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Feasibility Study

Operable Unit 2

Myrtle Beach, South Carolina

November 2010
Revised February 2011

ARCADIS

Feasibility Study
Operable Unit 2

Myrtle Beach, South Carolina

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Our Ref.:
B0007393.0000

Date:
November 2010
Revised February 2011

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Executive Summary

On behalf of AVX Corporation (AVX), ARCADIS has prepared this *Feasibility Study Operable Unit 2* (FS) to document the evaluation of remedial alternatives for groundwater and surface water in an area located to the northeast of a portion of the AVX facility (sometimes referred to as AVX MB1 or the “site”), which itself is located at 801 17th Avenue South in Myrtle Beach, South Carolina (see Figure 1-1 in body of text). Following October 2010 discussions with representatives from the South Carolina Department of Health and Environmental Control (SCDHEC), the on-site and off-site areas were split into two operable units, including Operable Unit 1 (OU-1) for on-site media and OU-2 for off-site media. The on-site area includes the older portion of the operations and surrounding land, which has historically been referred to as the “site”. OU-2 represents the off-site areas to the northeast of 17th Avenue South between OU-1 and Withers Swash (see Figure 1-1 in body of text). This split into two operable units was performed because:

- Potential changes in the OU-1 building use/configuration may allow for evaluation and potential selection of other remedial alternatives that are currently not feasible.

- Evaluation and selection of a remedial alternative for OU-2 can proceed without delay.

Therefore, the FS was performed in accordance with the March 2008 FS Work Plan (ARCADIS, 2008a) approved by the SCDHEC on June 18, 2009, but focuses specifically on the constituents of potential concern (COPCs) present in groundwater and surface water in areas to the northeast of OU-1 and between OU-1 and Withers Swash.

A human health risk assessment (HHRA) was also performed to characterize potential risks to human health based on existing conditions and presumed future land-use conditions using reasonable assumptions, including that groundwater will not be used as a potable water supply, given that city water is available. The results of the HHRA calculated risks are below or within the conservative federal and state risk-based levels. Therefore, there is no expectation of harm to public health with respect to the COPCs present in soil, soil gas, surface water, groundwater, and irrigation water.

Remedial Action Objectives

Based on a review of the characterization data collected during the remedial investigation and other investigations, the conclusions of the HHRA, and the applicable or relevant and appropriate requirements, the following remedial action objectives are proposed for OU-2:

- Prevent ingestion and dermal contact with groundwater containing COPCs above the federal Maximum Contaminant Levels (MCLs) for drinking water unless the SCDHEC Water Standards (drinking water standards) are more restrictive.
- Reduce the concentrations of COPCs in groundwater to below the MCLs.
- Mitigate the concentrations of COPCs in surface water to below the SCDHEC Water Standards for Surface Water. If there is not an SCDHEC Water Standard established for a constituent, the United States Environmental Protection Agency Regional Screening Level (RSL) for tap water has been applied.

Remedial Alternatives Screening

Potential technologies were evaluated based on effectiveness, implementability, and cost for remediating groundwater and surface water that were retained from the initial screening process. These remedial alternatives were developed based upon the technologies and process options that were carried forward, with these remedial alternatives being evaluated based on effectiveness, implementability, and cost.

Remedial alternatives that were retained for detailed analysis are summarized below by media.

Remedial Alternatives for Groundwater

Components	OGW-1: No Action	OGW-2: Limited Action	OGW-3a: Active Remediation – Hydraulic Containment	OGW-3b: Active Remediation – Enhanced Anaerobic Bioremediation
No Further Action	X			
Deed Notifications/ Restrictions		X	X	X
Well Abandonment		X	X	X
Monitored Natural Attenuation		X	X	X
Hydraulic Control			X	
Enhanced Anaerobic Bioremediation				X
Air Stripping (in conjunction with Hydraulic Control)			X	

Remedial Alternatives for Surface Water

Components	SW-1: No Action	SW-2: Limited Action	SW-3: Active Remediation
No Further Action	X		
Monitored Natural Attenuation		X	X
Phytoremediation			X

Acronyms and Abbreviations

1,1,1-TCA	1,1,1-trichloroethane
ARAR	applicable or relevant and appropriate requirement
AVX	AVX Corporation
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
cis-1,2-DCE	cis-1,2-dichloroethene
COPC	constituents of potential concern
ELCR	excess lifetime cancer risk
ERD Work Plan	*Enhanced Reductive Dechlorination Work Plan*
FS	*Feasibility Study Operable Unit 2*
FS Work Plan	*Feasibility Study Work Plan*
ft/day	feet per day
HHRA	Human Health Risk Assessment
HI	hazard index
HLC	Horry Land Company
IDW	investigation-derived waste
MNA	monitored natural attenuation
NCP	National Contingency Plan

NFA	no further action
O&M	operation and maintenance
OSWER	Office of Solid Waste and Emergency Response
OU	operable unit
OU-1	Operable Unit 1
OU-2	Operable Unit 2
RAO	Remedial Action Objective
RSL	Regional Screening Level
SCDHEC	South Carolina Department of Health and Environmental Control
site	the portion of the AVX facility referred to as AVX MB1 and located on 17th Avenue South in the City of Myrtle Beach, Horry County, South Carolina
TBC	to be considered
TCE	trichloroethene
µg/L	micrograms per liter
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound

1. Introduction

On behalf of AVX Corporation (AVX), ARCADIS has prepared this *Feasibility Study Operable Unit 2* (FS) in response to the South Carolina Department of Health and Environmental Control's (SCDHEC's) January 2, 2008 letter requesting that an FS be performed for the AVX facility, located in Myrtle Beach, South Carolina. Following October 2010 discussions with representatives from the SCDHEC, the on-site and off-site areas were split into two operable units (OUs) (Figure 1-1) including Operable Unit 1 (OU-1) for on-site media and Operable Unit 2 (OU-2) for off-site media. The on-site portion of the AVX facility includes the older portion of the operations (sometimes referred to as AVX MB1) and surrounding land, which has historically been referred to as the “site”. OU-2 represents the off-site areas to the northeast between OU-1 and Withers Swash (Figure 1-1).

A *Feasibility Study Work Plan* (FS Work Plan) was submitted to the SCDHEC in March 2008 and subsequently approved by the SCDHEC on June 18, 2009. The FS Work Plan provided the proposed roadmap for evaluation of remedial technologies, that when implemented, will be designed to address the constituents of potential concern (COPCs) that are comprised of a set of chlorinated volatile organic compounds (VOCs) in soil and groundwater. The FS Work Plan also focused on evaluation of remedial technologies for COPCs present in groundwater off of the AVX property so that appropriate and expeditious actions can be taken for these areas.

To supplement data collected during the numerous investigations previously completed, additional investigation activities were proposed in the FS Work Plan to assess and refine the following on the AVX property (OU-1):

- The horizontal and vertical extent of potential source areas.
- The hydrostratigraphic model within and downgradient of the potential source areas.
- General soil characteristics (e.g., grain-size distribution).
- General groundwater chemistry.

Additional hydrogeological characterization of the OU-2 area was also proposed as part of the *Enhanced Reductive Dechlorination Work Plan* (ERD Work Plan), included as Appendix B to the FS Work Plan (ARCADIS, 2008a). The ERD Work Plan was implemented to refine the understanding of the ERD process in the Pilot Test Study Area, as described in the *Pilot Study Summary Report* (ARCADIS, 2010a). Information developed during this pilot test will also be used for potential future scale-up of an ERD system or other groundwater remedy that may be implemented in OU-2.

Supplemental data collected during the implementation of the FS Work Plan are presented in the *Feasibility Study Data Gap Investigation Report* (ARCADIS, 2010b) being submitted concurrent with this FS. Data collected as part of the ERD pilot test are presented in the *Pilot Study Summary Report* (ARCADIS, 2010a).

Following discussions with SCDHEC representatives in October 2010, two OUs have been created, including OU-1 for on-site media and OU-2 for off-site media. The location of the OUs is presented on Figure 1-1. The two OUs were created because:

- Potential changes in the on-site (OU-1) building use/configuration may allow for evaluation and potential selection of other remedial alternatives that are currently not feasible.

- Evaluation and selection of a remedial alternative for the off-site area (OU-2) can proceed without delay.

As a measure of on-site control, the current on-site groundwater extraction and treatment system will continue to operate and provide proven capture for chlorinated VOCs in groundwater beneath the area of OU-1 until such time that additional remedial alternative evaluations can be completed taking into account potential future changes in building use/configuration in OU-1.

1.1 Purpose

This FS evaluates remedial alternatives for the groundwater and surface water within OU-2 that are appropriately protective of human health and the environment.

1.2 Report Organization

This FS follows the *Guidance for Conducting RIs and FSs Under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)* (EPA/540/G-89/004, Office of Solid Waste and Emergency Response [OSWER] Directive 9355.3-01, October 1988).

This FS is organized as follows:

- *Section 1 – Introduction*: This section describes the purpose and report organization.

- *Section* 2 – *Current Conditions*: This section provides some historical perspective, current conditions, and provides a summary of the nature and extent of contamination and the baseline risk assessment.

- *Section 3 – Basis for Operable Unit Remediation*: This section includes descriptions of applicable or relevant and appropriate requirements (ARARs) and OU-specific Remedial Action Objectives (RAOs).

- *Section 4 – Identification and Screening of Applicable Technologies*: This section identifies the potentially applicable technology types and process options for each impacted medium within OU-2.

- *Section 5 – Development of Remedial Action Alternatives*: This section provides an evaluation of the potential technologies for remediating groundwater and surface water within OU-2 that were retained from the initial screening.

- *Section 6 – Remedial Action Alternatives Screening Process*: This section describes the screening of the entire assembled alternatives on the basis of effectiveness, implementability, and cost.

- *Section 7 – Detailed Evaluation of Remedial Action Alternatives:* This section describes the detailed evaluation of the remedial action alternatives that passed the alternatives screening process described in Section 6. The detailed evaluation includes evaluation of two threshold criteria and five primary balancing criteria.

- *Section 8 – Development of Operable Unit 2 Alternatives:* This section compares each alternative against the others based on the two threshold criteria and five primary balancing criteria.

- *Section 9 – References:* This section lists the sources of information cited in this FS.

2. Current Conditions

This section describes the current conditions, including:

- relevant background and history
- description of the relevant physical setting
- nature and extent of COPCs and fate and transport analysis
- a baseline risk assessment

2.1 Background

2.1.1 Operable Unit 2 Description

OU-2 is located within an area of undeveloped, residential, and commercial properties in the City of Myrtle Beach, Horry County, South Carolina (Figure 1-1). The largest single property in OU-2 is an undeveloped and partially wooded parcel located between 17th and 13th Avenue South owned by Horry Land Company (HLC). A 3-acre portion the HLC property is open space, formerly used as a parking lot. This open area is referred to herein as the Pilot Test Area. The remaining land in OU-2 includes residential properties and a few undeveloped parcels.

The vicinity of OU-2 includes the following (Figure 1-1):

- The AVX manufacturing facility (OU-1) is located immediately to the southwest of 17th Avenue South, which is to the southwest of OU-2. OU-1 contains several buildings, including a 300,000 square-foot main manufacturing building and adjacent land, together sometimes referred to AVX MB1.
- Mixed-use residential or commercial properties surround OU-2 to the north, south, and east.

2.1.2 Environmental History

The Aerovox Corporation, the predecessor to AVX, began operations at OU-1 in 1953 on land formerly part of the Myrtle Beach Air Force Base. Chlorinated VOCs were used at OU-1 up until 1993 in the manufacturing of ceramic capacitors. In 1981, AVX discovered that shallow groundwater beneath OU-1 was impacted by chlorinated VOCs, notably the solvents trichloroethene (TCE) and 1,1,1-trichloroethane (1,1,1-TCA).

Several remedial investigations and activities have occurred at OU-1 since the 1996 Consent Order (96-43-HW and 96-71-DWP) was signed between AVX and the SCHDEC. A summary of these activities can be found in the FS Work Plan (ARCADIS, 2008a). Delineation of COPCs in OU-1 and OU-2 began with a five-phased investigation in 2007, and included investigation of soil, groundwater, surface water, and soil vapor. The focus of the OU-2 investigation was groundwater, surface water, and soil gas. Additional investigative activities completed since 2008 are described in the *Feasibility Study Data Gap Investigation Report* (ARCADIS, 2010b), which is being submitted concurrently with this FS.

2.2 Physical Setting

2.2.1 Topography and Drainage

The OU-2 area is relatively flat, with a gentle southwest to northeast slope (Figure 1-1). OU-2 lies approximately 2,500 feet northwest of the Atlantic Ocean. A small stream called Withers Swash flows to the northwest of the northwestern OU-2 boundary. This stream flows northeast approximately parallel to the beach and toward a flood control pond at the northeastern-most edge of OU-2. At the pond, water from Withers Swash flows over a control structure and turns perpendicular to the beach for roughly 500 feet. Past this point, Withers Swash flows northeast beyond the OU-2 boundary, flowing through two additional small ponds and eventually discharging to the Atlantic Ocean.

2.2.2 Geology

Myrtle Beach is within the Atlantic Coastal Plain physiographic province. Bedrock is approximately 1,400 to 1,500 feet below sea level (Zack, 1977). The majority of overlying thickness of consolidated sediments is Cretaceous age and older marine margin deposits; typically alternating beds of sand and clay. Thin beds of calcite-cemented siltstone or fine-grained sandstone are common throughout the section, interbedded with unconsolidated sediments. The two uppermost relevant units are:

- *Terrace Deposits (0 to 45 feet below ground surface [bgs])* – A Quaternary-aged sequence of marine terraces consisting of stratified sand, silt, and clay beds reflecting a beach and lagoon depositional environment.

- *Peedee Formation (45 to 300 feet bgs)* – A Cretaceous-aged marginal marine unit formed generally of stratified sand and clay (similar to the terrace deposits but much older), with thin beds of calcite-cemented siltstone or fine-grained sandstone.

The uppermost Peedee Formation was encountered in investigation borings within OU-1 and OU-2 and is described as a calcite-cemented siltstone. This lithified zone is interpreted to strongly inhibit vertical flow of groundwater between the Peedee Formation and the terrace deposits. Therefore, the investigations have largely focused on the terrace deposits.

2.2.3 Groundwater Hydrology

2.2.3.1 Hydrostratigraphy

The depth-to-groundwater at OU-2 varies from about 5 to 10 feet bgs and is found in the terrace deposits. Terrace deposits form the shallow aquifer in Myrtle Beach, though it is not used as a potable water resource. The terrace deposit sediment is a complex sequence of sand, silt, and clay beds reflecting a beach and lagoon depositional environment. Sands reflect beach face, dune, and dune blow-out deposits; silts and clays reflect quiescent lagoons and wetlands. Shells and organic matter are common.

Within the Pilot Test Area of OU-2, the terrace deposits generally occur as follows:

- 0 to 10 feet bgs: silt and clay

- 10 to 40 feet bgs: stratified sands, with occasional thin clay lenses

- 40 to 45 feet bgs: clay

This stratigraphy varies from that observed on OU-1, where thicker silty-clay beds interfinger with the main sand unit. The stratigraphy is illustrated in cross-section on Figure 2-1.

The sand units within the terrace deposits are predominantly fine- to medium-grained, stratified sands. These sands typically form in repeating fining upward sequences of 5 to 10 feet. Medium- to coarse-grained sand with abundant shells is often present at the base of sequence. Fine sand or a silt/clay bed may occur at the top of sequence.

The hydrogeologic parameters of the terrace deposits are interpreted to vary widely between the silt/clay aquitards and high-permeability beds of medium to coarse sand. A pumping test completed within OU-1 at pumping well DPW-4SD was evaluated to estimate a bulk aquifer transmissivity of approximately 2,000 square feet per day, equivalent to a hydraulic conductivity of approximately 65 feet per day (ft/day) (assuming an aquifer thickness of 30 feet). This is a hydraulic conductivity value, which is consistent with that expected for an aquifer comprised of medium sand. Specific-capacity tests completed in terrace deposit wells (ARCADIS, 2007) provided hydraulic conductivity values that varied from 17 to 91 ft/day.

In marine terrace depositional environments, individual beds are typically elongated parallel to the beach, imparting a strong lateral anisotropy favoring flow along the same axis. This anisotropy is apparent in the cone of depression created by pumping at pumping well DPW-4SD (Figures 2-2 and 2-3), which is elongated on an axis from southwest to northeast, parallel to the coast.

The highly stratified nature of deposits also imparts vertical anisotropy, favoring horizontal flow over vertical. Vertical anisotropy is most extreme where thick silt/clay beds separate sand units; however, thin silt and fine sand partings impart vertical anisotropy even within the more vertically extensive sand units.

2.2.3.2 Groundwater Flow

Groundwater flow in the terrace deposits trends across OU-2 toward the north-northeast parallel to the shoreline, except where influenced by OU-1’s groundwater pumping well DPW-4SD. Two potentiometric surfaces maps are included to illustrate the observed patterns of groundwater flow:

- November 7, 2008 (Figure 2-2)
- May 26, 2009 (Figure 2-3)

Groundwater elevation data are summarized in Table 2-1. Note that within OU-1, the terrace deposits are separated into upper and lower units; however, within OU-2 no silt or clay aquitard exists to justify dividing terrace deposits into separate hydrostratigraphic units. Monitoring wells in OU-2 are typically installed in the basal portion of the terrace deposit sands and are, therefore, referred to as Lower Terrace Deposits wells.

The capture zone created by the pumping well (DPW-4SD) is interpreted to extend to the northeast across the OU-1/OU-2 boundary, at least 750 feet northeastward of DPW-4SD. A stagnation point, dividing flow toward DPW-4SD with flow northeastward under the natural gradient, exists to the northeast of tracer test observation well OW-2D, in the OU-2 Pilot Study Area. AVX has operated this groundwater capture and treatment system to provide hydraulic containment since the mid-1980s. This system will continue to run unless a different remedial alternative is selected during future evaluation of remedial alternatives for OU-1.

Outside of the DPW-4SD capture zone, groundwater in the terrace deposits is interpreted to discharge to Withers Swash, focused principally near the flood control pond, and into the reach of the swash immediately downstream of the pond.

2.3 Nature and Extent of Constituents of Potential Concern

As discussed above, two OUs have been designated for the COPCs detected during the investigations. The COPCs for both OUs are discussed below due to the relationship between OU-1 and OU-2.

2.3.1 Potential Sources

TCE and its breakdown products are the principal COPCs within both OU-1 and OU-2. Based on the historical data and the recent data gap investigation findings, a source or sources of COPCs detected in the subsurface are likely located beneath the AVX main building in OU-1[1]. To date, no significant vadose zone source areas are known or have been discovered in either OU-1 or OU-2. Separate non-aqueous phase liquids have not been observed, above or below the water table.

2.3.2 Operable Unit 1 and Operable Unit 2 Groundwater

Groundwater within the terrace deposits beneath portions of OU-1 and OU-2 contains COPCs. The COPCs that have been detected at relatively elevated concentrations include TCE, cis-1,2-dichloroethene (cis-1,2-DCE), and vinyl chloride. Several other COPCs, including 1,1,1-TCA, 1,1-dichloroethane, and 1,1-dichloroethene, are also

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[1] ARCADIS has not evaluated other sources of TCE in groundwater in OU-1 and OU-2.

detected, albeit at significantly lower concentrations than TCE and its breakdown products.

Figures 2-4 and 2-5 illustrate the distribution of the principal COPCs in the Upper and Lower Terrace Deposits, respectively. The corresponding analytical data are summarized in Table 2-2.

