

Environmental Investigation
CSX Transportation, Inc. (CSXT) Property
Railroad Maintenance Yard – 100 South Maple Avenue
Brunswick, Frederick County, Maryland
MDE Case No. 94-1379 FR

The Maryland Department of the Environment (MDE), Oil Control Program (OCP), continues to oversee investigation and remediation of the subsurface impact of petroleum hydrocarbons at the CSXT Maintenance Yard located in the Town of Brunswick. Adjacent to the CSXT Maintenance Yard is the C&O Canal National Historical Park. The National Park Service plans to restore and rewater a portion of the C&O Canal between Mile Post 54.2 to Mile Post 55.2. The Potomac River is located approximately 700 feet south of the site.

Situated in western Frederick County within the Blue Ridge physiographic province of Maryland, the CSXT Maintenance Yard is located to the east of South Mountain in a broad valley floored by Precambrian gneiss. The overburden consists of Quaternary alluvial material (gravels and coarse sand) between 10 to 20 feet thick, overlying a saprolitic layer of low permeability. Depth to groundwater generally ranges from 12 to 20 feet in the quaternary alluvial material. Shallow groundwater flows varies across the site but generally trends southerly towards the C & O Canal.

In November 1993, the MDE-OCP was made aware of the results of environmental investigations on the adjoining C&O Canal National Historic Park operated by the National Park Service (NPS). Petroleum hydrocarbons were detected at concentrations up to 26,000 parts per million (ppm) in shallow soil surveys on the adjoining NPS property. Petroleum contamination was attributed to refueling operations conducted over many years at the CSXT Maintenance Yard. The Department subsequently opened a case and directed CSXT, Inc. to perform further subsurface investigation. Monitoring wells and temporary piezometers were installed in the vicinity of the former refueling facility on the CSXT property.

Historically, the CSXT facility was utilized for railroad maintenance purposes for trains on the northeastern transportation corridor. A 500,000-gallon diesel oil above-ground storage tank (AST) with secondary containment was formerly located on the premises, with supporting piping above and below ground. No drinking water supply wells are located on-site. The subject property and immediate vicinity are served with public water. A water intake structure for the Town of Brunswick water treatment plant is located downstream from the site in the Potomac River.

Presently the CSXT Maintenance Yard houses a diesel engine refueling station for MARC trains and operates two (2) 20,000-gallon diesel aboveground storage tank systems permitted through the MDE-Oil Control Program. The maintenance facility has been decommissioned and the abandoned railroad roundhouse structure and other subsidiary buildings were demolished.

Currently, five (5) monitoring wells (MW1 - MW3, MW5, MW6R), seven (7) extraction wells (EW1 - EW7) and eight (8) temporary piezometers are located on the property. This monitoring well network is supplemented by fifteen (15) off-site monitoring wells (MW1-NPS – MW5-NPS, MW10-NPS – MW17-NPS, MW8, MW9) strategically located along the C & O Canal.

Cleanup activities of petroleum contaminants on the CSXT Maintenance Yard began in January 1995 with passive recovery operations to remove liquid phase hydrocarbons (LPH or product). Liquid product has consistently been detected in the former fueling area (MW-1, MW-2, MW-4). Periodic enhanced fluid extraction events were implemented to reduce LPH thickness from extraction wells (EW3, EW4, EW5). Historically, only one off-site well on the property boundary (NPS-MW4) exhibited LPH, with thickness ranging between 0.01 and 0.65 inches. Since 2002, no measurable quantities of LPH have been identified in any off-site wells on the NPS property. It also appears that LPH thickness fluctuates with changes in water table elevations.

In 2002, the Department approved a Corrective Action Plan to install a barrier/recovery trench system to contain the migration of LPH. The trench was installed to a depth of 15 feet, lined with geotextile fabric and an impermeable polyethylene barrier on the canal side. Five six-inch diameter collection sumps were installed within the crushed stone, which filled the inside of the barrier/recovery trench. By July 2004, a total of 8,300 gallons of fluid (water and LPH) was recovered from the barrier trench and EFR events. Conservatively it was estimated that 378 gallons of LPH was recovered for that period. By 2006, as it became evident that recovery efforts had significantly decreased, the MDE-OCP required CSXT Inc. to implement corrective measures to enhance product recovery and conduct a supplemental site investigation. In September 2006, an active product recovery unit was added directly to MW-2. Further site delineation approved by the MDE-OCP is in progress on-site and off-site.

Chronology:

1990

- September 10 & 20, 1990: The National Park Service commissioned a preliminary survey of soil conditions within the C&O Canal prism for the purpose of restoring and rewatering a one-mile section of the C&O Canal National Historic Park (M.P.55.2 to M.P. 55.2) at Brunswick. As a result of this survey of 34 soil auger samples, it was determined by visual and olfactory evidence that soils in certain portions of the canal restoration area were impacted with petroleum constituents.

1992

- March 23, 1992: CSXT soil investigation identified petroleum-impacted soils in 4 samples from the canal prism.
 - Depth ranged from 1-3 feet: 8 soil samples analyzed. (See Table 3)
 - Total petroleum hydrocarbons - up to 4,270 ppm at 1.5' depth in one borehole.

1993

- July 14-19, 1993: CSXT second shallow soil investigation to define the scope of contamination.
 - Total petroleum hydrocarbons - up to 26,000 ppm at 1.5' depth in one borehole.
 - Most borings <2 feet: 23 soil samples analyzed by NPS; 28 by CSXT. (See Table 4)
- November 4, 1993: MDE-OCP received soil sampling data in a meeting with NPS.
- November 18, 1993: MDE-OCP letter to NPS acknowledging receipt of NPS environmental data.
 - MDE determined that sufficient evidence exists to indicate a petroleum discharge.
 - CSXT would be required to do further hydrogeological study.

1994

- January 6, 1994: MDE received NPS letter advising MDE of its interest in the investigation, legal authority to recover damages, and request to be an active party in the investigation of the CSXT site.
- January 11, 1994: MDE-OCP received *Soil Investigation within C&O Canal Mile Point 54.2-55.2, Brunswick, MD-1/7/94*.
 - Three (3) areas of concern identified on borings performed in July 1993.
 - Recommended proper handling of impacted soils during canal restoration activities.
 - Recommended no further action for TPH-impacted soils below the canal clay liner.
 - Recommended a groundwater monitoring well downgradient of Area 1.
- January 20, 1994: MDE issued *Notice of Violation NV-94-061* to CSXT, which required:
 - Install 4 groundwater monitoring wells on-site to assess groundwater contamination.
 - Complete a hydrogeological study.
 - Sample and analyze groundwater for hydrocarbon contaminants.
- March 10, 1994: MDE-OCP received response to *NV-94-061* from CSXT with notification of intended well installation.
- April 7, 1994: CSXT advised MDE that NPS denied access to park property for the purpose of installing a groundwater monitoring well along the canal. Access to park property was sought independently by the CSXT consultant without guidance or concurrence of MDE. Consultant was advised to install monitoring well on CSXT site.
- April 20, 1994: Letter to MDE from NPS management concerning the lack of progress in the site investigation and the lack of NPS involvement in discussions and decisions relating to the site investigation.



