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ST JULIENS CREEK
5090.3a

REVISED FINAL TECHNICAL MEMORANDUM MINOR MODIFICATIONS TO THE SELECTED REMEDY PRESENTED IN THE RECORD OF DECISION FOR SITE 2 WASTE DISPOSAL AREA B ST JULIENS CREEK ANNEX VA

10/14/2014

CH2M HILL

Minor Modifications to the Selected Remedy Presented in the Record of Decision for Site 2 – Waste Disposal Area B, St. Juliens Creek Annex, Chesapeake, Virginia

PREPARED FOR: St. Juliens Creek Annex Tier I Partnering Team

PREPARED BY: CH2M HILL

DATE: October 14, 2014

1 Scope and Purpose

This technical memorandum provides a summary of modifications to the selected remedy documented in the *Final Record of Decision, Site 2: Waste Disposal Area B, EPA Designation: OU-2 Landfill B* (Naval Facilities Engineering Command [NAVFAC], 2011). This technical memorandum was prepared under the United States Navy, NAVFAC Mid-Atlantic, Comprehensive Long-term Environmental Action—Navy 8012 Program, Contract N62470-11-D-8012, Contract Task Order WE05 for submittal to the St. Juliens Creek Annex (SJCA) Environmental Restoration (ER) Partnering Team, which consists of representatives from NAVFAC Mid-Atlantic, United States Environmental Protection Agency (USEPA) Region 3, and Virginia Department of Environmental Quality.

In accordance with USEPA's Guidance *A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents* (USEPA, 1999), post-Record of Decision (ROD) changes fit into one of three categories depending on the extent and scope of modification: non-significant or minor changes, significant changes, or fundamental changes. The modifications to the Site 2 selected remedy, detailed in Section 3, do not have a significant impact on the scope, performance, or cost of the remedy and are considered to be non-significant or minor modifications. This technical memorandum documents the modifications and will become part of the Administrative Record file for SJCA.

2 Background and Description of Selected Remedy

Site 2 consists of a former waste disposal area and former Installation Restoration (IR) Site 17 (buildings used for lead-acid battery maintenance) and is located in the southern portion of SJCA (**Figure 1**). Initially, refuse was burned openly onsite and used to fill portions of an inlet located in the center of the site. The inlet was surrounded by brush, trees, and grass, and directly connected to St. Juliens Creek through a culvert. The Site 2 inlet is no longer present at the site, as it was filled in during implementation of the selected remedy. Former IR Site 17 was incorporated into the Site 2 boundary due to the proximity of the sites. **Figure 1** shows the site conditions prior to implementation of the selected remedy.

The human health and ecological risk assessments conducted as part of the remedial investigation (RI) for Site 2 identified potential risks to human and ecological receptors from exposure to chemicals in soil (semi-volatile organic compounds [SVOCs], primarily polycyclic aromatic hydrocarbons [PAHs]; and inorganics), shallow aquifer groundwater (chlorinated volatile organic compounds [VOCs]), sediment (inorganics and PAHs), and surface water (chlorinated VOCs and inorganics). In addition, based on the nature of waste materials, the waste, which was not fully characterized, was assumed to pose a potential risk to human health and the environment. The ROD documenting the selected remedy was signed in January 2011. Following completion of the Site 2 ROD, a Remedial Design (RD) (CH2M HILL, 2011b) and RD Addendum

(CH2M HILL, 2013) were submitted to implement the selected remedy. The RA was initiated in April of 2012 and is currently in the operation phase.

The following Remedial Action Objectives (RAOs) for Site 2 were identified:

- Waste, soil, and sediment (including sediment pore water):
  - Prevent direct media contact with human and ecological receptors at concentrations that pose unacceptable risks
  - Prevent migration of contaminants through surface water runoff and erosion pathways
  - Prevent or minimize transport of constituents of concern (COCs) from waste to site media, including groundwater
- Shallow aquifer groundwater:
  - Reduce contaminant source mass to the maximum extent practicable
  - Prevent activities that might cause migration of COCs in the shallow aquifer to the underlying Yorktown (deep) aquifer
  - Prevent migration of COCs from shallow aquifer groundwater to surface water and sediment
  - Reduce COC concentrations in shallow aquifer groundwater to the maximum extent practicable
  - Prevent human exposure to COCs present in shallow aquifer groundwater at concentrations that pose unacceptable risks
- Surface Water:
  - Minimize degradation of surface water through source control in shallow aquifer groundwater, waste, surface soil, and sediment

The selected remedy identified in the ROD for Site 2 was chosen to meet the RAOs and includes the following major components:

- Cover installation over waste, soil, and inlet sediment
- Excavation of St. Juliens Creek sediment
- Enhanced reductive dechlorination (ERD) within high-concentration target area of shallow aquifer groundwater
- Monitored Natural Attenuation (MNA) within low-concentration, naphthalene, and heptachlor epoxide target areas of shallow aquifer groundwater
- Land use controls (LUCs)
- Performance monitoring
- Contingency permeable reactive barrier (PRB)

The conceptual layout for the selected remedy at the initiation of the RD (CH2M HILL, 2011b) is shown in **Figure 2**.

3 Description of Minor Modifications

During the construction phase of the RA, conducted from May 2012 through July 2014, two minor modifications to the RD (CH2M HILL, 2011b) were implemented. The minor modifications include the following:

- Extension of the cover
- Revision of the LUC boundaries, LUC objectives, and LUC remedy component

The SJCA ER Partnering Team has discussed and concurs with the modifications. The modifications are summarized in the following sections.

3.1 Extension of the Cover

Extension to the East

When Site 17 was incorporated into Site 2, the site boundary was extended north, which resulted in a small area without waste or risks to be included within the site boundary, and that site boundary was carried forward in the ROD. During the RD (CH2M HILL, 2011b) it was determined that the area east of the extent of waste needed to be incorporated into the cover to achieve appropriate grading and the soil cover was extended approximately 35 feet to the east towards the existing asphalt road, Reservoir Road (**Figure 3)**. The soil cover extension meets all of the design requirements set forth in the RD (CH2M HILL, 2011b) specifications.

Extension to the West

Near the western boundary of Site 2, a portion of the ERD area falls outside of the Waste, Soil, and Inlet Sediment Area (Figure 2). Although no waste is present in this area, during the RD (CH2M HILL, 2011b) it was determined that the area should be incorporated into the cover design to achieve appropriate grading and provide a suitable work area for the ERD implementation. Therefore, the soil cover was extended approximately 35 feet to the west towards Cradock Street (**Figure 3**). The soil cover extension meets all of the design requirements set forth in the RD (CH2M HILL, 2011b) specifications.

Extension to the Northwest

During RA construction activities, subsurface waste was encountered outside of the extent of waste depicted in the ROD and the designed soil cover (**Figure 3**). The waste was encountered during excavation activities that were being conducted to redirect the stormwater, which previously flowed through the Site 2 inlet, to the enhanced extended detention basin being constructed west of Site 2. Approximately 200 cubic yards of waste and soil was excavated to facilitate the stormwater system work and was placed within the limits of the Site 2 soil cover with Partnering Team consensus. Additional waste was visible beyond the stormwater system work area and was left in place.

The Partnering Team revised the waste boundary (**Figure 3**), taking into consideration the following:

- **Findings during the storm sewer installation in the parking lot:** Described above.
- **Historical imagery and Public Works drawings:** Review of historical imagery and building locations identified what appears to be a natural drainage in the area where waste disposal was identified (near former Building 249). Between 1937 and 1949 (**Figure 4**), possibly in association with the construction of Building 249, the drainage appeared to have been filled in. This former drainage and fill area coincided with a “dump” area shown in the 1942 Public Works Drawing 16606 (**Figure 3**). Therefore, the team assumed that waste could extend to the footprint of the former drainage.
- **Building 1556 construction records:** The Building 1556 as-built drawings did not contain notes of waste encountered on the building or utility demolition plans or the utility installation plans, and the grading plans showed no significant changes in grade (i.e., excavation or fill) in the area south of Building 1556. Therefore, it was assumed that additional waste was not placed and that existing waste was not moved. The geotechnical borings had no indications of waste or non-native material, except for M-6, which referenced “wood fragments” from a depth of 8 to 13 feet below ground surface (bgs). Therefore, the waste boundary was refined to include geotechnical boring M-6 and exclude the others.
- **The Virginia Electric and Power Company (VEPCO) utility easement:** No record of waste or debris within the VEPCO utility easement that runs along Cradock Street has been identified. Therefore, the western waste boundary was established at the eastern limit of the easement.

