Hazardous Waste Section

File Room Document Transmittal Sheet

Your Name:	Scott Ross
EPA ID:	N C D 0 8 8 5 6 0 0 3 2
Facility Name:	Ashland Raleigh
Document Group:	Corrective Action (CA)
Document Type:	Environmental Indicators (EI)
Description:	Environmental Indicators Determination
Date of Doc:	6/7/2011
Author of Doc:	Mary Siedlecki

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NCD088560032

	Month	Day	Year
Date Recieved by File Room:	1	3	2014
Date Scanned:	1	3	2014

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MEMORANDUM

TO: Ashland Inc. General File

FROM: Mary Siedlecki MS

DATE: June 7, 2011

SUBJ: Evaluation of Ashland Inc.'s status under the Environmental Indicator Event Codes (CA725 and CA750)
NCD# 088 560 032

I. PURPOSE OF MEMO

This memo is written to formalize an evaluation of Ashland Inc.'s status in relation to the following corrective action event codes defined in RCRAInfo:

1) Current Human Exposures Under Control (CA725) – YE,

2) Migration of Contaminated Groundwater Under Control (CA750) – YE.

II. SUMMARY OF FOLLOW-UP ACTIONS

Ashland Inc. submitted a *Corrective Measures Study Work Plan* (May 12, 2010) that presents the results of four phases of environmental investigation and discusses three interim measures that have been implemented to remediate impacted soil and groundwater. The *Corrective Measures Study Work Plan* was submitted to fulfill the Remedial Strategy requirements specified in the Administrative Order in Lieu of a Post-Closure Permit (effective June 17, 2011).

The *Corrective Measures Study Work Plan* presents a strategy to identify and develop appropriate corrective measure alternatives to protect human health and the environment at and in the vicinity of the Site. Risk management strategies (e.g., current and future land use controls, exposure pathways, and vapor intrusion assessments) were also evaluated during the remedy selection process. Supplemental data collected over a period of twelve months will be used to finalize the *Corrective Measures Study* and recommend the final remedy. It is anticipated that this work will be completed in 2011.

III. REFERNECES

Ashland Chemical, Inc. 1991. Closure Plan, Container Storage Area, Ashland Chemical, Raleigh, North Carolina. December 19.

Ashland Chemical, Inc. 1993. Closure Certification Report, Former Underground Storage Tank, Ashland Chemical, Raleigh, North Carolina. July 14.

ARCADIS. 2008. Semi-Annual Groundwater Monitoring Report, Former Ashland Distribution Company Facility, Raleigh, North Carolina. September 2008.

ARCADIS. 2009a. Preliminary Groundwater Flow and Transport Modeling Technical Summary, Former Ashland Inc. Chemical Distribution Company Facility, Raleigh, North Carolina. May 6.

ARCADIS. 2009b. Semi-Annual Groundwater Monitoring Report, Former Ashland Distribution Company Facility, Raleigh, North Carolina. March 2009.

ARCADIS. 2009c. Semi-Annual Groundwater Monitoring Report, Former Ashland Distribution Company Facility, Raleigh, North Carolina. September 2009.

ARCADIS, 2010, *Corrective Measures Study Work Plan,* Former Ashland Raleigh Chemical Company Facility, May 12, 2010.

Ashland, Inc. 1999. Transmittal - Surface Water Sampling Data, Ashland Chemical Company, Correspondence from Mr. Jack Spicuzza to Mr. James A. Carter, NCDENR. November 5.

Booz Allen Hamilton. 2003. RCRA Facility Assessment Report. Ashland Chemical Company, Raleigh, North Carolina. June 2003.

Fluor Daniel GTI. 1998. Phase IV Groundwater Assessment Report, Ashland Chemical Company, Raleigh, NC. March 18.

Groundwater Technology, Inc. 1995. Environmental Site Assessment, News and Observer Publishing Company Warehouse. Raleigh, North Carolina. June 7.

GT Design Services, Inc. 1998. Corrective Action Plan, Ashland Chemical Company, Raleigh, North Carolina. April 20.

Law Engineering. 1989a. Report of Preliminary Environmental Site Assessment, Cardinal International Trucks Site. May 12.

Law Engineering. 1989b. Report of Preliminary Site Contamination Assessment, Cardinal International Trucks Site. May 23.

Mid-Atlantic Associates, P.A. 2000. Phase I Environmental Site Audit, Target Area Within the Garner Road Industrial Area, Raleigh, North Carolina. April 18.

North Carolina Department of Environment and Natural Resources (NCDENR). 2007. Performance and Analysis of Aquifer Slug Tests and Pumping Tests Policy, Division of Water Quality, Aquifer Protection Section. May 31.

North Carolina Department of Environment and Natural Resources. 2009. Preliminary Draft Administrative Order in Lieu of Post-Closure Permit. September 29.

Robert J. Goldstein & Associates (RJG&A), Inc. 1997. Biological Assessment of Walnut Creek near the Ashland Chemical Company Site, Raleigh, North Carolina. November 7.

Rust Environment and Infrastructure. 1994a. Phase I Investigation, Ashland Chemical Company, Raleigh, North Carolina. March 9.

Rust Environment and Infrastructure. 1994b. Phase II Assessment, Ashland Chemical Company, Raleigh, North Carolina. September 1994.

Sirrine Environmental Consultants. 1991. Report on Pumping Test Performed on Well RW-4 and Well AR-8D, Ashland Chemical Company, Raleigh, North Carolina. November 6.

Soil & Material Engineers, Inc. (S&ME) 1985a. Soil Sampling Plan. Ashland Chemical Company, Raleigh, North Carolina. December 9.

S&ME. 1985b. Underground Storage Tank Closure, Ashland Chemical Company, Raleigh, North Carolina. Correspondence from Soil and Material Engineers, Inc to Mr. Jerry Rhodes, N.C. Department of Human Resources, Division of Health Services, Solid and Hazardous Waste Management Branch. December19.

S&ME. 1986a. Subsurface Investigation Report. Ashland Chemical Company, Raleigh, North Carolina. January 7.

S&ME. 1986b. Phase I Soil Sampling Report. Ashland Chemical Company, Raleigh, North Carolina. February 5.

S&ME. 1986c. Phase II Soil Sampling Report. Ashland Chemical Company, Raleigh, North Carolina. March 21.

S&ME. 1986d. Wet Period Runoff Samples Report Ashland Chemical Company, Raleigh, North Carolina. April 4.

S&ME. 1986e. Soil Remedial Action Plan. Ashland Chemical Company, Raleigh, North Carolina. May 2.

S&ME. 1987. Ecological and Biological Evaluation of an 18.44 Acre Site Located Between Hammond Avenue and Old Garner Road Just North of Walnut Creek. Ashland Chemical Company, Raleigh, North Carolina. March 31.

SPATCO Environmental. 1990. Soil Boring Assessment and Petroleum Hydrocarbon Soil Removal, 1500 Old Garner Road, Raleigh, North Carolina. August 2.

URS Corporation. 2003. EPA Requested Information RCRA Facility Investigation. Former Ashland Distribution Company Facility. Raleigh, North Carolina. April 1.

Westinghouse Environmental and Geotechnical Services, Inc. 1990. Saprolite Hydraulic Tests, Ashland Chemical Company, Inc., Raleigh, North Carolina. December 1990.

WoodwardClyde Consultants. 1995. Vapor Extraction System Effectiveness Evaluation Report. Ashland Chemical Company, Raleigh, North Carolina. November 6.

Attachments: 1. CA725: Current Human Exposures Under Control
2. CA750: Migration of Contaminated Groundwater Under Control

cc: John Johnston, US EPA Region 4, Restoration and UST Branch
Mike Dever – Ashland, Inc.
Don Malone -- Arcadis
Mary Siedlecki -- HWS Facility Manager

rc: Bud McCarty – HWS Branch Head
Vance Jackson – HWS Unit Supervisor

DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION
RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA725)

Current Human Exposures Under Control

Facility Name: Ashland, Incorporated
Facility Address: 1415 South Bloodworth Street, Raleigh, North Carolina
Facility EPA ID #: NCD 088 560 032

1. Has **all** available relevant/significant information on known and reasonably suspected releases to soil, groundwater, surface water/sediments, and air, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

   _√_ If yes - check here and continue with #2 below.

   _____ If no - re-evaluate existing data, or

   _____ if data are not available skip to #6 and enter "IN" (more information needed) status code.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Current Human Exposures Under Control" EI

A positive "Current Human Exposures Under Control" EI determination ("YE" status code) indicates that there are no "unacceptable" human exposures to "contamination" (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land- and groundwater-use conditions (for all "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Current Human Exposures Under Control" EI are for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and do not consider potential future land- or groundwater-use conditions or ecological receptors. The RCRA Corrective Action program's overall mission to protect human health and the environment requires that Final remedies address these issues (i.e., potential future human exposure scenarios, future land and groundwater uses, and ecological receptors).

