Monica Marrow

From: Stephanie.Sawyer@CH2M.com
Sent: Thursday, September 30, 2010 2:19 PM
To: Monica Marrow
Subject: FW: Site 11 Tech Memo - DEQ Comments

Categories: Blue Category

From: Smith,Wade [mailto:Wade.Smith@deq.virginia.gov]
Sent: Monday, August 31, 2009 1:16 PM
To: Murray, Christopher R CIV NAVFAC, AEVHR
Cc: Ivester, Marlene/HRO; Sawyer, Stephanie/VBO; Haug.Susanne@epamail.epa.gov
Subject: CAX: Site 11 Tech Memo - DEQ Comments

Thank you for giving the DEQ the opportunity to comment on the August 2009 Draft Tech Memo for CAX Site 11.

The Draft Tech Memo was received by the DEQ on August 11, 2009.

The DEQ's comments are attached (Track Changes via Microsoft Word).

Upon your acceptance of the proposed changes and upon your submittal of the requested revisions, the DEQ will issue an official letter for your files.

Please let me know if you have any questions.

Sincerely,

Wade M. Smith
Remediation Project Manager
Virginia Department of Environmental Quality
Office of Remediation Programs
Phone: (804) 698-4125
Fax: (804) 698-4234
wade.smith@deq.virginia.gov

Draft

Technical Memorandum
Consensus for No Further Action in Soil and Groundwater
Site 11 - ~~Old DuPont Disposal Area~~Bone Yard

Comment [WMS1]: Report Cover, Report Spine, and Cover Letter should reference Site 11 – Bone Yard

Naval Weapons Station Yorktown Cheatham Annex
Williamsburg, Virginia

Contract Task Order 017

August 2009

Prepared for

Department of the Navy
Naval Facilities Engineering Command
Mid-Atlantic

Under the

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Contract N62470-08-D-1000

Prepared by

CH2MHILL

Virginia Beach, Virginia

1. Introduction

This Technical Memorandum (TM) explains how potentially unacceptable human health and ecological risks identified during previous investigations have been managed or mitigated by the recently completed non time-critical removal action (NTCRA) at Site 11, Bone Yard, Naval Weapons Station (WPNSTA) Yorktown Cheatham Annex (CAX), Williamsburg, Virginia. The NTCRA, conducted in 2009, included removal of impacted soils to address potentially unacceptable ecological risks associated with upper and lower trophic receptor exposure (Shaw, 2009). Potentially unacceptable human health risks associated with exposure to metals in site groundwater were not addressed as part of this action. This technical memorandum summarizes the mitigation of unacceptable ecological risks and presents a supplemental groundwater evaluation to support consensus for no further action at the site.

Comment [WMS2]: See comment in References

2. Site History

Site 11 encompasses an estimated 2.7-acre area located in the south central portion of CAX, south of Antrim Road and the Public Works Facility and west of Penniman Lake (**Figure 1**). Site 11 consists of former Building 269, abandoned Building 268, and an old concrete foundation with a low retaining wall (**Figure 1**). Between 1940 and 1978, Site 11 was reportedly used by public works to store containers of waste-oil, tar and tar cylinders, asphalt, and other scrap materials. Oil, gasoline, petroleum containing tanks, drums, old containers, fence posts, abandoned cars, heavy construction equipment, and various other scrap metals have been observed at the site. It was reported wastes may have been buried at the site; however, previous investigations have not indicated the presence of buried waste. Removal actions, ~~were~~ conducted in 1986 and 1997, ~~which~~ included the disposal of 77 drums and their contents, tar storage containers, as well as miscellaneous scrap/materials located on the ground surface (Baker, 2000).

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Site 11 is mainly an open overgrown grassy field surrounded by mixed-hardwood woodland. The site is bordered on the west by Penniman Lake, and two unnamed tributaries to the north and south. The unnamed tributaries run eastward to Penniman Lake and drain Site 11. In addition to runoff from Site 11, the unnamed tributaries and Penniman Lake receive runoff from surrounding areas. Groundwater flow in the Columbia aquifer at Site 11 is to the east toward Penniman Lake (**Figure 1**).