- May 11, 1994: MDE letter to NPS, advising of the progress of the site investigation.
- May 23, 1994: MDE-OCP on-site to demarcate locations for 4 groundwater monitoring wells on CSX property.
- June 23-24, 1994: MDE-OCP and NPS on-site for well installation.
 - Initial observations indicate the presence of LPH- diesel fuel in the groundwater in the vicinity of the refueling area.
- August 1, 1994: Public meeting-Town of Brunswick.
- August 19, 1994: MDE-OCP received *Site Investigation-Brunswick Railyard-July 1994*.
 - Concluded that petroleum residue results from a surficial release because the highest TPH concentrations were found at less than 2-foot depth.
 - Did not determine whether dissolved petroleum is migrating from CSX to the canal.
 - Proposed 2 additional monitoring wells on CSX property.
- August 25, 1994: MDE-OCP received *NPS Recommendations for Site Characterization for the CSX Railroad Maintenance Yard and C&O Canal NHP properties-August 15, 1994*.
 - Collect sufficient data to adequately characterize site.
 - Develop acceptable exposure levels.
 - Design an effective remedial program.
- August 29, 1994: MDE-OCP received results of product characterization.
 - Identified product as #2 Diesel fuel in soil samples from MW-1, MW-2, and MW-4.
- August 30, 1994: MDE-OCP approved the *Site Investigation-Brunswick Railyard-July 1994*, and required 2-3 additional monitoring wells.
- August 31, 1994: MDE-OCP letter requested NPS to allow CSX access for drilling.
- September 22, 1994: MDE-OCP received *CSXT Response to MDE Comments on Site Investigation-Brunswick Railyard-July 1994*.
 - Redevelop existing monitoring wells.
 - Install additional 2-3 monitoring wells on CSX property or on other side of canal only if contamination found.
- September 30, 1994: NPS special use permit for access to C&O Canal property faxed to CSX.
- October 20, 1994: MDE-OCP received copy of revised special use permit from CSX.
- October 28, 1994: MDE-OCP site visit to inspect monitoring wells.
 - 1 foot of product in MW-2.
- December 12, 1994: MDE-OCP received final signed copy of special use permit.
- December 12, 1994: MDE-OCP received *Report of MW-2 Product Baildown Test-December 9, 1994*.
 - Slow re-entry of fluids (recharge by next day: 1/10th amount LPH).
 - Supported use of passive recovery techniques.
- December 23, 1994: MDE-OCP site visit to witness the start of decommissioning the 500,000-gallon Diesel AST.
- December 30, 1994: MDE-OCP received copy of Army Corps of Engineers denial of rewatering permit to NPS.

1995

- January 3 & 5, 1995: MDE-OCP site visits for continued demolition of 500,000-gallon Diesel AST.
 - No obvious petroleum contamination identified on sand exposed beneath removed AST.
- January 16, 1995: Passive recovery system installed on MW-2.
- February 20, 1995: MDE-OCP site visit to inspect status of monitoring wells.
- February 21, 1995: MDE-OCP received copy of NPS denial of revision to special use permit.
- March 8, 1995: MDE-OCP letter to NPS.
 - Concur with hold on rewatering until further investigation.
 - Additional wells should be placed on NPS property to define the petroleum plume.
- March 23, 1995: MDE-OCP site visit with NPS and CSX to facilitate site access to NPS property.
- May 10, 1995: MDE-OCP site visit to inspect the replacement AST installation.
- June 1, 1995: MDE-OCP site visit to inspect monitoring well status.
- August 11, 1995: MDE-OCP received copy of new NPS access agreement.
- August 28, 1995: MDE-OCP site visit to inspect passive recovery system.
 - LPH in unit reservoir container indicated successful use of passive recovery.
- August 29-September 1, 1995: MDE-OCP site visits to witness the installation of additional monitoring wells.
- December 13, 1995: MDE received *Additional Site Investigation-November 28, 1995* from CSXT.
 - 4 new monitoring wells installed.

- MW-7 could not be completed because of shallow refusal.
- TPH-DRO was not detected on the south side of the canal.

1996: MDE-OCP received *Quarterly Product Recovery Results*.

- Monthly bailing events.
- 5.1 gallons LPH collected to date from bailing and passive recovery.
- March 12, 1996: Independent Geoprobe Investigation for possible expansion of MARC parking lot.
 - Shallow study: 25 soil borings with maximum depth of 4 feet in and near parking area west of former AST.
 - TPH-DRO in 5 soil samples, maximum of 190 ppm. No apparent relation to former diesel AST.
 - No other petroleum constituents found.

1997: MDE-OCP received *Quarterly Product Recovery Results*.

- Monthly bailing events.
- 15.4 gallons LPH collected to date from bailing and passive recovery.
- March 10, 1997: MDE-OCP site visit to witness CSX consultant sampling and gauging monitoring wells.
 - Annual sampling/split samples with NPS.
 - Required cleaning of MW-9 due to sediment buildup.
 - Sample results and groundwater map provided.
- April 25, 1997: MDE-OCP received *First Quarter 1997 Product Recovery Volumes and Groundwater Sampling Results -April 22, 1997*.
 - 6.8 gallons LPH collected to date from bailing and passive recovery.
 - 11 feet of sediment fouling MW-9.
 - Groundwater sample results for CSX wells. (See Table 1)
- July 24, 1997: MDE-OCP site visit to inspect passive recovery unit-found full of product.

1998: MDE-OCP received *Quarterly Product Recovery Volumes*.

- Monthly bailing events.
- Enhanced Fluid Extraction events began on September 2, 1998.
- Total product recovery from monitoring wells: 21.6 gallons
- February 5, 1998: MDE-OCP received *Product Recovery and Baildown Tests Results-Fourth Quarter 1997 - February 2, 1998*.
 - 66 gallons LPH collected to date from bailing and passive recovery.
 - MW-1 added to bailing program with free product present.
 - Baildown tests indicate slow movement of product into MW-1 and MW-6.
- March 12, 1998: MDE-OCP site visit to observe well gauging and sampling.
- April 30, 1998: MDE-OCP received *First Quarter 1998 Product Recovery Volumes and Groundwater Sampling Results-April 27, 1998*.
 - Total LPH recovery from monitoring wells to date: 10.6 gallons.
 - Groundwater sample results for CSX wells. (See Table 1)
- June 24, 1998: MDE-OCP site visit to meet with CSX, NPS, and EPA.
 - Discuss cleanup goals and methods.
 - Required additional remediation.
 - Received NPS *Site Investigation Chesapeake and Ohio Canal Brunswick MD-July 1997*.
 - Annual sampling and access to NPS wells.
 - Possible sheen observed on creek below where it issues from culvert beneath RR yard.
 - Temporary weir constructed for observation and confirmation of sheen and possible product collection.
- October 15 and 23, 1998: MDE-OCP site visit to observe effect of weekly Enhanced Fluid Extraction events.
- December 9, 1998: MDE-OCP meeting with NPS and CSX: received NPS *Ground water quality at the C&O Canal NHP-November 9, 1998*.
 - Results of September 1998 sampling. (TPH-DRO only-see Table 2)

1999: MDE received *Quarterly Product Recovery Reports*.

- Total LPH recovery from monitoring wells to date: 29 gallons.
- February 11, 1999: MDE-OCP received *Conceptual Investigation Plan-February 8, 1999*.
 - Installation of five temporary piezometers for further delineation.
 - LPH is present in MW-2 and MW-6 during the spring and summer, and generally diminishes during the fall and winter.
- March 18, 1999: MDE-OCP approved *Conceptual Investigation Plan* for further sampling.
- April 15, 1999: MDE-OCP received copy of NPS *review of Conceptual Investigation Plan*.
 - Questioned validity of CSX observations and required substantiation.
 - Requested fingerprinting of product.
 - Required survey data compatibility with park needs, software, and equipment.
 - Schedule meeting to establish cleanup of NPS property.
- July 16, 1999: MDE-OCP received copy of NPS *Additional Comments to Conceptual Investigation Plan*.
 - Proposed additional sampling approved.
 - Remove LPH.
 - Install barrier to prevent migration.
- October 25, 1999: MDE received copy of letter requesting signature of special use permit from NPS to allow access to complete their *Conceptual Investigation Plan*.