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

Current Human Exposures Under Control
Environmental Indicator (EI) RCRIS code (CA725)

2. Are groundwater, soil, surface water, sediments, or air **media** known or reasonably suspected to be **"contaminated"**[1] above appropriately protective risk-based "levels" (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action (from SWMUs, RUs or AOCs)?

	Yes	No	?	Rationale / Key Contaminants
Groundwater	√			
Air (indoors) [2]		√		
Surface Soil (e.g., <2 ft)	√			
Surface Water		√		
Sediment		√		
Subsurf. Soil (e.g., >2 ft)	√			
Air (outdoors)		√		

____ If no (for all media) - skip to #6, and enter "YE," status code after providing or citing appropriate "levels," and referencing sufficient supporting documentation demonstrating that these "levels" are not exceeded.

_√__ If yes (for any media) - continue after identifying key contaminants in each "contaminated" medium, citing appropriate "levels" (or provide an explanation for the determination that the medium could pose an unacceptable risk), and referencing supporting documentation.

____ If unknown (for any media) - skip to #6 and enter "IN" status code.

Rationale and Reference(s):

The Former Ashland Chemical Company Facility (Ashland) is located at 1415 South Bloodworth Street in Raleigh, North Carolina. The Facility is located in an industrial area south of downtown Raleigh. It is bound to the north by East Hoke Street, to the south by Farmers Street, to the east by a former railroad spur, and to the west by South Bloodworth Street (CSM, June 2008). Surrounding properties currently include a vacant lot owned by Pentecostal Pilgrims (east), a plastics molding facility (north), a warehouse building and highway (west), Southern Pump and Tank Company (south) and a combination warehouse and multitenant commercial building owned by Apropos Holdings LLC (southeast). A residential area and a wetland area are located approximately 400 feet north and approximately 1,000 feet south of the site, respectively. Surface water bodies present in the vicinity of the site are located approximately 2,000 feet east (unnamed tributary); 2,500 feet west (Rocky Branch); and 1,500 feet south (Walnut Creek) (CMSWP, May 2010). The site layout is presented on the attached figure identified as Site Layout.

Operations at the Facility began in the 1950s when Ashland's predecessor, F.H. Ross, leased the property from its affiliate, the F.H. Ross Realty Company. Ashland purchased the stock of F.H. Ross on September 30, 1968. The Facility property was acquired in connection with this stock purchase (Draft AOC, 2010). Ashland used the former Facility as a packaging warehouse and bulk distribution center for industrial chemicals and solvents. Chemicals known to be associated with operations at the Facility included hexane, mineral spirits, rubber solvents, isopropyl alcohol, acetone, toluene, 1,1,1-trichloroethane (TCA), perchloroethylene (PCE), trichloroethylene (TCE), chloroform, 20% hydrochloric acid, 66% sulfuric acid, 50% caustic soda, and 42% nitric acid (CMSWP, May 2010).

During its operation as a bulk distribution center, chemicals and solvents were shipped to and from the site via tanker truck and rail car. The tanker truck loading and unloading operations were generally focused on the western portion of the site, and the rail car activities were conducted on a railroad spur located on the eastern boundary of the site. Although chemical containers were stored at multiple locations across the site, the majority of the bulk chemicals were stored in several above ground storage tanks (ASTs) located on the western side of the property. A 1,000-gallon hazardous waste underground storage tank (UST) which was used to collect product spillage associated with the transfer of bulk chemicals to and from tanker trucks was located adjacent to the AST tank farm. By 1988, Ashland ceased the handling of bulk chemicals at the Facility, and operations were limited to storage and redistribution of pre-packaged chemicals to various industrial customers. Ashland ceased all operations at the site on October 31, 2005.

Select Commercial, LLC (Select Commercial), is the current legal owner of the Facility. Select Commercial became legal owner of the Facility on April 28, 2006. In June of 2006, Select Commercial rented the property to FormTech Concrete Forms, Inc. (FormTech). FormTech utilizes the site for the company's local offices and warehouse facilities, including the staging of pre-engineered concrete forms.

Regulatory History

A Hazardous Waste Management Part B Permit was issued to Ashland on July 5, 1984. In accordance with the permit, Ashland was authorized to store hazardous waste(s) in a container storage unit consisting of a concrete pad with a maximum storage capacity of 224 fifty-five gallon containers (drums). The permit remained in effect until July 5, 1984, and was not renewed.

In October 1985, the North Carolina Department of Environment, Health, and Natural Resources (NC DEHNR) conducted an inspection at the Ashland Facility which included soil and groundwater sampling. The sampling event identified the presence of hazardous constituents in the soil and groundwater. Specifically,

- Soil samples obtained from the southern half of the site, collected to a maximum depth of two feet below ground surface, indicated the presence of dichloromethane, acetone, toluene, perchloroethylene (PCE), 1,1,1-trichloroethane (TCA), trichloroethylene (TCE), ethyl benzene, and xylenes.

- Analyses of a groundwater sample collected from along the southwest corner of the property indicated the presence of chloroform, TCA, carbon tetrachloride, TCE, and PCE.

- Analyses of 12 of the 280 drums, located in an area outside the container storage unit specified in the Part B Permit, indicated the presence of hazardous wastes and hazardous waste constituents, including TCE; 2-propanol; dichloromethane; PCE; 1,1,1-TCA; toluene; and, methyl ethyl ketone (MEK).

Based upon the results of the environmental sampling, and the discovery of a 1000-gallon hazardous waste UST, the NC DEHNR issued a Compliance Order with Administrative Penalty on November 15, 1985. The Compliance Order including the penalty provision was stayed following issuance of an Administrative Order On Consent (AOC) on December 10, 1985. The AOC named the 1000-gallon hazardous waste UST as the regulated unit.

In accordance with RCRA regulations and the 1984 Part B Permit, closure of the Facility's former hazardous waste UST and container storage area was required. In May 1991, NC DEHNR determined that Ashland should seek a modification of its Part B permit to include provisions for post-closure care and corrective actions associated with these two management units at the Facility. Closure and post-closure plans for the former UST were submitted by Ashland, and subsequently approved by the NC DEHNR in October 1992. However, based on the results of the closure investigation, Ashland could not document clean closure of the soils surrounding the former tank location. Therefore, Ashland was required to submit a post-closure care plan modification to close the unit as a landfill. The installation of a RCRA concrete

cap was approved by the NC DEHNR and subsequently installed by Ashland on May 12 to 13, 1993. A Closure Plan Certification Report for the Former UST was prepared by Ashland on July 14, 1993, to document the closure activities associated with the UST.

A Closure Plan for the Container Storage Area was prepared for the Site by Ashland on December 19, 1991. The Closure Plan addressed removing the existing inventory and infrastructure (concrete pad, curbing, and canopy), cleaning the structures, and then collecting wash water and rinsate samples. This closure plan did not address the surrounding soils since sampling results from 1986 indicated that there were no contaminants of potential concern (COPCs) in soils immediately adjacent to the container storage area (Ashland Chemical, 1991). The closure activities associated with the container storage area were completed in June of 1994.

Booz Allen Hamilton conducted a RCRA Facility Assessment (RFA) at the Ashland Facility from February to April 2003. The RFA report reviewed historical information for operations at the Facility and identified 16 Solid Waste Management Units (SWMUs). Further action was recommended for 4 of the 16 SWMUs:

- SWMU 5 – Warehouse and Loading Dock;
- SWMU 11 – MEK Peroxide Storage Building;
- SWMU 12 – Former Soil Vapor Extraction (SVE) Treatment System; and
- SWMU 13 – Groundwater Treatment System.

No further action status was withheld for the following SWMUs, which was contingent upon Ashland providing either (i) information demonstrating that releases had not occurred at the SWMUs, or (ii) results from confirmatory sampling conducted at the Facility:

- SWMU 1- Former 1,000-gallon underground storage tank (UST) that was used to collected spillage from the routine bulk transfer of solvents;
- SWMU 2 - Former aboveground storage tank farm;
- SWMU 3 - Former hazardous waste container storage area;
- SWMU 4 - Former storm water retention pond;
- SWMU 6 - Former paved yard area;
- SWMU 7 - Former aboveground solvent storage tank farm;
- SWMU 8 - Former solvents blending and drumming area;
- SWMU 9 - Former solvents drums storage area;
- SWMU 10 - Former acid drum filling facility;
- SWMU 14 - Former railroad spur loading and unloading dock;
- SWMU 15 - Former tanker truck loading and unloading area; and
- SWMU 16 - Former yard drain.