3. Risk Summary

The Site 11 Remedial Investigation (RI) was completed in April 2007 (Baker, 2007). A human health risk assessment (HHRA) and ecological risk assessment (ERA) were conducted in conjunction with the RI to quantify potential risk to human health and ecological receptors. The RI identified polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), pesticides, and metals in Site 11 media. The results of the HHRA and ERA are summarized below.

3.1 Human Health Risk Assessment

A HHRA was completed for Site 11 to evaluate the risks from current and future human exposure to site media (soil, groundwater, surface water, and sediment). The HHRA is an estimate of the likelihood of health problems occurring if no cleanup action is taken. Potential cancer risks and non-cancer hazards were calculated based on conservative reasonable maximum exposure (RME) concentrations, which portray the highest level of human exposure that could be expected to occur, and central tendency exposure (CTE) calculations based on more reasonable exposures. Potentially unacceptable cancer risks are expressed as the probability that a person has greater than a 1 in 10,000 ($1x10^{-4}$) chance of developing cancer, with an acceptable risk range of 10^{-4} to 10^{-6}. The potential for non-cancer hazards was evaluated by determining the ratio of exposure to toxicity; this ratio is called a hazard quotient (HQ). An HQ greater than 1 indicates that a receptor's exposures may present an unacceptable risk. The hazard index (HI) is generated by adding the HQs for all chemicals that affect the same target organ (for example, the liver) or cause adverse health effects within a medium or across all media to which an individual may reasonably be exposed. For non-cancer, an HI value greater than 1 indicates exposures may present an unacceptable risk.

Exposure point concentrations (EPCs) used to calculate risks for soil, groundwater, surface water, and sediment are summarized in Appendix J, Tables 3.1 through 3.7 of the RI Report (Baker, 2007), and a summary of RME and CTE cancer risks and non-cancer hazards for these media are presented in **Tables 1 and 2**, respectively.

3.1.1 Soil

Potential risks associated with exposure to site soil were quantitatively evaluated for the following receptors: current on-site workers, current adult and adolescent recreational users, current adult and adolescent trespassers, future industrial/commercial workers, future construction workers, future adult and adolescent trespassers, and future adult and child residents. The RME EPCs were calculated as the 95 percent upper confidence limit (95% UCL). The maximum detected concentration was used in place of the 95% UCL when the calculated 95% UCL was greater than the maximum detected value.

All non-cancer hazards and cancer risks for current use scenarios are within or below USEPA's acceptable risk ranges. The RME cancer risks associated with future exposure to soil are within or below USEPA's acceptable risk range for all future receptor scenarios evaluated and the RME non-cancer hazards associated with future exposure to soil are below 1 for the future industrial/commercial workers, future construction workers, future adult and adolescent trespassers, and future adult residents. The RME non-cancer hazard for the future child resident (HI = 2.7) is greater than 1 due primarily to the presence of iron (HQ = 1.2) in Site 11 soil. However, the EPC used to calculate RME risk (26,349 mg/kg) is below the Soil Association 2 background value (30,000 mg/kg) and there are no unacceptable future hazards associated with exposure to site soil based on CTE calculations.

3.1.2 Groundwater

Groundwater in the vicinity of Site 11 is not currently used as a potable water supply, and there is no complete exposure pathway. Exposure to groundwater as a future potable water

supply was quantitatively evaluated as a worst-case scenario for future adult and child residents, and future construction workers. Because of the limited data set and lack of contaminant plume, the RME and CTE EPCs used to calculate risks were the maximum detected concentrations for each COPC identified.

RME cancer risks and non-cancer hazards associated with future construction workers exposed to site groundwater are below USEPA's acceptable risk range. Possible future use of site groundwater as a residential potable water supply may result in a non-cancer hazard and cancer risk above USEPA's acceptable risk levels due to the presence of metals in groundwater, based on RME calculations. RME cancer risks (CR) associated with exposure to arsenic in groundwater are above USEPA's acceptable risk range (10^{-4} to 10^{-6}) for future adult (CR = 1.8×10^{-4}) and child (CR = 1.1×10^{-4}) residents. There are no unacceptable cancer risks associated with future potable use of groundwater based on CTE calculations. Future residential use of groundwater may result in a non-cancer hazard above USEPA's target threshold of 1 due to ingestion of arsenic, iron, and manganese based on RME and CTE calculations (**Tables 1 and 2**). Ingestion of groundwater by a future adult resident may result in a non-cancer hazard of 1.4 based on CTE calculations, although no individual target organ effects are greater than USEPA's target hazard index of 1.