- **Additional waste delineation activities:** Twelve soil borings were advanced in grassed areas in the vicinity of the "dump" and former natural drainage area. The soil borings were advanced to 15 feet bgs and visually observed for waste. Waste was identified in several of the borings (CB&I, 2013). The Partnering Team agreed that the waste in the top 2 feet (asphalt, concrete, brick, gravel, pipe/pipe casing, plastic sheeting, wire, and metal) was not indicative of historical waste disposal operations.

Sampling was performed to verify that the grass-covered areas in the western extension of the waste boundary met the RD (CH2M HILL, 2011b) criteria for the soil cover. In April 2014, one 5-point composite soil sample was collected from each of the two grass-covered areas (**Figure 3**). The samples were collected from 0 to 2 feet bgs (i.e., the soil cover thickness criterion) and analyzed in accordance with the Site 2 RD (CH2M HILL, 2011b) off-site borrow material specifications, which included analysis for: volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), herbicides, total metals, total petroleum hydrocarbons-diesel range organics (TPH-DRO), and total petroleum hydrocarbons-gasoline range organics (TPH-GRO). The field notes for the sampling events are provided in **Attachment A**. The analytical results are provided in **Attachment B** and the data validation summary report is provided in **Attachment C**.

The analytical results (**Table B-1**) were compared to the industrial Regional Screening Levels (RSLs) (**Table B-2**). One SVOC (benzo(a)pyrene) and two metals (arsenic and chromium) were detected in the soil samples at concentrations that exceed their industrial RSLs (**Table B-2**). The exceedances were compared to the SJCA 95% upper tolerance limit (UTL) background values (Bohicket and Munden Tetotem soil types) and the Site 2 ROD cleanup levels. The Bohicket soil type is a very poorly-drained soil of tidal marshes, including the former wetland of Site 2. The Munden Tetotem soil type is a moderately well-drained soil found in the southwest portion of SJCA, including the upland areas of Site 2; in the north central portion of the facility along Craddock Street; and along the northwest boundary of SJCA. The Bohicket background values were used to develop the cleanup levels in the ROD because at the time, the site was draining to the wetland inlet area of the site. However, because the inlet was filled in during installation of the cover, the data were also compared to the Munden Tetotem background values. Below is an evaluation of the constituents that exceeded the industrial RSLs.

- The Benzo(a)pyrene detections (170 and 320 micrograms [µg]/kilogram [kg]) are below the ROD cleanup level (1,100 µg/kg), below the SJCA 95% UTL background value established for Bohicket soil type (732 µg/kg), and similar to the SJCA 95% UTL background value established for Munden Tetotem soil type (91 µg/kg). Benzo(a)pyrene was identified as a COC in the ROD based on ecological risk, and was not identified as a human health risk-driver. The current concentrations are less than the concentrations detected during the RI/Expanded RI (maximum concentration of 1,400 µg/kg); therefore, it is assumed that the concentrations would not change the ROD cleanup level.
- Arsenic was not identified as a site COC in the ROD; therefore, there is no ROD cleanup value for comparison. The arsenic detections (3.76 and 2.02 milligrams [mg]/kg) are below the SJCA 95% UTL background values established for the Bohicket (21 mg/kg) and Munden Tetotem (5.7 mg/kg) soil types. Additionally, arsenic is very common in borrow sources and a variance was received during installation of the cover to use a borrow source that had an arsenic concentration (5.4 mg/kg) above the industrial RSL.
- Chromium was not identified as a site COC in the ROD; therefore, there is no ROD cleanup value for comparison. The chromium detections (4.33 and 11.4 mg/kg) are below the SJCA 95% UTL background values established for the Bohicket (53 mg/kg) and subsurface Munden Tetotem (18 mg/kg) soil types. At one location, the chromium concentration (11.4 mg/kg) exceeded the surface Munden Tetotem (9.6 mg/kg) background UTL; however, the detected concentration was similar in magnitude. Additionally, the chromium detections are similar to the concentrations of chromium that were detected in the borrow sources used for the cover (8.8 mg/kg for topsoil and 11.1 mg/kg for general fill).

Based on evaluation of the data, the existing soil chemical composition and thickness (greater than two feet) is consistent with the soil cover design and appropriate for the remedy. During the May 2014 partnering team meeting, the SJCA Partnering team agreed that no additional investigation or action is needed (beyond the LUCs to prevent exposure to subsurface waste) for those areas.

3.2 Revision of Land Use Control Boundaries, Land Use Control Objectives, and Land Use Control Remedy Component

Land Use Control Boundaries

As a result of the previously mentioned soil cover extensions on the eastern and western sides of the site, the Partnering Team agreed to expand the LUC boundary to include the areas to prevent digging into the soil cover (**Figure 5**). Additionally, it was agreed to slightly shift the LUC boundary in that area to the west edge of Reservoir Road because no waste or risks were identified within Reservoir Road or east of the road (**Figure 5**).

Based on the identification of waste outside of the designed soil cover on the northwestern side of the site, the Partnering Team agreed to extend the LUC boundary to include the areas where waste was identified.

The Partnering Team also agreed to revise the LUC boundary names to be based on media/exposure for consistency with the LUC boundaries facility-wide. The revised LUC boundaries are shown on **Figure 5** and consist of the groundwater (potable use), groundwater (inhalation), and waste and soil LUC boundaries. The waste and soil LUC boundary is a combination of the historical inlet disposal area and historical parking lot disposal area LUC boundaries.

Land Use Control Objectives

As a result of the changes in the LUC boundaries, the LUC objectives provided in the ROD (NAVFAC, 2011) and LUC RD (CH2M HILL, 2011a) were reviewed and revised to reflect the varying conditions within the expanded boundary and allow necessary base operations within Site 2 to be completed. The Partnering Team agreed to the following LUC objectives:

- Historical Inlet Disposal Area: Prohibit digging into the cover, disposal area contents, and/or contaminated soil and sediment except as required for Remedial Action-Operation and maintenance with the application of controls to prevent uncontrolled exposure to waste and contaminants in soil and inlet sediment that pose an unacceptable risk.
- Historical Parking Lot Disposal Area: Prohibit digging into the cover, disposal area contents, and/or contaminated soil and sediment except as required for Remedial Action-Operation and maintenance and/or facility operation and maintenance with the application of controls to prevent uncontrolled exposure to waste and contaminants in soil and inlet sediment that pose an unacceptable risk.

Land Use Control Remedy Component

The LUC remedy component provided in the ROD (NAVFAC, 2011) and LUC RD (CH2M HILL, 2011a) was updated to address varying site conditions, including both physical characteristics and operational needs, within the expanded site boundary. The Partnering Team agreed to the following LUC remedy component: LUCs to maintain the cover and prevent uncontrolled exposure to waste and contaminants in soil and inlet sediment that pose an unacceptable risk.

A revised final LUC RD is under development to further document the LUC changes.