The North Carolina Department of Environment and Natural Resources (NC DENR) issued a call for a RCRA Part B Permit Application on January 27, 2009. The call for the Part B Permit Application was withdrawn on April 23, 2009, and Ashland was issued an Administrative Order in Lieu of a Post-Closure Permit in February 2011.

Ashland is currently maintaining a regulated unit (former 1,000-gallon hazardous waste UST) under 40 CFR 264 post-closure provisions. These provisions require groundwater monitoring and regular inspections of the concrete cap overlying the former UST.

Soils

Multiple phases of field investigations were conducted from 1985 to 1995 to characterize soil and sediment quality on and downgradient of the former Ashland Facility. Ashland reviewed and tabulated the soils data contained in historical reports. For comparison purposes, data characterizing on-site soil samples were compared to the US Environmental Protection Agency (USEPA) Regions 3, 6, and 9 Regional Screening Levels (RSLs) for Industrial Soil (December 10, 2009). Consistent with NC DENR guidance, the RSLs based on non-cancer effects were adjusted by a factor of 0.2. The RSLs based on cancer effects correspond to a $1x10^{-6}$ target risk level.

Data characterizing off-site soil samples were compared to the USEPA Regions 3, 6, and 9 RSLs. Consistent with NC DENR guidance, the RSLs based on non-cancer effects were adjusted by a factor of 0.2. The RSLs based on cancer effects correspond to a $1x10^{-6}$ target risk level.

The complete evaluation of historic soils data can be found in the *Corrective Measures Study Work Plan* (Arcadis, *Corrective Measures Study Work Plan,* May 12, 2010, Section 2.6 and Table 1). For purposes of this EI Determination, the data are summarized below.

On-Site Soils

Ashland began collecting and evaluating soils data beginning in 1985. Over the course of several phases of investigation, more than 100 soil samples were collected from on-site locations. Sample depths ranged from approximately one foot below land surface (bls) to approximately seven feet bls.

Adverse impacts to soils were identified in several on-site locations. Specifically, impacts were identified on the property along the edge of pavement and/or the following product handling areas (see Former On-Site Soil Sample Location Map):

- the edge of the driveway at the main gate to the Facility near the former solvent drums storage area (SWMU 9);
- the edge of the driveway by the main gate to the Facility near the former paved yard area (SWMU 6);
- the south end of the truck loading and unloading area (SWMU 15);
- at the southwest corner of the former hazardous waste container storage area (SWMU 3);
- within and adjacent to the former above ground storage tank farm (SWMU 2); and
- below the former waste storage UST (SWMU 1).

Contaminants of Potential Concern (COPC) include PCE, toluene, benzene, ethyl benzene, xylenes, and 2-propanone (acetone). PCE detections generally exceeded the Region 3, 6, and 9 RSLs for Industrial Soil. Contaminant concentrations decreased with depth and were generally non-detect at depths of 7 feet bls.

Off-Site Soils

Soil samples were also collected from off-site locations. Soil samples were collected downgradient of the Facility along the trace of a surface drainage feature leading toward Walnut Creek and within the swamp area adjacent to the Creek. The majority of the samples were collected from near the ground surface.

The off-site soil sample results suggested that COPC impacts existed along the drainage ditch were generally not widespread. One soil sample, collected in 1986, was characterized by PCE at 34,000 micrograms/kilogram (ug/kg), which exceeds the Residential RSL of 550 ug/kg.

Groundwater

The initial phase of groundwater assessment was conducted in February 1986 and groundwater monitoring has been routinely conducted ever since. Groundwater monitoring was conducted on a quarterly basis until October 1994, at which time the Site transitioned to semi-annual sampling and reporting. Groundwater is sampled on a semi-annual basis, beginning in September 2007 to the present. Groundwater samples are collected from ten on-site monitoring wells and four off-site monitoring wells. The attached tables present the groundwater analytical results for the March and September 2009 sampling events (ARCADIS 2009a and 2009b).

VOC concentrations exceeded the 15A NCAC 2L Groundwater Standards in wells located onsite and downgradient of the Facility. Constituents exceeding the 15A NCAC 2L Groundwater Standards include carbon tetrachloride; 1,1-dichloroethene (1,1-DCE); cis-1,2-dichloroethene (cis-1,2-DCE); trans-1,2-dichloroethene (trans-1,2-DCE); PCE; 1,1,1-TCA; trichloroethene (TCE); and vinyl chloride.

Evaluation of total VOC concentrations measured in groundwater indicates that the highest on-site contaminant concentrations are generally present in monitoring well MW-1. The highest off-site concentrations are present in monitoring well MW-8DR, which is located on a vacant railroad spur to the south and hydraulically downgradient of the Site. Monitoring well MW-5 has historically been characterized by some of the highest concentrations; however, since the September 2008 sampling event, PCE concentrations have decreased from an historic average of ~41,000 micrograms per liter (µg/L) to 240 µg/L during March 2009. PCE concentrations rebounded slightly during the September 2009 event to 8,400 µg/L. This concentration variability over time is typical for the Piedmont region, as well as other geologic settings.

VOC concentrations in monitoring wells MW-1, MW-3, and MW-5, which are shallow wells close to the source area, have fluctuated historically with no apparent trends. Concentrations of PCE and TCE in monitoring wells MW-8/MW-8R remained generally steady from 1995 to 2006 and then exhibited increasing concentrations until March 2008. Significant PCE concentration decreases were observed since that time.

Concentrations of 1,1-DCE and cis-1,2-DCE in monitoring wells MW-8/MW-8R have increased steadily by one to two orders of magnitude since 1998. This increasing trend in DCE concentrations suggests that reductive dechlorination may be occurring at increasing rates in this portion of the aquifer. Concentrations of target constituents in monitoring wells MW-8D/MW-8DR have had significant and seemingly cyclical concentration fluctuations over time without any clear trends. Concentrations of target constituents in MW-12D have generally declined since 1997.

BTEX constituents have been detected at concentrations exceeding the 15A NCAC 2L Standards in down gradient monitoring well MW-19 in historic sampling events. Benzene has also been detected in monitoring wells MW-14OB, and MW-20 at concentrations exceeding the NCAC 2L Standard (see attached tables). The detection of BTEX constituents in these monitoring wells and surrounding monitoring wells are most likely attributable to the Dumas Oil site, located between these monitor wells and the Ashland Facility. The BTEX constituents in this area likely provide an anthropogenic carbon source that helps facilitate reductive dechlorination of the chlorinated aliphatic hydrocarbons in this area downgradient of the former Ashland Facility.

Surface Water

Surface water samples have been collected periodically from Walnut Creek since November 1997. Surface water samples were collected in November 1997, September 1998, October 1998, October 1999, September 2008, and September 2009. Based on these data, no exceedances of the 15A NCAC Subchapter 2B Surface Water Quality Criteria for Class C waters were present in any of the samples.

Indoor Air

Soil gas samples were collected from three locations and two depth intervals at the Apropos building, which is located downgradient of the Ashland facility. The purpose of sample collection was to evaluate whether site-related constituents discovered in groundwater may represent a potential source of vapor migration into the building. A human health risk assessment was completed to evaluate whether or not exposures to constituents detected in soil gas beneath and along-side the building may pose a risk or hazard to human health. Exposure to constituents in soil gas was evaluated assuming site worker exposure. Model results indicated that the risk posed was less than NC DENR's benchmark of 1×10^{-6}, which is designed to be protective of public health. Noncancer hazards were all below the benchmark of 1.

Current Human Exposures Under Control
Environmental Indicator (EI) RCRIS code (CA725)

3. Are there **complete pathways** between "contamination" and human receptors such that exposures can be reasonably expected under the current (land- and groundwater-use) conditions?

Summary Exposure Pathway Evaluation Table

	Potential **Human Receptors** (Under Current Conditions)						
"Contaminated" Media	Residents	Workers	Day-Care	Construction	Trespassers	Recreation	Food[3]
Groundwater	No	No	No	No	No	No	No
Air (indoors)	No	No	No	No	No	No	No
Soil (surface, e.g., <2 ft)	No	No	No	No	No	No	No
Surface Water	No	No	No	No	No	No	No
Sediment	No	No	No	No	No	No	No
Soil (subsurface e.g., >2 ft)	No	No	No	No	No	No	No
Air (outdoors)	No	No	No	No	No	No	No

Instructions for Summary Exposure Pathway Evaluation Table:

1. Strike-out specific Media including Human Receptors' spaces for Media which are not "contaminated") as identified in #2 above.