3.1.3 Surface Water and Sediment

Exposure to surface water and sediment for current on-site workers, current adult and adolescent recreational users, current and future adult and adolescent trespassers, and future adult and child residents were quantitatively evaluated for the two unnamed tributaries adjacent to Site 11. All cancer risks and non-cancer hazards associated with current and future exposure to surface water and sediment within the unnamed tributaries are within or below USEPA's acceptable risk ranges.

Surface water and sediment data collected from Penniman Lake was evaluated against screening criteria to identify COPCs; however, risks were not quantitatively evaluated due to an incomplete current exposure pathway and the uncertainty associated with future exposure. COPCs identified for Penniman Lake surface water are trichloroethene (TCE), total arsenic, and total and dissolved thallium. COPCs identified for Penniman lake sediment are methyl cyclohexane, Aroclor®-1260, arsenic, iron, and vanadium.

3.2 Ecological Risk Assessment

An ecological risk assessment (ERA), through Step 3A of the ERA process, was conducted to evaluate the potential risks to ecological receptors in the terrestrial habitat, north tributary aquatic habitat, and south tributary aquatic habitat at Site 11, and in adjacent Penniman Lake.

3.2.1 Soil - Terrestrial Habitats

Potentially unacceptable risks were identified for terrestrial plants and soil invertebrates from exposure to PAHs (total), 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, dieldrin, endrin, copper, iron, lead, mercury, selenium, thallium, and zinc in surface soil (0-6 inches bgs) and/or subsurface soil (6-24 inches bgs). Unacceptable risks to upper trophic level terrestrial receptors from food web exposures were also identified for 4,4'-DDD, 4,4'-DDE, and

mercury. The highest potential risks were associated with the area around samples 11SS16 and 11SS17 (**Figure 2**), although other localized areas contributing to risk were also identified.

3.2.2 Surface Water and Sediment - Site 11

Potentially unacceptable risks associated with Aroclor-1260 were identified for lower trophic level receptors in surface water, surface sediment (0-4 inches bgs), and subsurface sediment (4-8 inches bgs) from the northern tributary. Aroclor-1260 may also pose an unacceptable risk to avian piscivores using the northern tributary. Arsenic and iron were identified as COPCs in the surface water of the southern tributary, although potential risks associated with these metals appear to be minimal. Aroclor-1260 was identified as a COPC in surface and subsurface sediment at one location in the southern tributary near Penniman Lake. The PCBs in the surface water and sediment of both tributaries do not appear to be site-related; the source of the PCBs is not currently known.

3.2.3 Surface Water and Sediment - Penniman Lake

Aroclor-1260 in lake surface water and surface sediment (but not subsurface sediment) was associated with unacceptable risks for both lower and upper trophic level receptors. The PCBs in lake media do not appear to be associated with Site 11. In addition, arsenic was identified as a COPC in Penniman Lake surface water, although potential risks associated with this metal appear to be minimal. Lead was identified as a COPC in Penniman Lake surface sediment and may be site related. The soil removal action eliminated the source of lead at Site 11.

Comment [WMS3]: Will risks associated with arsenic in surface water be addressed as part of Penniman Lake?

4. Removal Action Summary

The removal of impacted soils was conducted in 2009 to provide long-term protection of human health and the environment and to reduce or eliminate chemicals determined to pose potentially unacceptable risk to ecological receptors in focus Areas 1, 2, 3, and 4 (**Figure 2**) (CH2M HILL, 2008). During the development of the EE/CA, preliminary remediation goals (PRGs) were developed based upon their protectiveness to ecological receptors (**Table 3**). Because there is no potentially unacceptable risk to human health from exposure to soil contamination attributable to the site, PRGs were identified as the higher of ecological screening criteria, background soil concentrations, or PRGs previously established at other CAX or WPNSTA Yorktown sites with similar characteristics. PRGs were not established for all ecological COCs identified based on frequency of detections and extent of screening criteria exceedances as discussed in Section 3.2.3 of the EE/CA. The removal of these constituents would be accomplished through the PRGs established for more prominent COCs.