The highest concentrations of COPCs beneath OU-1 and OU-2 have been observed in shallow groundwater near the presumed source area in OU-1 on the western side of AVX's main building. From the area of this apparent source, dissolved concentrations of COPCs form a dissolved plume extending to the northeast and crossing from OU-1 into OU-2. Data from OU-1 also show that the dissolved plume has apparently descended vertically through the terrace deposits and migrated toward the northeast. At the downgradient boundary of OU-1, where dissolved COPCs entered OU-2, the highest concentrations of COPCs are detected at wells screened in the lower portion of the terrace deposits.

The highest detected concentrations of COPCs in OU-2 are found in the Pilot Test Area and are limited to a narrow swath extending southwest to northeast, centered on the Pilot Test Area. The narrowness of this band and its alignment with the primary axis of anisotropy (i.e., parallel to the coast) suggests that groundwater flow and solute transport in this region strongly favor a single high-permeability bed. It should be noted that the capture zone of pumping well DPW-4SD encompasses the majority of the Pilot Test Area within OU-2, preventing continued migration of COPCs contained within the Pilot Test Area.

COPCs at lower concentrations are detected in groundwater within OU-2 northeast of the Pilot Test Area and beyond the capture zone of DPW-4SD. COPCs have been detected downgradient as far as Withers Swash in the vicinity of the stormwater runoff control pond (Table 2-2), where groundwater from the terrace deposits is interpreted to discharge to surface water.

2.3.3 Operable Unit 2 Irrigation Wells

Seven private irrigation wells are known to exist at OU-2 near the flood-control pond. The wells are believed to be shallow (i.e., in the terrace deposits), although well specifications and current usage are not known. The irrigation well locations are shown on Figure 2-6.

The SCDHEC collected groundwater samples from the seven irrigation wells in 2007. The analytical results, summarized in the table below, include detections of TCE and/or cis-1,2-DCE at three locations.

Summary of Groundwater Quality in Irrigation Wells Sampled by the SCDHEC in Vicinity of AVX Groundwater Investigation

Analyte	**1205 Beaver Rd. Ext.**	**1206 Beaver Rd. Ext.**	**1207 Beaver Rd. Ext.**	**707 11th Ave. South**	**713 11th Ave. South**	**806 11th Ave. South**	**610 13th Ave. South**
Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
TCE	1700	< 5.0	<5.0	360	< 5.0	< 5.0	5.4
cis-1,2-DCE	4400	<5.0	<5.0	870	<5.0	<5.0	<5.0

Notes:

µg/L = micrograms per liter

These irrigation well analytical results are assessed further with respect to the *Human Health Risk Assessment for Operable Unit 2* (HHRA) (see Appendix A) and summarized in Section 2.5. The results of the HHRA indicate that calculated risks are below or within the conservative federal and/or state risk-based levels. Therefore, there is no expectation of harm to public health with respect to the COPCs present in the irrigation water.

2.3.4 Operable Unit 2 Surface Water

Sampling of surface water in Withers Swash has shown detectable concentrations of COPCs that are consistent with discharge of COPC-containing groundwater from the terrace deposits. A total of 23 surface-water samples were collected from or near Withers Swash over the course of two sampling events: one on November 15, 2007 and one on December 17, 2007 (ARCADIS, 2008a). Surface-water analytical data are summarized in Table 2-3 and shown graphically on Figure 2-7.

The distribution of COPCs in surface water supports the following observations:

- COPCs are not present at detectable concentrations within the portion of Withers Swash nearest to OU-1 (at 17th Avenue South).

- Very low concentrations of cis-1,2-DCE (i.e., less than 1 µg/L) were detected upstream of the stormwater runoff control pond, starting approximately 1,000 feet downstream of OU-1.

- Higher COPC concentrations (where TCE, cis-1,2-DCE, and vinyl chloride are all present at detectable levels) were observed in water within the stormwater runoff control pond with the highest surface-water COPC concentrations observed immediately below the pond discharge point. None of the VOCs were reported at concentrations exceeding the SCDHEC's *Water Quality Numeric Criteria for the Protection of Aquatic Life and Human Health* (SCDHEC, 2004).

- COPC concentrations dissipate further downstream of the stormwater runoff control pond and are no longer detectable upon reaching Withers Swash Park Lake.

The location of maximum concentrations immediately below the spill-over dam on the stormwater runoff control pond is consistent with the observed course of COPC migration in groundwater and the expected patterns of groundwater flow.

Surface-water analytical data are assessed further with respect to human health risk in Section 2.5 and in Appendix A.

2.4 Conceptual Site Model Summary

Shallow groundwater occurs locally within an approximately 45-foot-thick unit of interbedded sand and clay referred to as the terrace deposits. In OU-2, the terrace deposits consist primarily of a stratified sand unit extending from 10 to 40 feet bgs, bound above and below by units of silt and clay.

Under natural gradients, when pumping wells are not operating, groundwater flow in the terrace deposits is directed predominantly northeastward, parallel to the coastline, eventually discharging into Withers Swash. Under pumping conditions (maintained by the groundwater extraction system at OU-1), a relatively broad cone of depression develops in the southeast corner of OU-1, centered on well DPW- 4SD. The capture zone of this well is interpreted to extend at least 750 feet northeastward of recovery well DPW-4SD, encompassing the region of highest dissolved COPC concentrations detected in the Pilot Study Area.

No TCE source is known or inferred to exist in OU-2. Dissolved TCE detected in OU-2 is likely related to source areas located within OU-1, beneath the main building or on its western perimeter.

The inferred source areas have created plumes of dissolved-phase TCE and its breakdown products extending to OU-2. The plume extent reflects patterns of groundwater flow. The groundwater extraction and treatment system at OU-1 appears to be significantly limiting solute migration to OU-2.

2.5 Summary of Human Health Risk Assessment

An HHRA was performed for OU-2 to evaluate whether constituent concentrations in groundwater, soil gas, or surface water pose a significant concern for human health based on existing conditions and presumed future land-use conditions. The primary conclusion drawn from this assessment is that there is no expectation of harm to public health with respect to the COPCs present in soil gas, surface water, groundwater, and irrigation water.

The following summarizes the HHRA presented in Appendix A.

The data were compared to United States Environmental Protection Agency (USEPA) Regional Screening Levels (RSLs) to identify COPCs. The potential exposure scenarios quantitatively evaluated for OU-2 included the following (by media):

- *Groundwater*: Exposure to hypothetical construction workers.

- *Surface Water*: Hypothetical exposure to adolescent residents/trespassers.

- *Irrigation Water*: Hypothetical exposure to child and adult residents during use to fill wading pools, swimming pools, and/or irrigation of plants in a greenhouse.

- *Vapors*: Hypothetical exposure, within buildings, to OU-2 workers and hypothetical future adult and child residents.

Site-specific exposure assumptions were used in conjunction with peer-reviewed toxicity values to characterize excess lifetime cancer risks (ELCRs) and non-cancer hazards. For cancer endpoints, the SCDHEC target risk considered protective of health is 1×10^{-6}, and the USEPA target risk range considered protective of health is 1×10^{-6} to 1×10^{-4}. For non-cancer endpoints, both the SCDHEC and the USEPA use a benchmark of 1.

Table A-34 (Appendix A) summarizes the results of the risk and hazard calculations. For each receptor, the risks and hazards from each of the exposure scenarios were calculated and added together. The exposure scenarios and results are summarized below by potential receptor.

- *OU-2 Worker*: Hypothetical future commercial or industrial workers were assumed to be exposed to COPCs in vapor migrating from the subsurface into buildings. The total ELCR was calculated to be 3 x 10^{-8} and the hazard index (HI) was calculated to be 0.00008. The risks and hazards are well below the regulatory benchmarks.

- *Hypothetical OU-2 Construction Worker*: Hypothetical future OU-2 construction workers were assumed to contact groundwater during excavation activities. The groundwater beneath OU-2 varies seasonally from about 7 to 10 feet bgs. As a result, depending on the type of construction project, contact with groundwater may not occur. The ELCR was calculated to be 9 x 10^{-7}, which is less than both the SCDHEC target risk of 1 x 10^{-6} and the USEPA target risk range of 10^{-6} to 10^{-4}. The calculated HI of 0.1 is less than the HI target of 1.

- *OU-2 Adult Resident*: Adult residents at OU-2 were hypothetically assumed to use irrigation well water to fill a swimming pool and use the irrigation well water in a greenhouse, and inhale soil vapors migrating into a home. The calculated total ELCR was 4 x 10^{-6}. This is slightly greater than the SCDHEC target risk and at the low end of the USEPA target risk range. The total HI was calculated to be 1. The calculation was conservative in that the irrigation well water concentrations in the swimming pool, which was the exposure scenario with the highest risk (3 x 10^{-6}) and HI (1), assumed that the COPC concentrations in the pool water would remain constant throughout the summer. Rather, constituents will volatilize and the concentrations will decrease over the summer months, thus reducing the calculated risks.

- *OU-2 Child Resident*: Child residents at OU-2 were hypothetically assumed to swim in a swimming pool or play in a wading pool filled with irrigation well water, and inhale soil vapors migrating into a home. The calculated total ELCR was 1 x 10^{-6}. The ELCR is equal to the SCDHEC regulatory benchmark and at the low of the USEPA target risk range. The total HI was calculated to be 4, which is greater than the regulatory benchmark of 1. The exposure to irrigation well water in a wading or swimming pool contributed to the slightly elevated risks and hazards. The calculation was conservative in that the irrigation well water concentrations in the wading or swimming pool was assumed to remain constant throughout the summer. Rather, COPCs will volatilize and the concentrations will decrease over the summer months, thus reducing the calculated risks.

- *OU-2 Adolescent Resident/Trespasser*: Adolescents or older children ages 7 to 16 were assumed to wade in surface water. The calculated ELCR for adolescent trespasser exposure to surface water while wading is 1 x 10^{-7}, which is below the SCDHEC target risk of 1 x 10^{-6} and the USEPA target risk range of 10^{-6} to 10^{-4}. The calculated HI is 0.006, which is well below the target value of 1.

The assumption in preparing the HHRA is that the groundwater will not be used as a potable water supply. In light of the foregoing, the results of analysis are below or within the conservative federal and/or state risk-based levels. Therefore, there is no expectation of harm to public health with respect to the COPCs present in soil gas, surface water, groundwater, and irrigation water.

3. Basis for Remediation

3.1 Applicable or Relevant and Appropriate Requirements

This section describes the applicable ARARs and to be considered (TBC) guidance that may be applied to actions at OU-2. ARARs are defined as cleanup standards; standards of control; and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, removal action, location, or circumstance at a site. The ARARs are used to develop quantitative RAOs, determine the appropriate extent of site cleanup, and govern the implementation and operation of the selected remedial action. The TBC guidance is comprised of non-promulgated advisories or guidance issued by federal or state governments that are not legally binding (USEPA, 1988).

Because of their site-specific nature, identification of ARARs requires evaluation of federal, state, and local environmental and health regulations regarding COPCs, characteristics of a site, and proposed remedial alternatives. The USEPA provides guidance on three categories, or ARARs, specific to the COPCs, location, or action. ARARs are classified as follows:

- *Chemical-specific* requirements are usually health- or risk-based numerical values or methods that, when applied to site-specific conditions, result in the establishment of numerical values for the acceptable loading or concentration of a hazardous substance that may be found in, or discharged to, the environment.

- *Location-specific* requirements are restrictions placed on the concentrations of hazardous substance or the conduct of activities solely because they occur in specific locations.

- *Action- (or remedy-) specific* are usually technology- or activity-based and may include limitations on actions taken with respect to hazardous constituents.

ARARs apply to activities, which include the geographical area of the COPCs to be remediated and all suitable areas in close proximity that are necessary for implementation of the remedial action. For off-site activities, no analysis of ARARs is required under CERCLA, but these activities are still subject to applicable laws. ARARs for the response action to be implemented include those that pertain to hydraulic containment or institutional controls.

Tables 3-1 through 3-3 identify potential ARARs and TBCs, including the regulatory citation and a brief description. Section 3.1.4 discusses the potential for waivers to ARARs.

3.1.1 Chemical-Specific Applicable or Relevant and Appropriate Requirements

Chemical-specific ARARs have been organized by relevant media for OU-2. These include groundwater and surface water. Table 3-1 summarizes the chemical-specific ARARs for OU-2.

3.1.2 Location-Specific Applicable or Relevant and Appropriate Requirements

Location-specific ARARs are those that commonly restrict certain activities or limit concentrations of hazardous substances solely because of geographical or land use concerns. The primary location-specific ARARs are related to the location of portions of the OU-2 within a coastal zone, the 100-year floodplain, and areas that may be designated as wetlands. Table 3-2 summarizes the location-specific ARARs for OU-2.

3.1.3 Action-Specific Applicable or Relevant and Appropriate Requirements

Action-specific ARARs are those that may place restrictions on the conduct of remediation activities or the use of certain technologies. Action-specific ARARs for OU-2 would primarily be related to air emissions from remedial actions, waste disposal, and groundwater treatment or discharge. Table 3-3 summarizes the action-specific ARARs for OU-2.

3.1.4 Potential Waivers to Applicable or Relevant and Appropriate Requirements

CERCLA Section 121(d)(4) establishes six waivers to ARARs for on-site actions. Waivers for specific ARARs can be granted for this project based on five of the six statutory waivers, as follows:

- Interim Measure

- Greater Risk to Human Health and the Environment

- Technical Impracticability
- Equivalent Standard of Performance
- Inconsistent Application of State Requirements
- Fund Balancing

3.2 Development of Remedial Action Objectives

RAOs are site-specific cleanup objectives established for protecting human health and the environment. RAOs specify contaminants and media of concern, potential exposure pathways and receptors, and RSLs [40 Code of Federal Regulations (CFR) 300.430 (e)(2)(i)]. RAOs indicate a contaminant level and an exposure route, rather than a contaminant level alone, because protection of human and ecological receptors may be achieved by reducing or eliminating exposure pathways, as well as by reducing COPC concentrations (USEPA, 1988). RAOs may be qualitative (e.g., to prevent exposure to contaminated groundwater) or quantitative (e.g., to specify the maximum contaminant concentration in groundwater).

CERCLA Section 121(d)(2)(A) requires that remedial actions meet any federal standards, requirements, criteria, or limitations that are determined to be legally applicable or relevant and appropriate. CERCLA Section 121(d)(2)(A)(ii) requires that state ARARs be met if they are more stringent than federal requirements. In addition, the National Contingency Plan (NCP), published in 40 CFR Part 300, requires that local ordinances, unpromulgated criteria, advisories, or guidance that do not meet the definition of ARARs but that may assist in the development of remedial objectives be listed as TBC. The key ARARs are presented in Section 3.1.

RAOs were developed based on a review of the characterization data, the conclusions of the HHRA, the applicable ARARs, and the FS Work Plan and are discussed in the following subsections. Numerical remediation goals are a subset of the RAOs and provide the measurable goals that drive remedial actions for each medium.

For each COPC in groundwater and surface water, the overall remediation goal was selected after a comparison of risk-based RSLs (based on the USEPA RSLs) and applicable ARARs. ARARs dictated the determination of the remediation goal, and in the absence of ARARs, the lowest of the risk-based RSLs was selected as the overall remediation goal. The resultant remediation goals for groundwater and surface water are presented in Table 3-4.

3.2.1 Groundwater

The groundwater sampling data for OU-2 is presented on Figure 2-4 for the Upper Terrace Deposits and on Figure 2-5 for the Lower Terrace Deposits. The risk assessment performed on potential residential exposure to volatile COPCs in groundwater migrating to indoor air via soil vapor resulted in a conclusion by ARCADIS and the SCDHEC that there is no unacceptable human health risk via the indoor air pathway (ARCADIS, 2008b and ARCADIS, 2009). Should future construction occur on the Horry Land Company property, the potential for vapor migration and the need, if any, for mitigation will be considered on a case-by-case basis.

The RAOs for groundwater within OU-2 include the following:

- Prevent ingestion and dermal contact with groundwater containing COPCs above MCLs for drinking water unless the SCDHEC Water Standards (drinking water standards) are more restrictive. Remediation goals for groundwater are presented in Table 3-4.

- Reduce the concentrations of COPCs in groundwater to below the MCLs.

3.2.2 Surface Water

The HHRA, provided in Appendix A, evaluated the human health risks associated with exposure to surface water. The exposure scenario assumed a child resident wading through surface water. The HHRA determined that there is currently no unacceptable human health risk.

The RAOs for surface water include the following:

- Mitigate the concentrations of COPCs in surface water to below the SCDHEC Water Standards for Surface Water. If there is not an SCDHEC Water Standard established for a constituent, the USEPA RSL for tap water has been applied. Remediation goals for surface water are presented in Table 3-4.

3.3 General Response Actions

General response actions have been developed for each medium of interest to define the actions that may be taken, either individually or in combination, to achieve the RAOs.

3.3.1 Groundwater

The extent of COPCs in groundwater at OU-2 follows a northeasterly groundwater flow direction (during non-pumping conditions) from OU-1 to the surface-water discharge point of Withers Swash. Potential general response actions for remediation of COPCs in groundwater within OU-2 include:

- No Further Action
- Institutional Controls
- Containment
- In-Situ Treatment
- Ex-Situ Treatment

3.3.2 Surface Water

The extent of COPCs in surface water is limited to a portion of Withers Swash between the flood-control pond and Withers Swash Park Lake (Figure 2-7). Potential general response actions for remediation of COPCs in surface water include:

- No Further Action
- In-Situ Treatment

4. Identification and Screening of Applicable Technologies

This section identifies the potentially applicable technology types and process options for each impacted medium within OU-2. Potentially applicable technology types and process options were developed for groundwater and surface water. These technologies and options were derived from professional experience with the COPCs, technologies identified in other Records of Decision, and the Federal Remediation Technologies Roundtable Remediation Technologies Screening Matrix (www.frtr.gov).

An initial screening of the technical implementability of each process option and technology type was performed to reduce the number of technologies potentially applicable to a manageable number before performing a more rigorous screening and evaluation process. Technical implementability refers to the ability of a remedial action or process to meet an RAO or RSL. The initial screening process also eliminates those technologies or process options that are not applicable based on the COPCs and site-specific characteristics. As a result, remedial technology types and process options that cannot be effectively implemented were eliminated from further consideration.

The potential remedial technology types and process options are described in Tables 4-1 and 4-2 for groundwater and surface water, respectively. The potential remedial technology type is a general category of technologies, while the process options are specific methods within each remedial technology type. Technologies and process options that were eliminated from further consideration on the basis of implementability are shaded within the tables for clarity.

5. Development of Remedial Action Alternatives

This section evaluates the potential technologies for remediating groundwater and surface water that were retained from the initial screening process referenced above. These technologies are evaluated based on effectiveness, implementability, and cost. The remaining technologies are then assembled into remedial alternatives for further evaluation.

5.1 Groundwater

5.1.1 Remedial Action Alternatives Components

Table 5-1 summarizes and compares the groundwater technologies retained in Section 4 for secondary screening. Groundwater technologies were compared based on relative effectiveness, implementability, and cost. Technologies that were retained after this comparison were assembled into remedial alternatives that are discussed in Section 5.1.2.

5.1.2 Remedial Action Alternatives

Groundwater remedial alternatives were developed based upon those technologies and process options that were carried forward from Section 4. In assembling groundwater alternatives, the general response actions and the technologies chosen to represent the various process options for groundwater were combined to form alternatives for groundwater within OU-2. The following groundwater alternatives have been assembled and will be discussed further in Section 6.