2. Enter "yes" or "no" for potential "completeness" under each "Contaminated" Media -- Human Receptor combination (Pathway).

Note: In order to focus the evaluation to the most probable combinations some potential "Contaminated" Media - Human Receptor combinations (Pathways) do not have check spaces ("___"). While these combinations may not be probable in most situations they may be possible in some settings and should be added as necessary.

__√__ If no (pathways are not complete for any contaminated media-receptor combination) - skip to #6, and enter "YE" status code, after explaining and/or referencing condition(s) in-place, whether natural or man-made, preventing a complete exposure pathway from each contaminated medium (e.g., use optional Pathway Evaluation Work Sheet to analyze major pathways).

_____ If yes (pathways are complete for any "Contaminated" Media - Human Receptor combination) - continue after providing supporting explanation.

_____ If unknown (for any "Contaminated" Media - Human Receptor combination) - skip to #6 and enter "IN" status code

Rationale and Reference(s):

Based on the information contained in historical reports for the Site, three primary potential exposure pathways were evaluated to assess whether additional potential exposure scenarios could contribute to risk to human health or the environment. The potential exposure pathways are described below.

Groundwater to Potable Well Exposure Pathway

Ashland conducted a receptor survey ion 1998 to evaluate potential groundwater receptors located within ½ mile of the site. The survey focused primarily on the residential area southeast of the Facility. The survey was conducted in two parts. The first part consisted of visiting the City of Raleigh GIS Mapping Office and City of Raleigh Engineering Department to obtain tax maps and utility maps. The second part included a site reconnaissance trip to verify the findings on the city maps and to ensure that city water was

available to all residences within the study area. A visual check was made for the presence of private water wells during the reconnaissance trip. It was concluded that water and sewer service is available to all residential and commercial buildings within the survey area. No private water wells were evident in the survey area. Additionally, Ashland entered into an environmental covenant with Select Commercial on April 27, 2006, that prohibits the use of groundwater for any purpose.

To further to verify the absence of groundwater receptors, Ashland will conduct a second potable well survey of the surrounding area to identify all potential public or private water wells within ½ mile of the Facility. To conduct this work, Ashland will research files located at various local governmental offices including NC DENR, as well as the City of Raleigh GIS Mapping Office and City Engineering Department to obtain tax and utility maps. A windshield drive-by reconnaissance will be performed to verify the findings of the city maps, to ensure that city water is available to all residences within the study area, and to attempt to visually confirm the presence or absence of private water wells within the study area.

Groundwater to Surface Water Exposure Pathway

Surface water samples were collected in November 1997, September 1998, October 1998, October 1999, September 2008, and September 2009. Based on these data, no exceedances of the 15A NCAC Subchapter 2B Surface Water Quality Criteria for Class C were present in any of the samples.

Ashland developed a preliminary groundwater flow and transport model to evaluate potential mass loading rates to Walnut Creek and the potential effects to surface water quality as a result of these discharges. The model indicated that contaminant plume migration likely would not impact water quality within Walnut Creek under normal conditions, and that unrealistic long-term low-flow conditions would be required to adversely impact surface water quality. Based on these studies, it does not appear that the groundwater to surface water pathway is an important contaminant pathway of concern for the Facility. Ashland proposes continued sampling in Walnut Creek and in monitoring wells immediately upgradient of Walnut Creek to evaluate continued compliance with surface water quality standards.

Groundwater to Indoor Air Exposure Pathway

Ashland has not conducted any indoor air investigations on Facility property. However, Ashland entered into an environmental covenant with Select Commercial, on April 27, 2006, that prohibits the construction of any structure with subsurface features other than minimal building footings. In addition, any new structure would require design and installation of vapor barriers or other intrusion controls prior to construction. The primary structures at the Facility are open and non-conditioned garages and warehouse spaces that freely exchange air with the ambient outdoors.

The highest COPC concentrations in groundwater are typically located in the vicinity of the Apropos Holdings LLC commercial building, located southeast of the Facility at 1500 Garner Road. Although the Purchase Agreement between Ashland and Apropos Holdings LLC restricts the property to non-residential use, Ashland evaluated the vapor intrusion pathway for the western section of the Apropos Holdings LLC commercial building in October 2010.

Soil gas samples were collected from three locations and two depth intervals at the Apropos building, which is located downgradient of the Ashland facility. A human health risk assessment was completed to evaluate whether or not exposures to constituents detected in soil gas beneath and along-side the building may pose a risk or hazard to human health. Exposure to constituents in soil gas was evaluated assuming site worker exposure. Model results indicated that the risk posed was less than NC DENR's benchmark of 1×10^{-6}, which is designed to be protective of public health. Noncancer hazards were all below the benchmark of 1.

Current Human Exposures Under Control
Environmental Indicator (EI) RCRIS code (CA725)

4. Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be **"significant"**[4] (i.e., potentially "unacceptable" because exposures can be reasonably expected to be: 1) greater in magnitude (intensity, frequency and/or duration) than assumed in the derivation of the acceptable "levels" (used to identify the "contamination"); or 2) the combination of exposure magnitude (perhaps even though low) and contaminant concentrations (which may be substantially above the acceptable "levels") could result in greater than acceptable risks)?

_____ If no (exposures can not be reasonably expected to be significant (i.e., potentially "unacceptable") for any complete exposure pathway) - skip to #6 and enter "YE" status code after explaining and/or referencing documentation justifying why the exposures (from each of the complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

_____ If yes (exposures could be reasonably expected to be "significant" (i.e., potentially "unacceptable") for any complete exposure pathway) - continue after providing a description (of each potentially "unacceptable" exposure pathway) and explaining and/or referencing documentation justifying why the exposures (from each of the remaining complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

_____ If unknown (for any complete pathway) - skip to #6 and enter "IN" status code

Rationale and Reference(s):

Current Human Exposures Under Control
Environmental Indicator (EI) RCRIS code (CA725)

5. Can the "significant" **exposures** (identified in #4) be shown to be within **acceptable** limits?

_____ If yes (all "significant" exposures have been shown to be within acceptable limits) - continue and enter "YE" after summarizing and referencing documentation justifying why all "significant" exposures to "contamination" are within acceptable limits (e.g., a site-specific Human Health Risk Assessment).

_____ If no (there are current exposures that can be reasonably expected to be "unacceptable")- continue and enter "NO" status code after providing a description of each potentially "unacceptable" exposure.

_____ If unknown (for any potentially "unacceptable" exposure) - continue and enter "IN" status code

Rationale and Reference(s):

Current Human Exposures Under Control
Environmental Indicator (EI) RCRIS code (CA725)

6. Check the appropriate RCRIS status codes for the Current Human Exposures Under Control EI event code (CA725), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (and attach appropriate supporting documentation as well as a map of the facility):

_√_ YE - Yes, "Current Human Exposures Under Control" has been verified. Based on a review of the information contained in this EI Determination, "Current Human Exposures" are expected to be "Under Control" at the **Ashland, Incorporated** facility, EPA ID # **088 560 032,** located at **1415 South Bloodworth Street in Raleigh, North Carolina**, under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the facility.

____ NO - "Current Human Exposures" are NOT "Under Control."

____ IN - More information is needed to make a determination.

Completed by (signature) Mary Siedlecki Date 6/7/11
Mary Siedlecki
Project Manager

Supervisor (signature) Vance Jackson Date 6/7/11
Vance Jackson
Hazardous Waste Section Unit Supervisor
North Carolina State

Locations where References may be found:

To obtain these documents, please contact: Hazardous Waste File Clerk
1646 Mail Service Center, Raleigh, North Carolina, 27699, telephone number: 919-508-8564

Contact telephone number and e-mail:

Mary Siedlecki
(919) 508-8568
mary.siedlecki@ndenr.gov

FINAL NOTE: THE HUMAN EXPOSURES EI IS A QUALITATIVE SCREENING OF EXPOSURES AND THE DETERMINATIONS WITHIN THIS DOCUMENT SHOULD NOT BE USED AS THE SOLE BASIS FOR RESTRICTING THE SCOPE OF MORE DETAILED (E.G., SITE-SPECIFIC) ASSESSMENTS OF RISK.

DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION
RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA750)

Migration of Contaminated Groundwater Under Control

Facility Name: Ashland, Incorporated
Facility Address: 1415 South Bloodworth, Street, Raleigh, North Carolina
Facility EPA ID #: NCD 088 560 032

1. Has **all** available relevant/significant information on known and reasonably suspected releases to the groundwater media, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

   _√__ If yes - check here and continue with #2 below.