Pre-construction sampling was performed in January and February 2009 to establish horizontal "clean lines" to define the removal areas. Pre-construction sampling results are provided as Appendix B of the Construction Closeout Report (CCR) (Shaw, 2009). Surface and subsurface (Areas 1 and 2 only) soil samples were collected along the perimeters of each focus area to ensure remediation areas had been fully delineated (**Figure 3**). Samples were

Comment [WMS4]: See comment in References

analyzed for area specific COCs and results were compared against PRGs. The final removal areas are shown on **Figure 3**.

During development of the Removal Action Work Plan, an additional hotspot for removal (Area 5) was identified due to lead exceeding the ecological soil screening criteria at sample location 11SS12 (**Figure 2**). Although the calculated post-remedial (Areas 1 through 4) site-wide risk associated with lead met the PRG without the Area 5 removal, the ~~regulators~~ USEPA and VDEQ Remedial Project Managers expressed concern at the magnitude of the lead concentration at this location and the lack of nearby bounding samples. Surface and subsurface soil samples were collected in March 2009 to delineate the lateral and vertical extent of Area 5 removal. Samples were collected 10 feet and 30 feet north, south, east, and west of 11SS12 and analyzed for lead. Results were compared to the lead PRG and the final removal boundary was established (**Figure 3**).

Focus area excavation was completed in March 2009. Approximately 2,803 cubic yards of contaminated soil and debris and 89 cubic yards of concrete were excavated from focus Areas 1, 2, 3, 4, and 5. Post-excavation confirmation samples were collected from each focus area for comparison to PRGs. Sample locations and analytical results are presented on **Figure 4**. Raw analytical data is presented in Appendix B of the CCR. Each area was excavated until all sample results met established PRGs. Following removal the site was backfilled with clean fill, covered with 6 inches of top soil, and seeded.

5. Supplemental Groundwater Evaluation

To address potentially unacceptable risks associated with potable use of groundwater due to arsenic, iron, and manganese identified in the RI, a supplemental groundwater evaluation is presented below in consideration of **Attachment 1**, the December 6, 2004 Statement to Tier I Teams in which Tier II encourages flexibility by the partnering teams when assessing beneficial use and potability of groundwater and site-specific cleanup goals.

5.1.1 Background

The HHRA indicated that unacceptable risks from groundwater were due principally to two point locations of elevated dissolved arsenic, iron, and manganese in monitoring wells 11GW01 and 11GW05 (**Figure 5**). Groundwater flow direction at Site 11 is northeast towards Penniman Lake (**Figure 1**); therefore, monitoring wells 11GW01 and 11GW05 are located hydraulically upgradient of historic site activities. Detected concentrations of metals in groundwater from monitoring wells 11GW01 and 11GW05 are representative of background conditions and not historic site activities; therefore, should not be considered when evaluating site risks. Because the maximum detected concentrations were used as EPCs to quantitatively evaluate risks to human health, the removal of monitoring wells 11GW01 and 11GW05 from the site impacted well network would reduce the EPCs (maximum detected) of iron and manganese to levels below the adjusted tap-water RSLs. Arsenic was not detected in site impacted monitoring wells. Therefore, these constituents would not be selected as COPCs for further quantitative evaluation in the risk assessment.

5.1.2 No Discernable Plume

Arsenic was detected in two of eight monitoring wells 11GW01 and 11GW05 (Figure 5). Although iron and manganese were detected in several site monitoring wells, concentrations exceeded maximum background concentrations in only 2 of 8 wells. No discernable plume of arsenic, iron, or manganese is present at Site 11.

5.1.3 Aquifer Classification Status

It is anticipated that Cheatham Annex will remain a military installation for the foreseeable future. The Columbia aquifer is not used as a drinking water source at the base and is not anticipated to be used as a drinking water source since other sources of higher quality water are available.