2000: MDE received *Quarterly Product Recovery Results*.

- LPH total recovery to date: 37 gallons.
- February 7, 2000: MDE-OCP received *Fourth Quarter 1999 Product Recovery Volumes and Annual Groundwater Sampling Results-February 1, 2000*.
 - Groundwater sample results for CSX wells. (See Table 1)
- March 22-23, 2000: MDE-OCP site visit for geoprobe subsurface investigation and to observe progress gauging and bailing monitoring wells.
- May 30, 2000: MDE-OCP received *Annual Groundwater Sampling and First Quarter 2000 Product Recovery Results-May 25, 2000*.
 - Groundwater sample results for CSX wells. (See Table 1)
- September 8, 2000: MDE-OCP site visit to observe progressive effect of weekly bailing of monitoring wells- apparently decreasing influx with repeated application.
- December 8, 2000: MDE received *Site Investigation Report-December 2000*.
 - 11 temporary piezometers installed from 11/1999 – 03/2000.
 - 1 geotechnical soil boring indicated poorly graded sand, silt and clay.
 - 1 soil sample adjacent to drainage culvert: 10,600 ppm TPH-DRO, 1760 ppb naphthalene.
 - Recommended collection trench or high vacuum recovery.

2001: MDE received *Quarterly Product Recovery Reports*.

- Product recovery to date: 47 gallons.
- May 16, 2001: MDE-OCP site visit to witness the effects of bailing events and annual sampling.
- October 12, 2001: MDE-OCP received *Annual Groundwater Sampling and Second Quarter 2001 Product Recovery Results-October 9, 2001*.
 - Groundwater sample results for CSX wells. (See Table 1)
- October 12, 2001: MDE-OCP site visit to witness the effects of bailing event.

2002: MDE received *Quarterly Product Recovery Reports*.

- LPH Product recovery: 56 gallons.
- March 7, 2002: MDE directive letter required *Corrective Action Plan* within 45 days.
- April 22, 2002: MDE received CSX *Corrective Action Plan-April 19, 2002*.
 - Presented conceptual design of Barrier/Recovery Trench.
- May 7, 2002: MDE-OCP site visit to gauge monitoring wells before annual sampling.
- May 13, 2002: MDE received *Oil Spill Investigation of C&O Canal N.H.P.-February, 2002*.

- Installed 5 monitoring wells and 1 piezometer north of the canal.
- Installed 3 wells on the south side of the canal.
- TPH-DRO Groundwater sample results for NPS wells. (See Table 2)
- July 15, 2002: MDE-OCP received copy of NPS comments on the CSX *Corrective Action Plan*.
 - Adequately assesses area 1 and probably most of Area 2, doesn't address Area 3.
 - Disagree with the description of soils as low permeability.
- August 8, 2002: MDE-OCP received copy of CSX responses to NPS comments.
- August 12, 2002: MDE-OCP received *Annual Groundwater Sampling and Second Quarter 2002 Product Recovery Report-August 6, 2002*
 - Groundwater sample results for CSX wells. (See Table 1)

2003: MDE received *Quarterly Product Recovery Reports*.

- EFR Product recovery: 64 gallons.
- January 10, 2003: MDE-OCP received copy of NPS comments on the *Preliminary Contractor Bid Package for the Barrier/Recovery Trench*.
- May 15, 2003: MDE-OCP site visit to gauge monitoring wells before annual sampling.
- August 12, 2003: MDE received copy of CSX response letter to NPS comments.
- August 15, 2003: MDE received *Annual Groundwater Sampling and Second Quarter 2003 Product Recovery Report-August 12, 2003*.
 - Groundwater sample results for CSX wells. (See Table 1)
- August 20, 2003: MDE received *Technical Specifications for Barrier/Recovery Trench-August 2003*.
- November 5, 2003: MDE approved CSX *Corrective Action Plan* for immediate implementation.
 - Barrier/Recovery Trench to intercept and recover product from groundwater.
 - located at the CSX/NPS property boundary north of the canal.
 - Supplemented by six-inch extraction well network to control migration eastward.
- November 6, 2003: MDE-OCP site visit to witness drilling and barrier trench construction.

2004: MDE received *Quarterly Product Recovery Reports*.

- Product recovery to date: 64.77 gallons.
- May 28, 2004: MDE-OCP site visit to witness drilling of new recovery wells.
 - Continue biweekly recovery and extraction events.
 - Prepare operation plan for next phase.
- June 21, 2004: MDE received *Barrier/Recovery Trench Construction Report* summarizing construction details.
- July 15, 2004: MDE-OCP site visit to witness the results of the scheduled extraction event.
 - 60 gallons removed from EW-3 in 1 hour.
 - Include NPS-4 in quarterly gauging.
 - Continue removal of all possible product.
- August 25, 2004: MDE received *Annual Groundwater Sampling and Second Quarter 2004 Product Recovery Report-August 23, 2004*.
 - Groundwater sample results for CSX wells. (See Table 1)
 - 15 gallons recovered from EW-3 and EW-4 this quarter.
- October 28, 2004: MDE received *Third Quarter 2004 Product Recovery Report-October 27, 2004*.
 - EFR fluid recovery: 930 Gallons (7/15/04), 945 gallons (8/12/04), 264 gallons (9/14/04).

2005

- February 8, 2005: MDE received *Fourth Quarter 2004 Product Recovery Report-February 3, 2005*.
 - EFR fluid recovery: 755 Gallons (10/28/04), 1018 gallons (11/23/04), 582 gallons (12/27/04).
- May 16, 2005: MDE-OCP site visit to gauge monitoring wells and to observe the results of the scheduled extraction event.
- May 20, 2005: MDE received *First Quarter 2005 Product Recovery Report-May 19, 2005*.
 - EFR fluids recovered: 550 gallons.
- August 19, 2005: MDE received *Second Quarter 2005 Product Recovery Report-August 18, 2005*.

- EFR fluids recovered: 472 gallons.
- Groundwater sample results for CSX wells. (See Table 1)
- September 7, 2005: MDE-OCP site visit to gauge monitoring wells and to observe the results of the scheduled extraction event.

2006

- January 19, 2006: MDE received *Third Quarter 2005 Product Recovery Report-17 January 2006*.
 - Increased LPH thickness in MW-2 attributed to groundwater fluctuation.
 - LPH thicknesses decrease in EW-3 and EW-4.
 - Total fluids recovered: 1629 gallons.
- January 30, 2006: MDE received *Fourth Quarter 2005 Product Recovery Report-27 January 2006*.
 - Continued increasing trend in LPH thickness in MW-2 may indicate enhanced flow recovery.
 - LPH thicknesses show decreasing trend in EW-3 and EW-4.
 - Total fluids recovered: 2803 gallons.
 - CSX proposed using surfactant to increase LPH recovery.
- February 16, 2006: MDE-OCP site visit to witness the results of the scheduled extraction event.
- March 13, 2006: MDE-OCP letter to CSX clarifying compliance with COMAR 26.10.03.09 requirements of notification of changes in tank status.
- May 3, 2006: Meeting at Brunswick City Hall requested by State Delegate Rick Weldon.
 - MDE, National Park Service and their consultant (Ecology and Environment, Inc.) and public.
 - CSXT not attending.
 - Del. Weldon views environmental clean up as primary and more important than rewatering the canal.
 - MDE presented summary of work to date by CSX as overseen by MDE.
 - Ecology & Environment presented their interpretation of geological information available and NPS concerns.
- May 10, 2006: MDE received *Quarterly Report-First Quarter 2006-April 21, 2006*.
 - EFR, groundwater & LPH gauging monthly.
 - Total fluids recovered by EFR this quarter: 4,035 gallons.
 - Product recovered from TP-3 by bailing this quarter: 1/8 gallon.
- May 30, 2006: MDE directive letter required completion of a *Corrective Action Plan* with the following tasks:
 - Determine the current state of contamination on NPS property.
 - Investigate potential westerly groundwater movement near the stream culvert.
 - Define the current extent and source of contamination downstream (NPS area 3).
 - Discuss proposed pilot tests and specific measures of mitigation across the entire site.
 - The use of Surfactant as proposed is not approved.
 - Quarterly sampling of all CSX & NPS monitoring wells.
 - Continue EFR, increasing to twice/month.
 - Install an active product recovery skimmer pump in MW-2.
- June 6, 2006: MDE issued Notice of Compliance closing *Case No. 92-2061 FR*.
 - Noted that *Case No. 94-1379* remains open with monitoring wells at the site.
 - Cautions excavation of impacted soils and recommends engineering controls.
- July 20, 2006: MDE received CSXT response to MDE May 30, 2006 letter.
 - Request chance to review NPS information.
 - Beginning installation of power for active product recovery skimmer pump in MW-2.
 - Continue EFR, increasing to twice/month starting in July.
 - Quarterly sampling of all CSX & NPS monitoring wells requires NPS access permission.