   _____ If no - re-evaluate existing data, or

   _____ If data are not available, skip to #8 and enter "IN" (more information needed) status code.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Migration of Contaminated Groundwater Under Control" EI

A positive "Migration of Contaminated Groundwater Under Control" EI determination ("YE" status code) indicates that the migration of "contaminated" groundwater has stabilized, and that monitoring will be conducted to confirm that contaminated groundwater remains within the original "area of contaminated groundwater" (for all groundwater "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Migration of Contaminated Groundwater Under Control" EI pertains ONLY to the physical migration (i.e., further spread) of contaminated ground water and contaminants within groundwater (e.g., non-aqueous phase liquids or NAPLs). Achieving this EI does not substitute for achieving other stabilization or final remedy requirements and expectations associated with sources of contamination and the need to restore, wherever practicable, contaminated groundwater to be suitable for its designated current and future uses.

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

Migration of Contaminated Groundwater Under Control
Environmental Indicator (EI) RCRIS code (CA750)

2. Is **groundwater** known or reasonably suspected to be **"contaminated"**[1] above appropriately protective "levels" (i.e., applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action, anywhere at, or from, the facility?

   √ If yes - continue after identifying key contaminants, citing appropriate "levels," and referencing supporting documentation.

   _____ If no - skip to #8 and enter "YE" status code, after citing appropriate "levels," and referencing supporting documentation to demonstrate that groundwater is not "contaminated."

   _____ If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s):

Regular groundwater monitoring events have been conducted at the Site since September 1986. The attached tables present groundwater monitoring data for March and September 2009. VOC concentrations exceeded the 15A North Carolina Administrative Code (NCAC) Subchapter 2L groundwater quality standards in various wells both on Site and downgradient of the Facility. Target constituents exceeding the 15A NCAC 2L Groundwater Quality Standards included carbon tetrachloride; 1,1-dichloroethene (1,1-DCE); cis-1,2-dichloroethene (cis-1,2-DCE); trans-1,2-dichloroethene (trans-1,2-DCE); PCE; 1,1,1-TCA; trichloroethene (TCE); and vinyl chloride.

Migration of Contaminated Groundwater Under Control
Environmental Indicator (EI) RCRIS code (CA750)

3. Has the **migration** of contaminated groundwater **stabilized** (such that contaminated groundwater is expected to remain within "existing area of contaminated groundwater"[2] as defined by the monitoring locations designated at the time of this determination)?

__√__ If yes - continue, after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the "existing area of groundwater contamination"[2]).

_____ If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the "existing area of groundwater contamination"[2]) - skip to #8 and enter "NO" status code, after providing an explanation.

_____ If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s):

A groundwater contaminant plume is considered stable and at steady state conditions when contaminant concentrations remain relatively constant or decrease as a function of time and/or distance from the source area. Constant and/or decreased contaminant concentrations indicate that physical processes (advection, dispersion, and sorption) and biological processes (biodegradation) are sufficient to limit the continued downgradient migration of the plume and to reduce the contaminant concentrations.

Available groundwater monitoring data collected for the Ashland facility indicate that the groundwater contaminant plume has stabilized. The most recent sampling event was conducted in September 2010. Groundwater samples were collected from eight onsite and from 18 offsite monitoring wells. The samples were analyzed for the constituents listed under US EPA Method 8260B.

Contaminant concentrations in shallow monitoring wells located close to the source area (MW-1, MW-3, and MW-5) are characterized by moderate fluctuations as a result of seasonality and historic corrective action, but have not exhibited a significant decreasing trend in concentration over time. Concentrations of PCE and TCE in monitor wells MW-8/MW-8R remained generally steady from 1995 to 2006 and then exhibited increasing concentrations until March 2008. Significant PCE concentration decreases were observed since that time. Concentrations of 1,1-DCE and cis-1,2-DCE in monitoring wells MW-8/MW-8R have increased steadily by one to two orders of magnitude since 1998. This increasing trend in DCE concentrations suggests that reductive dechlorination may be occurring at increasing rates in this portion of the aquifer. Concentrations of target constituents in monitor wells MW-8D/MW-8DR have had significant and seemingly cyclical concentration fluctuations over time without any clear trends. Concentrations of target constituents in MW-12D have generally declined since 1997.

Migration of Contaminated Groundwater Under Control
Environmental Indicator (EI) RCRIS code (CA750)

4. Does "contaminated" groundwater **discharge** into **surface water** bodies?

__√__ If yes - continue after identifying potentially affected surface water bodies.

_____ If no - skip to #7 (and enter a "YE" status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater "contamination" does not enter surface water bodies.

_____ If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s):

Ashland developed a numerical groundwater flow model to simulate the migration and degradation of contaminant plumes under existing flow conditions at the site (Arcadis May 6, 2009). The major chemicals of concern (COCs) included PCE, TCE, and DCE. Initial contaminant plumes for each of the COCs were based on the observed groundwater concentration data measured in September 2008. Transport simulations for individual compounds were then conducted for a period of 50 years. The simulated concentration distributions over time were used for a preliminary evaluation of the effects of natural attenuation for the COCs, as well as the potential impact of COC mass loading to Walnut Creek. Walnut Creek is the downgradient groundwater discharge point, and represents a hydrologic boundary.

Because the leading edge of the plume was not well defined by the existing groundwater monitoring network, the model simulation predicted that the COC plume will expand over time. This expansion results in increasing mass loading to Walnut Creek during the first several years of transport simulation. It is reasonable to assume that the contaminant plume is already discharging into Walnut Creek.

Migration of Contaminated Groundwater Under Control
Environmental Indicator (EI) RCRIS code (CA750)

5. Is the **discharge** of "contaminated" groundwater into surface water likely to be **"insignificant"** (i.e., the maximum concentration3 of each contaminant discharging into surface water is less than 10 times their appropriate groundwater "level," and there are no other conditions (e.g., the nature, and number, of discharging contaminants, or environmental setting), which significantly increase the potential for unacceptable impacts to surface water, sediments, or eco-systems at these concentrations)?

__√__ If yes - skip to #7 (and enter "YE" status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected concentration3 of key contaminants discharged above their groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) provide a statement of professional judgement/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or eco-system.

_____ If no - (the discharge of "contaminated" groundwater into surface water is potentially significant) - continue after documenting: 1) the maximum known or reasonably suspected concentration3 of each contaminant discharged above its groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations3 greater than 100 times their appropriate groundwater "levels," the estimated total amount (mass in kg/yr) of each of these contaminants that are being discharged (loaded) into the surface water body (at the time of the determination), and identify if there is evidence that the amount of discharging contaminants is increasing.

_____ If unknown - enter "IN" status code in #8.

Rationale and Reference(s):

Preliminary transport modeling suggests that the contaminant plume migration would likely not impact water quality at Walnut Creek under average conditions. Surface water excursions above the 15A NCAC Subchapter 2B - Surface Water Quality Criteria for Class C waters would likely require unrealistic long-term (i.e., one year or more) low-flow conditions (i.e., less than one-third of monthly flows during extreme drought or less than 5% of the average flow conditions). The absence of long-term impacts to Walnut Creek is supported by results from surface water sampling activities presented in previous reports for the Site (ARCADIS 2008; Ashland 1999, and Fluor Daniel GTI 1998).

6. Can the **discharge** of "contaminated" groundwater into surface water be shown to be "**currently acceptable**" (i.e., not cause impacts to surface water, sediments or eco-systems that should not be allowed to continue until a final remedy decision can be made and implemented[4])?

_____ If yes - continue after either: 1) identifying the Final Remedy decision incorporating these conditions, or other site-specific criteria (developed for the protection of the site's surface water, sediments, and eco-systems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR 2) providing or referencing an interim-assessment,5 appropriate to the potential for impact, that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialists, including ecologist) adequately protective of receiving surface water, sediments, and eco-systems, until such time when a full assessment and final remedy decision can be made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, use/classification/habitats and contaminant loading limits, other sources of surface water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment "levels," as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or site-specific ecological Risk Assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination.

_____ If no - (the discharge of "contaminated" groundwater can not be shown to be "**currently acceptable**") - skip to #8 and enter "NO" status code, after documenting the currently unacceptable impacts to the surface water body, sediments, and/or eco-systems.

_____ If unknown - skip to 8 and enter "IN" status code.

Rationale and Reference(s):

7. Will groundwater **monitoring** / measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the "existing area of contaminated groundwater?"

__√__ If yes - continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify the well/measurement locations which will be tested in the future to verify the expectation (identified in #3) that groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the "existing area of groundwater contamination."