Remedial Action Alternatives for OU-2 Groundwater

Components	OGW-1: No Action	OGW-2: Limited Action	OGW-3a: Active Remediation – Hydraulic Containment	OGW-3b: Active Remediation – Enhanced Anaerobic Bioremediation
NFA	X			
Deed Notifications/ Restrictions		X	X	X
Well Abandonment		X	X	X
MNA		X	X	X
Hydraulic Control			X	
Enhanced Anaerobic Bioremediation				X

Remedial Action Alternatives for OU-2 Groundwater

Components	OGW-1: No Action	OGW-2: Limited Action	OGW-3a: Active Remediation – Hydraulic Containment	OGW-3b: Active Remediation – Enhanced Anaerobic Bioremediation
Air Stripping (in conjunction with Hydraulic Control)			X	

Notes:
NFA = no further action
MNA = monitored natural attenuation

5.2 Surface Water

5.2.1 Remedial Action Alternatives Components

The surface-water technologies retained in Section 4 for secondary screening are summarized and compared in Table 5-2. Surface-water technologies were compared based on relative effectiveness, implementability, and cost. Technologies that were retained after this comparison were assembled into remedial alternatives that are discussed in Section 5.2.2.

5.2.2 Remedial Action Alternatives

Surface-water remedial alternatives were developed based upon those technologies and process options that were carried forward from Section 4. In assembling surface-water alternatives, the general response actions and the technologies chosen to represent the various process options for surface water were combined to form alternatives for surface water. The following surface-water alternatives have been assembled and will be discussed further in Section 6.

Remedial Action Alternatives for Surface Water

Components	SW-1: No Action	SW-2: Limited Action	SW-3: Active Remediation
NFA	X		
MNA		X	X
Phytoremediation			X

6. Remedial Action Alternatives Screening Process

This section screens the remedial action alternatives that were assembled in Section 5. The entire assembled alternatives were screened based on effectiveness, implementability, and cost. The comparison between alternatives in this screening step is generally made between similar alternatives. Each alternative includes a description and incorporates information regarding the different remedial components, as appropriate. The screening criteria are defined as follows.

Effectiveness	Implementability	Cost
Overall protectiveness of human health and the environment	Technical feasibility	Equipment/construction
Compliance with remediation goals	Demonstrated performance	Operation and maintenance (O&M)
Reduction of toxicity, mobility, or volume of contaminants	Availability of equipment, space, and services	
Adverse short- and long-term effects caused by implementation	Administrative feasibility	

Alternative screening for groundwater and surface water are included below.

6.1 Groundwater Remedial Action Alternatives

The four remedial alternatives developed in Section 5 for groundwater are:

- Alternative OGW-1: No Action
- Alternative OGW-2: Limited Action
- Alternative OGW-3a: Active Remediation – Hydraulic Containment
- Alternative OGW-3b: Active Remediation – Enhanced Anaerobic Bioremediation

These four alternatives are described and screened in Sections 6.1.1 through 6.1.4, respectively.

6.1.1 Alternative OGW-1: No Action

This alternative consists of no remedial activities beyond those that have already been conducted within OU-2. It is the minimum proposed remedial action for groundwater.

Table 6-1 presents the evaluation of the effectiveness, implementability, and cost associated with the No Action Alternative for groundwater. The evaluation concludes that the No Action Alternative would not be acceptable. However, this alternative is retained for detailed analysis as required by the NCP as a baseline for evaluating the remaining alternatives.

6.1.2 Alternative OGW-2: Limited Action

This alternative provides protection to human health by preventing or controlling potential exposure to groundwater through institutional controls. Receptor access would be limited through deed notifications/restrictions and by abandoning existing irrigation wells. Under this alternative, natural attenuation by dilution and natural subsurface processes would reduce the concentrations in groundwater, and monitoring would be performed to evaluate changes in COPC concentrations within groundwater or risks to human health or the environment.

Table 6-2 presents the evaluation of the effectiveness, implementability, and cost associated with the Limited Action Alternative for groundwater. The evaluation concludes that the Limited Action Alternative would be protective of receptors by limiting exposure and is retained for detailed analysis.

6.1.3 Alternative OGW-3a: Active Remediation – Hydraulic Containment

This alternative provides protection to human health by preventing or controlling potential exposure to groundwater through institutional controls and hydraulic containment of groundwater. Access would be limited through deed notifications/restrictions and irrigation well abandonment. Natural attenuation from natural subsurface processes would reduce the concentrations in groundwater, while the operation of a groundwater extraction and treatment system would prevent further migration of COPCs in groundwater and accelerate the groundwater remediation process. Monitoring would be performed to evaluate changes in COPC concentrations within groundwater or risks to human health or the environment.

The evaluation of the effectiveness, implementability, and cost associated with the Active Remediation – Hydraulic Containment Alternative is presented in Table 6-3. The evaluation concludes that this alternative would be protective of receptors and meeting remediation goals and is retained for detailed analysis.

6.1.4 Alternative OGW-3b: Active Remediation – Enhanced Anaerobic Bioremediation

This alternative provides protection to human health by preventing or controlling potential exposure to groundwater through institutional controls and enhanced anaerobic bioremediation of groundwater. Access would be limited through deed notifications/restrictions and irrigation well abandonment. The COPC concentrations in groundwater would be reduced through the implementation of enhanced anaerobic bioremediation, accelerating the groundwater remediation process, and preventing the future migration or surface-water infiltration of impacted groundwater. Natural attenuation from natural subsurface processes would reduce any remaining COPC concentrations in groundwater after the enhanced anaerobic bioremediation is complete. Monitoring would be performed to evaluate changes in COPC concentrations within groundwater or risks to human health or the environment.

The evaluation of the effectiveness, implementability, and cost associated with the Active Remediation – Enhanced Anaerobic Bioremediation Alternative is presented in Table 6-4. The evaluation concludes that this alternative would be protective of receptors and meeting remedial goals and is retained for detailed analysis.

6.2 Surface-Water Remedial Action Alternatives

Three alternatives were assembled in Section 5 and are described in detail in the following sections. The three remedial alternatives for surface water are:

- Alternative SW-1: No Action
- Alternative SW-2: Limited Action
- Alternative SW-3: Active Remediation – Phytoremediation

These three alternatives are described and screened in Sections 6.2.1 through 6.2.3, respectively.

6.2.1 Alternative SW-1: No Action

This alternative consists of no remedial activities beyond those that have already been conducted within OU-2. It is the minimum proposed remedial action for surface water.

Table 6-5 presents the evaluation of the effectiveness, implementability, and cost associated with the No Action Alternative for surface water. The evaluation concludes that the No Action Alternative would meet remediation goals. This alternative is, therefore, retained for detailed analysis.

6.2.2 Alternative SW-2: Limited Action

This alternative provides additional protection to human health by monitoring for changes in surface-water concentrations or risks to human health or the environment. Under this alternative, natural attenuation by natural subsurface processes would reduce the concentrations in surface water. Monitoring would be performed to evaluate changes in COPC concentrations in surface-water or risks to human health or the environment.

Table 6-6 presents the evaluation of the effectiveness, implementability, and cost associated with the Limited Action Alternative for surface water. The evaluation concludes that the Limited Action Alternative would meet remediation goals by monitoring for changes in surface-water concentrations and is retained for detailed analysis.

6.2.3 Alternative SW-3: Active Remediation – Phytoremediation

This alternative provides protection to human health by monitoring for changes in surface-water concentrations and phytoremediation. Phytoremediation would eliminate the source of future impacted surface water by preventing the infiltration of impacted shallow groundwater. Natural attenuation from natural subsurface processes would reduce the concentrations in surface water. Monitoring would be performed to evaluate changes in COPC concentrations in surface water or risks to human health or the environment.

The evaluation of the effectiveness, implementability, and cost associated with the Active Remediation – Phytoremediation Alternative is presented in Table 6-7. The evaluation concludes that this alternative would meet remediation goals and is retained for detailed analysis.

7. Detailed Evaluation of Remedial Action Alternatives

This section presents a detailed analysis of each remedial action alternative developed in Section 6 based on the standard criteria specified in the NCP (USEPA, 1990). These analyses are intended to aid in selection of an alternative that satisfies the RAOs; complies with the ARARs; provide a permanent solution; and reduces toxicity, mobility, and/or volume of area-specific COPCs for groundwater and surface water.

In accordance with CERCLA Section 121, the NCP (USEPA, 1990), and USEPA Remedial Investigation/FS guidance (USEPA, 1988 and 2000), each alternative will undergo detailed analysis based on the following nine criteria:

1. *Overall Protection of Human Health and the Environment* – Addresses how the alternative protects human health and the environment. This assessment focuses on how an alternative achieves protection over time and indicates how each source of COPCs would be minimized, reduced, or controlled through treatment, engineering, or institutional controls. The evaluation of the degree of overall protection associated with each alternative is based largely on the exposure pathways and scenarios set forth in the risk assessment.

2. *Compliance with ARARs* – Addresses whether the alternative complies with ARARs developed in Section 3.

3. *Long-Term Effectiveness and Permanence* – Addresses the results of an alternative in terms of the residual risk remaining after the RAOs have been met. The primary focus of this evaluation is the extent and effectiveness of the controls that will be applied to manage the risk posed by the residual COPCs of the treatment process and/or untreated COPCs.

4. *Reduction of Mobility, Toxicity, or Volume* – Addresses the statutory preference for selecting remedial actions that include treatment technologies that permanently and significantly reduce the mobility, toxicity, or volume of the COPCs. Factors of this criterion to be evaluated include the treatment process employed; the amount of COPCs destroyed or treated; the degree of reduction in toxicity, mobility, or volume expected; the degree to which the treatment will be irreversible; and the type and quantity of residual COPCs.

5. *Short-Term Effectiveness* – Addresses potential human health and environmental risks of the alternative during the construction and implementation phase until remedial response objectives are met.

6. *Implementability* – Addresses the technical and administrative feasibility of implementing an alternative and the availability of services and materials required during implementation. Implementability is further categorized into technical feasibility, administrative feasibility, and availability criteria.

7. *Cost* – Addresses the capital and O&M costs, and includes a present worth analysis of all costs. The capital costs consist of direct costs (construction) and indirect costs (non-construction and overhead). Direct capital costs include construction costs, equipment costs, land and development costs, relocation expenses, and disposal costs. Indirect capital costs include engineering expenses, legal fees and license or permit costs, startup costs, and contingency allowances.

   O&M costs are post-construction costs necessary to confirm the continued effectiveness of a remedial action. These costs include operating labor costs, maintenance materials and labor costs, auxiliary materials and energy, treatment residue disposal costs, purchased services, administrative cost, insurance, taxes, licensing costs, maintenance reserve and contingency funds, rehabilitation costs, and costs of periodic site reviews, if required.

   The cost estimates presented in this FS were developed utilizing USEPA guidance, professional engineering judgment, and quotations from appropriate vendors. In accordance with USEPA guidance, the cost estimates in this FS have been prepared to provide accuracy in the range of -30 to +50 percent (USEPA, 2000). All capital and O&M cost estimates are expressed in 2010 dollars.

   After development of the capital and O&M costs, a present-worth analysis of the overall remedial action costs associated with each alternative was completed. A present-worth analysis relates costs that occur over different time periods to present costs by discounting all future costs to the present value. This allows the cost of alternatives to be compared on the basis of a single figure that represents the capital required in 2010 dollars to construct, operate, and maintain the alternative throughout its planned life. The present-worth calculations are based on a discount rate of 7 percent. Life-cycle costs are calculated for each alternative

8. *State Acceptance* – Addresses the technical and administrative issues and concerns of the state (or support agency) regarding the alternative. This input is limited to formal comments made by the state following the FS submittal.

9. *Community Acceptance* – Addresses public issues and concerns regarding the alternative. This input is limited to comments made during the public comment period following the FS submittal.

The detailed analysis includes a detailed description of each remedial alternative followed by a detailed evaluation of each remedial alternative evaluation Criteria 1 through 7. Criteria 1 and 2 are considered to be threshold criteria, Criteria 3 through 7 are considered primary balancing criteria, and Criteria 8 and 9 are considered modifying criteria. The selected remediation alternatives developed in Section 6 are presented in Table 7-1. The evaluation of the remediation alternatives is presented below.

7.1 Detailed Analysis of Groundwater Remedial Action Alternatives

Four groundwater remedial action alternatives have been retained for detailed analysis. The detailed analysis of the remedial action alternatives is summarized in Table 7-2 and presented in the following sections.

7.1.1 Alternative OGW-1: No Action

The following sections present a detailed analysis of remedial action Alternative OGW-1 for groundwater. Table 7-2 presents a summary of this analysis. This alternative is retained for detailed analysis as required by the NCP as a baseline for evaluating the remaining alternatives.

7.1.1.1 Overall Protection of Human Health and the Environment

Although the No Action Alternative does not incorporate any activities that would present exposure risks to the community, workers, or the environment, it would not reduce existing COPC concentrations in groundwater, or provide measures to eliminate or control potential exposure pathways associated with possible future use of groundwater containing COPCs. Natural attenuation processes may reduce COPC concentrations to remedial goals within groundwater, although monitoring of these processes would not be performed to evaluate risks or determine when remedial goals were met. Additionally, this alternative has the potential to allow groundwater containing COPCs to migrate, potentially intercepting downgradient surface water or other potential receptors. Therefore, the No Action Alternative would not achieve groundwater RAOs.

7.1.1.2 Compliance with Applicable or Relevant and Appropriate Requirements

Alternative OGW-1 would not comply with chemical-specific ARARs for groundwater because NFA would be taken to control potential exposure pathways or address COPC concentrations in groundwater. Alternative OGW-1 would not comply with location-specific ARARs. There are no action-specific ARARs for Alternative OGW-1.

7.1.1.3 Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence would not be achieved through the No Action Alternative because existing COPC concentrations in groundwater would not be addressed and institutional controls would not be implemented to eliminate or provide long-term control of potential exposure pathways. Additionally, this alternative has the potential to allow COPCs in groundwater to migrate, potentially intercepting downgradient surface water or other receptors and could increase the eventual future capital and O&M expenditures if future remediation is required. Natural attenuation processes may reduce COPC concentrations in groundwater to remedial goals, but monitoring of these processes would not be performed under the No Action Alternative to evaluate risks or determine when remedial goals are met.

7.1.1.4 Reduction of Mobility, Toxicity, or Volume

Natural attenuation mechanisms may result in reduction of COPC mobility, toxicity, and volume in groundwater, although monitoring of these processes would not be performed with Alternative OGW-1 to evaluate risks or determine when remedial goals are met.

7.1.1.5 Short-Term Effectiveness

The No Action Alternative does not incorporate any activities that would present exposure risks to the community, workers, or the environment.

7.1.1.6 Implementability

As no technical implementation is required, the No Action Alternative is technically feasible and would not limit or interfere with the ability to perform future remedial actions. However, the No Action Alternative is unlikely to be administratively feasible due to the anticipated lack of monitoring and protection of human health and the environment.

7.1.1.7 Cost

Table 7-3 and Appendix B present a summary of the present value calculations for Alternative OGW-1 and the detailed cost backup, respectively. There are no capital or O&M costs associated with Alternative OGW-1. Total costs for this alternative are estimated to be approximately $0 in 2010 dollars.

7.1.2 Alternative OGW-2: Limited Action

The following sections present a detailed analysis of remedial action Alternative OGW-2 for groundwater. This alternative would use deed notifications and restrictions to limit access to groundwater, as well as with MNA to document the declining concentrations of COPCs via natural processes. The existing irrigation wells would also be abandoned to prevent the use of groundwater. Table 7-2 presents a summary of this analysis.

7.1.2.1 Overall Protection of Human Health and the Environment

Implementation of this alternative is not expected to result in exposure risks to the community, workers, or the environment. MNA monitoring would be used to document the natural decline of COPCs via natural processes. Institutional controls (i.e., groundwater use restrictions) would protect against human exposure to COPCs in groundwater while COPC concentrations attenuate. Existing irrigation wells would be abandoned to prevent the use of the groundwater as well. Groundwater monitoring would be used to assess achievement of RAOs. Alternative OGW-2 would thereby protect indefinitely against both current and future human exposure to groundwater and would be protective of human health and the environment.

7.1.2.2 Compliance with Applicable or Relevant and Appropriate Requirements

Alternative OGW-2 would comply with chemical-specific ARARs for groundwater by preventing completion of an exposure pathway for groundwater and documenting the natural attenuation of groundwater identified as having COPC concentrations in exceedance of chemical-specific ARARs. Alternative OGW-2 would comply with location- and action-specific ARARs.

7.1.2.3 Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence would be achieved through institutional controls, irrigation well abandonment, and groundwater monitoring. Institutional controls, including deed notification and restrictions, as well as abandonment of irrigation wells, would prevent access to COPCs in groundwater. Also, as natural attenuation processes reduce COPC concentrations in groundwater, periodic groundwater monitoring will allow for determination of when remedial goals are met.

7.1.2.4 Reduction of Mobility, Toxicity, or Volume

Alternative OGW-2 does not reduce COPC mobility or prevent migration of COPCs in groundwater or which will need to be addressed to protect human. This alternative also does nothing to intercept COPCs that may discharge to surface water at Withers Swash. However, natural attenuation mechanisms may result in reduction of COPC toxicity and volume in groundwater without active treatment. Monitoring of these processes would allow for assessment of risk and determination of when remedial goals are met.

7.1.2.5 Short-Term Effectiveness

Implementation of this alternative would result in minimal exposure risks to the community, workers, and the environment; however, additional monitoring wells may be required within residential areas. Institutional controls (i.e., groundwater use restrictions) would prevent exposure to groundwater while concentrations of COPCs attenuate, but no mass removal or reduction in COPC toxicity or volume would occur in the short term.

7.1.2.6 Implementability

Implementation of this alternative is technically feasible, as the technology is conventional; however, it may not be administratively feasible as potential discharge of COPCs from groundwater to surface-water infiltration may need to be addressed. New monitoring wells may be required to expand the existing network into residential areas or to improve long-term data resolution. Monitoring wells would be installed using standard well drilling methods and materials. These services are readily available as are the services and materials necessary for abandoning the existing irrigation wells and the collection and analysis of groundwater samples. This alternative would not limit or interfere with the ability to perform future remedial actions and institutional controls would be readily implementable.

7.1.2.7 Cost

Table 7-3 and Appendix B present a summary of the present value calculations for Alternative OGW-2 and the detailed cost backup, respectively. Capital costs include implementation of institutional controls, abandonment of irrigation wells, and the installation of additional monitoring wells. O&M costs include MNA and institutional controls for 30 years.

Total capital costs are estimated to be approximately $44,251 for irrigation well abandonment and placing institutional controls. Total annual O&M costs are estimated to be approximately $62,322 per year. Based on USEPA guidance, the total present value life cycle cost of Alternative OGW-2 using a discount rate of 7 percent for 30 years is $872,000 (USEPA, 2000).

7.1.3 Alternative OGW3a: Active Remediation – Hydraulic Containment

The following sections present a detailed analysis of remedial action Alternative OGW-3a for groundwater. This alternative would use deed notifications and restrictions to limit access to groundwater. The existing irrigation wells would also be abandoned to prevent the use of groundwater. Active groundwater recovery and treatment with air stripping would also be performed to prevent further migration of groundwater or potential surface-water infiltration and reduce the overall time to reach RAOs. This system would consist of five groundwater extraction wells operating at extraction rates of 60 gallons per minute for 30 years. MNA would be conducted to document the declining concentrations of COPCs via natural processes. Table 7-2 presents a summary of this analysis. The preliminary locations of the five extraction wells are presented on Figure 7-1.