4 Conclusions

The construction phase of the RA for the selected remedy at Site 2 was completed in July 2014 in accordance with the RD (CH2M HILL, 2011b), RD Addendum (CH2M HILL, 2013), and the minor modifications

described in this technical memorandum. The selected remedy as presented in the ROD (NAVFAC, 2011) and the minor modifications presented herein remains protective of human health and the environment, complies with federal and state ARARs, is cost-effective, utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable, and includes treatment as a principal element. Because the remedy will result in hazardous substances, pollutants, or contaminants remaining onsite above levels that allow for unlimited use and unrestricted exposure, the Navy will maintain LUCs and conduct a statutory remedy review every 5 years after initiating remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

A construction closeout report is being prepared to summarize the construction activities and the variations from the original scope of work and engineering specifications. Additionally, an interim remedial action completion report will be prepared in accordance with the USEPA's Guidance "*Close Out Procedures for National Priorities List Sites"* (USEPA, 2011) to document the completion of the RA, the remedy in place (RIP), and that the remedy is operational and functional in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act.

5 References

CB&I. 2013. *Waste Delineation Investigation Technical Memorandum, St. Juliens Creek Annex, Site 2, Chesapeake, Virginia.* September.

CH2M HILL. 2010 revision. *Expanded Remedial Investigation Report for Site 2, St. Juliens Creek Annex, Chesapeake, Virginia.* January.

CH2M HILL. 2011a. Final Land Use Control Remedial Design, Site 2: Waste Disposal Area B (USEPA OU-2: Landfill B), *St. Juliens Creek Annex, Chesapeake, Virginia*. March.

CH2M HILL. 2011b. *Final 100% Design Submittal Site 2 Basis of Design Report, St. Juliens Creek Annex, Chesapeake, Virginia*. November.

CH2M HILL. 2013. *Final 100% Design Submittal Site 2 Basis of Design Report Addendum, St. Juliens Creek Annex, Chesapeake, Virginia*. January.

NAVFAC. 2011. *Final Record of Decision, Site 2: Waste Disposal Area B, USEPA Designation: OU-1 Landfill B, St. Juliens Creek Annex, Chesapeake, Virginia*. January.

USEPA. 1999. *A Guide to Preparing Superfund Proposed Plans, Records of Decisions, and Other Remedy Selection Decision Documents*. USEPA 540-R-98-031, OSWER 9200.1-23P, PB98-963241. July.

USEPA. 2011. *Close Out Procedures for National Priorities List Sites*. OSWER 9320.2-22. May.

Figures

R:\USNavFacEngCom405450\387405StJuliensCreek\MapFiles\423809_Site2_Memo\Figure 1 - Site 2 Vicinity.mxd7/28/2014cbowman

Legend

- ROD Site 2 Boundary
- Former Site 17 Boundary
- ROD Extent of Waste
- Approximate Location of UST
- Approximate Location of AST
- Storm Sewer System
- Drainage
- Wetlands
- Demolished Building

Notes:
Figure represents the site conditions prior to implementation of the selected remedy.

N W E S

0 60 120 Feet

Figure 1
Pre-Remedial Action Site Vicinity
St. Juliens Creek Annex
Chesapeake, Virginia

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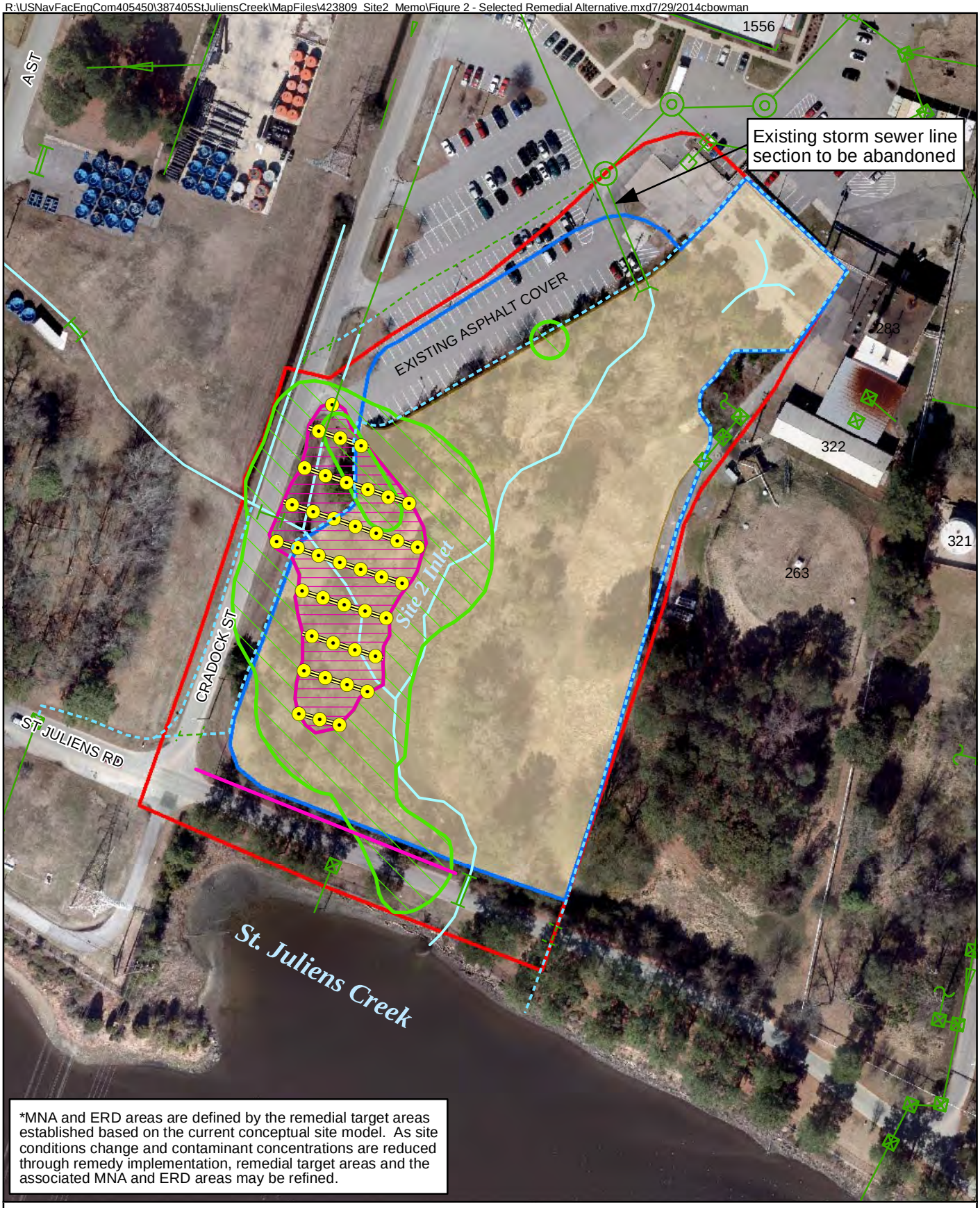
R:\USNavFacEngCom405450\387405StJuliensCreek\MapFiles\423809_Site2_Memo\Figure 2 - Selected Remedial Alternative.mxd7/29/2014cbowman



*MNA and ERD areas are defined by the remedial target areas established based on the current conceptual site model. As site conditions change and contaminant concentrations are reduced through remedy implementation, remedial target areas and the associated MNA and ERD areas may be refined.