_____ If no - enter "NO" status code in #8.

_____ If unknown - enter "IN" status code in #8.

Rationale and Reference(s):

Groundwater monitoring is conducted on a semi-annual basis, generally in March and September of each year. Groundwater samples are currently collected from 14 monitoring wells, including MW-1, MW-2, MW-2D, MW-3, Mw-3D, MW-4, MW-5, MW-7, MW-7D, MW-8, MW-8D, MW-11D, MW-12D and MW-13D. All samples are analyzed for volatile organic constituents using EPA Method 8260B.

Migration of Contaminated Groundwater Under Control
Environmental Indicator (EI) RCRIS code (CA750)

8. Check the appropriate RCRIS status codes for the Migration of Contaminated Groundwater Under Control EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (attach appropriate supporting documentation as well as a map of the facility).

__√__ YE - Yes, "Migration of Contaminated Groundwater Under Control" has been verified. Based on a review of the information contained in this EI determination, it has been determined that the "Migration of Contaminated Groundwater" is "Under Control" at the **Ashland, Incorporated,** facility, EPA ID # **088 560 032,** located at **1415 South Bloodworth Street, Raleigh, North Carolina.** Specifically, this determination indicates that the migration of "contaminated" groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the "existing area of contaminated groundwater" This determination will be re-evaluated when the Agency becomes aware of significant changes at the facility.

_____ NO - Unacceptable migration of contaminated groundwater is observed or expected.

_____ IN - More information is needed to make a determination.

Completed by (signature) Mary Siedlecki Date 6/7/11
Mary Siedlecki
Project Manager

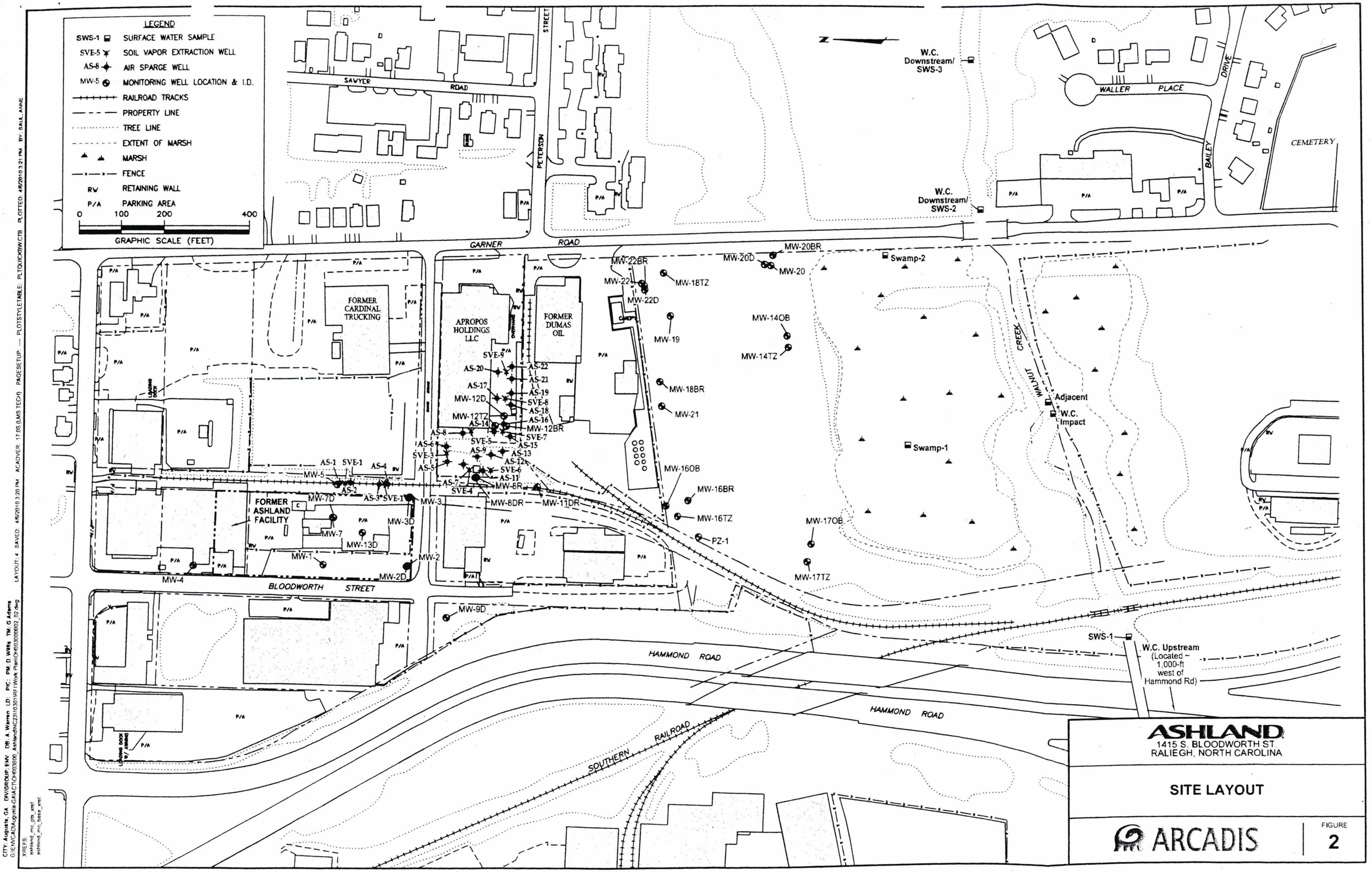
Supervisor (signature) Vance Jackson Date 6/7/11
Vance Jackson
Hazardous Waste Section Unit Supervisor
North Carolina State

Locations where References may be found:

To obtain these documents, please contact: Hazardous Waste File Clerk
1646 Mail Service Center, Raleigh, North Carolina, 27699, telephone number: 919-508-8564

Contact telephone number and e-mail:

Mary Siedlecki
(919) 508-8568
mary.siedlecki@ndenr.gov



CITY: Augusta, GA DIV/GROUP: ENV DB: A. Warren LD: PIC: PM: D. Willis TM: G Adams
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XREFS:
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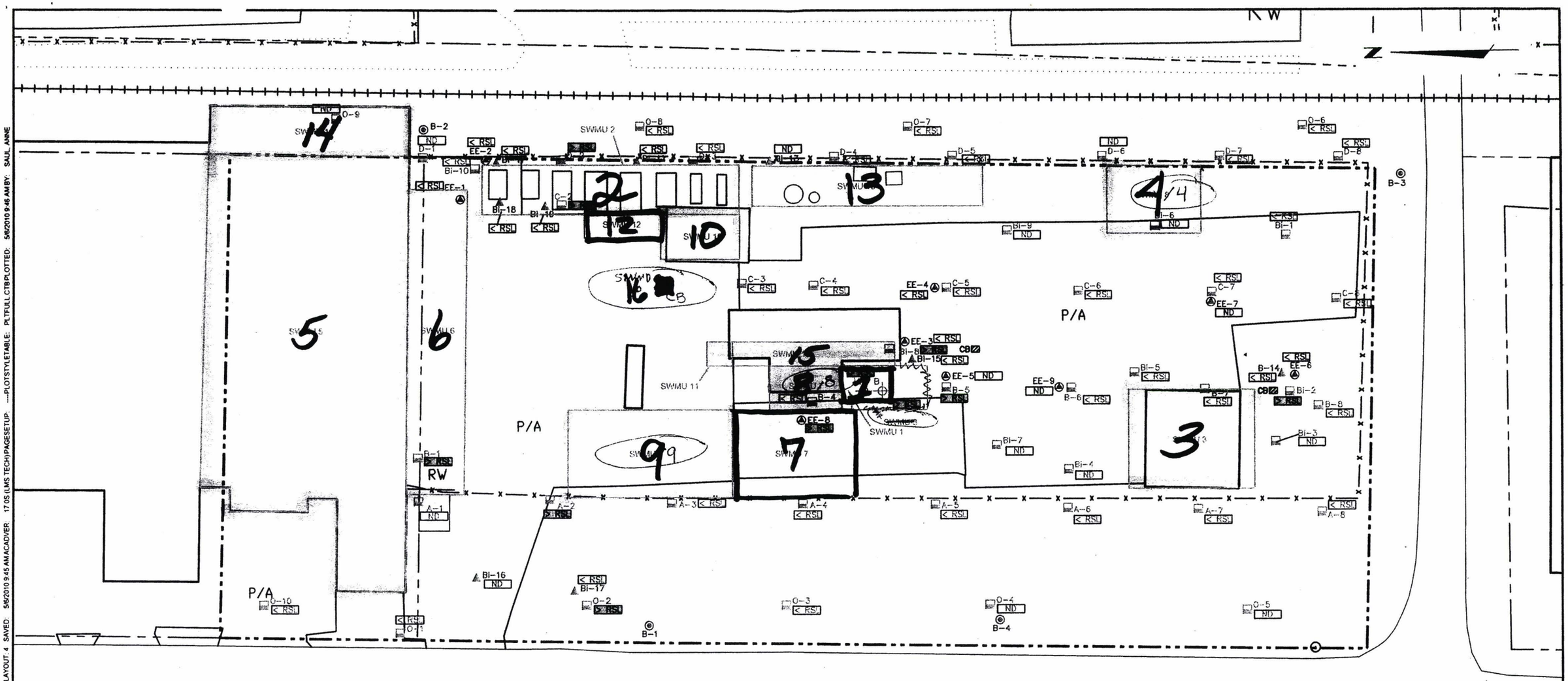
ashland_mc_base_xref