7.1.3.1 Overall Protection of Human Health and the Environment

Implementation of this alternative is not expected to result in exposure risks to the community, workers, or the environment. COPC concentrations in groundwater would be reduced via natural attenuation processes, while institutional controls (i.e., groundwater use restrictions) and abandonment of irrigation wells would protect against human exposure to COPCs in groundwater while the COPC concentrations attenuate. Operation of a groundwater extraction and treatment system would prevent further migration of COPCs in groundwater or potential discharge of COPCs from groundwater to surface water and accelerate the groundwater remediation process. Groundwater monitoring would be used to assess achievement of RAOs. Alternative OGW-3a would thereby be protective of human health and the environment by limiting exposure to COPCs in groundwater and by removing COPC mass.

7.1.3.2 Compliance with Applicable or Relevant and Appropriate Requirements

Alternative OGW-3a would comply with chemical-specific ARARs for COPCs in groundwater by destruction of COPCs and by minimizing potential exposure via institutional controls. Alternative OGW-3a would comply with location- and action-specific ARARs.

7.1.3.3 Long-Term Effectiveness and Permanence

Alternative OGW-3a would prevent receptor access through institutional controls and abandonment of irrigation wells. Further COPC migration and potential discharge of COPCs from groundwater to surface water would be controlled. Natural attenuation processes would result in the reduction of COPC concentrations in groundwater to RAOs. With the implementation of groundwater extraction and treatment as an active treatment method, this alternative would decrease the overall timeframe required to achieve remedial goals, but long-term O&M of the groundwater pump and treat system would still be required for the minimum 30 years it is estimated it would take for this alternative to achieve remedial goals. The actual remediation duration for this alternative may be longer than the standard 30-year horizon evaluated herein.

7.1.3.4 Reduction of Mobility, Toxicity, or Volume

Alternative OGW-3a would reduce the mobility, toxicity, and volume of COPCs in groundwater. Further COPC migration or potential discharge of COPCs from groundwater to surface water would be controlled and groundwater remediation time would be accelerated through groundwater extraction and treatment. Concurrently, natural attenuation processes would reduce COPC concentrations over time to achieve remedial goals.

7.1.3.5 Short-Term Effectiveness

Implementation of this alternative would result in minimal exposure risks to the community, workers, and the environment. Additional monitoring wells may be required in residential areas to evaluate the capture zone of the treatment system. Investigation-derived waste (IDW) from well installation, groundwater sampling, or remedial activities would be handled using approved methods.

7.1.3.6 Implementability

Implementation of this alternative is both technically and administratively feasible. Monitoring wells would be installed using standard well drilling methods and materials. These services are readily available as are the services and materials necessary for the collection and analysis of groundwater samples. Implementation of this alternative would not limit or interfere with the ability to perform future remedial actions. Institutional controls would be readily implementable. The remedial technology is conventional and proven with COPCs.

7.1.3.7 Cost

Total capital costs are estimated to be approximately $969,040 for the active remediation systems. Total annual O&M costs are estimated to be approximately $322,371 each year for 30 years. Based on USEPA guidance, the total present value life cycle cost of Alternative OGW-3a using a discount rate of 7 percent for 30 years is $5,250,000 (USEPA, 2000).

7.1.4 Alternative OGW-3b: Active Remediation – Enhanced Anaerobic Bioremediation

The following sections present a detailed analysis of remedial action Alternative OGW-3b for groundwater. This alternative would use deed notifications and restrictions to limit access to groundwater until groundwater remedial goals are met. The existing irrigation wells would also be abandoned to prevent the use of groundwater. Enhanced anaerobic bioremediation would be implemented to remediate the COPCs in groundwater and reduce the overall time to achieve RAOs. For the purposes of evaluating this alternative, the following preliminary system design was developed. Should this alternative be selected, a remedial design plan would be developed and approved prior to implementation. The enhanced anaerobic bioremediation system developed for this FS would consist of using the existing injection well transect from the pilot test and constructing five additional injection well transects of five wells each for a total of 30 injection wells. Injections of a carbon substrate, such as molasses, would be conducted four times a year at all 30 injection wells for 5 years. It is assumed that methane vapor monitoring and potential mitigation would be performed in the vicinity of the residential properties within the treatment areas for 15 years. Operation of the OU-1 pumping well would also be optimized to minimize hydraulic interference with the ERD transects. After the 5 years of ERD injections, monitoring would be conducted for an additional 10 years. Table 7-2 presents a summary of this analysis. The preliminary locations of the six injection well transects are presented on Figure 7-2.

7.1.4.1 Overall Protection of Human Health and the Environment

Implementation of this alternative is not expected to result in exposure risks to the community, workers, or the environment; however, methane monitoring and potential mitigation activities will be required in residential areas. COPC concentrations in groundwater would be reduced via ERD and natural attenuation processes, while institutional controls (i.e., land and groundwater use restrictions) and abandonment of irrigation wells would protect against human exposure to COPCs in groundwater while the COPC concentrations attenuate. Groundwater monitoring would be used to assess achievement of RAOs. Alternative OGW-3b would thereby protect indefinitely against both current and future human exposure to groundwater and would be protective of human health and the environment.

7.1.4.2 Compliance with Applicable or Relevant and Appropriate Requirements

Alternative OGW-3b would comply with chemical-specific ARARs for COPCs in groundwater by destruction of COPCs and by minimizing potential exposure via institutional controls. Alternative OGW-3b would comply with location- and action-specific ARARs.

7.1.4.3 Long-Term Effectiveness and Permanence

Alternative OGW-3b would result in the permanent reduction of COPC concentrations in groundwater to RAOs. Due to the implementation of ERD as an active treatment method, it is assumed that this alternative would significantly decrease the overall timeframe required to achieve remedial goals. The ERD system will operate for a 5-year timeframe. Monitoring will be performed during the ERD injection period and continue for an additional 10 years. After completion of monitoring, the remedial goals in groundwater will have been met and groundwater monitoring, institutional controls, and vapor monitoring and mitigation will be discontinued.

7.1.4.4 Reduction of Mobility, Toxicity, or Volume

Alternative OGW-3b would permanently reduce the mobility, toxicity, and volume of COPCs in groundwater, as treatment via ERD and natural attenuation processes would result in permanent destruction of the COPCs. Additionally, future COPC mobility would be controlled, and groundwater remedial goals would be met at the groundwater to surface-water discharge boundary with this alternative.

7.1.4.5 Short-Term Effectiveness

Implementation of this alternative would result in minimal exposure risks to the community, workers, and the environment. Substrate injection wells would be installed as part of the ERD treatment zones. Additional monitoring wells may also be needed to monitor ERD performance. Carbohydrate substrates injected to promote ERD may include molasses, corn syrup, whey, or other similar products that would not result in additional risks to the community, workers, and the environment. IDW from well installation, groundwater sampling, or remedial activities would be handled using approved methods. Vapor monitoring and mitigation may be necessary in residential areas to control risks from methane production/migration.

7.1.4.6 Implementability

Implementation of this alternative is both technically and administratively feasible. Monitoring or injection wells would be installed using standard well drilling methods and materials. These services are readily available, as are the services and materials necessary for the collection and analysis of groundwater samples. Implementation of this alternative would not limit or interfere with the ability to perform future remedial actions. Institutional controls would be readily implementable. The remedial technology is conventional and proven, and pilot testing has already been conducted to provide refinement of well spacing and injection concentrations, volumes, and frequency. Access to various properties would be required for installation of injection wells, establishment of the injection programs, and associated vapor monitoring and mitigation.

7.1.4.7 Cost

Table 7-3 and Appendix B present a summary of the present value calculations for Alternative OGW-3b and the detailed cost backup, respectively. Capital costs include installation of monitoring and substrate injection wells, abandonment of irrigation wells, and implementation of institutional controls. O&M costs include the O&M of the ERD system, MNA, and institutional controls. The duration (injection of 5 years plus post injection monitoring) for Alternative OGW-3b is estimated to be 15 years.

Total capital costs are estimated to be approximately $1,150,764 for the active remediation systems. Annual O&M costs are estimated to total approximately $805,470 each year. Periodic costs are estimated to be $53,021. Based on USEPA guidance, the total present value life cycle cost of Alternative OGW-3b using a discount rate of 7 percent for 15 years is $5,417,000 (USEPA, 2000), which includes 5 years of active remediation and 10 years of post-remediation groundwater monitoring.

7.2 Detailed Analysis of Surface-Water Remedial Action Alternatives

Three surface-water remedial action alternatives have been retained for detailed analysis. The detailed analysis of the remedial action alternatives is summarized in Table 7-4 and presented in the following sections.

7.2.1 Alternative SW-1: No Action

The following sections present a detailed analysis of remedial action Alternative SW-1 for surface water. Table 7-4 presents a summary of this analysis. This alternative is retained for detailed analysis as required by the NCP as a baseline for evaluating the remaining alternatives.

7.2.1.1 Overall Protection of Human Health and the Environment

The No Action Alternative does not incorporate any implementation activities that would present exposure risks to the community, workers, or the environment. Natural attenuation processes may continue to reduce COPC concentrations of the surface-water bodies to remedial goals, but monitoring of these processes would not be performed to evaluate risks or determine when remedial goals were met. Therefore, the No Action Alternative would not achieve surface-water RAOs.

7.2.1.2 Compliance with Applicable or Relevant and Appropriate Requirements

The No Action Alternative would not comply with chemical-specific ARARs for surface water because NFA would be taken to address existing COPC concentrations in surface water.

7.2.1.3 Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence would not be achieved through the No Action Alternative because existing COPC concentrations in surface water would not be directly addressed. Natural attenuation processes may continue to reduce COPC concentrations of COPCs in groundwater discharging to surface-water bodies to remedial goals, but monitoring of these processes would not be performed under the No Action Alternative to evaluate risks or determine when remedial goals are met.

7.2.1.4 Reduction of Mobility, Toxicity, or Volume

Although natural attenuation processes may result in the reduction of COPC mobility, toxicity, or volume in surface water, monitoring of these processes would not be performed under the No Action Alternative.

7.2.1.5 Short-Term Effectiveness

The No Action Alternative does not incorporate any implementation activities that would present exposure risks to the community, workers, or the environment.

7.2.1.6 Implementability

The No Action Alternative is technically feasible and would not limit or interfere with the ability to perform future remedial actions. However, the No Action Alternative is unlikely to be administratively feasible due to the anticipated lack of monitoring. There is currently no unacceptable human health risk due to COPCs in surface water.

7.2.1.7 Cost

Table 7-5 and Appendix C present a summary of the present value calculations for Alternative SW-1 and the detailed cost backup, respectively. There are no capital, O&M, or periodic costs associated with Alternative SW-1.

7.2.2 Alternative SW-2: Limited Action

The following sections present a detailed analysis of remedial action Alternative SW-2 for surface water. COPC concentrations in surface water would be reduced via natural attenuation processes and MNA would be conducted to document the declining concentrations of COPCs. Table 7-4 presents a summary of this analysis.

7.2.2.1 Overall Protection of Human Health and the Environment

Alternative SW-2 does not incorporate any implementation activities that would present exposure risks to the community, workers, or the environment. This alternative does not actively reduce existing COPC concentrations in surface water, but does provide measures to monitor changes in surface-water concentrations due to natural degradation. The Limited Action Alternative would, therefore, achieve surface-water RAOs.

7.2.2.2 Compliance with Applicable or Relevant and Appropriate Requirements

The Limited Action Alternative would comply with chemical-specific ARARs for surface water by documenting natural attenuation of surface water identified as having COPC concentrations in exceedance of the chemical-specific ARARs for surface water.

7.2.2.3 Long-Term Effectiveness and Permanence

Though existing COPC concentrations in surface water would not be addressed, monitoring of surface water will document the natural attenuation processes and will achieve long-term effectiveness and permanence.

7.2.2.4 Reduction of Mobility, Toxicity, or Volume

While Alternative SW-2 does not provide an active treatment option, it would permanently reduce the mobility, toxicity, and volume of COPCs in surface water via natural attenuation processes. MNA would document the attenuation of the COPCs.

7.2.2.5 Short-Term Effectiveness

Implementation of this alternative would result in minimal exposure risks to the community, workers, and the environment. The Limited Action Alternative includes periodic surface-water monitoring, which will be conducted by trained workers.

7.2.2.6 Implementability

Implementation of this alternative is both technically and administratively feasible and would not interfere with ongoing operations. This alternative would not limit or interfere with the ability to perform future remedial actions. There are no current surface-water exposure pathways that present human health exposure risks.

7.2.2.7 Cost

Table 7-5 and Appendix C present a summary of the present value calculations for Alternative SW-2 and the detailed cost backup, respectively. There are no capital costs associated with this alternative. O&M costs include MNA. The total remediation duration is estimated to be 30 years.

The O&M costs are estimated to total approximately $2,300 per year for the next 30 years. Based on USEPA guidance, the total present value life cycle cost of Alternative SW-2 using a discount rate of 7 percent is $31,000 (USEPA, 2000).

7.2.3 Alternative SW-3: Active Remediation – Phytoremediation

The following sections present a detailed analysis of remedial action Alternative SW-3 for surface water. This alternative would implement phytoremediation by planting hybrid poplar trees along the banks of the surface-water body, in the area of likely discharge of COPCs from groundwater to surface water, to reduce potential future discharge of COPCs in groundwater to surface water. MNA would be conducted to document the declining concentrations of COPCs. Table 7-4 presents a summary of this analysis. Figure 7-3 presents the preliminary locations of poplar tree plantings.

7.2.3.1 Overall Protection of Human Health and the Environment

Alternative SW-3 incorporates implementation activities (planting/maintenance/monitoring of hybrid poplars and surface-water monitoring) that would present minimal risks of exposure to COPCs in surface water to workers. Phytoremediation would reduce the potential discharge of COPC concentrations from groundwater to surface water by reducing groundwater flow to surface water and by improving natural degradation of the COPCs in the root mat of the trees. This would help to reduce COPC concentrations in groundwater that may exceed USEPA RSLs for tap water to surface water. The Limited Action Alternative would, therefore, achieve surface-water RAOs.

7.2.3.2 Compliance with Applicable or Relevant and Appropriate Requirements

Alternative SW-3 includes monitoring of the attenuation of surface water identified as having COPC concentrations in exceedance of RSLs for tap water following implementation of the phytoremediation component. Alternative SW-3, therefore, complies with chemical-specific ARARs by documenting these attenuation trends until the RSLs for tap water in surface water are achieved.

7.2.3.3 Long-Term Effectiveness and Permanence

Monitoring of the surface water will document the effectiveness of phytoremediation in reducing discharge of COPCs in groundwater to surface water and the process of COPC destruction via the natural attenuation process. Alternative SW-3 would, therefore, achieve long-term effectiveness and permanence.

7.2.3.4 Reduction of Mobility, Toxicity, or Volume

Alternative SW-3 would permanently reduce the mobility, toxicity, and volume of COPCs in surface water, as interception of shallow groundwater and COPCs in the groundwater potentially discharging to surface water. This, including the natural attenuation processes, would result in permanent destruction of COPCs to levels below the RSLs for tap water.

7.2.3.5 Short-Term Effectiveness

Alternative SW-3 incorporates implementation activities (planting/maintenance/monitoring of hybrid poplars and surface-water monitoring) that would present minimal risks of exposure risks to the community, workers, or the environment.

7.2.3.6 Implementability

Alternative SW-3 is technically feasible and would not limit or interfere with the ability to perform future remedial actions. Installation of the phytoremediation component may require access to other properties, which may affect administrative feasibility.

7.2.3.7 Cost

Total capital costs are estimated to be approximately $11,800. Total annual O&M costs are estimated to be approximately $7,000 per year for the first three years, $5,800 for years 3 through 9, and $2,300 per year for the following years. Based on USEPA guidance, the total present value life cycle cost of Alternative SW-3 using a discount rate of 7 percent for 30 years is $72,000 (USEPA, 2000).

8. Development of Operable Unit 2 Alternatives

The development of remedial action alternatives has followed the process below:

- Identification of RAOs and requirements for remediation (Section 3)
- Identification and screening of applicable technologies and formulation of remedial action alternatives for groundwater and surface water (Sections 4 through 6)
- Individual analysis of groundwater and surface-water remedial action alternatives (Section 7)

The formulation of the OU alternatives for this FS is developed using a comparative analysis of the alternatives relative to one another.

The identification of and selection of the preferred remedial action alternative are based on consideration of the major trade-offs among the alternatives in terms of the nine evaluation criteria. The USEPA has categorized the evaluation criteria into three groups:

- *Threshold Criteria* – The selected remedial action alternative must be protective of human health and the environment and comply with ARARs. Therefore, the USEPA has designated overall protection of human health and the environment and compliance with ARARs as the two threshold criteria. Absent an appropriate case for a waiver of some ARARs, an alternative must meet both criteria to be eligible for selection as the remedial action alternative.
- *Balancing Criteria* – The five primary balancing criteria are long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost. This balancing provides a preliminary assessment of the maximum extent to which permanent solutions and treatment can be used practicably in a cost-effective manner. The alternative that is protective of human health and the environment, complies with ARARs, and affords the most favorable balancing criteria is identified as the preferred remedial action alternative.
- *Modifying Criteria* – State and community acceptance are factored into a final evaluation that determines which remedial action alternatives are acceptable.

> As stated at the beginning of Section 7, state and community acceptance will be addressed after comments on the FS have been received.

A comparative analysis of the groundwater and surface-water remedial action alternatives is presented using the threshold and balancing evaluation criteria in Sections 8.1 and 8.2.

8.1 Comparative Analysis of Groundwater Remedial Action Alternatives

A summary of the individual analysis of the groundwater remedial action alternatives was presented in Table 7-2. This section provides a comparative analysis of the expected performance of each alternative relative to the other alternatives to identify their respective advantages and disadvantages.

8.1.1.1 Overall Protection of Human Health and the Environment

As indicated in Table 7-2, Alternatives OGW-2, OGW-3a, and OGW-3b achieve each of the RAOs identified for groundwater and offer a similar level of protection of human health and the environment, although OGW-3b would achieve the RAOs in a shorter period of time through active in-situ destruction of COPCs. It is estimated that OGW-3b would achieve RAOs in 15 years (including 5 years of active ERD injections and an additional 10 years of monitoring) compared to the 30-year estimate for OGW-3a. MNA monitoring would verify that the RAOs are achieved. In the absence of monitoring, the protectiveness of Alternative OGW-1 could not be verified.

8.1.1.2 Compliance with Applicable or Relevant and Appropriate Requirements

Each of the alternatives would attain remedial goals in the long term, although in the absence of monitoring, the attainment of remedial goals via Alternative OGW-1 could not be verified. Alternatives OGW-3b would attain ARARs much more quickly than OGW-3a, and OGW-3a would attain ARARs more quickly than Alternative OGW-2. For Alternatives OGW-3a and OGW-3b, monitoring would be used to assess both the effectiveness of the active remediation technology and that natural attenuation continues to make progress toward achievement of RAOs for groundwater.

8.1.1.3 Long-Term Effectiveness and Permanence

Alternative OGW-1 would provide the least long-term effectiveness because there would be no controls to limit access to COPCs in groundwater or monitoring to indicate when RAOs have been reached. Alternative OGW-2 would be more effective than Alternative OGW-1 because institutional controls and irrigation well abandonment would be implemented to limit access to COPCs in groundwater, but migration and potential discharge of COPCs from groundwater to surface water could continue to occur. Alternatives OGW-3a and OGW-3b are the most effective alternatives in the long-term because, in addition to limiting access to COPCs in groundwater, they would manage the migration of COPCs in groundwater or actively destroy COPCs within groundwater. All alternatives would permanently reduce COPC concentrations to remedial goals; however, OGW-3b provides the greatest permanence in the shortest timeframe by destroying the COPCs in-situ.