- Phased approach to completion of CAP.
- August 4, 2006: MDE received *Copy of February 2006 Letter Report for NPS Bi-Annual Groundwater Sampling at C&O Canal National Historical Park, Brunswick, Maryland- August 3, 2006.*
 - Twelve wells sampled for TPH-DRO.
 - LPH not found in any monitoring well.
 - Five showed TPH: MW-5, MW-13, MW-14, MW-15, MW-17.
- August 7, 2006: MDE received *Quarterly Report-Second Quarter 2006-August 4, 2006.*
 - EFR, groundwater & LPH gauging monthly.
 - LPH recovery pump installed on MW-2 on September 12, 2006.
 - Total fluids recovered by EFR this quarter: 1,526 gallons.
 - Product recovered from TP-3 by bailing this quarter: 1/5 gallon.
- August 30, 2006: MDE received *Corrective Action Plan/Work Plan - August 29, 2006.*
 - Quarterly sampling and analysis from all CSXT and NPS monitoring wells.
 - Continued twice monthly EFR events with groundwater and LPH monitoring of wells with LPH.
 - Recovery skimmer pump on MW-2 to consistently recover LPH.
 - Redevelop all monitoring wells.
 - Surfactant Enhanced Aquifer Recovery pilot program testing for increased LPH recovery.
- September 12, 2006: Meeting at MDE including representatives of MDE, CSXT and their consultant, and National Park Service and their consultant.
 - Suggestions that dissolved contamination is moving beneath the described clay layer.
 - Concerned that CSXT won't investigate Area 1 and Area 3 to determine source & extent of contamination.
 - The barrier trench does not appear to be effective.
 - NPS is to work with CSXT on formalizing a permit to allow sampling of all wells by CSXT & NPS together.
 - MDE intends to require a comprehensive *Corrective Action Plan* and *Site Conceptual Model* from CSXT.
 - NPS to provide MDE with a copy of the evidence cited in their geological interpretations.
- September 20, 2006: MDE received follow-up summary letter from NPS via fax to the foregoing meeting.
- October 23, 2006: MDE received follow-up summary of geologic information from NPS consultant: *Site Conceptual Model Generation at the CSX Transportation Rail Yard & National Park Service C&O Canal Site, Brunswick, Maryland-October 19, 2006.*
 - Included diagrammatic cross-sections at three points along the canal.
- October 27, 2006: MDE received CSXT response to NPS September 20, 2006 letter.
 - CSXT does not yet have current groundwater data to assess the extent of contamination on NPS property.
 - Groundwater flow is not likely either east or west as it is cross-gradient.
 - LPH thickness has decreased in monitoring wells behind the barrier trench.
 - CSXT should not be obligated to investigate petroleum contamination not linked to a likely source on CSX property.
 - CSXT has interpreted the site geology as necessary to implement MDE directives.
- November 15, 2006: MDE directive letter to CSXT required completion of a *Supplemental Subsurface Investigation and Site Conceptual Model* and the following tasks:
 - Assess off-site migration of the plume and determine the current extent of contamination on NPS property.
 - Continue current remedial activities.
 - Quarterly sampling of all monitoring wells.
 - Replace MW-4 and TP monitoring points with 4-inch permanent monitoring wells.
 - Surfactant pilot test not approved.
 - Perform a detailed analysis of the geology and identify shallow and deep zones of groundwater movement.



- December 6, 2006: MDE received *Quarterly Report-Third Quarter 2006 - December 1, 2006*.
 - July - August - September 2006: bi-weekly EFR, groundwater & LPH gauging.
 - MW-4 properly abandoned because it's integrity was compromised.
 - Recovery skimmer pump installed on MW-2 on 09/12/06.
 - Total fluids recovered by EFR this quarter: 3,229 gallons.
 - LPH recovered from MW-2 this quarter: 36 gallons.
 - Product recovered from TP-3 (1" temporary monitoring point) by bailing this quarter: 1/2 gallon.

2007

- January 31, 2007: MDE received *Site Conceptual Model and Supplemental Work Plan - January 30, 2007*.
 - Quarterly sampling and monitoring wells of all CSX and NPS wells without LPH with quarterly reporting.
 - Twice monthly EFR events with groundwater and LPH monitoring of wells with LPH.
 - Recovery skimmer pump on MW-2 to consistently recover LPH.
 - Install 7 new or replacement monitoring wells.
 - Slug testing of 4 new monitoring wells for hydraulic characteristics.
 - Grain size analysis of soil samples from new wells for better understanding of the residual LPH saturation.
 - Groundwater sampling of new wells for baseline chemical characterization.
- March 2, 2007: MDE received *Quarterly Report-Fourth Quarter 2006 - March 1, 2007*.
 - October - November - December 2006: bi-weekly EFR, groundwater & LPH gauging.
 - Quarterly sampling of 19 shallow monitoring wells with quarterly reporting. (See Table 1 and 2)
 - Six CSXT monitoring wells: MW-1, 3, 5, 6R, 8, and 9.
 - Thirteen NPS monitoring wells: MW-1, 2, 3, 4, 5, 10 through 17.
 - Full VOC, TPH-GRO and TPH-DRO.
 - Total fluids recovered by EFR this quarter: 2,170 gallons including about 106 gallons of LPH.
 - LPH recovered from MW-2 this quarter: 45 gallons.
 - Product recovered from TP-3 (1" temporary monitoring point) by bailing this quarter: 0.04 gallon.
- April 10, 2007: MDE received comments from the National Park Service (NPS) in their *Review of ARCADIS Site Conceptual Model and Supplemental Work Plan (January 30, 2007) - April 10, 2007*
- April 16, 2007: MDE directive letter to CSXT approved *Supplemental Work Plan and Site Conceptual Model* and required the following tasks:
 - Continue operation of the active product recovery skimmer pump installed in MW-2.
 - Continue current biweekly program of EFR and bailing events
 - Sample all CSX and NPS monitoring wells quarterly for petroleum constituents.
 - Convert all existing temporary piezometers to permanent monitoring wells at least 4 inches in diameter.
 - Install the 7 monitoring wells proposed by CSXT in addition to the following:
 - Delineate the area of the former AST with the installation of 6 additional wells (MW26, MW27, MW28, MW29, MW30, MW31).
 - Install 2 additional wells (MW32, MW33) topographically upgradient of the area of concern.
 - Install 3 additional wells (MW34, MW35, MW36) on the eastern portion of the property.
 - Install 5 additional wells (MW37, MW38, MW39, MW40, MW41) in the vicinity of the former roundhouse.
 - Submit a *Work Plan for Additional Groundwater Extraction Testing* by May 31, 2007.
 - Refine the *Site Conceptual Model* by June 15, 2007.
 - Submit a final *Corrective Action Plan* no later than July 30, 2007.
- May 3, 2007: MDE received CSX *Response to 16 April 2007 Supplemental Work Plan Approval - 1 May 2007*.
 - Requested clarification on the rationale for the installation of additional monitoring wells.
 - Requested extension of due dates for the Work Plan, revised Site Conceptual Model and the final Corrective Action Plan to accommodate the completion of field activities.
 - Requested a phased approach using direct push before the installation of the approved additional wells.