According to the *Guidelines for Ground-Water Classification* (USEPA, 1986), a Class IIB Drinking Water Source is a "potential source of drinking water and water having other beneficial uses." Site 11 may meet the USEPA's guidelines for a Class II drinking water source (TDS less than 10,000 mg/L, treatable constituent concentrations, and yield of 150 gallons/day). However, the Columbia aquifer at Site 11 does not meet the Virginia Private Well Regulations guidelines for installation of groundwater wells for potable use. Yield from Site 11 wells is not likely to meet the Virginia Private Well Regulation guideline of a yield of 5 gallons per minute (gpm) for 10 minutes. Additionally, according to 12 VAC 5-590-840, the shortest permitted casing length for wells is 50 feet (Class II, Type B), which would extend below the bottom depth of the Columbia aquifer underlying Site 11.

Comment [WMS5]: Define

6. Consensus for No Further Action

The 2009 removal action mitigated the unacceptable ecological risk identified in the RI for exposure to soil by removing areas with soil concentrations of COCs exceeding established remediation goals. Therefore, no further actions are warranted to protect ecological receptors from potential exposures to soil. Potentially unacceptable ecological risks associated with exposure to surface water and sediment in the unnamed tributaries and Penniman Lake were identified due to Aroclor-1260. However, data indicate this constituent is not related to historic Site 11 activities and, therefore, PCBs within these tributaries and Penniman Lake will be addressed as part of Penniman Lake investigations.

Although the arsenic, iron, and manganese groundwater concentrations evaluated in the RI result in non-cancer hazards and cancer risks greater than USEPA's acceptable thresholds, with the exception of upgradient monitoring wells 11GW01 and 11GW05, concentrations of iron and manganese detected in site impacted monitoring wells are below background and arsenic is not detected. No discernable metals plume is present at the site. Elevated concentrations of these constituents have been detected in hydraulically upgradient groundwater collected from monitoring wells 11GW01 and 11GW05 and are a reflection of background conditions and not a CERCLA release from historic Site 11 activities. For these reasons, no further action is warranted for groundwater at Site 11.

7. References

Baker. 2000. *Draft Removal Closeout Report, Site 11 – Bone Yard, Naval Weapons Station Yorktown, Cheatham Annex, Williamsburg, Virginia.* April.

Baker. 2007. *Remedial Investigation Site 11 – Bone Yard, Naval Weapons Station Yorktown, Cheatham Annex, Williamsburg, Virginia.* April.

CH2M HILL. 2008. *Engineering Evaluation/Cost Analysis (EE/CA), Site 11 (Bone Yard), Naval Weapons Station Yorktown, Cheatham Annex, Williamsburg, Virginia.* November.

Shaw Environmental, Inc. (Shaw). 2009. *Final Work Plan, Site 11 Hot Spot Removal Action, Naval Weapons Station Yorktown, Cheatham Annex, Williamsburg, Virginia.* February.

Shaw. 2009. *Draft Final Construction Completion Report Hot Spot ~~removal~~ Removal Action at Site 11, Naval Weapons Station Yorktown, Cheatham Annex, ~~Yorktown Naval Weapons Station,~~ Williamsburg, Virginia.* ~~July~~August.

Comment [WMS6]: Cannot have two (Shaw, 2009) references

No Further Action Consensus for Site 11

The Navy, in partnership with the USEPA and VDEQ, agree that, based on the lines of evidence presented in this Technical Memorandum *"Risk Mitigation and Management of Metals in Soil and Groundwater, Site 11 - Bone Yard"*, risks associated with PCBs in sediment and surface water will be addressed as part of Penniman Lake and NFA for soil and groundwater are necessary at Site 11 to protect human health and the environment.

Comment [WMS7]: This is not the title of this Tech Memo

Mr. Christopher Murray
NAVFAC Mid-Atlantic

_____ Date _____

Ms. Sue Haug
USEPA Region 3

_____ Date _____

Mr. Wade Smith
Virginia DEQ

_____ Date _____

Tables

Figures

Attachment 1
Statement to Tier 1 Teams