Legend

- Site 2 Boundary
- Soil Cover Extent
- Drainage
- MNA Area*
- ERD Area*
- Waste, Soil, and Inlet Sediment Area
- Storm Sewer Lines
- Potential New Storm Sewer Line
- Potential New Drainage
- ERD Injection Line*
- ERD Injection Well*
- Contingency PRB*

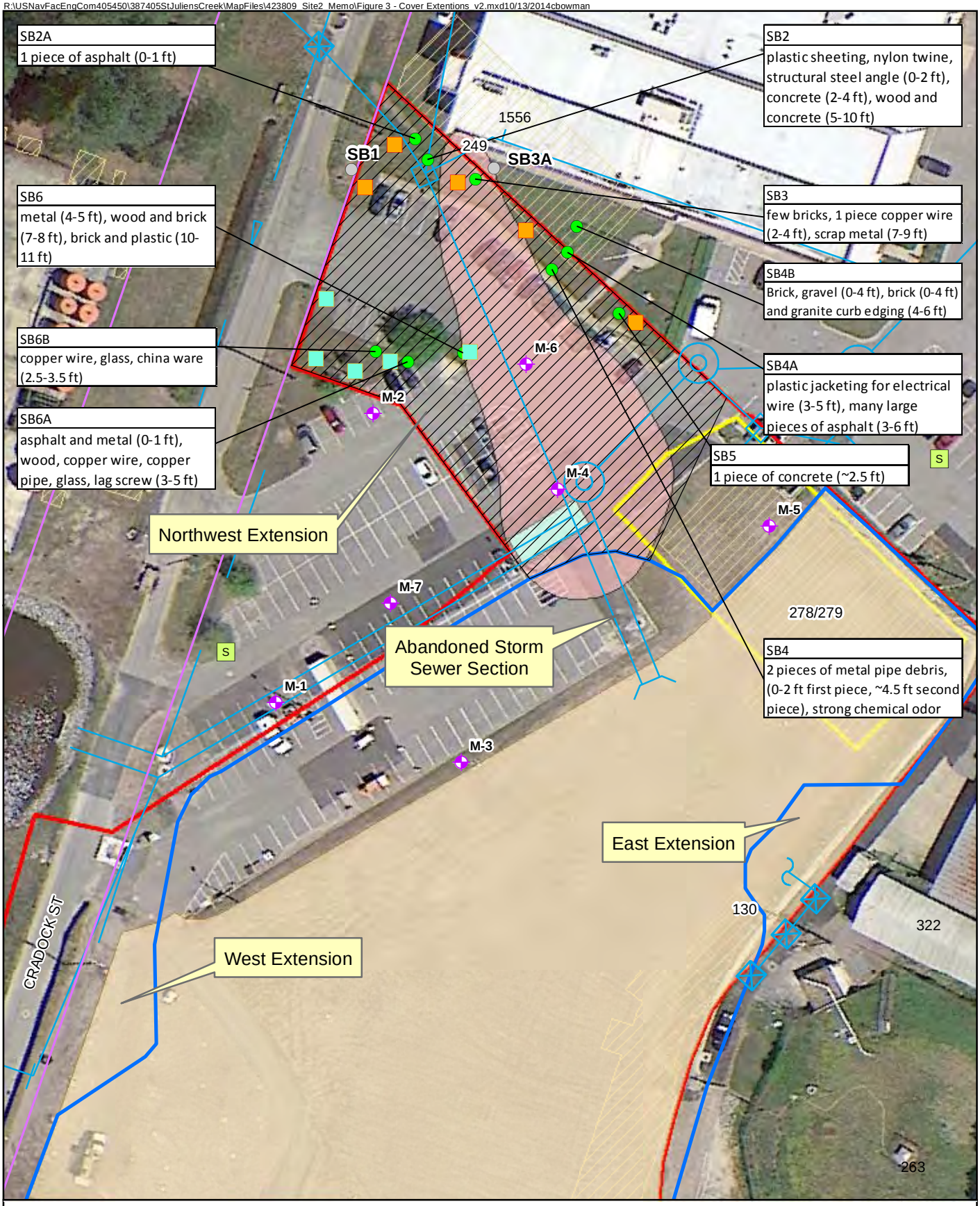
N W E S

0 60 120 Feet

Figure 2
Selected Remedial Alternative
Conceptual Layout
St. Juliens Creek Annex
Chesapeake, Virginia

CH2MHILL

R:\USNavFacEngCom405450\387405StJuliensCreek\MapFiles\423809_Site2_Memo\Figure 3 - Cover Extentions_v2.mxd10/13/2014cbowman



Legend

- Geotechnical Boring Location
- DPT Soil Boring Location with Debris
- DPT Soil Boring Location without Debris
- SJS02-BRS01 (5 Point Composite)
- SJS02-BRS02 (5 Point Composite)
- S LUC Sign
- VEPCO Utility Easement
- Storm Sewer System
- Drainage
- Demolished Buildings
- Waste, Soil, and Inlet Sediment Area
- Former Site 17 Boundary
- Updated Site 2 Boundary
- RD Soil Cover Boundary
- Excavated Waste During Storm Sewer Installation
- Dump Area, 1942 Public Works Drawing
- Additional Waste (Northwest Extension)

N W E S

0 35 70 Feet

Imagery: © 2014 Google

Figure 3
Cover Extensions
St. Juliens Creek Annex
Chesapeake, Virginia

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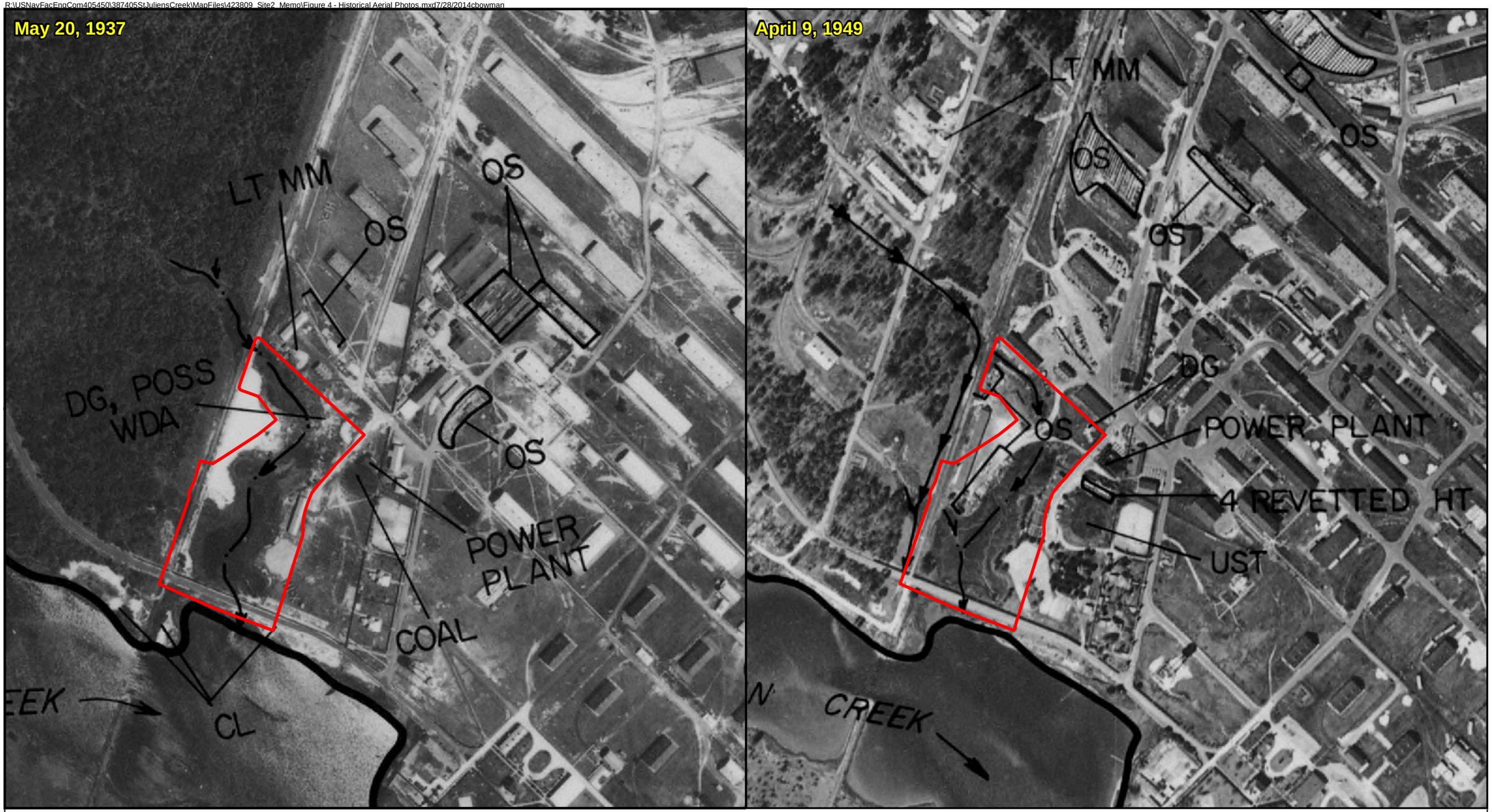
R:\USNavFacEngCom405450\387405StJuliensCreek\MapFiles\423809_Site2_Memo\Figure 4 - Historical Aerial Photos.mxd7/28/2014cbowman