8.1.1.4 Reduction of Mobility, Toxicity, or Volume

All alternatives would reduce toxicity and volume of COPCs through natural attenuation processes. Alternatives OGW-3a and OGW-3b also provide active containment and/or treatment of COPCs in groundwater, which would reduce the mobility, volume, and toxicity of these COPCs in some portions of the aquifer.

8.1.1.5 Short-Term Effectiveness

Alternative OGW-1 is the most effective at attaining short-term results with minimal risks as there would not be any activities during the implementation phase that would present exposure risks. Alternative OGW-2 would require limited activities (abandoning irrigation wells, monitoring existing wells) that would result in short-term exposure risks and potential physical construction-related hazards to workers, communities, or the environment, although these activities would be managed through engineering controls. Under Alternative OGW-3a, there would also be minimal risks from the installation of a groundwater extraction and treatment system, but O&M of the extraction system may increase exposure risks to workers and would be required for 30 years. Under Alternative OGW-3b, the installation of injection wells and injection activities may result in short-term exposure risks to workers, adjacent populations, or the environment. These potential risks would be managed through engineering controls and vapor monitoring and mitigation. Alternative OGW-3b would also achieve RAOs in a significantly shorter time period (5 years of active remediation plus 10 years of monitoring) compared to the other remedial action alternatives.

8.1.1.6 Implementability

Alternative OGW-1 is simple to implement and involves no O&M. Alternative OGW-2 is less simple to implement, requiring institutional controls over a number of properties, the establishment of a groundwater monitoring program, and the long-term maintenance of each of these programs. The groundwater extraction and treatment system planned for Alternative OGW-3a is conventional equipment, although would require access and long-term maintenance to remain effective. Alternative OGW-3b would be more difficult to implement, with access necessary to several properties required for the installation of injection wells and establishment of injection programs, as well as with the associated methane vapor monitoring and potential mitigation program. However, Alternative OGW-3b would meet RAOs in the shortest timeframe of any of the alternatives.

8.1.1.7 Cost

Alternative OGW-1, estimated to cost $0, is the most economical option. Alternative OGW-2, estimated to cost $872,000, is the most economical of the other three alternatives. Alternative OGW-3b is the most costly alternative with present worth cost estimate of $5,417,000 but would result in the destruction of COPCs and meet RAOs in the shortest timeframe and is only slightly more costly than Alternative OGW-3a. Alternative OGW-3a is the least costly active remediation alternative with a present worth cost estimate of $5,250,000, but would require operating the extraction wells for 30 years.

8.2 Comparative Analysis of Surface-Water Remedial Action Alternatives

A summary of the individual analysis of the surface-water remedial alternatives is presented in Table 7-4. This section provides a comparative analysis of the expected performance of each alternative relative to the other alternatives to identify their respective advantages and disadvantages.

8.2.1.1 Overall Protection of Human Health and the Environment

As indicated in Table 7-4, Alternatives SW-2 and SW-3 achieve the RAOs identified for surface water. SW-3 would achieve the RAOs in a shorter period of time by addressing potential discharge of COPCs from groundwater to surface water and actively reducing existing COPC concentrations. MNA monitoring would verify that the RAOs are achieved. In the absence of monitoring, the protectiveness of Alternative SW-1 could not be verified.

8.2.1.2 Compliance with Applicable or Relevant and Appropriate Requirements

Each of the alternatives would attain remedial goals in the long-term, although in the absence of monitoring, the attainment of remedial goals via Alternative SW-1 could not be verified. Alternative SW-3 would attain ARARs more quickly than Alternative SW-2. For Alternatives SW-2 and SW-3, monitoring would be used to verify that natural attenuation continues to make progress toward reduction of COPCs remaining in surface water eventually toward achievement of RAOs.

8.2.1.3 Long-Term Effectiveness and Permanence

Alternative SW-1 would provide the least long-term effectiveness because there would be no monitoring to indicate when RAOs have been reached. Alternative SW-2 would be more effective than Alternative SW-1 because monitoring of surface water will document the natural attenuation processes. Alternative SW-3 is the most effective alternative in the long-term because it would also further reduce the potential for COPCs in groundwater to discharge to surface water. All alternatives would permanently reduce COPC concentrations to remedial goals; however, SW-3 provides greater permanence in a shorter timeframe.

8.2.1.4 Reduction of Mobility, Toxicity, or Volume

All alternatives would reduce toxicity and volume of COPCs through natural attenuation processes. Alternative SW-3 also provides active reduction of COPC concentrations by preventing infiltration of groundwater potentially containing COPCs.

8.2.1.5 Short-Term Effectiveness

Alternative SW-1 is the most effective at attaining short-term results with minimal risks, as there would not be any activities during the implementation phase that would present exposure risks. Alternative SW-2 would require limited activities (e.g., surface-water monitoring) that would result in short-term exposure risks to workers, communities, or the environment and these activities would be managed through engineering controls. Under Alternative SW-3, there would also be the potential for exposure risks from the planting of the poplar tree phytoremediation system. These potential risks would also be managed through engineering controls. Alternative SW-3 would also achieve RAOs in the shortest time period.

8.2.1.6 Implementability

Alternative SW-1 is simple to implement and involves no O&M. Alternative SW-2 is also relatively simple to implement, requiring regular surface-water monitoring events. The poplar tree phytoremediation system planned for Alternative SW-3 is an accepted technology, though it would require access and long-term maintenance to remain effective. However, Alternative SW-3 would meet RAOs in the shortest timeframe of any of the alternatives.

8.2.1.7 Cost

Alternative SW-1, estimated to cost $0, is the most economical option. Alternative SW-2, estimated to cost $31,000, is slightly less economical but would meet the RAOs. Alternative SW-3 is the most costly alternative with present worth cost estimate of $72,000 but would prevent potential for discharge of COPCs in groundwater into surface-water bodies and meet RAOs in the shortest timeframe.

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Tables

Table 2-1
Monitoring Well and Pumping Well Water-Level Data

Feasibility Study Operable Unit 2
AVX Corporation
Myrtle Beach, South Carolina

Measuring Point I.D.	Ground Surface Elevation (ft amsl)	Reference Point (RP) Elevation (ft amsl)	October 7, 2008		May 26, 2009		July 20-21, 2009		April 14, 2010	
			Depth to Water from RP (ft)	Groundwater Elevation (ft amsl)	Depth to Water from RP (ft)	Groundwater Elevation (ft amsl)	Depth to Water from RP (ft)	Groundwater Elevation (ft amsl)	Depth to Water from RP (ft)	Groundwater Elevation (ft amsl)
MW-1S	20.50	20.49	4.43	16.06	NA[2]	--	NA[2]	--	NA[2]	--
MW-2S	19.00	18.55	5.58	12.97	6.01	12.54	6.45	12.10	4.31	14.24
MW-5S	19.50	19.30	NA	--	NA	--	5.84	13.46	NA	--
MW-14S	20.50	20.18	5.34	14.84	5.61	14.57	6.21	13.97	3.93	16.25
MW-15S	20.80	20.42	NA	--	8.38	12.04	8.73	11.69	7.4	13.02
MW-16S	20.00	19.53	6.90	12.63	6.55	12.98	7.47	12.06	5.55	13.98
MW-19S	19.00	18.34	NA	--	5.34	13.00	5.93	12.41	3.71	14.63
MW-20S	19.00	18.18	NA	--	6.20	11.98	6.48	11.70	4.61	13.57
MW-21S	20.50	20.35	10.20	10.15	10.44	9.91	10.94	9.41	7.46	12.89
MW-22S	19.32	18.98	8.85	10.13	NA	--	9.74	9.24	7.82	11.16
MW-101S	21.01	20.55	10.83	9.72	NA	--	11.71	8.84	9.69	10.86
MW-102S	21.70	21.45	10.00	11.45	NA	--	10.74	10.71	8.88	12.57
MW-103S	22.03	21.65	10.24	11.41	NA	--	9.87	11.78	7.76	13.89
MW-104S	21.05	20.81	9.30	11.51	NA	--	10.20	10.61	6.79	14.02
MW-105S	19.71	19.25	8.48	10.77	NA	--	9.16	10.09	6.43	12.82
MW-106S	NA	19.97	12.11	7.86	12.08	7.89	13.08	6.89	10.68	9.29
MW-7D	21.00	20.91	NA	--	NA	--	NA	--	NA	--
MW-8D	20.00	19.55	6.58	12.97	6.80	12.75	7.40	12.15	5.11	14.44
MW-9D	20.50	20.20	9.29	10.91	9.61	10.59	10.15	10.05	NA	--
MW-10D	21.85	21.65	9.47	12.18	10.55	11.10	11.20	10.45	9.07	12.58
MW-11D	21.90	21.79	NA	--	NA	--	9.60	12.19	NA	--
MW-17D	20.00	19.47	6.38	13.09	6.76	12.71	7.43	12.04	4.91	14.56
MW-21D	20.50	20.16	10.01	10.15	10.35	9.81	10.89	9.27	7.15	13.01
MW-23D	20.47	20.17	9.28	10.89	9.66	10.51	9.97	10.20	7.19	12.98
MW-24D	18.17	17.99	7.80	10.19	8.22	9.77	NA	--	6.67	11.32
MW-25D	12.93	12.62	4.63	7.99	4.78	7.84	NA	--	4.08	8.54
MW-26D	23.68	23.23	NA	--	12.01	11.22	12.07	11.16	10.43	12.80
MW-27D	19.49	19.11	6.02	13.09	NA	--	6.93	12.18	4.97	14.14
MW-28D	24.05	23.23	12.19	11.04	NA	--	13.22	10.01	10.43	12.80
MW-29D	18.11	17.69	3.40	14.29	NA	--	4.67	13.02	1.8	15.89
MW-101D	20.97	20.68	10.36	10.32	NA	--	11.51	9.17	9.69	10.99
MW-102D	21.73	21.27	8.89	12.38	NA	--	9.91	11.36	7.45	13.82
MW-103D	22.03	21.65	9.01	12.64	NA	--	9.80	11.85	7.55	14.10
MW-104D	20.94	20.60	9.45	11.15	NA	--	10.21	10.39	6.83	13.77
MW-105D	19.75	19.51	8.22	11.29	NA	--	9.26	10.25	6.89	12.62
DPW-1SD	20.50	20.23	14.14	6.09	14.06	6.17	15.61	4.62	13.03	7.20
DPW-2SD	21.00	20.69	11.91	8.78	11.96	8.73	12.79	7.90	10.72	9.97
DPW-3SD	19.00	18.95	8.51	10.44	8.78	10.17	9.18	9.77	6.65	12.30
DPW-4SD	20.50	20.24	17.69	2.55	14.60	5.64	17.35	2.89	14.7	5.54
MW-22DD	19.16	18.74	12.05	6.69	NA	--	9.12	9.62	7.84	10.90
MW-23DD	20.56	20.10	10.50	9.60	9.03	11.07	8.31	11.79	7.31	12.79
MW-25DD	12.92	12.63	10.40	2.23	3.29	9.34	NA	--	5.82	6.81

Table 2-1
Monitoring Well and Pumping Well Water-Level Data

Feasibility Study Operable Unit 2
AVX Corporation
Myrtle Beach, South Carolina

Measuring Point I.D.	Ground Surface Elevation (ft amsl)	Reference Point (RP) Elevation (ft amsl)	October 7, 2008		May 26, 2009		July 20-21, 2009		April 14, 2010	
			Depth to Water from RP (ft)	Groundwater Elevation (ft amsl)	Depth to Water from RP (ft)	Groundwater Elevation (ft amsl)	Depth to Water from RP (ft)	Groundwater Elevation (ft amsl)	Depth to Water from RP (ft)	Groundwater Elevation (ft amsl)
P-1D	20.02	19.65	8.65	11.00	NA	--	9.46	10.19	NA	--
P-2D	20.13	19.84	8.84	11.00	NA	--	9.71	10.13	NA	--
P-3D	19.29	18.95	8.81	10.14	NA	--	8.79	10.16	NA	--
P-4D	20.28	19.98	9.00	10.98	NA	--	NA	--	7.13	12.85
P-5D	19.61	19.27	8.20	11.07	NA	--	8.94	10.33	6.1	13.17
PW-1S	19.00	18.82	7.82	11.00	9.97	8.85	NA	--	6.8	12.02
PW-6S	20.00	19.18	6.21	12.97	6.31	12.87	6.64	12.54	4.65	14.53
PW-7S	19.00	18.49	5.81	12.68	8.53	9.96	NA	--	7.03	11.46
SVE-1	18.33	20.71	NA	--	8.29	12.42	8.84	11.87	6.55	14.16
Injection Wells										
IW-1D	20.75	20.23	NA	--	NA	--	9.94	10.29	6.66	13.57
IW-2D	19.65	19.45	NA	--	NA	--	9.30	10.15	NA	--
IW-3D	19.90	19.65	NA	--	NA	--	9.52	10.13	NA	--
IW-4D	20.20	19.90	NA	--	NA	--	9.79	10.11	NA	--
IW-5D	20.54	20.19	NA	--	NA	--	10.05	10.14	NA	--
IW-6D	20.25	19.60	NA	--	NA	--	9.47	10.13	NA	--
Observation Wells										
OW-1D	20.67	20.40	NA	--	NA	--	10.12	10.28	6.9	13.50
OW-2D	20.77	20.55	NA	--	NA	--	10.25	10.30	7.12	13.43
OW-3D	20.87	20.67	NA	--	NA	--	10.39	10.28	7.24	13.43
OW-4D	20.77	20.52	NA	--	NA	--	10.23	10.29	6.95	13.57
OW-5D	20.67	20.43	NA	--	NA	--	10.14	10.29	6.76	13.67
OW-6D	20.65	20.35	NA	--	NA	--	10.09	10.26	6.73	13.62
OW-7D	20.05	19.71	NA	--	NA	--	9.58	10.13	NA	--
OW-8D	19.95	19.66	NA	--	NA	--	9.57	10.09	NA	--
OW-9D	20.26	20.03	NA	--	NA	--	9.95	10.08	NA	--
OW-10D	20.00	19.69	NA	--	NA	--	9.66	10.03	NA	--
Carmike Wells										
TW-1	NA	26.10	NA	--	NA	--	NA	--	NA	--
TW-2	NA	25.30	NA	--	NA	--	NA	--	NA	--
TW-3	NA	25.80	NA	--	NA	--	NA	--	NA	--
TW-4	NA	23.41	NA	--	NA	--	NA	--	NA	--
MWCC-5	NA	20.94	10.57	10.37	10.49	10.45	NA	--	8.35	12.59
MWCC-6	NA	21.43	NA	--	NA	--	NA	--	NA	--
MWCC-7	NA	21.51	12.27	9.24	9.89	11.62	NA	--	7.86	13.65
MWCC-8	NA	21.14	10.13	11.01	10.08	11.06	NA	--	8.16	12.98

Notes:
amsl = above mean sea level
ft = feet
NA = not available

Table 2-2
Historical Groundwater Sample Analytical Data

Feasibility Study Operable Unit 2
AVX Corporation
Myrtle Beach, South Carolina

Location ID:			DPW-1D																															
Date Collected:	**EPA/SCDHEC M**	**Units**	**12/01/90**	**11/01/91**	**05/01/92**	**09/01/92**	**02/01/93**	**12/01/93**	**07/01/94**	**12/01/94**	**09/29/96**	**06/01/97**	**01/27/98**	**07/13/98**	**01/25/99**	**07/13/99**	**01/01/00**	**06/01/00**	**01/01/01**	**08/01/01**	**01/07/02**	**06/17/02**	**01/21/03**	**07/23/03**	**10/14/03**	**02/07/04**	**07/08/04**	**10/05/05**	**07/26/06**	**05/22/07**	**05/27/08**	**05/26/09**	**04/13/10**
Detected Volatile Organics																																		
1,1,1-Trichloroethane	200	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20.0 U	250 U	250 U	47.0 U
1,1-Dichloroethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20.0 U	250 U	250 U	150 U
1,1-Dichloroethene	7	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	***42.0***	250 U	250 U	150 U
1,2,4-Trichlorobenzene	70	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	250 U	250 U	230 U
1,2,4-Trimethylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	250 U	250 U	170 U
1,2-Dichloroethane	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20.0 U	250 U	250 U	78.0 U
1,3,5-Trimethylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	250 U	250 UJ	88.0 U
2-Butanone	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	200 U	6,250 U	6,250 U	830 U
2-Hexanone	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	200 U	1,250 U	1,250 U	310 U
Acetone	- -	µg/L	ND	780 JB	16,000 JB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	500 U	6,250 U	6,250 U	2,500 U
Benzene	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20.0 U	250 U	250 U	100 U
Bromodichloromethane	81	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20.0 U	250 U	250 U	110 U
Carbon Disulfide	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	40.0 U	250 U	250 U	200 U
Chlorobenzene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20.0 U	250 U	250 U	53.0 U
Chloroethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20.0 U	250 U	250 U	190 U
Chloroform	86	µg/L	ND	ND	ND	ND	ND	ND	ND	***6,700 J***	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20.0 U	250 U	250 U	150 U
Chloromethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20.0 U	250 U	250 U	200 U
cis-1,2-Dichloroethene	70	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	***24,000 J***	***9,600***	***21,000***	***5,800***	***31,000***	***9,100***	***25,000***	***1,000***	***5,600***	***18,000***	***19,000***	***26,000***	***21,000***	***1,800***	***3,300***	***4,200***	***5,200***	***3,200***	***17,000 D***	***3,860***	***7,470***	***13,000***
Ethylbenzene	700	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20.0 U	250 U	250 U	95.0 U
m-,p-Xylene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	500 U	500 U	120 U
Methylene Chloride	5	µg/L	ND	***210 JB***	***5,800 JB***	***27,000***	***3,400 J***	***140,000 JB***	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	100 U	1,250 U	1,250 U	180 U
Naphthalene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	250 U	250 U	140 U
o-Xylene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	250 U	250 U	53.0 U
p-Isopropyltoluene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	250 U	250 U	130 U
Styrene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20.0 U	250 U	250 U	52.0 U
tert-Butylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	250 U	250 U	120 U
Tetrachloroethene	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20.0 U	250 U	250 U	250 U
Toluene	1,000	µg/L	ND	210 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20.0 U	250 U	250 U	130 U
trans-1,2-Dichloroethene	100	µg/L	***1,600 T***	***6,000 T***	***6,500 JT***	***8,100 JT***	***10,000 T***	***11,000 JT***	***9,100 JT***	***12,000 T***	***4,600 T***	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	42.0	67.0	250 U	250 U	220 U
Trichloroethene	5	µg/L	***22,000***	***89,000 E***	***180,000***	***220,000***	***360,000***	***460,000***	***350,000***	***380,000***	***53,000***	***88,000***	***76,000***	***1,800***	***47,000***	***190,000***	***46,000***	***88,000***	***3,700***	***15,000***	***59,000***	***50,000***	***89,000***	***40,000***	***2,400***	***3,700***	***3,000***	***2,200***	***1,700***	***23,000 D***	***2,460***	***6,470***	***10,000***
Vinyl Chloride	2	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	***2,800***	ND	ND	ND	ND	ND	ND	ND	ND	***330 J***	***240***	ND	ND	ND	***97.0***	ND	***260***	250 U	250 U	190 U
Xylenes (total)	10,000	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	40.0 U	NA	NA	NA

Location ID:			DPW-2SD																
Date Collected:	**EPA/SCDHEC M**	**Units**	**12/01/90**	**11/01/91**	**05/01/92**	**09/01/92**	**02/01/93**	**12/01/93**	**07/01/94**	**12/01/94**	**09/29/96**	**06/01/97**	**01/27/98**	**07/13/98**	**01/25/99**	**07/13/99**	**01/01/00**	**06/01/00**	**01/01/01**
Detected Volatile Organics																			
1,1,1-Trichloroethane	200	µg/L	160	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	- -	µg/L	360	73.0 J	18.0	ND	ND	5.00 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	7	µg/L	***61.0***	ND	***15.0***	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	70	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	5	µg/L	***8.00***	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	- -	µg/L	ND	950 B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	- -	µg/L	ND	2,400 B	33.0	ND	41.0 JB	ND	14.0 JB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	81	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	86	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	38.0	ND	***180***	ND	ND	ND	ND	ND	ND
Chloromethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	70	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	***280***	57.0	54.0	53.0	50.0	46.0	39.0	17.0
Ethylbenzene	700	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
m-,p-Xylene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	5	µg/L	***13.0***	***100 JB***	ND	ND	***15.0 J***	ND	ND	ND	ND	***15.0***	ND	ND	ND	ND	ND	ND	ND
Naphthalene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND
o-Xylene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
p-Isopropyltoluene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
tert-Butylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	5	µg/L	***10.0***	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	1,000	µg/L	11.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	100	µg/L	***4,400 T***	***490 T***	***220 T***	***250 T***	***250 T***	***180 T***	***160 T***	100 T	100 T	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	5	µg/L	***8,400***	***2,800 B***	***1,200***	***1,400***	***1,400***	***730***	***450***	***270***	***40.0***	***290***	***15.0 J***	***15.0***	4.00	4.00	3.00	3.00	***12.0***
Vinyl Chloride	2	µg/L	***140***	ND	ND	ND	ND	***14.0 J***	ND	ND	ND	***12.0***	ND	ND	***4.00***	ND	1.00 J	2.00 J	ND
Xylenes (total)	10,000	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes:
1. Maximum Contaminant Levels (MCLs); if SCDHEC MCL not available, MCL developed by USEPA shown
Bold and Italicized values exceed MCLs
µg/L - micrograms per liter
J - The compound was identified; however, the associated numerical value is an estimated concentration
U - Compound not detected above reported sample quantitation limit.
B - Analyte was also detected in the associated method blank.
D - Compound quantitated using a secondary dilution.
E - Analyte exceeded calibration range.
ND - None detected.
Results in brackets are duplicate sample results.