LEGEND:

- RAILROAD TRACKS
- PROPERTY LINE
- TREE LINE
- FENCE
- RW — RETAINING WALL
- P/A — PARKING AREA
- MARSH
- O-8 — PHASE I SOIL BORING LOCATION (Soil & Material Engineers, Inc.; 02/86)
- B-13 — PHASE II SOIL BORING LOCATION (Soil & Material Engineers, Inc.; 03/86)
- B-4 — SUBSURFACE INVESTIGATION REPORT (SEME; 1986a)
- EE-9 — FORMER SOIL BORING LOCATION (Woodward-Clyde Consultants, Inc.; 9/95)
- A — FORMER SOIL BORING LOCATION (Soil & Material Engineers, Inc.; 12/85)
- CB — CATCH BASIN
- ND — NON-DETECT
- < RSL — DETECTED CONCENTRATIONS ARE BELOW THE REGIONAL SCREENING LEVEL (RSL) FOR INDUSTRIAL SOIL
- > RSL — INDICATES A DETECTION OF A CHEMICAL AT A CONCENTRATION GREATER THAN THE RSL

TANK CAPACITIES

1	5,000-GALLON
2	5,000-GALLON
3	6,000-GALLON
4	10,000-GALLON
5	10,000-GALLON
6	5,000-GALLON
7	2,000-GALLON
8	6,000-GALLON

0 20 40 80

GRAPHIC SCALE (FEET)

NOTE:
BASE MAP GENERATED FROM A DRAWING PROVIDED BY CLIENT; DATED 03/16/83; SCALE 1"=20' (NO BAR SCALE NOTED)

ASHLAND
1415 S. BLOODWORTH ST.
RALIEGH, NORTH CAROLINA

FORMER ON-SITE SOIL SAMPLE LOCATION MAP

ARCADIS

FIGURE 5

CITY: Augusta, GA DIV/GROUP: ENV DB: A. Warren LD: PIC: PM: D. Willis TM: G Adams
G:\ENVCAD\Augusta-GA\ACT\OH003000_Ashland\NC231031\RFI Work Plan\OH003000C01_05.dwg LAYOUT: 4 SAVED: 5/6/2010 9:45 AM ACADVER: 17.0S (LMS TECH) PAGESETUP: ----- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 5/6/2010 9:46 AM BY: SAUL, ANNE
XREFS: ashland_mc_pts_xref

Table 3. Summary of Groundwater Analytical Results, March 2009 Semi-Annual Groundwater Monitoring Event, Ashland Inc., Raleigh, North Carolina

	NCAC 2L Standard[a]	Sample Location: / Lab Sample ID: / Date Sampled:	MW-1 3/25/2009 680-45902-1	MW-2 3/25/2009 680-45902-2	MW-2D 3/25/2009 680-45902-3	MW-3 3/25/2009 680-45902-4	MW-3D 3/25/2009 680-45902-5	MW-4 3/24/2009 680-45902-6	MW-5 3/25/2009 680-45902-7	MW-7 3/24/2009 680-45902-8	MW-7D 3/24/2009 680-45902-9	MW-8R 3/24/2009 680-45902-10	MW-8DR 3/24/2009 680-45902-11	MW-11DR 3/24/2009 680-45902-12	MW-12D 3/25/2009 680-45902-13	MW-13D 3/24/2009 680-45902-14
Volatile Organics (USEPA Method 8260B) (µg/L)																
Acetone	700		<1,200	<120	<25	<1,200	<250	<25	<50	<1,200	<120	<2,500	<5,000	<250	<100	<25
Benzene	1		<50	<5.0	<1.0	<50	<10	<1.0	<2.0	<50	<5.0	<100	<200	<10	<4.0	<1.0
Bromoform	4.43		<50	<5.0	<1.0	<50	<10	<1.0	<2.0	<50	<5.0	<100	<200	<10	<4.0	<1.0
Bromomethane	NE		<50	<5.0	<1.0	<50	<10	<1.0	<2.0	<50	<5.0	<100	<200	<10	<4.0	<1.0
2-Butanone (MEK)	4,200		<500	<50	<10	<500	<100	<10	<20	<500	<50	<1,000	<2,000	<100	<40	<10
Carbon Disulfide	700		<100	<10	<2.0	<100	<20	<2.0	<4.0	<100	<10	<200	<400	<20	<8.0	<2.0
Carbon Tetrachloride	0.269		<50	<5.0	<1.0	<50	**15**	<1.0	<2.0	<50	<5.0	<100	**210**	**12**	**4.1**	<1.0
Chlorobenzene	50		<50	<5.0	<1.0	<50	<10	<1.0	<2.0	<50	<5.0	<100	<200	<10	<4.0	<1.0
Chlorodibromomethane	NE		<50	<5.0	<1.0	<50	<10	<1.0	<2.0	<50	<5.0	<100	<200	<10	<4.0	<1.0
Chloroethane	2,800		<50	<5.0	<1.0	<50	**23**	<1.0	<2.0	<50	<5.0	<100	<200	<10	<4.0	<1.0
Chloroform	70		<50	<5.0	**7.7**	<50	**15**	**12**	<2.0	<50	<5.0	<100	<200	<10	**5.0**	**2.0**
Chloromethane	2.6		<50	<5.0	<1.0	<50	<10	<1.0	<2.0	<50	<5.0	<100	<200	<10	<4.0	<1.0
Dichlorobromomethane	0.56		<50	<5.0	<1.0	<50	<10	<1.0	<2.0	<50	<5.0	<100	<200	<10	<4.0	<1.0
1,1-Dichloroethane	70		<50	<5.0	<1.0	<50	**18**	<1.0	<2.0	**63**	<5.0	<100	<200	<10	<4.0	<1.0
1,2-Dichloroethane	0.38		<50	<5.0	<1.0	<50	<10	<1.0	<2.0	<50	<5.0	<100	<200	<10	<4.0	<1.0
1,1-Dichloroethene	7		**300**	**8.0**	<1.0	**140**	**91**	<1.0	<2.0	**52**	<5.0	**260**	**730**	**35**	**14**	<1.0
cis-1,2-Dichloroethene	70		**500**	**8.1**	<1.0	**650**	**170**	<1.0	<2.0	**1,200**	<5.0	**1,600**	**1,000**	**210**	**64**	<1.0
trans-1,2-Dichloroethene	100		<50	<5.0	<1.0	<50	<10	<1.0	<2.0	<50	<5.0	<100	<200	<10	<4.0	<1.0
1,2-Dichloropropane	0.51		<50	<5.0	<1.0	<50	<10	<1.0	<2.0	<50	<5.0	<100	<200	<10	<4.0	<1.0
cis-1,3-Dichloropropene	0.19[b]		<50	<5.0	<1.0	<50	<10	<1.0	<2.0	<50	<5.0	<100	<200	<10	<4.0	<1.0
trans-1,3-Dichloropropene	0.19[b]		<50	<5.0	<1.0	<50	<10	<1.0	<2.0	<50	<5.0	<100	<200	<10	<4.0	<1.0
Ethylbenzene	550		<50	<5.0	<1.0	<50	<10	<1.0	<2.0	<50	<5.0	<100	<200	<10	<4.0	<1.0
2-Hexanone	NE		<500	<50	<10	<500	<100	<10	<20	<500	<50	<1,000	<2,000	<100	<40	<10
Methyl Isobutyl Ketone (MIBK)	NE		<500	<50	<10	<500	<100	<10	<20	<500	<50	<1,000	<2,000	<100	<40	<10
Methylene Chloride	4.6		<250	<25	<5.0	<250	<50	<5.0	<10	<250	<25	<500	<1,000	<50	<20	<5.0
Styrene	100		<50	<5.0	<1.0	<50	<10	<1.0	<2.0	<50	<5.0	<100	<200	<10	<4.0	<1.0
1,1,2,2-Tetrachloroethane	NE		<50	<5.0	<1.0	<50	<10	<1.0	<2.0	<50	<5.0	<100	<200	<10	<4.0	<1.0
Tetrachloroethene	0.7		**7,600**	**450**	**67**	**4,900**	**1,300**	<1.0	**240**	**3,000**	**270**	**7,100**	**36,000**	**2,000**	**400**	**9.6**
Toluene	1,000		**51**	<5.0	<1.0	<50	<10	<1.0	<2.0	<50	<5.0	<100	<200	<10	<4.0	<1.0
1,1,1-Trichloroethane	200		**830**	**7.5**	<1.0	**71**	**28**	<1.0	<2.0	**230**	<5.0	<100	<200	<10	<4.0	<1.0
1,1,2-Trichloroethane	NE		<50	<5.0	<1.0	<50	<10	<1.0	<2.0	<50	<5.0	<100	<200	<10	<4.0	<1.0
Trichloroethene	2.8		**390**	**9.3**	**2.5**	**740**	**430**	<1.0	**2.1**	**480**	<5.0	**1,500**	**5,400**	**78**	**140**	**1.2**
Vinyl Chloride	0.015		<50	<5.0	<1.0	<50	**15**	<1.0	<2.0	<50	<5.0	<100	<200	<10	<4.0	<1.0
Xylenes (Total)	530		<100	<10	<2.0	<100	<20	<2.0	<4.0	<100	<10	<200	<400	<20	<8.0	<2.0