Legend

- Updated Site 2 Boundary
- Drainage (Channelized)
- Drainage (Natural)

DG - Disturbed Ground
OS - Open Storage Area
WDA - Waste Disposal Area

Source:
Aerial Photographic Site Analysis
Norfolk Naval Shipyard: Annex Areas
Norfolk, Virginia
February 1995

N
W E
S

0 150 300 600
Feet

Figure 4
Historical Aerial Photo Review
St. Juliens Creek Annex
Chesapeake, Virginia

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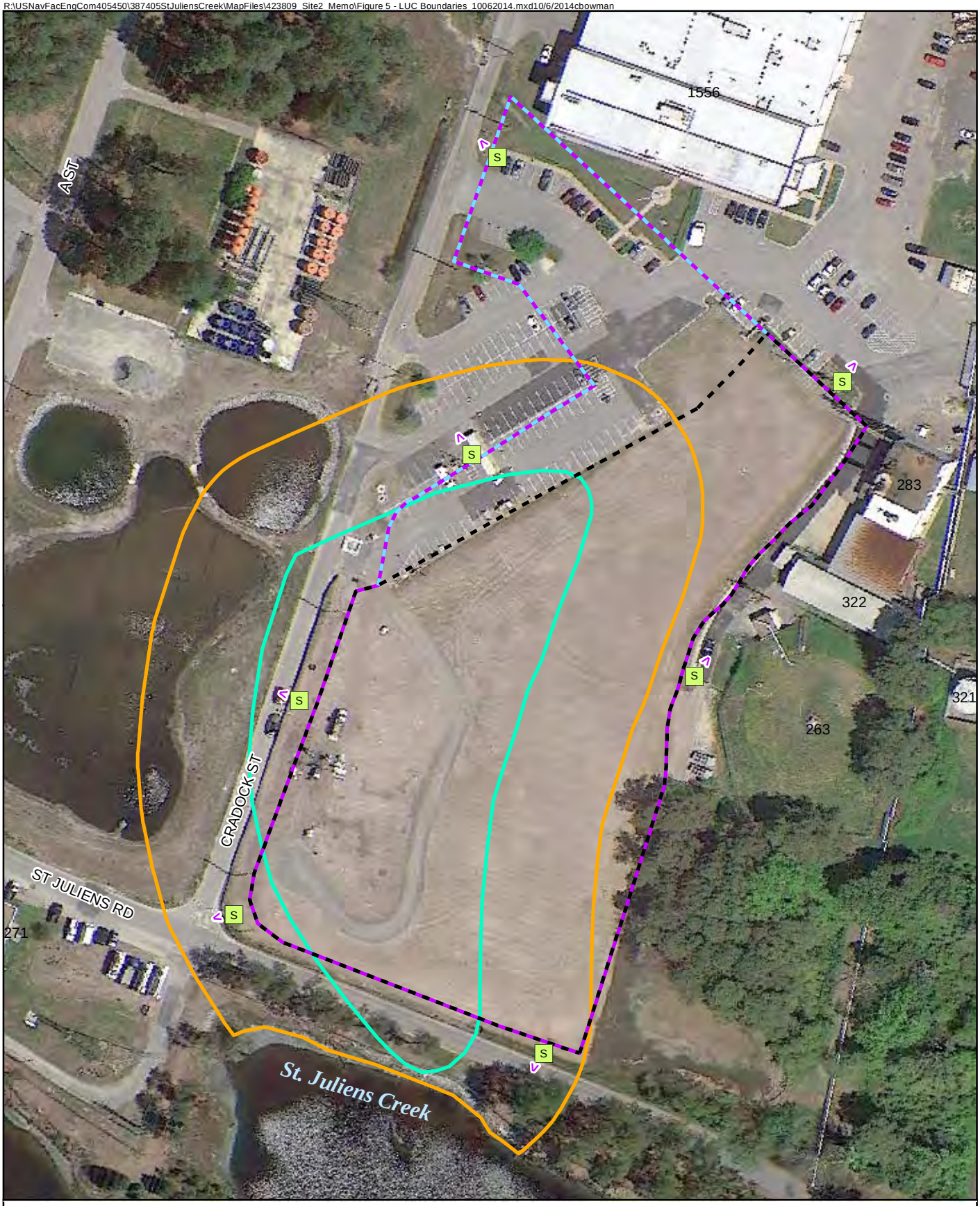
R:\USNavFacEngCom405450\387405StJuliensCreek\MapFiles\423809_Site2_Memo\Figure 5 - LUC Boundaries_10062014.mxd10/6/2014cbowman



Legend

> Indicates facing direction of sign

S LUC Sign

Land Use Control Boundary - Groundwater (Potable use)

Land Use Control Boundary - Groundwater (Inhalation)

Land Use Control Boundary - Waste and Soil

Historical Inlet Disposal Area LUC Boundary

Historical Parking Lot Disposal Area LUC Boundary

N W E S

0 60 120 Feet

Imagery: © 2014 Google

Figure 5
LUC Boundaries
St. Juliens Creek Annex
Chesapeake, Virginia

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Attachment A
Field Notes

Location SJCA CHESAPEAKE, VA Date 4/8/14

Project / Client SITE 2 BORROW SOIL

1325 - DEPART VBO

1350 - ARRIVE AT SITE 2, CHECK IN AT CB&I TRAILER

1415 - COLLECT SJS02-BRS01-040814

*5-POINT COMPOSITE SAMPLE; NO DEBRIS NOTED AT ANY LOCATION; SMALL ROCKS (<1") BELOW TOPSOIL LAYER AT ALL 5 LOCATIONS

1445 - COLLECT SJS02-BRS02-040814

*5-POINT COMPOSITE SAMPLE; NO DEBRIS NOTED AT ANY LOCATION; SMALL ROCKS (<1") BELOW TOPSOIL LAYER AT ALL 5 LOCATIONS

SAMPLE COORDINATES

- SJS02-BRS01-01 ⇒ 12122598.32/3453225.41
- BRS01-02 ⇒ 12122614.03/3453247.81
- BRS01-03 ⇒ 12122647.19/3453227.96
- BRS01-04 ⇒ 12122683.09/3453202.86
- BRS01-05 ⇒ 12122740.64/3453154.66

- BRS02-01 ⇒ 12122577.97/3453166.83
- BRS02-02 ⇒ 12122572.58/3453135.71
- BRS02-03 ⇒ 12122593.22/3453129.08
- BRS02-04 ⇒ 12122611.76/3453134.33
- BRS02-05 ⇒ 12122653.51/3453139.26

(NP)