- May 22, 2007: MDE received *Schedule for Implementing Supplemental Work Plan - 18 May 2007*.
- June 1, 2007. MDE letter to CSXT in response their letter received on 05/03/07 and 05/22/07.
 - Provided further clarification on the rationale for the installation of additional monitoring wells.
 - Submit a *Work Plan for Additional Groundwater Extraction Testing* by September 30, 2007.
 - Refine the *Site Conceptual Model* by August 30, 2007 .
 - Submit a final *Corrective Action Plan* no later than December 30, 2007.
 - MDE approved a phased approach using direct push before the installation of the required additional wells provided that this approach will meet yield the data to be incorporated in the revised Site Conceptual Model due in August 2007.

Future Activities:

- MDE is awaiting receipt of the *Quarterly Report-First Quarter 2007*.
- Installation of twenty-three (23) additional wells to be completed in summer 2007.
- Next quarterly sampling event scheduled to be completed in May 2007.

Related cases

- Closed Case Nos. *1990-2874 FR; 1992-0878 FR; 1992-1421 FR; 1992-2061 FR; 1997-0669 FR; 1999-0803 FR*

Future Updates:

- Future updates on this case investigation will be posted at www.mde.state.md.us [at the MDE home page, (select) Land, (select) Program, (select) Oil Control, (select) Remediation Sites].

Contacts

- Maryland Department of the Environment (MDE): Oil Control Program: 410-537-3443
- Frederick County Health Department (FCHD): 301-600-1715
- National Park Service 301-739-4200

Disclaimer

The intent of this fact sheet is to provide the reader a summary of site events as they are contained within documents available to MDE. To fully understand the site and surrounding environmental conditions, MDE recommends that the reader review the case file that is available at MDE through the Public Information Act. The inclusion of a person or company’s name within this fact sheet is for informational purposes only and should not be considered a conclusion by MDE on guilt, involvement in a wrongful act or contribution to environmental damage.

Legend for Tables 1-4 (including regulatory standard values for select petroleum compounds)

ND	= Not Detected above the laboratory quantitation limit.
--	= No data Available: Not Applicable, Not Sampled, Not Reported, or Not Analyzed
J	= Indicates an estimated value
All results in micrograms per liter (ug/L) or parts per billion (ppb) unless otherwise indicated.	
BENZENE	(MCL –5 ppb)
TOLUENE	(1,000 ppb)
ETHYL-BENZENE	(700 ppb)
XYLENE	(10,000 ppb)
MTBE	= Methyl-tertiary Butyl-ether (Action Level – 20 ppb)
Naphthalene	(10 ppb)
LPH	= liquid or separate phase petroleum product
TPH-DRO	= Total Petroleum Hydrocarbons - Diesel Range Organics (47 ppb)
TPH-GRO	= Total Petroleum Hydrocarbons - Gasoline Range Organics (47 ppb)

Table 1: Monitoring Wells at CSX

Well Information	Sample Dates	Depth to groundwater	Petroleum Constituents of Concern									
			LPH	Benzene	Toluene	Ethyl benzene	Xylene	MTBE	Naphthalene	TPH-DRO	TPH-GRO	
MW-1 25 ft, 4" diameter Installed 6/23/94 on-site overburden monitoring well	7/5/94	--	--	2	ND	ND	ND	ND	--	--	9700	--
	8/29/95	--	--	ND	ND	ND	ND	ND	--	ND	19000	--
	3/10/97	13.92	--	ND	ND	ND	ND	ND	--	ND	13000	--
	3/12/98	13.36	--	ND	ND	ND	ND	ND	--	ND	25700	--
	11/9/99	16.40	--	ND	ND	ND	ND	ND	--	6	7560	--
	4/11/00	14.68	--	ND	ND	ND	ND	ND	--	ND	9580	--
	5/16/01	16.06	LPH	--	--	--	--	--	--	--	--	--
	5/7/02	15.56	--	ND	ND	ND	ND	ND	--	ND	37300	--
	5/15/03	14.42	--	ND	ND	ND	ND	ND	--	ND	2510	--
	5/7/04	13.83	--	ND	ND	ND	ND	ND	--	ND	ND	--
	5/16/05	15.38	--	ND	ND	ND	ND	ND	--	ND	750	--
	6/6/06	16.48	--	ND	ND	ND	ND	ND	--	ND	11000	--
	12/27/06	15.22	--	ND	ND	ND	ND	ND	97	ND	12000	690
3/5/07	--	--	ND	ND	ND	ND	ND	ND	ND	11000	68	
MW-2 25 ft, 4" diameter Installed 6/23/94 on-site overburden monitoring well	7/5/94	--	--	31	2	9	22	--	--	110000	--	
	8/29/95	16.93	LPH	--	--	--	--	--	--	--	--	--
	3/10/97	13.90	LPH	--	--	--	--	--	--	--	--	--
	3/12/98	12.83	LPH	--	--	--	--	--	--	--	--	--
	11/9/99	16.33	LPH	--	--	--	--	--	--	--	--	--
	4/11/00	13.56	LPH	--	--	--	--	--	--	--	--	--
	5/16/01	16.11	LPH	--	--	--	--	--	--	--	--	--
	5/7/02	15.18	--	13	6	1	62	--	63	222000	--	
	5/15/03	13.61	--	ND	ND	ND	103	--	ND	188000	--	
	5/6/04	12.80	--	ND	ND	ND	ND	--	10	4120	--	
	5/16/05	15.59	LPH	--	--	--	--	--	--	--	--	--
	6/6/06	18.90	LPH	--	--	--	--	--	--	--	--	--
12/21/06	--	LPH	--	--	--	--	--	--	--	--	--	
MW-3 25 ft, 4" diameter Installed 6/24/94 on-site overburden monitoring well	7/5/94	--	--	ND	ND	ND	ND	--	--	830	--	
	8/29/95	--	--	ND	ND	ND	ND	--	ND	ND	--	
	3/10/97	12.28	--	ND	ND	ND	ND	--	ND	470	--	
	3/12/98	13.59	--	ND	ND	ND	ND	--	ND	ND	--	
	11/9/99	16.81	--	ND	ND	ND	ND	--	ND	540	--	
	4/11/00	14.76	--	ND	ND	ND	ND	--	ND	ND	--	
	5/16/01	16.26	--	ND	ND	ND	ND	--	ND	ND	--	
	5/7/02	15.96	--	ND	ND	ND	ND	--	ND	ND	--	
	5/15/03	14.66	--	ND	ND	ND	ND	--	ND	ND	--	
	5/6/04	14.21	--	ND	ND	ND	ND	--	ND	ND	--	
	5/16/05	15.76	--	ND	ND	ND	ND	--	ND	ND	--	
	6/6/06	17.12	--	ND	ND	ND	ND	--	ND	ND	--	
	12/14/06	15.16	--	ND	ND	ND	ND	ND	ND	ND	ND	
3/5/07	--	--	ND	ND	ND	ND	ND	ND	ND	ND		
MW-4 25 ft, 4" diameter Installed 6/24/94 on-site overburden monitoring well	7/5/94	--	--	94	ND	7	12	--	--	210000	--	
	7/5/94 dup	--	--	83	ND	7	13	--	--	150000	--	
	8/29/95	--	LPH	--	--	--	--	--	--	--	--	
	3/10/97	12.17	LPH	--	--	--	--	--	--	--	--	
	3/12/98	10.95	--	ND	ND	ND	ND	--	ND	78800	--	
	11/9/99	15.96	--	ND	ND	ND	ND	--	136000	53400	--	
	4/11/00	12.65	--	ND	ND	ND	ND	--	ND	13100	--	
	5/16/01	15.60	--	ND	ND	ND	ND	--	ND	1270	--	
	5/7/02	14.72	--	ND	ND	ND	ND	--	ND	2660	--	
	5/15/03	13.30	--	ND	ND	ND	ND	--	ND	ND	--	
	5/6/04	12.62	--	ND	ND	ND	ND	--	ND	ND	--	
	5/16/05	14.92	--	ND	ND	ND	ND	--	ND	3900	--	
	6/6/06	--		(damaged)								
12/27/06	--		(abandoned)									