Table 2-2
Historical Groundwater Sample Analytical Data

Feasibility Study Operable Unit 2
AVX Corporation
Myrtle Beach, South Carolina

Location ID:			DPW-3SD																							
Date Collected:	**EPA/SCDHEC M**	**Units**	**07/01/94**	**12/01/94**	**09/29/96**	**06/01/97**	**01/27/98**	**07/13/98**	**01/25/99**	**07/13/99**	**01/01/00**	**06/01/00**	**01/01/01**	**08/01/01**	**01/07/02**	**06/17/02**	**01/21/03**	**07/23/03**	**10/14/03**	**02/07/04**	**07/08/04**	**10/05/05**	**07/26/06**	**05/22/07**	**05/28/08**	**04/13/10**
Detected Volatile Organics																										
1,1,1-Trichloroethane	200	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.00 U	100 U	100 U
1,1-Dichloroethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.00 U	100 U	100 U
1,1-Dichloroethene	7	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	***11.0 J***	***12.0 J***	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.00 U	100 U	100 U
1,2,4-Trichlorobenzene	70	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	100 U	100 U
1,2,4-Trimethylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	100 U	100 U
1,2-Dichloroethane	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.00 U	100 U	100 U
1,3,5-Trimethylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	100 U	100 U
2-Butanone	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	50.0 U	2,500 U	2,500 U
2-Hexanone	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	50.0 U	500 U	500 U
Acetone	- -	µg/L	210 JB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	130 U	2,500 U	2,500 U
Benzene	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.00 U	100 U	100 U
Bromodichloromethane	81	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.00 U	100 U	100 U
Carbon Disulfide	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0 U	100 U	100 U
Chlorobenzene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.00 U	100 U	100 U
Chloroethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.00 U	100 U	100 U
Chloroform	86	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.00 U	100 U	100 U
Chloromethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.00 U	100 UJ	100 U
cis-1,2-Dichloroethene	70	µg/L	NA	NA	NA	***20,000***	***5,200***	***1,300***	***1,700***	***1,600***	***1,900***	***1,800***	***840***	***1,300***	***1,600***	***1,400***	***1,400***	***1,300***	***460***	***1,100***	***950***	***900***	***260***	***1,000***	***1,520***	***1,080***
Ethylbenzene	700	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.00 U	100 U	100 U
m-,p-Xylene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	200 U	200 U
Methylene Chloride	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	25.0 U	500 U	500 U
Naphthalene	- -	µg/L	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	100 U	100 U
o-Xylene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	100 U	100 U
p-Isopropyltoluene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	100 U	100 U
Styrene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.00 U	100 U	100 U
tert-Butylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	100 U	100 U
Tetrachloroethene	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.00 U	100 U	100 U
Toluene	1,000	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.00 U	100 U	100 U
trans-1,2-Dichloroethene	100	µg/L	***1,900 T***	***14,000 T***	***1,600 T***	***960 J***	ND	ND	ND	ND	ND	ND	ND	ND	15.0 J	ND	13.0 J	13.0 J	ND	ND	ND	24.0	3.20	5.30	100 U	100 U
Trichloroethene	5	µg/L	***7,700***	***96,000***	***3,500***	***170,000 E***	***31,000***	***5,400***	***9,700***	***5,200***	***420***	***360***	***88.0***	***61.0***	***160***	***240***	***170***	***400***	***52.0***	***67.0***	***90.0***	***910***	***7.70***	***710***	***2,330***	***64.0 J***
Vinyl Chloride	2	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	***190 J***	***200***	***47.0***	***250***	***200***	***280***	***340***	***250***	***120***	ND	ND	***19.0***	***22.0***	***250***	100 U	***100***
Xylenes (total)	10,000	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0 U	NA	NA

Location ID:			DPW-4SD																													
Date Collected:	**EPA/SCDHEC M**	**Units**	**11/01/91**	**05/01/92**	**09/01/92**	**02/01/93**	**12/01/93**	**07/01/94**	**12/01/94**	**04/01/95**	**09/29/96**	**07/01/97**	**01/27/98**	**07/20/98**	**01/25/99**	**07/12/99**	**01/01/00**	**06/01/00**	**01/01/01**	**08/01/01**	**01/07/02**	**06/17/02**	**01/21/03**	**07/23/03**	**10/14/03**	**02/07/04**	**07/08/04**	**10/05/05**	**01/12/06**	**07/26/06**	**05/21/07**	**05/27/08**	**05/26/09**	**04/13/10**
Detected Volatile Organics																																		
1,1,1-Trichloroethane	200	µg/L	ND	***1,100***	ND	***220 J***	ND	ND	ND	ND	ND	ND	140	ND	ND	200	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20.0 U [20.0 U	320 U	320 U	320 U
1,1-Dichloroethane	- -	µg/L	460	470 J	ND	370 J	250 J	ND	ND	ND	750	400	700	940	ND	560	220 J	770	310	280	370	150 J	ND	370 J	160 J	200	250	46.0	110	110	140 [140]	320 U	320 U	80.0 J
1,1-Dichloroethene	7	µg/L	***110 J***	ND	ND	ND	ND	ND	ND	ND	***250***	***100***	***250***	***460***	ND	***290***	ND	ND	***140 J***	***130 J***	***230***	ND	ND	ND	***130 J***	***120***	***100***	ND	ND	***47.0***	***68.0 [69.0]***	320 U	320 U	320 U
1,2,4-Trichlorobenzene	70	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	320 U	320 U	320 U
1,2,4-Trimethylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	320 U	320 U	320 U
1,2-Dichloroethane	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20.0 U [20.0 U	320 U	320 U	320 U
1,3,5-Trimethylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	320 U	320 UJ	320 U
2-Butanone	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	200 U [200 U]	8,000 U	8,000 U	8,000 U
2-Hexanone	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	200 U [200 U]	1,600 U	1,600 U	1,600 U
Acetone	- -	µg/L	700 B	630 JB	ND	1,500 JB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	500 U [500 U]	8,000 U	8,000 U	8,000 U
Benzene	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20.0 U [20.0 U	320 U	320 U	320 U
Bromodichloromethane	81	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20.0 U [20.0 U	320 U	320 U	320 U
Carbon Disulfide	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	16.0 J	47.0 J	ND	40.0 U [40.0 U	320 U	320 U	320 U
Chlorobenzene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20.0 U [20.0 U	320 U	320 U	320 U
Chloroethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20.0 U [20.0 U	320 U	320 U	320 U
Chloroform	86	µg/L	ND	ND	ND	ND	ND	ND	***400 J***	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20.0 U [20.0 U	320 U	320 U	320 U
Chloromethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20.0 U [20.0 U	320 U	320 U	320 U
cis-1,2-Dichloroethene	70	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	***9,900***	***10,000***	***12,000***	***7,700***	***11,000***	***9,000***	***3,900***	***6,400***	***7,900***	***7,000***	***25,000***	***5,000***	***6,000***	***5,700***	***6,500***	***120***	***6,700***	***6,700***	***600 D [9,500***	***8,170***	***7,850***	***6,490***
Ethylbenzene	700	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20.0 U [20.0 U	320 U	320 U	320 U
m-,p-Xylene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	640 U	640 U	640 U
Methylene Chloride	5	µg/L	***540 B***	***340 JB***	ND	***420 J***	***370 JB***	ND	***640 J***	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	100 U [100 U]	1,600 U	1,600 U	1,600 U
Naphthalene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	435	320 U	320 U
o-Xylene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	320 U	320 U	320 U
p-Isopropyltoluene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	320 U	320 U	320 U
Styrene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20.0 U [20.0 U	320 U	320 U	320 U
tert-Butylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	320 U	320 U	320 U
Tetrachloroethene	5	µg/L	***51.0 J***	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20.0 U [20.0 U	320 U	320 U	320 U
Toluene	1,000	µg/L	60.0 J	ND	ND	180 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	13.0 J [13.0 J]	320 U	320 U	320 U
trans-1,2-Dichloroethene	100	µg/L	***4,300 T***	***11,000 T***	***12,000 T***	***13,000 T***	***9,400 T***	***11,000 T***	***9,800 T***	***8,200 T***	***8,200 T***	***180***	***110 J***	ND	***130 J***	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	84.0 J	100	ND	68.0	***120***	85.0 [91.0]	320 U	320 U	320 U
Trichloroethene	5	µg/L	***8,100***	***46,000***	***39,000***	***43,000***	***24,000***	***24,000***	***20,000***	***26,000***	***6,700***	***8,400***	***4,200***	***7,800***	***9,900***	***5,400***	***8,400***	***3,600***	***2,500***	***3,000***	***3,300***	***6,400***	***120,000***	***2,800***	***6,500***	***3,700***	***3,200***	ND	***3,600***	***4,700***	***100 D [5,100***	***5,980***	***3,170***	***2,950***
Vinyl Chloride	2	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	***2,400***	***1,200***	***1,000***	***2,400***	***430***	***1,400***	***740***	***600***	***560***	***620***	***830***	***870 J***	***350 J***	***580***	***360***	***500***	***1,800***	***610***	***370***	***740 D [760]***	***534***	***787***	***842***
Xylenes (total)	10,000	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	40.0 U [40.0 U	NA	NA	NA

Notes:
1. Maximum Contaminant Levels (MCLs); if SCDHEC MCL not available, MCL developed by USEPA shown
Bold and Italicized values exceed MCLs
µg/L - micrograms per liter
J - The compound was identified; however, the associated numerical value is an estimated concentration
U - Compound not detected above reported sample quantitation limit.
B - Analyte was also detected in the associated method blank.
D - Compound quantitated using a secondary dilution.
E - Analyte exceeded calibration range.
ND - None detected.
Results in brackets are duplicate sample results.

Table 2-2
Historical Groundwater Sample Analytical Data

Feasibility Study Operable Unit 2
AVX Corporation
Myrtle Beach, South Carolina

Location ID:			**MW-1S**																										
Date Collected:	**EPA/SCDHEC M**	**Units**	**12/01/90**	**11/01/91**	**05/01/92**	**09/01/92**	**02/01/93**	**12/01/93**	**07/01/94**	**12/01/94**	**09/29/96**	**06/01/97**	**01/27/98**	**07/13/98**	**01/25/99**	**07/01/99**	**01/01/00**	**06/01/00**	**01/01/01**	**08/01/01**	**01/07/02**	**06/17/02**	**01/20/03**	**07/22/03**	**02/06/04**	**07/08/04**	**10/05/05**	**07/26/06**	**05/21/07**
Detected Volatile Organics																													
1,1,1-Trichloroethane	200	µg/L	ND	***980***	***270***	ND	95.0	92.0	29.0	10.0	ND	ND	ND	200	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U
1,1-Dichloroethane	- -	µg/L	ND	310	220	400	230	220	200	82.0	51.0	190	ND	450	98.0	480	94.0	420	230	250	ND	44.0	11.0	2.00 J	6.00	7.00	3.00	ND	1.00 U
1,1-Dichloroethene	7	µg/L	ND	***21.0 J***	ND	ND	5.00 J	***11.0***	***8.00 J***	ND	ND	ND	ND	ND	***14.0 J***	***170***	ND	***22.0***	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U
1,2,4-Trichlorobenzene	70	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
1,2,4-Trimethylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
1,2-Dichloroethane	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U
1,3,5-Trimethylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
2-Butanone	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0 U
2-Hexanone	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0 U
Acetone	- -	µg/L	ND	130 B	ND	ND	13.0 JB	10.0 J	110	280	96.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	14.0 J	17.0	10.0 J
Benzene	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U
Bromodichloromethane	81	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U
Carbon Disulfide	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.00 U
Chlorobenzene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U
Chloroethane	- -	µg/L	ND	210	ND	6,100	250	140	450	26.0	190	ND	82.0 J	600	83.0	970	100	440	ND	400	ND	61.0	13.0	4.00	7.00	8.00	2.00	ND	1.00 U
Chloroform	86	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	***190***	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U
Chloromethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U
cis-1,2-Dichloroethene	70	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	***2,500 E***	***2,200***	***2,500***	***940***	***3,400***	***380***	***2,200 E***	***2,800***	***1,700***	***530***	24.0	***98.0***	8.00	26.0	35.0	41.0	25.0	30.0
Ethylbenzene	700	µg/L	ND	12.0	24.0 J	110 J	13.0	9.00 J	37.0	12.0	32.0	ND	ND	ND	15.0 J	51.0	44.0	44.0	ND	ND	ND	ND	3.00 J	ND	ND	ND	1.00 J	ND	1.00 U
m-,p-Xylene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	5	µg/L	ND	***25.0 JB***	ND	ND	3.00 JB	4.00 JB	***7.00 J***	ND	ND	***43.0***	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.00 U
Naphthalene	- -	µg/L	ND	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	390	ND	180 J	ND	ND	ND	ND	ND	ND	ND	ND	NA
o-Xylene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
p-Isopropyltoluene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U
tert-Butylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
Tetrachloroethene	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U
Toluene	1,000	µg/L	ND	ND	ND	ND	5.00 J	2.00 J	46.0	2.00 J	ND	25.0	ND	ND	ND	33.0 J	ND	16.0 J	ND	ND	ND	13.0 J	ND	ND	ND	ND	ND	ND	1.00 U
trans-1,2-Dichloroethene	100	µg/L	ND	54.0 T	***150 T***	***120 JT***	100 T	***300 T***	***270 T***	84.0 T	***104 T***	ND	***160***	ND	ND	33.0 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U
Trichloroethene	5	µg/L	ND	***52.0***	***120***	ND	***110***	***280***	***100***	***31.0***	ND	***370***	***140***	***480***	***200***	***49.0***	***39.0***	***38.0***	***740***	ND	***130***	ND	***24.0***	1.00 J	***6.00***	5.00	1.00 J	2.10	***36.0***
Vinyl Chloride	2	µg/L	ND	ND	ND	***87.0 J***	ND	***28.0***	***4.00 J***	***24.0***	***31.0***	ND	ND	***650***	***160***	***4,000***	***71.0***	***1,100***	***610***	***4,500***	***90.0 J***	***650***	***23.0***	***3.00***	***3.00***	***4.00***	***4.00***	***120***	1.90
Xylenes (total)	10,000	µg/L	ND	55.0	98.0	400	51.0	12.0	69.0	26.0	37.0	51.0	ND	ND	ND	142	133	150	ND	ND	ND	26.0 J	ND	6.00	ND	ND	4.00	ND	2.00 U

Location ID:			**MW-2S**																												
Date Collected:	**EPA/SCDHEC M**	**Units**	**12/01/90**	**11/01/91**	**05/01/92**	**09/01/92**	**02/01/93**	**12/01/93**	**07/01/94**	**12/01/94**	**09/29/96**	**06/01/97**	**01/27/98**	**07/13/98**	**01/25/99**	**07/01/99**	**01/01/00**	**06/01/00**	**01/01/01**	**08/01/01**	**01/07/02**	**06/17/02**	**01/20/03**	**07/22/03**	**02/07/04**	**07/08/04**	**10/05/05**	**07/26/06**	**05/21/07**	**05/28/08**	**04/14/10**
Detected Volatile Organics																															
1,1,1-Trichloroethane	200	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0 U	1,000 U	0.0940 U
1,1-Dichloroethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0 U	1,000 U	0.290 U
1,1-Dichloroethene	7	µg/L	***810***	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0 U	1,000 U	5.20
1,2,4-Trichlorobenzene	70	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	1,000 U	0.460 U
1,2,4-Trimethylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	1,000 U	0.340 U
1,2-Dichloroethane	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0 U	1,000 U	0.160 U
1,3,5-Trimethylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	1,000 U	0.180 U
2-Butanone	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	100 U	25,000 U	1.70 U
2-Hexanone	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	100 U	5,000 U	0.610 U
Acetone	- -	µg/L	ND	33,000 B	ND	8,600 JB	5,800 JB	ND	7,200 J	3,100 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	250 U	25,000 U	5.00 U
Benzene	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0 U	1,000 U	0.210 U
Bromodichloromethane	81	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0 U	1,000 U	0.220 U
Carbon Disulfide	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20.0 U	1,000 U	0.410 U
Chlorobenzene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0 U	1,000 U	0.110 U
Chloroethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0 U	1,000 U	0.390 U
Chloroform	86	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0 U	1,000 U	0.300 U
Chloromethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0 U	1,000 UJ	0.410 U
cis-1,2-Dichloroethene	70	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	***36,000***	***17,000***	***39,000***	***16,000***	***38,000***	***39,000***	***52,000***	***29,000***	***31,000***	***19,000***	***23,000***	***26,000***	***17,000***	***19,000***	***20,000***	***4,300***	***15,000***	***5,300 D***	***8,860***	***2,300***
Ethylbenzene	700	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0 U	1,000 U	0.190 U
m-,p-Xylene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2,000 U	0.250 U
Methylene Chloride	5	µg/L	ND	***5,500 JB***	***1,400 JB***	ND	***2,700 JB***	***3,900 JB***	ND	***520 J***	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	50.0 U	5,000 U	0.360 U
Naphthalene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	1,000 U	0.280 U
o-Xylene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,000 U	0.110 U
p-Isopropyltoluene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,000 U	0.260 U
Styrene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0 U	1,000 U	0.100 U
tert-Butylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	1,000 U	0.240 U
Tetrachloroethene	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0 U	1,000 U	0.510 U
Toluene	1,000	µg/L	ND	***1,300 JB***	ND	ND	ND	ND	ND	ND	ND	***1,100***	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0 U	1,000 U	0.260 U
trans-1,2-Dichloroethene	100	µg/L	***14,000 T***	***16,000 T***	***19,000 T***	***21,000 T***	***11,000 T***	***24,000 T***	***33,000 T***	***11,000 T***	***26,000 T***	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	***200***	***200***	ND	***220***	37.0	1,000 U	51.0
Trichloroethene	5	µg/L	***62,000***	***65,000***	***130,000***	***140,000***	***73,000***	***130,000***	***160,000***	***57,000***	***110,000***	***78,000***	***60,000***	***120,000***	***54,000***	***110,000***	***82,000***	***78,000***	***58,000***	***55,000***	***42,000***	***50,000***	***59,000***	***27,000***	***22,000***	***17,000***	***12,000***	***3,800***	***7,300 D***	***16,800***	***1,800***
Vinyl Chloride	2	µg/L	***1,100***	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	***340 J***	***140 J***	***120 J***	ND	ND	***150***	***38.0***	1,000 U	***26.0***
Xylenes (total)	10,000	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	20.0 U	NA	NA

Notes:
1. Maximum Contaminant Levels (MCLs); if SCDHEC MCL not available, MCL developed by USEPA shown
Bold and Italicized values exceed MCLs
µg/L - micrograms per liter
J - The compound was identified; however, the associated numerical value is an estimated concentration
U - Compound not detected above reported sample quantitation limit.
B - Analyte was also detected in the associated method blank.
D - Compound quantitated using a secondary dilution.
E - Analyte exceeded calibration range.
ND - None detected.
Results in brackets are duplicate sample results.