a Title 15A North Carolina Administrative Code Subchapter 2L Groundwater Quality Standards.
b The 2L standard of 0.19 ug/L is for the cis and trans isomers.
* Field duplicate sample associated with MW-8DR.
°C Degrees Celcius.
mg/L Milligrams per liter.
µS/cm Microsiemens per centimeter.
mV Millivolts.
NTU Nephelometric Turbidity Units.
µg/L Micrograms per liter.
< Compound was not detected above the reporting limit.
NA Not analyzed.
NE Not Established.
J / UJ Compound concentration is qualified as estimated (detected / nondetect).
[ ] Value exceeds the NCAC 2L Standard.

Table 4. Summary of Groundwater Analytical Results, September 2009 Semi-Annual Groundwater Monitoring Event, Ashland Inc., Raleigh, North Carolina

	NCAC 2L Standard[a]	Sample Location:	MW-1	MW-2	MW-2D	MW-3	MW-3D	MW-4	MW-5	FLD DUP*	MW-7	MW-7D	MW-8R	MW-8DR
		Lab Sample ID:	680-50424-12	680-50505-6	680-50505-5	680-50505-4	680-50505-3	680-50424-14	680-50424-13	680-50424-17FD	680-50424-10	680-50424-11	680-50424-4	680-50424-3
		Date Sampled:	9/2/2009	9/3/2009	9/3/2009	9/3/2009	9/3/2009	9/2/2009	9/2/2009	9/2/2009	9/2/2009	9/2/2009	9/1/2009	9/1/2009
Volatile Organics (USEPA Method 8260B) (ug/L)														
Acetone	700		<1,200	<100	<25	<1,200	<250	<25	<2,500	<2,500	<250	<25	<120	<6,200
Benzene	1		<50	<4.0	<1.0	<50	<10	<1.0	<100	<100	<10	<1.0	<5.0	<250
Bromoform	4.43		<50	<4.0	<1.0	<50	<10	<1.0	<100	<100	<10	<1.0	<5.0	<250
Bromomethane	NE		<50	<4.0	<1.0	<50	<10	<1.0	<100	<100	<10	<1.0	<5.0	<250
2-Butanone (MEK)	4,200		<500	<40	<10	<500	<100	<10	<1,000	<1,000	<100	<10	<50	<2,500
Carbon Disulfide	700		<100	<8.0	<2.0	<100	<20	<2.0	<200	<200	<20	<2.0	<10	<500
Carbon Tetrachloride	0.269		<50	<4.0	<1.0	<50	<10	<1.0	<100	<100	<10	<1.0	**45**	<250
Chlorobenzene	50		<50	<4.0	<1.0	<50	<10	<1.0	<100	<100	<10	<1.0	<5.0	<250
Chlorodibromomethane	0.41[b]		<50	<4.0	<1.0	<50	<10	<1.0	<100	<100	<10	<1.0	<5.0	<250
Chloroethane	2,800		<50	<4.0	<1.0	<50	<10	<1.0	<100	<100	<10	<1.0	<5.0	<250
Chloroform	70		<50	<4.0	**6.5**	<50	<10	**12**	<100	<100	<10	<1.0	**9.2**	<250
Chloromethane	2.6		<50	<4.0	<1.0	<50	<10	<1.0	<100	<100	<10	<1.0	<5.0	<250
Dichlorobromomethane	0.56		<50	<4.0	<1.0	<50	<10	<1.0	<100	<100	<10	<1.0	<5.0	<250
1,1-Dichloroethane	70		<50	<4.0	<1.0	<50	<10	<1.0	<100	<100	<10	<1.0	**13**	<250
1,2-Dichloroethane	0.38		<50	<4.0	<1.0	<50	<10	<1.0	<100	<100	<10	<1.0	<5.0	<250
1,1-Dichloroethene	7		**290**	**5.8**	<1.0	**130**	**83**	<1.0	<100	<100	**15**	<1.0	**97**	**480**
cis-1,2-Dichloroethene	70		**410**	**5.6**	<1.0	**750**	**190**	<1.0	<100	<100	**250**	<1.0	**780**	**730**
trans-1,2-Dichloroethene	100		<50	<4.0	<1.0	<50	<10	<1.0	<100	<100	<10	<1.0	<5.0	<250
1,2-Dichloropropane	0.51		<50	<4.0	<1.0	<50	<10	<1.0	<100	<100	<10	<1.0	<5.0	<250
cis-1,3-Dichloropropene	0.19[c]		<50	<4.0	<1.0	<50	<10	<1.0	<100	<100	<10	<1.0	<5.0	<250
trans-1,3-Dichloropropene	0.19[c]		<50	<4.0	<1.0	<50	<10	<1.0	<100	<100	<10	<1.0	<5.0	<250
Ethylbenzene	550		<50	<4.0	<1.0	<50	<10	<1.0	<100	<100	<10	<1.0	<5.0	<250
2-Hexanone	280[b]		<500	<40	<10	<500	<100	<10	<1,000	<1,000	<100	<10	<50	<2,500
Methyl Isobutyl Ketone (MIBK)	NE		<500	<40	<10	<500	<100	<10	<1,000	<1,000	<100	<10	<50	<2,500
Methylene Chloride	4.6		<250	<20	<5.0	<250	<50	<5.0	<500	<500	<50	<5.0	<25	<1,200
Styrene	100		<50	<4.0	<1.0	<50	<10	<1.0	<100	<100	<10	<1.0	<5.0	<250
1,1,2,2-Tetrachloroethane	0.17[b]		<50	<4.0	<1.0	<50	<10	<1.0	<100	<100	<10	<1.0	<5.0	<250
Tetrachloroethene	0.7		**4,800**	**300**	**44**	**4,400**	**1,200**	<1.0	**8,400**	**8,700**	**1,100**	**190**	**2,500**	**28,000**
Toluene	1,000		<50	<4.0	<1.0	<50	<10	<1.0	<100	<100	<10	<1.0	<5.0	<250
1,1,1-Trichloroethane	200		**1,100**	**5.2**	<1.0	**64**	**19**	<1.0	**120**	**100**	**62**	<1.0	**18**	<250
1,1,2-Trichloroethane	NE		<50	<4.0	<1.0	<50	<10	<1.0	<100	<100	<10	<1.0	<5.0	<250
Trichloroethene	2.8		**460**	**7.5**	**1.8**	**810**	**440**	<1.0	**690**	**670**	**170**	**1.4**	**790**	**5,100**
Vinyl Chloride	0.015		<50	<4.0	<1.0	<50	<10	<1.0	<100	<100	<10	<1.0	<5.0	<250
Xylenes (Total)	530		<100	<8.0	<2.0	<100	<20	<2.0	<200	<200	<20	<2.0	<10	<500

a Title 15A North Carolina Administrative Code Subchapter 2L Groundwater Quality Standards.
b The 2L standard is an Interim Maximum Allowable Concentration (effective May 24, 1999)
c The 2L standard of 0.19 ug/L is for the cis and trans isomers.
* Field duplicate sample associated with MW-5.
°C Degrees Celcius.
mg/L Milligrams per liter.
µS/cm Microsiemens per centimeter.

mV Millivolts.
NTU Nephelometric Turbidity Units.
µg/L Micrograms per liter.
< Compound was not detected above the reporting limit.
NA Not analyzed.
NE Not Established.
Value exceeds the NCAC 2L Standard.