Table 1 (continued): Monitoring Wells at CSX

Well Information	Sample Dates	Depth to groundwater	Petroleum Constituents of Concern									
			LPH	Benzene	Toluene	Ethyl benzene	Xylene	MTBE	Naphthalene	TPH-DRO	TPH-GRO	
MW-5 25 ft, 4" diameter Installed 8/30/95 on-site overburden monitoring well	8/29/95	--	--	ND	ND	ND	ND	ND	--	23	4300	--
	8/29/95 dup	--	--	ND	ND	ND	ND	ND	--	23	4300	--
	3/10/97	11.60	--	ND	ND	ND	ND	ND	--	ND	1160	--
	3/12/98	10.95	--	ND	ND	ND	ND	ND	--	ND	77300	--
	11/9/99	14.49	LPH	--	--	--	--	--	--	--	--	--
	4/11/00	12.50	--	ND	ND	ND	ND	ND	--	ND	28900	--
	5/16/01	14.15	--	ND	ND	ND	ND	ND	--	ND	13900	--
	5/7/02	13.55	--	ND	ND	ND	ND	ND	--	ND	36700	--
	5/15/03	12.18	--	ND	ND	ND	ND	ND	--	ND	8220	--
	5/6/04	11.75	--	ND	ND	ND	ND	ND	--	ND	2310	--
	5/16/05	13.31	--	ND	ND	ND	ND	ND	--	ND	20000	--
	5/16/05 Dup	13.31	--	ND	ND	ND	ND	ND	--	ND	11000	--
6/6/06	14.63	--	ND	ND	ND	ND	ND	--	ND	21000	--	
12/14/06	12.77	--	ND	ND	ND	ND	ND	110	ND	14000	ND	
3/5/07	--	--	ND	ND	ND	ND	ND	52	ND	9000	ND	
MW-6 22 ft, 2" diameter Installed 8/30/95	8/29/95	7.39	--	ND	ND	ND	ND	ND	--	ND	6800	--
	3/10/97	5.68	LPH	--	--	--	--	--	--	--	--	--
	3/12/98	3.50	LPH	--	--	--	--	--	--	--	--	--
	11/9/99	6.31	--	10	ND	ND	ND	ND	--	20	251000	--
	4/11/00	4.62	--	17	ND	ND	ND	ND	--	ND	79400	--
	5/16/01	6.15	--	10	4	2	35	35	--	ND	45000	--
	5/7/02	5.39	--	7	6	ND	187	187	--	ND	150000	--
	5/15/03	4.41	--	12	54	13	253	253	--	ND	250000	--
	--			(abandoned)								
MW-6R 15 ft, 4" diameter Installed 3/29/04	5/7/04	4.61	--	ND	ND	ND	ND	ND	--	9	15400	--
	5/16/05	6.03	--	ND	ND	ND	ND	ND	--	ND	24000	--
	6/6/06	7.52	--	ND	ND	ND	ND	ND	--	ND	2200	--
	12/15/06	5.88	--	ND	ND	ND	ND	ND	ND	ND	5100	140
	3/2/07	--	--	ND	ND	ND	ND	ND	ND	ND	2400	67
MW-8 25 ft, 4" diameter Installed 8/31/95 off-site overburden monitoring well	8/29/95	--	--	ND	ND	ND	ND	ND	--	ND	ND	--
	3/10/97	9.92	--	ND	ND	ND	ND	ND	--	ND	ND	--
	3/12/98	9.25	--	ND	ND	ND	ND	ND	--	ND	ND	--
	9/26/98	15.38	--	--	--	--	--	--	--	--	170	--
	11/9/99	13.48	--	ND	ND	ND	ND	ND	--	ND	420	--
	4/11/00	10.36	--	ND	ND	ND	ND	ND	--	ND	ND	--
	5/16/01	12.72	--	ND	ND	ND	ND	ND	--	ND	ND	--
	5/7/02	11.85	--	ND	ND	ND	ND	ND	--	ND	ND	--
	5/15/03	10.47	--	ND	ND	ND	ND	ND	--	ND	ND	--
	5/7/04	10.27	--	ND	ND	ND	ND	ND	--	ND	ND	--
	5/16/05	21.32	--	ND	ND	ND	ND	ND	--	ND	140	--
	6/6/06	--	--	ND	ND	ND	ND	ND	--	ND	ND	--
12/15/06	11.36	--	ND	ND	ND	ND	ND	38	ND	97	ND	
2/28/07	--	--	ND	ND	ND	ND	ND	ND	ND	150	ND	
MW-9 25 ft, 4" diameter Installed 8/31/95 off-site overburden monitoring well	8/29/95	--	--	ND	ND	ND	ND	ND	--	ND	ND	--
	3/10/97	12.74	--	ND	ND	ND	ND	ND	--	ND	ND	--
	3/12/98	12.00	--	ND	ND	ND	ND	ND	--	ND	ND	--
	11/9/99	13.64	--	ND	ND	ND	ND	ND	--	ND	1500	--
	4/11/20	10.36	--	ND	ND	ND	ND	ND	--	ND	1690	--
	5/16/01	14.25	--	ND	ND	ND	ND	ND	--	ND	ND	--
	5/7/02	13.38	--	ND	ND	ND	ND	ND	--	ND	ND	--
	5/15/03	12.67	--	ND	ND	ND	ND	ND	--	ND	ND	--
	5/7/04	12.20	--	ND	ND	ND	ND	ND	--	ND	ND	--
	5/16/05	13.15	--	ND	ND	ND	ND	ND	--	ND	380	--
	6/6/2006	--	--	ND	ND	ND	ND	ND	--	ND	160	--
12/18/06	12.77	--	ND	ND	ND	ND	ND	ND	ND	390	ND	
2/28/07	--	--	ND	ND	ND	ND	ND	ND	ND	680	ND	