Table 2-2
Historical Groundwater Sample Analytical Data

Feasibility Study Operable Unit 2
AVX Corporation
Myrtle Beach, South Carolina

Location ID:			MW-5S																				MW-6
Date Collected:	**EPA/SCDHEC M**	**Units**	**12/01/90**	**11/01/91**	**05/01/92**	**09/01/92**	**02/01/93**	**12/01/93**	**07/01/94**	**12/01/94**	**09/29/96**	**06/01/97**	**01/27/98**	**07/13/98**	**01/25/99**	**07/01/99**	**01/01/00**	**06/01/00**	**01/01/01**	**01/07/02**	**01/20/03**	**02/06/04**	**12/01/90**
Detected Volatile Organics																							
1,1,1-Trichloroethane	200	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	7	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	70	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	- -	µg/L	ND	17.0 B	2.00 JB	ND	3.00 JB	5.00 JB	4.00 J	24.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	81	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
Chlorobenzene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	86	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	70	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	3.00	ND	ND	ND	ND	ND	ND	ND	ND	NA
Ethylbenzene	700	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
m-,p-Xylene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	5	µg/L	ND	2.00 JB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
o-Xylene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
p-Isopropyltoluene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
tert-Butylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	1,000	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	100	µg/L	ND	4.00 JT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.00 T
Trichloroethene	5	µg/L	ND	1.00 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	***58.0***
Vinyl Chloride	2	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	***5.00***	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylenes (total)	10,000	µg/L	ND	ND	1.00 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Location ID:			MW-7D																												
Date Collected:	**EPA/SCDHEC M**	**Units**	**12/01/90**	**11/01/91**	**05/01/92**	**09/01/92**	**02/01/93**	**12/01/93**	**07/01/94**	**12/01/94**	**09/29/96**	**06/01/97**	**01/27/98**	**07/13/98**	**01/25/99**	**07/01/99**	**01/01/00**	**06/01/00**	**01/01/01**	**08/01/01**	**01/07/02**	**06/17/02**	**01/20/03**	**07/22/03**	**02/07/04**	**07/08/04**	**10/05/05**	**07/26/06**	**05/21/07**	**05/27/08**
Detected Volatile Organics																															
1,1,1-Trichloroethane	200	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U
1,1-Dichloroethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U
1,1-Dichloroethene	7	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U
1,2,4-Trichlorobenzene	70	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	1.00 U
1,2,4-Trimethylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	1.00 U
1,2-Dichloroethane	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U
1,3,5-Trimethylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	1.00 U
2-Butanone	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0 U	25.0 U
2-Hexanone	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0 U	5.00 U
Acetone	- -	µg/L	ND	21.0 B	ND	ND	ND	23.0 B	4.00 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	25.0 U	25.0 U
Benzene	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U
Bromodichloromethane	81	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U
Carbon Disulfide	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.00 U	1.00 U
Chlorobenzene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U
Chloroethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U
Chloroform	86	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.20	1.00 U	1.00 U
Chloromethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U
cis-1,2-Dichloroethene	70	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.00 J	ND	***97.0***	6.00	ND	1.00 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.10	1.00 U
Ethylbenzene	700	µg/L	ND	ND	ND	ND	ND	1.00 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U
m-,p-Xylene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.00 U
Methylene Chloride	5	µg/L	ND	2.00 JB	ND	ND	ND	3.00 JB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.00 U	5.00 U
Naphthalene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	1.00 U
o-Xylene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.00 U
p-Isopropyltoluene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.00 U
Styrene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U
tert-Butylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	1.00 U
Tetrachloroethene	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U
Toluene	1,000	µg/L	ND	2.00 JB	ND	ND	ND	2.00 J	1.00 J	1.00 J	ND	4.00	ND	8.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U
trans-1,2-Dichloroethene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U
Trichloroethene	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.00	ND	***690 E***	2.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	***6.00***	***7.00***	ND	ND	***16.0***	1.00 U
Vinyl Chloride	2	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U
Xylenes (total)	10,000	µg/L	ND	3.00 J	2.00	ND	ND	5.00	ND	ND	ND	2.00 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.00 U	NA

Notes:
1. Maximum Contaminant Levels (MCLs); if SCDHEC MCL not available, MCL developed by USEPA shown
Bold and Italicized values exceed MCLs
µg/L - micrograms per liter
J - The compound was identified; however, the associated numerical value is an estimated concentration
U - Compound not detected above reported sample quantitation limit.
B - Analyte was also detected in the associated method blank.
D - Compound quantitated using a secondary dilution.
E - Analyte exceeded calibration range.
ND - None detected.
Results in brackets are duplicate sample results.

Table 2-2
Historical Groundwater Sample Analytical Data

Feasibility Study Operable Unit 2
AVX Corporation
Myrtle Beach, South Carolina

Location ID:			MW-8D																
Date Collected:	**EPA/SCDHEC M**	**Units**	**12/01/90**	**11/01/91**	**05/01/92**	**09/01/92**	**02/01/93**	**12/01/93**	**07/01/94**	**12/01/94**	**09/29/96**	**06/01/97**	**01/27/98**	**07/13/98**	**01/25/99**	**07/01/99**	**01/01/00**	**06/01/00**	**01/01/01**
Detected Volatile Organics																			
1,1,1-Trichloroethane	200	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	7	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	70	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	- -	µg/L	ND	2.00 JB	5.00 JB	ND	3.00 JB	10.0	3.00 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	81	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	86	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	70	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.00	ND	ND	ND	ND	ND	2.00	ND
Ethylbenzene	700	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
m-,p-Xylene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	5	µg/L	ND	ND	2.00 JB	***8.00 J***	ND	2.00 JB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND
o-Xylene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
p-Isopropyltoluene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
tert-Butylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	1,000	µg/L	ND	0.700 J	ND	ND	ND	ND	2.00 J	ND	ND	2.00 J	4.00	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	5	µg/L	ND	3.00 JB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.00	ND
Vinyl Chloride	2	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylenes (total)	10,000	µg/L	ND	ND	ND	ND	ND	ND	1.00 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Location ID:			MW-9D																														
Date Collected:	**EPA/SCDHEC M**	**Units**	**12/01/90**	**11/01/91**	**05/01/92**	**09/01/92**	**02/01/93**	**12/01/93**	**07/01/94**	**12/01/94**	**04/01/95**	**09/29/96**	**06/01/97**	**01/27/98**	**07/13/98**	**01/25/99**	**07/12/99**	**01/01/00**	**06/01/00**	**01/01/01**	**08/01/01**	**01/07/02**	**06/17/02**	**01/21/03**	**07/23/03**	**02/07/04**	**07/08/04**	**10/05/05**	**07/27/06**	**05/22/07**	**05/27/08**	**05/26/09**	**04/14/10**
Detected Volatile Organics																																	
1,1,1-Trichloroethane	200	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	20.0 U [10.0 U]	20.0 U	0.0940 U
1,1-Dichloroethane	- -	µg/L	310	35.0	130	33.0 J	49.0 J	2.00 J	470	ND	ND	ND	ND	ND	ND	ND	2.00	15.0	42.0	28.0	78.0	75.0	74.0	60.0 J	56.0 J	54.0	40.0	1.00 J	ND	43.0	20.0 U [16.2]	25.2	23.0
1,1-Dichloroethene	7	µg/L	***180***	***14.0***	***54.0***	ND	ND	ND	***19.0 J***	ND	ND	ND	ND	ND	ND	ND	ND	7.00	***17.0 J***	ND	***24.0***	***28.0***	ND	ND	ND	***10.0 J***	***10.0 J***	ND	ND	3.60	20.0 U [10.0 U]	20.0 U	***10.0***
1,2,4-Trichlorobenzene	70	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	20.0 U [10.0 U]	20.0 U	0.460 U
1,2,4-Trimethylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	20.0 U [10.0 U]	20.0 U	0.340 U
1,2-Dichloroethane	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	20.0 U [10.0 U]	20.0 U	0.160 U
1,3,5-Trimethylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	20.0 U [10.0 U]	20.0 UJ	0.180 U
2-Butanone	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0 U	500 U [250 U]	500 U	1.70 U
2-Hexanone	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0 U	100 U [50.0 U]	100 U	0.610 U
Acetone	- -	µg/L	ND	1.00 JB	25.0	ND	280 B	ND	ND	530 B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	25.0 U	500 U [250 U]	500 U	5.00 U
Benzene	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	20.0 U [10.0 U]	20.0 U	0.420 J
Bromodichloromethane	81	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	20.0 U [10.0 U]	20.0 U	0.220 U
Carbon Disulfide	- -	µg/L	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.00 U	20.0 U [10.0 U]	20.0 U	0.410 U
Chlorobenzene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	20.0 U [10.0 U]	20.0 U	0.110 U
Chloroethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	20.0 U [10.0 U]	20.0 U	0.390 U
Chloroform	86	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.00	1.00 U	20.0 U [10.0 U]	20.0 U	0.300 U
Chloromethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	20.0 U [10.0 U]	20.0 U	0.410 U
cis-1,2-Dichloroethene	70	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	67.0	45.0	51.0	60.0	***200***	***380***	***530***	***340***	***650***	***680***	***650***	***690***	***570***	***430***	***350***	54.0	ND	***240 D***	***264 [303]***	***495***	***490***
Ethylbenzene	700	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	20.0 U [10.0 U]	20.0 U	0.190 U
m-,p-Xylene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	40.0 U [20.0 U]	40.0 U	0.250 U
Methylene Chloride	5	µg/L	ND	ND	***8.00***	***39.0 J***	***28.0 JB***	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.00 U	100 U [50.0 U]	100 U	0.360 U
Naphthalene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	20.0 U [10.0 U]	20.0 U	0.280 U
o-Xylene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	20.0 U [10.0 U]	20.0 U	0.110 U
p-Isopropyltoluene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	20.0 U [10.0 U]	20.0 U	0.260 U
Styrene	100	µg/L	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	20.0 U [10.0 U]	20.0 U	0.100 U
tert-Butylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	20.0 U [10.0 U]	20.0 U	0.240 U
Tetrachloroethene	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	20.0 U [10.0 U]	20.0 U	0.510 U
Toluene	1,000	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	12.0 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	20.0 U [10.0 U]	20.0 U	0.260 U
trans-1,2-Dichloroethene	100	µg/L	***380 T***	5.00 T	59.0 T	***220 T***	***430 T***	20.0 T	ND	***420 T***	***500 T***	***190 T***	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.90	20.0 U [10.0 U]	20.0 U	0.430 U
Trichloroethene	5	µg/L	***3,100***	***29.0 B***	***470***	***2,100***	***3,700***	***170***	***2,300***	***2,400***	***1,800***	***1,000***	***2,000***	***34.0***	***12.0***	***26.0***	***88.0***	***29.0***	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00	ND	***450 D***	20.0 U [10.0 U]	20.0 U	0.230 U
Vinyl Chloride	2	µg/L	***15.0***	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	***62.0***	***100***	***160***	***400***	***400***	***360***	***470***	***370***	***280***	***200***	***13.0***	ND	***360 D***	***81.2 [104]***	***299***	***300***
Xylenes (total)	10,000	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.00 U	NA	NA	NA

Notes:
1. Maximum Contaminant Levels (MCLs); if SCDHEC MCL not available, MCL developed by USEPA shown
Bold and Italicized values exceed MCLs
µg/L - micrograms per liter
J - The compound was identified; however, the associated numerical value is an estimated concentration
U - Compound not detected above reported sample quantitation limit.
B - Analyte was also detected in the associated method blank.
D - Compound quantitated using a secondary dilution.
E - Analyte exceeded calibration range.
ND - None detected.
Results in brackets are duplicate sample results.

Table 2-2
Historical Groundwater Sample Analytical Data

Feasibility Study Operable Unit 2
AVX Corporation
Myrtle Beach, South Carolina

Location ID:			MW-10D																	MW-11D										
Date Collected:	**EPA/SCDHEC M**	**Units**	**12/01/90**	**11/01/91**	**05/01/92**	**09/01/92**	**02/01/93**	**12/01/93**	**07/01/94**	**12/01/94**	**09/29/96**	**06/01/97**	**01/27/98**	**07/13/98**	**01/25/99**	**07/01/99**	**01/01/00**	**06/01/00**	**01/01/01**	**07/01/94**	**12/01/94**	**09/29/96**	**06/01/97**	**01/27/98**	**07/13/98**	**01/25/99**	**07/12/99**	**01/01/00**	**06/01/00**	**01/01/01**
Detected Volatile Organics																														
1,1,1-Trichloroethane	200	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	7	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	70	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	- -	µg/L	ND	1.00 JB	ND	ND	ND	15.0 B	4.00 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	81	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	86	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	70	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.00	2.00 J	3.00	2.00	1.00	4.00	1.00 J	1.00 J	NA	NA	NA	31.0	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	700	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
m-,p-Xylene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	5	µg/L	ND	ND	ND	ND	1.00 JB	3.00 JB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.00 J	ND	ND	ND	ND	ND	ND	ND
Naphthalene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA	6.00	ND	ND	ND	ND	ND	ND	ND
o-Xylene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
p-Isopropyltoluene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
tert-Butylbenzene	- -	µg/L	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	1,000	µg/L	ND	1.00 J	ND	ND	ND	ND	3.00 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.00 J	ND	ND	4.00	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	100	µg/L	10.0 T	2.00 JT	3.00 JT	6.00 JT	3.00 JT	8.00 T	32.0 T	34.0 T	5.70 T	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	5	µg/L	ND	***8.00 B***	3.00 J	ND	***7.00***	ND	***7.00***	ND	ND	ND	2.00 J	ND	2.00	ND	***11.0***	ND	ND	ND	ND	ND	***7.00***	ND	ND	ND	ND	1.00 J	ND	ND
Vinyl Chloride	2	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	***59.0***	ND	ND	ND	ND	ND	ND	ND
Xylenes (total)	10,000	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 J	ND	ND	1.00 J	ND	ND	ND	ND	ND	ND	ND

Location ID:			MW-13			MW-14S																								
Date Collected:	**EPA/SCDHEC M**	**Units**	**12/01/90**	**11/01/91**	**05/01/92**	**12/01/90**	**11/01/91**	**05/01/92**	**09/01/92**	**02/01/93**	**12/01/93**	**07/01/94**	**12/01/94**	**09/29/96**	**06/01/97**	**01/27/98**	**07/13/98**	**01/25/99**	**07/12/99**	**01/01/00**	**06/01/00**	**01/01/01**	**01/07/02**	**01/20/03**	**02/07/04**	**10/05/05**	**05/21/07**	**05/27/08**	**05/26/09**	**04/13/10**
Detected Volatile Organics																														
1,1,1-Trichloroethane	200	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U	1.00 U	1.00 U
1,1-Dichloroethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	2.00 JT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U	1.00 U	1.00 U
1,1-Dichloroethene	7	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U	1.00 U	1.00 U
1,2,4-Trichlorobenzene	70	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	1.00 U	1.00 U	1.00 U
1,2,4-Trimethylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	1.00 U	1.00 U	1.00 U
1,2-Dichloroethane	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U	1.00 U	1.00 U
1,3,5-Trimethylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	1.00 U	1.00 UJ	1.00 U
2-Butanone	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0 U	25.0 U	25.0 U	25.0 U
2-Hexanone	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0 U	5.00 U	5.00 U	5.00 U
Acetone	- -	µg/L	27.0 B	2.00 JB	2.00 JB	56.0 B	1.00 JB	ND	ND	ND	ND	3.00 J	29.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	25.0 U	25.0 U	25.0 U	25.0 U
Benzene	5	µg/L	ND	ND	ND	ND	0.600 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U	1.00 U	1.00 U
Bromodichloromethane	81	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U	1.00 U	1.00 U
Carbon Disulfide	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.00 U	1.00 U	1.00 U	1.00 U
Chlorobenzene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U	1.00 U	1.00 U
Chloroethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U	1.00 U	1.00 U
Chloroform	86	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U	1.00 U	1.00 U
Chloromethane	- -	µg/L	ND	ND	ND	43.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U	1.00 U	1.00 U
cis-1,2-Dichloroethene	70	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 J	3.00 B	6.00	1.00 U	0.380 J	0.470 J
Ethylbenzene	700	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U	1.00 U	1.00 U
m-,p-Xylene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.00 U	2.00 U	2.00 U
Methylene Chloride	5	µg/L	ND	ND	ND	***7.00***	ND	ND	***15.0***	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.00 U	5.00 U	5.00 U	5.00 U
Naphthalene	- -	µg/L	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	8.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	1.00 U	1.00 U	1.00 U
o-Xylene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.00 U	1.00 U	1.00 U
p-Isopropyltoluene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.00 U	1.00 U	1.00 U
Styrene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U	1.00 U	1.00 U
tert-Butylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 J	3.00	3.00	ND	2.00	ND	1.00 J	ND	1.00 J	1.00 J	1.00 J	ND	NA	1.00 U	0.430 J	0.680 J
Tetrachloroethene	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U	1.00 U	1.00 U
Toluene	1,000	µg/L	ND	0.800 J	ND	ND	1.00 J	ND	ND	ND	ND	2.00 J	0.600 J	ND	ND	ND	2.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U	1.00 U	1.00 U
trans-1,2-Dichloroethene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	2.00 J	8.00	7.00	6.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U	1.00 U	1.00 U
Trichloroethene	5	µg/L	ND	4.00 JB	ND	***37.0***	4.00 JB	ND	ND	4.00 J	***6.00***	***7.00***	3.00 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.00	ND	***15.0***	1.00 U	1.00 U	1.00 U
Vinyl Chloride	2	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U	1.00 U	1.00 U
Xylenes (total)	10,000	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.800 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.00 U	NA	NA	NA

Notes:
1. Maximum Contaminant Levels (MCLs); if SCDHEC MCL not available, MCL developed by USEPA shown

Bold and Italicized values exceed MCLs
µg/L - micrograms per liter
J - The compound was identified; however, the associated numerical value is an estimated concentration
U - Compound not detected above reported sample quantitation limit.
B - Analyte was also detected in the associated method blank.
D - Compound quantitated using a secondary dilution.
E - Analyte exceeded calibration range.
ND - None detected.
Results in brackets are duplicate sample results.

