areas where upgradient surface runoff would likely converge/collect.
14	Evaluate surface runoff and soil deposition that may have occurred during plant operation or as a result of building demolition from the upgradient Building 375 to the previously remediated (excavated and removed) discharge area (former Site 7 area). This sample will be placed at the most upgradient point of the drainage area to confirm surface runoff and building demolition did not result in recontamination of the previously remediated drainage area.
15 and 16	Evaluate soil characteristics beneath former Building 375. No floor drains were located within this building and there was no known release within this area; therefore, 2 discrete sample locations are recommended to confirm no release has occurred.
17	Evaluate surface runoff and soil deposition that may have occurred during plant operation or as a result of building demolition from the upgradient Building 375 to the south (toward the wetland). This sample will be placed in a low lying area where upgradient surface runoff would likely converge/collect.
18, 21, and 25	Evaluate soil characteristics beneath the footprint of the former conveyor belt 502A located between Building 502 and Building 375. 3 discrete sample locations are recommended within the former conveyor belt area. The two edge samples (Sample 18 and Sample 25) will be biased toward the respective buildings because it is believed to be most likely to to have received contamination based on historical operation of the conveyor system.
19 and 20	Evaluate soil characteristics beneath the footprint of the former conveyor belt 505A located between Buildings 504/505 and Building 375. It is unknown if a release has occurred; therefore, 2 discrete sample locations are recommended within the former conveyor belt area.
22	Evaluate surface runoff and soil deposition that may have occurred during plant operation or as a result of building demolition from the upgradient former 502A conveyor belt area to the south (toward the wetlands). This sample will be placed in a low lying area where upgradient surface runoff would have likely converged/collected.
23	Evaluate soil characteristics at the discharge location from drainage feature located south of former Buildings 504 and 505. This sample will be collected at the base of the corrugated metal pipe extending from the base of the soil berm that connects to the concrete drainage feature located south of the buildings.
24	Evaluate soil characteristics beneath former Building 505 and former Building 504. No floor drains were located within these buildings and there were no known releases associated with this area; therefore, 1 discrete sample location is recommended from between the former location of the buildings.
26	Evaluate soil characteristics beneath former Building 2008. No floor drains were located within this building and a there is no known release associated with this area; therefore, 1 discrete sample location is recommended from the building footprint to confirm no release has occured.
27, 28, 29, and 30	Evaluate soil characteristics beneath former Building 502. Two floor drains were located within this building; therefore, 4 discrete sample locations are recommended to determine if a release has occurred. Two of these sample locations will placed at the approximate location of the former floor drains.
31	Evaluate surface runoff and soil deposition that may have occurred during plant operation or as a result of building demolition from the upgradient former Building 502 to the south (toward the wetlands). This sample will be placed in a low lying area where upgradient surface runoff would likely converge/collect.
32-35	Evaluate soil/sediment characteristics at each downgradient outfall (NR 016, 017, 018, 018A, and 006A). One discrete soil sample will be collected at the discharge of each outfall.

Appendix E
Ecological Screening Values (ESVs) for Soil

Analytical Group	Chemical	ESV	Units	Reference	Comments
Explosives	1,3,5-Trinitrobenzene	NSV	--	--	
Explosives	1,3-Dinitrobenzene	NSV	--	--	
Explosives	2,4,6-Trinitrotoluene	10,000	ug/kg	Talmage et al. 1999	Plant
Explosives	2,4-Dinitrotoluene	11,000	ug/kg	NRCC 2006	Plant/Invertebrate
Explosives	2,6-Dinitrotoluene	8,500	ug/kg	NRCC 2006	Plant/Invertebrate
Explosives	2-Amino-4,6-dinitrotoluene	80,000	ug/kg	Talmage et al. 1999	Plant
Explosives	2-Nitrotoluene	NSV	--	--	
Explosives	3,5-Dinitroaniline	NSV	--	--	
Explosives	3-Nitrotoluene	NSV	--	--	
Explosives	4-Amino-2,6-dinitrotoluene	80,000	ug/kg	2-Amino-4,6-dinitrotoluene	Plant
Explosives	4-Nitrotoluene	NSV	--	--	
Explosives	HMX	10,000	ug/kg	Talmage et al. 1999	Invertebrate
Explosives	Nitrobenzene	2,260	ug/kg	Efroymson et al. 1997b	LC50 of 226,000; UF of 100
Explosives	Perchlorate	1,000	ug/kg	USEPA 2002	Invertebrate
Explosives	RDX	10,000	ug/kg	Talmage et al. 1999	Invertebrate
Explosives	Tetryl	10,000	ug/kg	Talmage et al. 1999	Plant
Inorganics	Aluminum	pH < 5.5	--	USEPA 2003a	Eco-SSL
Inorganics	Antimony	78.0	mg/kg	USEPA 2005a	Eco-SSL - Invertebrate
Inorganics	Arsenic	18.0	mg/kg	USEPA 2005b	Eco-SSL - Plant
Inorganics	Barium	330	mg/kg	USEPA 2005c	Eco-SSL - Invertebrate
Inorganics	Beryllium	40.0	mg/kg	USEPA 2005d	Eco-SSL - Invertebrate
Inorganics	Cadmium	32.0	mg/kg	USEPA 2005e	Eco-SSL - Plant
Inorganics	Calcium	NSV	--	--	
Inorganics	Chromium	64.0	mg/kg	CCME 2007	Soil Quality Guideline
Inorganics	Cobalt	13.0	mg/kg	USEPA 2005f	Eco-SSL - Plant
Inorganics	Copper	70.0	mg/kg	USEPA 2007a	Eco-SSL - Plant
Inorganics	Cyanide	15.8	mg/kg	MHSPE 2000	Geomean of target/intervention - complex
Inorganics	Iron	5 < pH > 8	--	USEPA 2003b	Eco-SSL
Inorganics	Lead	120	mg/kg	USEPA 2005g	Eco-SSL - Plant
Inorganics	Magnesium	NSV	--	--	
Inorganics	Manganese	220	mg/kg	USEPA 2007b	Eco-SSL - Plant
Inorganics	Mercury	0.10	mg/kg	Efroymson et al. 1997b	Invertebrate