Location SJCA CHESAPEAKE, VA Date 4/8/14

Project / Client SITE 2 BORROW SOIL

1550 - DEPART SITE 2 TO PACK AND SHIP COOLER

1800 - COOLER DROPPED OFF AT FEDEX FOR OVERNIGHT SHIPPING

Jad Rice 4/8/14

Attachment B
Analytical Data Tables

TABLE B-1

Site 2 Soil Raw Analytical Data

Minor Modifications to the Selected Remedy Presented in the ROD for Site 2

St. Juliens Creek Annex

Chesapeake, Virginia

Sample ID	SJS-BRS01-040814	SJS-BRS02-040814
Sample Date	4/8/14	4/8/14
Chemical Name		
Volatile Organic Compounds (µg/kg)		
1,1,1-Trichloroethane	2 U	2.3 U
1,1,2,2-Tetrachloroethane	2 UJ	2.3 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	2 U	2.3 U
1,1,2-Trichloroethane	2 U	2.3 U
1,1-Dichloroethane	2 U	2.3 U
1,1-Dichloroethene	2 U	2.3 U
1,2,4-Trichlorobenzene	2 UJ	2.3 U
1,2-Dibromo-3-chloropropane	2 UJ	2.3 U
1,2-Dibromoethane	2 U	2.3 U
1,2-Dichlorobenzene	2 UJ	2.3 U
1,2-Dichloroethane	2 U	2.3 U
1,2-Dichloropropane	2 U	2.3 U
1,3-Dichlorobenzene	2 UJ	2.3 U
1,4-Dichlorobenzene	2 UJ	2.3 U
2-Butanone	10 UJ	11 UJ
2-Hexanone	10 U	11 U
4-Methyl-2-pentanone	10 U	11 U
Acetone	10 UJ	11 UJ
Benzene	2 U	2.3 U
Bromodichloromethane	2 U	2.3 U
Bromoform	2 U	2.3 U
Bromomethane	4.1 U	4.6 U
Carbon disulfide	2 U	2.3 U
Carbon tetrachloride	2 U	2.3 U
Chlorobenzene	2 U	2.3 U
Chloroethane	4.1 U	4.6 U
Chloroform	2 U	2.3 U
Chloromethane	4.1 U	4.6 U
cis-1,2-Dichloroethene	2 U	2.3 U
cis-1,3-Dichloropropene	2 U	2.3 U
Cyclohexane	2 U	2.3 U
Dibromochloromethane	2 U	2.3 U
Dichlorodifluoromethane (Freon-12)	4.1 U	4.6 U
Ethylbenzene	2 U	2.3 U
Isopropylbenzene	2 UJ	2.3 U
m- and p-Xylene	4.1 U	4.6 U
Methyl acetate	2.5 U	2.7 U
Methylcyclohexane	2 U	2.3 U
Methylene chloride	10 U	11 U
Methyl-tert-butyl ether (MTBE)	2 U	2.3 U
o-Xylene	2 U	2.3 U
Styrene	2 U	2.3 U
Tetrachloroethene	2 U	2.3 U
Toluene	2 U	2.3 U
trans-1,2-Dichloroethene	2 U	2.3 U
trans-1,3-Dichloropropene	2 U	2.3 U
Trichloroethene	2 U	2.3 U
Trichlorofluoromethane (Freon-11)	4.1 U	4.6 U
Vinyl chloride	4.1 U	4.6 U
Xylene, total	6.2 U	6.8 U
Semivolatile Organic Compounds (µg/kg)		
1,1-Biphenyl	270 U	280 U
2,2'-Oxybis(1-chloropropane)	270 UJ	280 UJ
2,4,5-Trichlorophenol	670 U	710 U
2,4,6-Trichlorophenol	270 U	280 U
2,4-Dichlorophenol	270 U	280 U
2,4-Dimethylphenol	270 U	280 U
2,4-Dinitrophenol	670 U	710 U
2,4-Dinitrotoluene	270 U	280 U
2,6-Dinitrotoluene	270 U	280 U
2-Chloronaphthalene	270 UL	280 UL
2-Chlorophenol	270 U	280 U
2-Methylnaphthalene	270 U	280 U
2-Methylphenol	270 U	280 U
2-Nitroaniline	670 U	710 U
2-Nitrophenol	270 U	280 U
3- and 4-Methylphenol	270 U	280 U
3,3'-Dichlorobenzidine	270 U	280 U
3-Nitroaniline	670 U	710 U
4,6-Dinitro-2-methylphenol	670 U	710 U
4-Bromophenyl-phenylether	270 U	280 U
4-Chloro-3-methylphenol	270 U	280 U
4-Chloroaniline	270 UJ	280 UJ
4-Chlorophenyl-phenylether	270 U	280 U

TABLE B-1

Site 2 Soil Raw Analytical Data

Minor Modifications to the Selected Remedy Presented in the ROD for Site 2

St. Juliens Creek Annex

Chesapeake, Virginia

Sample ID	SJS-BRS01-040814	SJS-BRS02-040814
Sample Date	4/8/14	4/8/14
Chemical Name		
4-Nitroaniline	670 U	710 U
4-Nitrophenol	670 U	710 U
Acenaphthene	270 U	280 U
Acenaphthylene	270 U	280 U
Acetophenone	270 U	280 U
Anthracene	270 U	280 U
Atrazine	270 UJ	280 UJ
Benzaldehyde	270 UJ	280 UJ
Benzo(a)anthracene	**260 J**	**130 J**
Benzo(a)pyrene	**320 J**	**170 J**
Benzo(b)fluoranthene	**500**	**280 J**
Benzo(g,h,i)perylene	**130 J**	280 UJ
Benzo(k)fluoranthene	**250 J**	**140 J**
bis(2-Chloroethoxy)methane	270 U	280 U
bis(2-Chloroethyl)ether	270 UJ	280 UJ
bis(2-Ethylhexyl)phthalate	270 U	280 U
Butylbenzylphthalate	270 U	280 U
Caprolactam	270 UJ	280 UJ
Carbazole	270 U	280 U
Chrysene	**380**	**180 J**
Dibenz(a,h)anthracene	270 U	280 U
Dibenzofuran	270 U	280 U
Diethylphthalate	270 U	280 U
Dimethyl Phthalate	270 U	280 U
Di-n-butylphthalate	270 U	280 U
Di-n-octylphthalate	270 U	280 U
Fluoranthene	**410**	**190 J**
Fluorene	270 U	280 U
Hexachlorobenzene	270 U	280 U
Hexachlorobutadiene	270 U	280 U
Hexachlorocyclopentadiene	270 U	280 U
Hexachloroethane	270 U	280 U
Indeno(1,2,3-cd)pyrene	**200 J**	280 U
Isophorone	270 U	280 U
Naphthalene	270 U	280 U
Nitrobenzene	270 U	280 U
n-Nitroso-di-n-propylamine	270 U	280 U
n-Nitrosodiphenylamine	270 U	280 U
Pentachlorophenol	670 UJ	710 UJ
Phenanthrene	**240 J**	280 U
Phenol	270 U	280 U
Pyrene	**680**	**270 J**
Pesticide/Polychlorinated Biphenyls (µg/kg)		
4,4'-DDD	**14 J**	**15 J**
4,4'-DDE	**30 J**	**35 J**
4,4'-DDT	**22 J**	**130 J**
Aldrin	0.91 UJ	0.94 UJ
alpha-BHC	0.91 UJ	0.94 UJ
alpha-Chlordane	**7.4 J**	0.94 UJ
Aroclor-1016	9.1 U	8.4 U
Aroclor-1221	9.1 U	8.4 U
Aroclor-1232	11 U	9.9 U
Aroclor-1242	9.1 U	8.4 U
Aroclor-1248	9.1 U	8.4 U
Aroclor-1254	9.1 U	8.4 U
Aroclor-1260	9.1 U	8.4 U
beta-BHC	0.91 UJ	0.94 UJ
delta-BHC	0.91 UJ	0.94 UJ
Dieldrin	1.8 UJ	1.8 UJ
Endosulfan I	0.91 UJ	0.94 UJ
Endosulfan II	1.8 UJ	1.8 UJ
Endosulfan sulfate	1.8 UJ	1.8 UJ
Endrin	1.8 UJ	1.8 UJ
Endrin aldehyde	1.8 UJ	1.8 UJ
Endrin ketone	1.8 UJ	1.8 UJ
gamma-BHC (Lindane)	0.91 UJ	0.94 UJ
gamma-Chlordane	**4.8 J**	0.94 UJ
Heptachlor	0.91 UJ	0.94 UJ
Heptachlor epoxide	0.91 UJ	0.94 UJ
Methoxychlor	9.1 UJ	9.4 UJ
Toxaphene	18 UJ	18 UJ