Table 2: Monitoring Wells at CSX/C&O Canal

Well Information	Sample Dates	Depth to groundwater	Petroleum Constituents of Concern									
			LPH	Benzene	Toluene	Ethyl benzene	Xylene	MTBE	Naphthalene	TPH-DRO	TPH-GRO	
NPS-MW-1 19 ft, 4" diameter Installed 8/29/96 overburden monitoring well	9/96	6.72	--	--	--	--	--	--	--	--	740	--
	9/26/98	10.30	--	--	--	--	--	--	--	--	380	--
	4/99	--	--	--	--	--	--	--	--	--	710	--
	11/99	--	--	--	--	--	--	--	--	--	ND	--
	12/02	--	--	--	--	--	--	--	--	--	436	--
	6/03	--	--	--	--	--	--	--	--	--	450	--
	7/04	--	--	--	--	--	--	--	--	--	310	--
	12/04	--	--	--	--	--	--	--	--	--	325	--
	7/05	--	--	--	--	--	--	--	--	--	ND	--
	1/4/06	5.70	--	--	--	--	--	--	--	--	ND	--
	12/18/06	8.27	--	ND	ND	ND	ND	ND	ND	ND	180	ND
2/28/07	--	--	ND	ND	ND	ND	ND	ND	ND	450	ND	
NPS-MW-2 21 ft, 4" diameter Installed 8/30/96 overburden monitoring well	9/96	4.80	--	--	--	--	--	--	--	--	640	--
	9/26/98	6.80	--	--	--	--	--	--	--	--	320	--
	9/26/98	6.80	--	--	--	--	--	--	--	--	280	--
	4/99	--	--	--	--	--	--	--	--	--	470	--
	4/99	--	--	--	--	--	--	--	--	--	510	--
	11/99	--	--	--	--	--	--	--	--	--	ND	--
	12/02	--	--	--	--	--	--	--	--	--	764	--
	6/03	--	--	--	--	--	--	--	--	--	550	--
	1/04	--	--	--	--	--	--	--	--	--	579	--
	1/04	--	--	--	--	--	--	--	--	--	588	--
	7/04	--	--	--	--	--	--	--	--	--	241	--
	7/04	--	--	--	--	--	--	--	--	--	184	--
	12/04	--	--	--	--	--	--	--	--	--	425	--
	7/05	--	--	--	--	--	--	--	--	--	ND	--
7/05	--	--	--	--	--	--	--	--	--	ND	--	
1/4/06	4.10	--	--	--	--	--	--	--	--	ND	--	
12/14/06	4.77	--	ND	ND	ND	ND	ND	ND	ND	930	ND	
3/1/07	--	--	ND	ND	ND	ND	ND	ND	ND	1400	ND	
NPS-MW-3 24 ft, 4" diameter Installed 8/27/96 overburden monitoring well	9/96	7.63	--	--	--	--	--	--	--	--	180	--
	9/26/98	15.35	--	--	--	--	--	--	--	--	820	--
	4/99	--	--	--	--	--	--	--	--	--	83	--
	11/99	--	--	--	--	--	--	--	--	--	ND	--
	12/02	--	--	--	--	--	--	--	--	--	427	--
	6/03	--	--	--	--	--	--	--	--	--	106	--
	1/04	--	--	--	--	--	--	--	--	--	131	--
	7/04	--	--	--	--	--	--	--	--	--	ND	--
	12/04	--	--	--	--	--	--	--	--	--	217	--
	7/05	--	--	--	--	--	--	--	--	--	ND	--
	1/4/06	5.40	--	--	--	--	--	--	--	--	ND	--
12/15/06	6.18	--	ND	ND	ND	ND	ND	ND	ND	190	ND	
2/27/07	--	--	ND	ND	ND	ND	ND	ND	ND	340	ND	
NPS-MW-4 14 ft, 2" diameter Installed 9/3/96 overburden monitoring well	9/96	4.06	--	--	--	--	--	--	--	--	--	--
	9/26/98	--	LPH	--	--	--	--	--	--	--	--	--
	4/99	8.03	LPH	--	--	--	--	--	--	--	--	--
	11/99	8.36	LPH	--	--	--	--	--	--	--	--	--
	11/01	10.01	--	--	--	--	--	--	--	--	--	--
	12/02	6.03	LPH	--	--	--	--	--	--	--	--	--
	6/03	7.05	LPH	--	--	--	--	--	--	--	--	--
	5/7/04	--	LPH	--	--	--	--	--	--	--	--	--
	7/04	7.53	--	--	--	--	--	--	--	--	--	--
	12/04	6.23	--	--	--	--	--	--	--	--	--	--
	5/16/05	7.70	--	ND	ND	ND	ND	--	ND	ND	30000	--
	7/05	6.75	--	--	--	--	--	--	--	--	--	--
	1/4/06	6.37	--	--	--	--	--	--	--	--	--	--
	6/6/2006	8.53	--	ND	ND	ND	ND	--	ND	ND	21000	--
12/18/06	7.11	--	ND	ND	ND	ND	ND	ND	ND	10000	170	
3/2/07	--	--	ND	ND	ND	ND	ND	ND	ND	33000	92	

Table 2 (continued): Monitoring Wells at CSX/C&O Canal

Well Information	Sample Dates	Depth to groundwater	Petroleum Constituents of Concern									
			LPH	Benzene	Toluene	Ethyl benzene	Xylene	MTBE	Naphthalene	TPH-DRO	TPH-GRO	
NPS-MW-5 24 ft, 4" diameter Installed 8/28/96 overburden monitoring well	9/96	5.43	--	--	--	--	--	--	--	--	540	--
	9/26/98	9.20	--	--	--	--	--	--	--	--	530	--
	4/99	--	--	--	--	--	--	--	--	--	320	--
	11/99	--	--	--	--	--	--	--	--	--	ND	--
	11/01	--	--	--	--	--	--	--	--	--	--	--
	12/02	--	--	--	--	--	--	--	--	--	497	--
	6/03	--	--	--	--	--	--	--	--	--	506	--
	6/03	--	--	--	--	--	--	--	--	--	300	--
	1/04	--	--	--	--	--	--	--	--	--	598	--
	7/04	--	--	--	--	--	--	--	--	--	374	--
	12/04	--	--	--	--	--	--	--	--	--	534	--
	7/05	--	--	--	--	--	--	--	--	--	ND	--
	1/4/06	5.80	--	--	--	--	--	--	--	--	360	--
12/15/06	6.32	--	ND	ND	ND	ND	ND	ND	ND	900	ND	
2/28/07	--	--	ND	ND	ND	ND	ND	ND	ND	1100	ND	
NPS-MW-10 21 ft, 2" diameter Installed 11/27/01 overburden monitoring well	12/6/01	8.59	--	--	--	--	--	--	--	--	496	--
	12/02	--	--	--	--	--	--	--	--	--	249	--
	6/03	--	--	--	--	--	--	--	--	--	214	--
	1/04	--	--	--	--	--	--	--	--	--	139	--
	7/04	--	--	--	--	--	--	--	--	--	ND	--
	12/04	--	--	--	--	--	--	--	--	--	257	--
	7/05	--	--	--	--	--	--	--	--	--	ND	--
	1/4/06	4.97	--	--	--	--	--	--	--	--	ND	--
12/15/06	5.64	--	ND	ND	ND	ND	ND	ND	ND	410	ND	
3/1/07	--	--	ND	ND	ND	ND	ND	ND	ND	700	ND	
NPS-MW-11 21 ft, 2" diameter Installed 11/27/01 overburden monitoring well	12/6/01	5.19	--	--	--	--	--	--	--	--	504	--
	12/02	--	--	--	--	--	--	--	--	--	410	--
	6/03	--	--	--	--	--	--	--	--	--	358	--
	1/04	--	--	--	--	--	--	--	--	--	335	--
	7/04	--	--	--	--	--	--	--	--	--	158	--
	12/04	--	--	--	--	--	--	--	--	--	295	--
	7/05	--	--	--	--	--	--	--	--	--	ND	--
	1/4/06	1.45	--	--	--	--	--	--	--	--	ND	--
12/15/06	2.19	--	ND	ND	ND	ND	ND	ND	ND	430	ND	
3/1/07	--	--	ND	ND	ND	ND	ND	ND	ND	770	ND	
NPS-MW-12 27 ft, 2" diameter Installed 11/28/01 overburden monitoring well	12/6/01	14.50	--	--	--	--	--	--	--	--	585	--
	12/02	--	--	--	--	--	--	--	--	--	750	--
	6/03	--	--	--	--	--	--	--	--	--	438	--
	1/04	--	--	--	--	--	--	--	--	--	509	--
	7/04	--	--	--	--	--	--	--	--	--	209	--
	12/04	--	--	--	--	--	--	--	--	--	405	--
	7/05	--	--	--	--	--	--	--	--	--	ND	--
	1/4/06	9.85	--	--	--	--	--	--	--	--	ND	--
12/14/06	10.65	--	ND	ND	ND	ND	ND	ND	ND	590	ND	
3/1/07	--	--	ND	ND	ND	ND	ND	ND	ND	930	ND	
NPS-MW-13 25 ft, 2" diameter Installed 11/28/01 overburden monitoring well	12/5/01	12.11	--	--	--	--	--	--	--	--	460	--
	12/02	--	--	--	--	--	--	--	--	--	356	--
	6/03	--	--	--	--	--	--	--	--	--	229	--
	1/04	--	--	--	--	--	--	--	--	--	363	--
	7/04	--	--	--	--	--	--	--	--	--	155	--
	12/04	--	--	--	--	--	--	--	--	--	327	--
	7/05	--	--	--	--	--	--	--	--	--	ND	--
	1/4/06	9.85	--	--	--	--	--	--	--	--	220	--
12/21/06	10.58	--	ND	ND	ND	ND	ND	ND	ND	530	ND	
3/1/07	--	--	ND	ND	ND	ND	ND	ND	ND	650	ND	