Appendix E
Ecological Screening Values (ESVs) for Soil

Analytical Group	Chemical	ESV	Units	Reference	Comments
Inorganics	Nickel	38.0	mg/kg	USEPA 2007c	Eco-SSL - Plant
Inorganics	Potassium	NSV	--	--	
Inorganics	Selenium	0.52	mg/kg	USEPA 2007d	Eco-SSL - Plant
Inorganics	Silver	560	mg/kg	USEPA 2006a	Eco-SSL - Plant
Inorganics	Sodium	NSV	--	--	
Inorganics	Thallium	1.00	mg/kg	Efroymson et al. 1997a	Plant
Inorganics	Vanadium	130	mg/kg	CCME 2007	Soil Quality Guideline
Inorganics	Zinc	120	mg/kg	USEPA 2007e	Eco-SSL - Invertebrate
Pesticides	4,4'-DDD	583	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Pesticides	4,4'-DDE	114	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Pesticides	4,4'-DDT	100	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Pesticides	Aldrin	3.63	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Pesticides	alpha-BHC	226	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Pesticides	alpha-Chlordane	11.0	ug/kg	MHSPE 2000	Geomean of target/intervention
Pesticides	beta-BHC	342	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Pesticides	delta-BHC	226	ug/kg	alpha-BHC	
Pesticides	Dieldrin	10.5	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Pesticides	Endosulfan I	6.32	ug/kg	MHSPE 2000	Geomean of target/intervention
Pesticides	Endosulfan II	6.32	ug/kg	MHSPE 2000	Geomean of target/intervention
Pesticides	Endosulfan sulfate	6.32	ug/kg	Endosulfan	
Pesticides	Endrin	1.95	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Pesticides	Endrin aldehyde	1.95	ug/kg	Endrin	
Pesticides	Endrin ketone	1.95	ug/kg	Endrin	
Pesticides	gamma-BHC (Lindane)	7.75	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Pesticides	gamma-Chlordane	11.0	ug/kg	MHSPE 2000	Geomean of target/intervention
Pesticides	Heptachlor	52.9	ug/kg	MHSPE 2000	Geomean of target/intervention
Pesticides	Heptachlor epoxide	52.9	ug/kg	Heptachlor	
Pesticides	Methoxychlor	500	ug/kg	Beyer 1990	B value
Pesticides	Toxaphene	500	ug/kg	Beyer 1990	B value
PCBs	Aroclor-1016	8,000	ug/kg	Efroymson et al. 1997a	Lowest EC50 (40,000); UF of 5
PCBs	Aroclor-1221	8,000	ug/kg	Efroymson et al. 1997a	Lowest EC50 (40,000); UF of 5
PCBs	Aroclor-1232	8,000	ug/kg	Efroymson et al. 1997a	Lowest EC50 (40,000); UF of 5