TABLE B-1

Site 2 Soil Raw Analytical Data

Minor Modifications to the Selected Remedy Presented in the ROD for Site 2

St. Juliens Creek Annex

Chesapeake, Virginia

Sample ID	SJS-BRS01-040814	SJS-BRS02-040814
Sample Date	4/8/14	4/8/14
Chemical Name		
Herbicides (µg/kg)		
2,4,5-T	29 U	27 U
2,4,5-TP (Silvex)	29 U	27 U
2,4-D	58 U	55 U
2,4-DB	29 U	27 U
2,4-DP (Dichloroprop)	29 UL	27 UL
Dalapon	29 U	27 U
Dicamba	29 U	27 U
Dinoseb	29 U	27 U
MCPA	2900 U	2700 U
MCPP	2900 U	2700 U
Total Metals (mg/kg)		
Aluminum	**7,640**	**3,600**
Antimony	**0.38 J**	0.42 U
Arsenic	**3.76**	**2.02**
Barium	**42.6**	**18.5**
Beryllium	**0.244 J**	**0.234 J**
Cadmium	**0.597**	**0.174 J**
Calcium	**1,820**	**2,950**
Chromium	**11.4**	**4.33**
Cobalt	**1.44**	**0.824 J**
Copper	**42.1**	**13.3**
Cyanide	0.4 U	0.4 U
Iron	**6,760**	**4,190**
Lead	**74.7**	**31.7**
Magnesium	**858**	**580**
Manganese	**73.2**	**76.8**
Mercury	**0.0918**	**0.0539**
Nickel	**4.89**	**1.96**
Potassium	**594**	**437**
Selenium	0.62 U	0.5 B
Silver	**0.22 J**	**0.063 J**
Sodium	**64.6 J**	**24.8 J**
Thallium	0.12 B	0.42 U
Vanadium	**16.3**	**6.67**
Zinc	**89.4**	**41.2**
Total Petroleum Hydrocarbons (mg/kg)		
TPH-diesel range	**30**	**18**
TPH-gas range	3.8 U	3.7 U

Notes:

Bold font indictaes a detected analyte

B - Analyte not detected substantially above the level reported in laboratory or field blanks

J - Analyte present; value may or may not be accurate/precise

U - Analyte was analyzed for, but not detected

UJ - Anlayte not detected, quantitation limit may be inaccurate/imprecise

UL - Analyte not detected, quantitation limit is probably higher

mg/kg - Milligrams per kilogram

µg/kg - Micrograms per kilogram

TABLE B-2

Site 2 Soil Analytical Data Exceedances

Minor Modifications to the Selected Remedy Presented in the ROD for Site 2

St. Juliens Creek Annex

Chesapeake, Virginia

Sample ID **Sample Date**	**Site 2 ROD Cleanup Level**	**Adjusted Industrial Soil RSL (November 2013)**	**Bohicket Background 95% UTL[1]**	**Munden Tetotem Background 95% UTL[2]**	SJS-BRS01-040814 4/8/14	SJS-BRS02-040814 4/8/14
Chemical Name						
Semivolatile Organic Compounds (µg/kg)						
Benzo(a)pyrene	1,100	210	732	91	**320 J**	**170 J**
Total Metals (mg/kg)						
Arsenic	--	2.4	21	5.7	**3.76**	**2.02**
Chromium	--	5.6	53	7	**11.4**	**4.33**

Notes:

J - Analyte present; value may or may not be accurate/precise

mg/kg - Milligrams per kilogram

µg/kg - Micrograms per kilogram

[1]Bohicket background values for the constituents shown were the same between surface and subsurface soil

[2]Munden Tetotem surface soil value for chromium shown because it is lower than the subsurface value (18 mg/kg); the other values are the same between surface soil and subsurface soil

Bold text indicates detection

Grey shaded cell indicates exceedance of adjusted industrial soil RSLs

Blue text indicates exceedance of Munden Tetotem background UTL

Attachment C
Data Validation Report

MEMORANDUM CH2MHILL

Data Validation Summary

St. Juliens, Site 2

TO: Megan Morrison/WDC

Anita Dodson/VBO

FROM: Tiffany McGlynn/GNV

CC: Herb Kelly/GNV

DATE: May 21, 2014

Introduction

The following data validation report discusses the data validation process and findings for Katahdin Laboratories, for SDG SH2218.

Samples were analyzed using the following analytical methods:

- SW8270D Semivolatiles
- SW8260C Volatiles
- SW8081B Pesticides
- SW8082A PCB Aroclors
- SW8151A Herbicides
- SW8015G/SW8015D DRO/GRO TPH
- SW6010C Metals
- SW7471A Mercury
- SW9012A Cyanide

The samples included in this SDG are listed in the table below.

Sample Name	Matrix
SJS-BRS01-040814	Soil
SJS-BRS02-040814	Soil

Data Evaluation

Data was evaluated in accordance with the analytical methods and with the criteria found in the following guidance documents: Region III Modifications for Organic Data Review (EPA 1994) and Region III Modifications for Inorganic Data Review (EPA 1993), as applicable. The samples were evaluated based on the following criteria:

- Data Completeness
- Technical Holding Times
- Instrument Tuning
- Initial/Continuing Calibrations
- Blanks
- Internal Standards
- Laboratory Control Samples
- Matrix Spike Recoveries
- Surrogates
- Column Confirmation
- Field Duplicates
- Interference Check Sample
- Serial Dilution
- Identification/Quantitation
- Reporting Limits

Overall Evaluation of Data/Potential Usability Issues

Specific details regarding qualification of the data are addressed in the sections below. If an issue is not addressed there were no actions required based on unmet quality criteria. When more than one qualifier is associated with a compound/analyte, the validator has chosen the qualifier that best indicates possible bias in the results and qualified these data accordingly.

Data Completeness

The SDG was received complete and intact.

Technical Holding Times

According to the chain of custody records, sampling was performed on 4/8/14. Samples were received at the laboratory on 4/9/14. All sample preparation analysis was performed within holding time requirements with the exception of samples for method SW8081B which were slightly outside of holding time. Affected data are summarized in **Attachment 1**.

Blanks

Selenium and thallium were detected in the calibration blanks as listed below. Affected data are summarized in **Attachment 1**.

Blank ID	Compound	Conc.	Units
CCB	Selenium	6.921	UG_L
CCB	Thallium	1.398	UG_L

Lab Control Sample/Sample Duplicate

2-Chloronaphthalene and 2,4-DP exhibited low recoveries in the LCS/LCSD. Affected data are summarized in **Attachment 1**.

Calibration

Compounds in method SW8270D did not meet initial calibration and second source calibration criteria. Benzo(g,h,i)perylene exhibited low responses in the continuing calibration. Affected data are summarized in **Attachment 1**.

Internal Standards

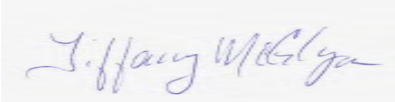
Internal standards were low for sample SJS-BRS01-040814 for method SW8260C affecting several compounds. Affected data are summarized in **Attachment 1**.

Conclusion

These data can be used in the project decision-making process as qualified by the data quality evaluation process.

Please do not hesitate to contact us about this validation report.

Sincerely,



Tiffany McGlynn

Qualification Flags

Exclude	More appropriate data exist for this analyte.
R	Data were rejected for use.
UL	Analyte not detected, quantitation limit is potentially biased low.
UJ	Analyte not detected, estimated quantitation limit.
U	Analyte not detected.
B	Not detected substantially above the level reported in laboratory or field blanks.
L	Analyte present, estimated value potentially biased low.
K	Analyte present, estimated value potentially biased high.
N	Analyte identification presumptive; no second column analysis performed or GC/MS tentative identification.
J	Analyte present, estimated value.
NJ	Analysis indicates the presence of an analyte that was "tentatively identified" and the associated value represents its approximate concentration.
None	Placeholder for calculating quality control issues that do not require flagging.
=	Analyte was detected at a concentration greater than the quantitation limit.