Table 2 (continued): Monitoring Wells at CSX/C&O Canal

Well Information	Sample Dates	Depth to groundwater	Petroleum Constituents of Concern									
			LPH	Benzene	Toluene	Ethyl benzene	Xylene	MTBE	Naphthalene	TPH-DRO	TPH-GRO	
NPS-MW-14 27 ft, 2" diameter Installed 11/29/01 overburden monitoring well	12/5/01	12.00	--	--	--	--	--	--	--	--	757	--
	12/5/01	12.00	--	--	--	--	--	--	--	--	729	--
	12/02	--	--	--	--	--	--	--	--	--	804	--
	6/03	--	--	--	--	--	--	--	--	--	517	--
	1/04	--	--	--	--	--	--	--	--	--	1050	--
	7/04	--	--	--	--	--	--	--	--	--	685	--
	12/04	--	--	--	--	--	--	--	--	--	929	--
	7/05	--	--	--	--	--	--	--	--	--	420	--
	1/4/06	7.94	--	--	--	--	--	--	--	--	ND	--
	12/14/2006	7.78	--	ND	ND	ND	ND	ND	ND	ND	1700	ND
	12/14/06	7.78	--	ND	ND	ND	ND	ND	ND	ND	2300	ND
3/2/07	--	--	ND	ND	ND	ND	ND	ND	ND	2400	ND	
NPS-MW-15 24 ft, 2" diameter Installed 11/30/01 overburden monitoring well	12/5/01	12.20	--	--	--	--	--	--	--	--	1090	--
	12/02	--	--	--	--	--	--	--	--	--	1420	--
	6/03	--	--	--	--	--	--	--	--	--	1490	--
	7/04	--	--	--	--	--	--	--	--	--	750	--
	12/04	--	--	--	--	--	--	--	--	--	1100	--
	7/05	--	--	--	--	--	--	--	--	--	760	--
	1/4/06	8.50	--	--	--	--	--	--	--	--	620	--
	12/18/06	8.19	--	ND	ND	ND	ND	ND	ND	ND	1800	ND
3/2/07	--	--	ND	ND	ND	ND	ND	ND	ND	1800	ND	
NPS-MW-16 22 ft, 2" diameter Installed 12/3/01 overburden monitoring well	12/6/01	11.31	--	--	--	--	--	--	--	--	482	--
	12/02	--	--	--	--	--	--	--	--	--	434	--
	6/03	--	--	--	--	--	--	--	--	--	581	--
	1/04	--	--	--	--	--	--	--	--	--	873	--
	7/04	--	--	--	--	--	--	--	--	--	204	--
	12/04	--	--	--	--	--	--	--	--	--	874	--
	12/04	--	--	--	--	--	--	--	--	--	816	--
	7/05	--	--	--	--	--	--	--	--	--	530	--
	1/4/06	7.55	--	--	--	--	--	--	--	--	270	--
	1/4/06	7.55	--	--	--	--	--	--	--	--	280	--
	12/15/06	8.44	--	ND	ND	ND	ND	ND	ND	ND	1300	ND
3/2/07	--	--	ND	ND	ND	ND	ND	ND	ND	1400	ND	
NPS-MW-17 31 ft, 2" diameter Installed 12/3/01 overburden monitoring well	12/6/01	18.14	--	--	--	--	--	--	--	--	545	--
	12/02	--	--	--	--	--	--	--	--	--	166	--
	6/03	--	--	--	--	--	--	--	--	--	115	--
	1/04	--	--	--	--	--	--	--	--	--	121	--
	7/04	--	--	--	--	--	--	--	--	--	ND	--
	12/04	--	--	--	--	--	--	--	--	--	ND	--
	7/05	--	--	--	--	--	--	--	--	--	ND	--
	1/4/06	14.30	--	--	--	--	--	--	--	--	ND	--
	12/14/06	14.99	--	ND	ND	ND	ND	ND	ND	ND	120	ND
	3/1/07	--	--	ND	ND	ND	ND	ND	ND	ND	210	ND
NTP-7 22 ft, 2" diameter Installed 11/26/01	12/6/01	12.36	--	--	--	--	--	--	--	--	2480	--
	12/02	--	LPH	--	--	--	--	--	--	--	--	--
	6/03	--	--	--	--	--	--	--	--	--	1890	--
	11/03	--	(destroyed)									

Table 3: C&O Canal initial sediment samples (March 1992)				
location	sample depth	Total VOC (ppb)	Total SVOC (ppb)	TPH (ppm)
NPS-1	2 ft.	257	ND	274
NPS-13	3 ft.	13	ND	137
NPS-14	1 ft.	24	ND	4270
NPS-15	1 ft.	ND	ND	141
NPS-17	1 ft.	ND	ND	547
NPS-18	1 ft.	17	ND	54
NPS-21	2 ft.	ND	ND	509
NPS-22	2 ft.	ND	ND	1910

Table 4: C&O Canal second soil samples (July 1993)		
Location	Sample depth	TPH (ppm)
B-1	2.5 ft.	ND
B-2	2.5 ft.	ND
B-3	12.5 ft.	ND
B-4	2.5 ft.	ND
B-5	2 ft.	ND
B-6	2.5 ft.	ND
B-7	1 ft.	40
B-8	2.2 ft.	ND
B-10	1.5 ft.	ND
B-11	1.5 ft.	1400
B-12	9 ft.	30
B-13	1.5 ft.	ND
B-14	1.5 ft.	26,000
HA-1	1.5 ft.	ND
B-15	1 ft.	12,000
B-17	1.5 ft.	27
B-19	1 ft.	21,000
B-20	0.8 ft.	20
B-21	3 ft.	ND
B-22	2.8 ft.	310
B-23	3 ft.	350
B-26	2 ft.	490
B-27	7 ft.	80
B-30	5 ft.	1900
B-31	5 ft.	1000
B-32	3 ft.	1500
B-33	5 ft.	290