Appendix E
Ecological Screening Values (ESVs) for Soil

Analytical Group	Chemical	ESV	Units	Reference	Comments
PCBs	Aroclor-1242	8,000	ug/kg	Efroymson et al. 1997a	Lowest EC50 (40,000); UF of 5
PCBs	Aroclor-1248	8,000	ug/kg	Efroymson et al. 1997a	Lowest EC50 (40,000); UF of 5
PCBs	Aroclor-1254	8,000	ug/kg	Efroymson et al. 1997a	Lowest EC50 (40,000); UF of 5
PCBs	Aroclor-1260	8,000	ug/kg	Efroymson et al. 1997a	Lowest EC50 (40,000); UF of 5
VOCs	1,1,1-Trichloroethane	1,025	ug/kg	MHSPE 2000	Geomean of target/intervention
VOCs	1,1,2,2-Tetrachloroethane	5,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC
VOCs	1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NSV	--	--	
VOCs	1,1,2-Trichloroethane	2,000	ug/kg	MHSPE 2000	Geomean of target/intervention
VOCs	1,1-Dichloroethane	548	ug/kg	MHSPE 2000	Geomean of target/intervention
VOCs	1,1-Dichloroethene	173	ug/kg	MHSPE 2000	Geomean of target/intervention
VOCs	1,2,3-Trichlorobenzene	1,150	ug/kg	Efroymson et al. 1997b	LC50 of 115,000; UF of 100
VOCs	1,2,4-Trichlorobenzene	1,270	ug/kg	Efroymson et al. 1997b	LC50 of 127,000; UF of 100
VOCs	1,2-Dibromo-3-chloropropane	NSV	--	--	
VOCs	1,2-Dibromoethane	300	ug/kg	CCME 2007	IRC
VOCs	1,2-Dichlorobenzene	1,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC
VOCs	1,2-Dichloroethane	2,190	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
VOCs	1,2-Dichloropropane	38,800	ug/kg	Efroymson et al. 1997b	LC50 of 3,880,000; UF of 100
VOCs	1,3-Dichlorobenzene	1,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC
VOCs	1,4-Dichlorobenzene	1,280	ug/kg	Efroymson et al. 1997b	LC50 of 128,000; UF of 100
VOCs	2-Butanone	NSV	--	--	
VOCs	2-Hexanone	NSV	--	--	
VOCs	4-Methyl-2-pentanone	NSV	--	--	
VOCs	Acetone	NSV	--	--	
VOCs	Benzene	1,140	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
VOCs	Bromochloromethane	NSV	--	--	
VOCs	Bromodichloromethane	NSV	--	--	
VOCs	Bromoform	300	ug/kg	CCME 2007	Plant; IRC
VOCs	Bromomethane	NSV	--	--	
VOCs	Carbon disulfide	NSV	--	--	
VOCs	Carbon tetrachloride	3,400	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
VOCs	Chlorobenzene	2,400	ug/kg	Efroymson et al. 1997b	LC50 of 240,000; UF of 100
VOCs	Chloroethane	5,000	ug/kg	CCME 2007	IRC

Appendix E
Ecological Screening Values (ESVs) for Soil

Analytical Group	Chemical	ESV	Units	Reference	Comments
VOCs	Chloroform	1,844	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
VOCs	Chloromethane	5,000	ug/kg	CCME 2007	IRC
VOCs	cis-1,2-Dichloroethene	447	ug/kg	MHSPE 2000	Geomean of target/intervention
VOCs	cis-1,3-Dichloropropene	5,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC
VOCs	Cyclohexane	6,000	ug/kg	Beyer 1990	B value
VOCs	Dibromochloromethane	NSV	--	--	
VOCs	Dichlorodifluoromethane(Freon-12)	NSV	--	--	
VOCs	Ethylbenzene	1,815	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
VOCs	Isopropylbenzene	NSV	--	--	
VOCs	m- and p-Xylene	1,300	ug/kg	Total xylenes	
VOCs	Methyl acetate	NSV	--	--	
VOCs	Methylcyclohexane	NSV	--	--	
VOCs	Methylene chloride	1,250	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
VOCs	Methyl-tert-butyl ether (MTBE)	NSV	--	--	
VOCs	o-Xylene	1,300	ug/kg	Total xylenes	
VOCs	Styrene	64,000	ug/kg	Efroymson et al. 1997a	EC50 (320,000); UF of 5
VOCs	Tetrachloroethene	179	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
VOCs	Toluene	40,000	ug/kg	Efroymson et al. 1997a	EC50 (200,000); UF of 5
VOCs	trans-1,2-Dichloroethene	447	ug/kg	MHSPE 2000	Geomean of target/intervention
VOCs	trans-1,3-Dichloropropene	5,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC
VOCs	Trichloroethene	500	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
VOCs	Trichlorofluoromethane(Freon-11)	NSV	--	--	
VOCs	Vinyl chloride	412	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
VOCs	Xylene, total	1,300	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC

NSV - No Screening Value

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