Qualifier Code Reference

Value	Description
%SOL	High Moisture content
2C	Second Column – Poor Dual Column Reproducibility
2S	Second Source – Bad reproducibility between tandem detectors
BD	Blank Spike/Blank Spike Duplicate(LCS/LCSD) Precision
BRL	Below Reporting Limit
BSH	Blank Spike/LCS – High Recovery
BSL	Blank Spike/LCS – Low Recovery
CC	Continuing Calibration
CCBL	Continuing Calibration Blank Contamination
CCH	Continuing Calibration Verification – High Recovery
CCL	Continuing Calibration Verification – Low Recovery
DL	Redundant Result – due to Dilution
EBL	Equipment Blank Contamination
EMPC	Estimated Possible Maximum Concentration
ESH	Extraction Standard - High Recovery
ESL	Extraction Standard - Low Recovery
FBL	Field Blank Contamination
FD	Field Duplicate
HT	Holding Time
ICB	Initial Calibration – Bad Linearity or Curve Function
ICH	Initial Calibration – High Relative Response Factors
ICL	Initial Calibration – Low Relative Response Factors
IR15	Ion ratio exceeds +/- 15% difference
ISH	Internal Standard – High Recovery
ISL	Internal Standard – Low Recovery
LD	Lab Duplicate Reproducibility
LR	Concentration Exceeds Linear Range
MBL	Method Blank Contamination
MDP	Matrix Spike/Matrix Spike Duplicate Precision
MI	Matrix interference obscuring the raw data

MSH	Matrix Spike and/or Matrix Spike Duplicate – High Recovery
MSL	Matrix Spike and/or Matrix Spike Duplicate – Low Recovery
OT	Other
PD	Pesticide Degradation
RE	Redundant Result - due to Reanalysis or Re-extraction
SD	Serial Dilution Reproducibility
SSH	Spiked Surrogate – High Recovery
SSL	Spiked Surrogate – Low Recovery
TBL	Trip Blank Contamination
TN	Tune

St. Juliens Site 2
Attachment 1 Change Qual. Table
SDG SH2218

Sample ID	Compound	Q Flag	Qual Code
SJS-BRS01-040814	Thallium	B	CCBL
SJS-BRS02-040814	Selenium	B	CCBL
SJS-BRS01-040814	2,2'-Oxybis(1-chloropropane)	UJ	2S
SJS-BRS01-040814	2-Chloronaphthalene	UL	BSL
SJS-BRS01-040814	4-Chloroaniline	UJ	ICB
SJS-BRS01-040814	Atrazine	UJ	2S
SJS-BRS01-040814	Benzaldehyde	UJ	ICB
SJS-BRS01-040814	Benzo(g,h,i)perylene	J	CCL
SJS-BRS01-040814	bis(2-Chloroethyl)ether	UJ	2S
SJS-BRS01-040814	Caprolactam	UJ	ICB
SJS-BRS01-040814	Pentachlorophenol	UJ	2S
SJS-BRS01-040814	1,1,2,2-Tetrachloroethane	UJ	ISL
SJS-BRS01-040814	1,2,4-Trichlorobenzene	UJ	ISL
SJS-BRS01-040814	1,2-Dibromo-3-chloropropane	UJ	ISL
SJS-BRS01-040814	1,2-Dichlorobenzene	UJ	ISL
SJS-BRS01-040814	1,3-Dichlorobenzene	UJ	ISL
SJS-BRS01-040814	1,4-Dichlorobenzene	UJ	ISL
SJS-BRS01-040814	2-Butanone	UJ	2S
SJS-BRS01-040814	Acetone	UJ	2S
SJS-BRS01-040814	Isopropylbenzene	UJ	ISL
SJS-BRS01-040814	2,4-DP (Dichloroprop)	UL	BSL
SJS-BRS01-040814	4,4'-DDD	J	HT
SJS-BRS01-040814	4,4'-DDE	J	HT
SJS-BRS01-040814	4,4'-DDT	J	HT
SJS-BRS01-040814	Aldrin	UJ	HT
SJS-BRS01-040814	alpha-BHC	UJ	HT
SJS-BRS01-040814	alpha-Chlordane	J	HT
SJS-BRS01-040814	beta-BHC	UJ	HT
SJS-BRS01-040814	delta-BHC	UJ	HT
SJS-BRS01-040814	Dieldrin	UJ	HT
SJS-BRS01-040814	Endosulfan I	UJ	HT
SJS-BRS01-040814	Endosulfan II	UJ	HT
SJS-BRS01-040814	Endosulfan sulfate	UJ	HT
SJS-BRS01-040814	Endrin	UJ	HT
SJS-BRS01-040814	Endrin aldehyde	UJ	HT
SJS-BRS01-040814	Endrin ketone	UJ	HT
SJS-BRS01-040814	gamma-BHC (Lindane)	UJ	HT
SJS-BRS01-040814	Heptachlor	UJ	HT
SJS-BRS01-040814	Heptachlor epoxide	UJ	HT
SJS-BRS01-040814	Methoxychlor	UJ	HT
SJS-BRS01-040814	Toxaphene	UJ	HT
SJS-BRS02-040814	2,2'-Oxybis(1-chloropropane)	UJ	2S
SJS-BRS02-040814	2-Chloronaphthalene	UL	BSL

St. Juliens Site 2
Attachment 1 Change Qual. Table
SDG SH2218

Sample ID	Compound	Q Flag	Qual Code
SJS-BRS02-040814	4-Chloroaniline	UJ	ICB
SJS-BRS02-040814	Atrazine	UJ	2S
SJS-BRS02-040814	Benzaldehyde	UJ	ICB
SJS-BRS02-040814	Benzo(g,h,i)perylene	UJ	CCL
SJS-BRS02-040814	bis(2-Chloroethyl)ether	UJ	2S
SJS-BRS02-040814	Caprolactam	UJ	ICB
SJS-BRS02-040814	Pentachlorophenol	UJ	2S
SJS-BRS02-040814	2-Butanone	UJ	2S
SJS-BRS02-040814	Acetone	UJ	2S
SJS-BRS02-040814	2,4-DP (Dichloroprop)	UL	BSL
SJS-BRS02-040814	4,4'-DDD	J	HT
SJS-BRS02-040814	4,4'-DDE	J	HT
SJS-BRS02-040814	Aldrin	UJ	HT
SJS-BRS02-040814	alpha-BHC	UJ	HT
SJS-BRS02-040814	alpha-Chlordane	UJ	HT
SJS-BRS02-040814	beta-BHC	UJ	HT
SJS-BRS02-040814	delta-BHC	UJ	HT
SJS-BRS02-040814	Dieldrin	UJ	HT
SJS-BRS02-040814	Endosulfan I	UJ	HT
SJS-BRS02-040814	Endosulfan II	UJ	HT
SJS-BRS02-040814	Endosulfan sulfate	UJ	HT
SJS-BRS02-040814	Endrin	UJ	HT
SJS-BRS02-040814	Endrin aldehyde	UJ	HT
SJS-BRS02-040814	Endrin ketone	UJ	HT
SJS-BRS02-040814	gamma-BHC (Lindane)	UJ	HT
SJS-BRS02-040814	gamma-Chlordane	UJ	HT
SJS-BRS02-040814	Heptachlor	UJ	HT
SJS-BRS02-040814	Heptachlor epoxide	UJ	HT
SJS-BRS02-040814	Methoxychlor	UJ	HT
SJS-BRS02-040814	Toxaphene	UJ	HT
SJS-BRS02-040814	4,4'-DDT	J	HT