Table 2-2
Historical Groundwater Sample Analytical Data

Feasibility Study Operable Unit 2
AVX Corporation
Myrtle Beach, South Carolina

Location ID:			MW-15S																										
Date Collected:	**EPA/SCDHEC M**	**Units**	**12/01/90**	**11/01/91**	**05/01/92**	**09/01/92**	**02/01/93**	**12/01/93**	**07/01/94**	**12/01/94**	**09/29/96**	**06/01/97**	**01/27/98**	**07/13/98**	**01/26/99**	**07/12/99**	**01/01/00**	**06/01/00**	**01/01/01**	**08/01/01**	**01/07/02**	**06/17/02**	**01/20/03**	**07/22/03**	**02/07/04**	**07/08/04**	**10/05/05**	**07/26/06**	**05/21/07**
Detected Volatile Organics																													
1,1,1-Trichloroethane	200	µg/L	ND	ND	***440 J***	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U
1,1-Dichloroethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	11.0
1,1-Dichloroethene	7	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U
1,2,4-Trichlorobenzene	70	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
1,2,4-Trimethylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
1,2-Dichloroethane	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U
1,3,5-Trimethylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
2-Butanone	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0 U
2-Hexanone	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0 U
Acetone	- -	µg/L	ND	4,900 JB	5,500 B	6,900 B	4,000 JB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	25.0 U
Benzene	5	µg/L	ND	ND	ND	***2,200 J***	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U
Bromodichloromethane	81	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U
Carbon Disulfide	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.00 U
Chlorobenzene	100	µg/L	ND	ND	ND	ND	ND	***570 J***	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U
Chloroethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U
Chloroform	86	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U
Chloromethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U
cis-1,2-Dichloroethene	70	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	***26,000***	***3,300***	***1,400***	16.0	28.0	***190***	69.0	***340***	***190***	***1,400***	***7,400***	***7,300***	***1,300***	***1,000***	***1,200***	16.0	26.0	6.70
Ethylbenzene	700	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.00	2.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00	ND	1.00 U
m-,p-Xylene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	5	µg/L	ND	***1,300 JB***	***730 JB***	***5,200***	***910 JB***	***910 J***	***18,000***	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.00 U
Naphthalene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	2,000	ND	ND	ND	ND	ND	ND	ND	ND	NA
o-Xylene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
p-Isopropyltoluene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U
tert-Butylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
Tetrachloroethene	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U
Toluene	1,000	µg/L	ND	430 JB	ND	ND	360 J	310 JB	ND	ND	ND	ND	ND	ND	2.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00	2.10	1.00 U
trans-1,2-Dichloroethene	100	µg/L	***51,000 T***	***79,000 T***	***98,000 T***	***91,000 T***	***96,000 T***	***81,000 T***	***130,000 T***	***62,000 T***	***28,000 T***	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U
Trichloroethene	5	µg/L	ND	ND	ND	ND	ND	***4,100***	ND	ND	ND	***740 J***	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	***15.0***
Vinyl Chloride	2	µg/L	***37,000***	***33,000***	***11,000***	***32,000***	***21,000***	***34,000***	***13,000***	***20,000***	***9,500***	***19,000***	***4,400***	***3,400***	***53.0***	***91.0***	***300***	***78.0***	***760***	***590***	***2,000***	***1,500***	***6,600***	***1,100***	***690***	***560***	***37.0***	***160***	***10.0***
Xylenes (total)	10,000	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.00 U

Location ID:			MW-16S																						
Date Collected:	**EPA/SCDHEC M**	**Units**	**12/01/90**	**11/01/91**	**05/01/92**	**09/01/92**	**02/01/93**	**12/01/93**	**07/01/94**	**12/01/94**	**09/29/96**	**06/01/97**	**07/12/99**	**01/01/00**	**06/01/00**	**01/01/01**	**08/01/01**	**01/07/02**	**06/17/02**	**01/20/03**	**07/22/03**	**02/07/04**	**07/08/04**	**10/05/05**	**07/26/06**	**05/21/07**
Detected Volatile Organics																										
1,1,1-Trichloroethane	200	µg/L	ND	ND	7.00	ND	12.0 J	ND	ND	ND	ND	15.0	19.0	ND	ND	ND	ND	5.00	ND	ND	73.0	1.00 J	ND	5.00	ND	8.80 [1.00 U]
1,1-Dichloroethane	- -	µg/L	120	73.0	79.0	65.0	130	31.0	45.0	16.0	17.0	26.0	6.00	ND	2.00 J	8.00	4.00	8.00	14.0	9.00	99.0	11.0	12.0	5.00	1.80	14.0 [1.00 U]
1,1-Dichloroethene	7	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4.00	NA	ND	ND	ND	1.00 U [1.00 U]
1,2,4-Trichlorobenzene	70	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
1,2,4-Trimethylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
1,2-Dichloroethane	5	µg/L	ND	0.800 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U [1.00 U]
1,3,5-Trimethylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
2-Butanone	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0 U [10.0 U]
2-Hexanone	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0 U [10.0 U]
Acetone	- -	µg/L	ND	5.00 JB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	25.0 U [25.0 U]
Benzene	5	µg/L	ND	2.00 J	2.00 J	ND	ND	2.00 J	ND	ND	ND	***350***	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U [1.00 U]
Bromodichloromethane	81	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U [1.00 U]
Carbon Disulfide	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.00 U [2.00 U]
Chlorobenzene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U [1.00 U]
Chloroethane	- -	µg/L	ND	ND	ND	45.0	ND	7.00 J	ND	ND	ND	ND	10.0	2.00	9.00	9.00	17.0	ND	9.00	3.00	7.00	ND	ND	ND	ND	1.00 U [1.00 U]
Chloroform	86	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U [1.00 U]
Chloromethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U [1.00 U]
cis-1,2-Dichloroethene	70	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	***240***	7.00	5.00	19.0	35.0	4.00	6.00	47.0	56.0	40.0	17.0	13.0	13.0 B	28.0	39.0 [5.20]
Ethylbenzene	700	µg/L	14.0	5.00	3.00 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U [1.00 U]
m-,p-Xylene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	5	µg/L	ND	2.00 JB	ND	4.00 J	***7.00 JB***	ND	***7.00 J***	ND	ND	***14.0***	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.00 U [5.00 U]
Naphthalene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
o-Xylene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
p-Isopropyltoluene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U [1.00 U]
tert-Butylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
Tetrachloroethene	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U [1.00 U]
Toluene	1,000	µg/L	ND	1.00 JB	2.00 J	ND	4.00 J	1.00 J	ND	ND	ND	ND	ND	2.00	4.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U [1.00 U]
trans-1,2-Dichloroethene	100	µg/L	***350 T***	***150 T***	***200 T***	***160 T***	***900 T***	***160 T***	***420 T***	***220 T***	***220 T***	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U [1.00 U]
Trichloroethene	5	µg/L	ND	2.00 J	4.00 J	ND	ND	1.00 J	ND	5.00 J	ND	ND	ND	ND	ND	2.00	ND	1.00 J	1.00 J	3.00	***6.00***	2.00 J	ND	1.00 J	2.30	***1.90 [5.40]***
Vinyl Chloride	2	µg/L	***180***	***63.0***	***88.0***	***100***	***290***	***71.0***	***110***	***50.0***	***58.0***	***70.0***	***3.00***	***8.00***	***6.00***	***10.0***	***4.00***	ND	***12.0***	***7.00***	***4.00***	1.00 J	***4.00***	ND	***3.10***	***5.00 [1.00 U]***
Xylenes (total)	10,000	µg/L	16.0	8.00	5.00 B	ND	ND	3.00 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.00 U [2.00 U]

Notes:
1. Maximum Contaminant Levels (MCLs); if SCDHEC MCL not available, MCL developed by USEPA shown
Bold and Italicized values exceed MCLs
µg/L - micrograms per liter
J - The compound was identified; however, the associated numerical value is an estimated concentration
U - Compound not detected above reported sample quantitation limit.
B - Analyte was also detected in the associated method blank.
D - Compound quantitated using a secondary dilution.
E - Analyte exceeded calibration range.
ND - None detected.
Results in brackets are duplicate sample results.

Table 2-2
Historical Groundwater Sample Analytical Data

Feasibility Study Operable Unit 2
AVX Corporation
Myrtle Beach, South Carolina

Location ID:			MW-17D																														MW-18		
Date Collected:	**EPA/SCDHEC M**	**Units**	**12/01/90**	**11/01/91**	**05/01/92**	**09/01/92**	**02/01/93**	**12/01/93**	**07/01/94**	**12/01/94**	**09/29/96**	**06/01/97**	**01/27/98**	**07/13/98**	**01/25/99**	**07/12/99**	**01/01/00**	**06/01/00**	**01/01/01**	**08/01/01**	**01/07/02**	**06/17/02**	**01/20/03**	**07/22/03**	**02/06/04**	**07/08/04**	**10/05/05**	**07/26/06**	**05/21/07**	**05/27/08**	**05/26/09**	**04/14/10**	**12/01/90**	**11/01/91**	**05/01/92**
Detected Volatile Organics																																			
1,1,1-Trichloroethane	200	µg/L	ND	4.00 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U	1.00 U	0.0940 U	ND	ND	ND
1,1-Dichloroethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U	1.00 U	0.290 U	ND	ND	ND
1,1-Dichloroethene	7	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U	1.00 U	0.300 U	ND	ND	ND
1,2,4-Trichlorobenzene	70	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	1.00 U	1.00 U	0.460 U	ND	ND	ND
1,2,4-Trimethylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	1.00 U	1.00 U	0.340 U	ND	ND	ND
1,2-Dichloroethane	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U	1.00 U	0.160 U	ND	ND	ND
1,3,5-Trimethylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	1.00 U	1.00 UJ	0.180 U	ND	ND	ND
2-Butanone	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0 U	25.0 U	25.0 U	1.70 U	ND	ND	ND
2-Hexanone	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0 U	5.00 U	5.00 U	0.610 U	ND	ND	ND
Acetone	- -	µg/L	15.0 B	5.00 JB	13.0 JB	ND	9.00 JB	28.0 B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	25.0 U	25.0 U	25.0 U	5.00 U	15.0 B	2.00 JB	3.00
Benzene	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U	1.00 U	0.210 U	ND	ND	ND
Bromodichloromethane	81	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U	1.00 U	0.220 U	ND	ND	ND
Carbon Disulfide	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.00 U	1.00 U	1.00 U	0.410 U	ND	ND	ND
Chlorobenzene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U	1.00 U	0.110 U	ND	ND	ND
Chloroethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U	1.00 U	0.390 U	ND	ND	ND
Chloroform	86	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U	1.00 U	0.300 U	ND	ND	ND
Chloromethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U	1.00 U	0.410 U	ND	ND	ND
cis-1,2-Dichloroethene	70	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.00	2.00 J	ND	ND	2.00	7.00	1.00 J	1.00 J	2.00 J	2.00 J	2.00 J	ND	1.00 J	5.00	3.00	3.00	3.10	5.20	6.43	1.81	2.50 J	NA	NA	NA
Ethylbenzene	700	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U	1.00 U	0.190 U	ND	ND	ND
m-,p-Xylene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.00 U	2.00 U	0.250 U	NA	NA	NA
Methylene Chloride	5	µg/L	ND	1.00 JB	3.00 JB	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.00 U	5.00 U	5.00 U	0.360 U	ND	ND	ND
Naphthalene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	1.00 U	1.00 U	0.280 U	ND	ND	ND
o-Xylene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.00 U	1.00 U	0.110 U	NA	NA	NA
p-Isopropyltoluene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.00 U	1.00 U	0.260 U	NA	NA	NA
Styrene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U	1.00 U	0.100 U	ND	ND	ND
tert-Butylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	1.00 U	1.00 U	0.240 U	ND	ND	ND
Tetrachloroethene	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U	1.00 U	0.510 U	ND	ND	ND
Toluene	1,000	µg/L	ND	ND	3.00 J	ND	ND	ND	0.800 J	0.800 J	ND	1.00 J	4.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U	1.00 U	0.260 U	ND	ND	ND
trans-1,2-Dichloroethene	100	µg/L	ND	17.0 BT	***190 T***	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U	1.00 U	0.430 U	ND	3.00 JBT	1.00
Trichloroethene	5	µg/L	***14.0***	***46.0***	***270***	ND	3.00 J	2.00 J	ND	ND	ND	2.00 J	ND	ND	1.00	2.00	***7.00***	ND	ND	ND	ND	1.00 J	ND	ND	4.00	3.00	***6.00***	5.00	5.00	2.90	0.950 J	2.30 J	***6.00***	3.00 J	ND
Vinyl Chloride	2	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.00 U	1.00 U	1.00 U	0.380 U	ND	ND	ND
Xylenes (total)	10,000	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.00 U	NA	NA	NA	ND	ND	1.00

Location ID:			MW-19S																												
Date Collected:	**EPA/SCDHEC M**	**Units**	**12/01/90**	**11/01/91**	**05/01/92**	**09/01/92**	**02/01/93**	**12/01/93**	**07/01/94**	**12/01/94**	**09/29/96**	**06/01/97**	**01/27/98**	**07/13/98**	**01/25/99**	**07/12/99**	**01/01/00**	**06/01/00**	**01/01/01**	**08/01/01**	**01/07/02**	**06/17/02**	**01/20/03**	**07/22/03**	**02/07/04**	**07/08/04**	**10/05/05**	**07/26/06**	**05/21/07**	**05/21/07**	**05/27/08**	**05/26/09**	**04/14/10**
Detected Volatile Organics																																	
1,1,1-Trichloroethane	200	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	25.0 U	80.0 U	10.0 U	0.0940 U
1,1-Dichloroethane	- -	µg/L	8.00	5.00	3.00 J	4.00 J	4.00 J	7.00	11.0	ND	ND	ND	3.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	25.0 U	80.0 U	10.0 U	0.290 U
1,1-Dichloroethene	7	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	25.0 U	80.0 U	10.0 U	0.300 U
1,2,4-Trichlorobenzene	70	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	80.0 U	10.0 U	0.460 U
1,2,4-Trimethylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	10.0	ND	7.00	3.00	ND	3.00	ND	ND	ND	10.0 J	ND	ND	ND	ND	ND	ND	ND	NA	NA	80.0 U	10.0 U	0.340 U
1,2-Dichloroethane	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	25.0 U	80.0 U	10.0 U	0.160 U
1,3,5-Trimethylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	80.0 U	10.0 U	0.180 U
2-Butanone	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	250 U	2,000 U	250 U	1.70 U
2-Hexanone	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	250 U	400 U	50.0 U	0.610 U
Acetone	- -	µg/L	ND	10.0 B	2.00 JB	ND	ND	ND	8.00 J	13.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	630 U	2,000 U	250 U	5.00 U
Benzene	5	µg/L	***15.0***	***20.0***	ND	***15.0***	***10.0***	***9.00***	***14.0***	2.00 J	***8.40***	5.00	ND	***10.0***	4.00	ND	5.00	***23.0 J***	ND	ND	***11.0 J***	ND	ND	ND	1.00 J	ND	2.00	2.40	NA	***17.0 J***	80.0 U	10.0 U	4.20 J
Bromodichloromethane	81	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	25.0 U	80.0 U	10.0 U	0.220 U
Carbon Disulfide	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	50.0 U	80.0 U	10.0 U	0.410 U
Chlorobenzene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	40.0 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	25.0 U	80.0 U	10.0 U	0.110 U
Chloroethane	- -	µg/L	43.0	ND	ND	20.0	ND	ND	ND	ND	ND	ND	9.00	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	25.0 U	80.0 U	10.0 U	0.390 U
Chloroform	86	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	25.0 U	80.0 U	10.0 U	0.300 U
Chloromethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	25.0 U	NA	80.0 U	10.0 U	0.410 U
cis-1,2-Dichloroethene	70	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	26.0	6.00	12.0	6.00	***130***	10.0	ND	ND	ND	ND	ND	ND	4.00	4.00	5.00	2.00	1.60	NA	25.0 U	80.0 U	10.0 U	2.20 J
Ethylbenzene	700	µg/L	19.0	19.0	16.0	26.0	15.0	14.0	25.0	4.00 J	22.0	11.0	ND	13.0	2.00	ND	4.00	ND	ND	ND	12.0 J	ND	ND	4.00	4.00	4.00	2.00	4.90	NA	25.0 U	80.0 U	2.20 J	1.30 J
m-,p-Xylene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	160 U	20.0 U	0.750 J
Methylene Chloride	5	µg/L	ND	1.00 JB	ND	ND	ND	2.00 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	130 U	400 U	50.0 U	0.360 U
Naphthalene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 E	ND	3,800 E	430	1,500	590 E	3,600	1,500	2,000	1,300	1,100	1,000	ND	ND	ND	ND	ND	NA	NA	1,940	208	330
o-Xylene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	80.0 U	10.0 U	4.00 J
p-Isopropyltoluene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	80.0 U	10.0 U	0.260 U
Styrene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.500	ND	NA	25.0 U	80.0 U	10.0 U	0.100 U
tert-Butylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA	80.0 U	10.0 U	0.240 U
Tetrachloroethene	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	25.0 U	80.0 U	10.0 U	0.510 U
Toluene	1,000	µg/L	12.0	16.0 B	ND	14.0	9.00	7.00 B	17.0	ND	12.0	6.00	ND	9.00	ND	ND	3.00	53.0	ND	22.0 J	12.0 J	ND	ND	ND	1.00 J	2.00	2.00	2.30	NA	25.0 U	80.0 U	3.30 J	2.40 J
trans-1,2-Dichloroethene	100	µg/L	48.0 T	35.0 T	38.0 T	28.0 T	23.0 T	16.0 T	13.0 T	7.00 T	7.80 T	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	25.0 U	80.0 U	10.0 U	0.430 U
Trichloroethene	5	µg/L	***9.00***	3.00 J	***7.00***	ND	2.00 J	***7.00***	ND	4.00 J	ND	***31.0***	1.00 J	2.00	ND	ND	2.00	ND	ND	***21.0 J***	ND	ND	ND	1.00 J	1.00 J	2.00	ND	ND	NA	25.0 U	80.0 U	10.0 U	0.230 U
Vinyl Chloride	2	µg/L	***5.00***	***3.00 J***	ND	2.00 J	ND	ND	ND	ND	ND	***21.0***	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA	25.0 U	80.0 U	10.0 U	0.380 U
Xylenes (total)	10,000	µg/L	20.0	21.0	17.0 B	15.0	16.0	16.0	24.0	5.00	20.0	13.0	ND	18.0	3.00	ND	7.00	23.0 J	ND	ND	12.0 J	ND	ND	1.00 J	2.00 J	4.00	4.00	6.00	NA	50.0 U	NA	NA	NA

Notes:
1. Maximum Contaminant Levels (MCLs); if SCDHEC MCL not available, MCL developed by USEPA shown
Bold and Italicized values exceed MCLs
µg/L - micrograms per liter
J - The compound was identified; however, the associated numerical value is an estimated concentration
U - Compound not detected above reported sample quantitation limit.
B - Analyte was also detected in the associated method blank.
D - Compound quantitated using a secondary dilution.
E - Analyte exceeded calibration range.
ND - None detected.
Results in brackets are duplicate sample results.

Table 2-2
Historical Groundwater Sample Analytical Data

Feasibility Study Operable Unit 2
AVX Corporation
Myrtle Beach, South Carolina

Location ID: Date Collected:	EPA/SCDHEC M	Units	MW-20S 12/01/90	11/01/91	05/01/92	09/01/92	02/01/93	12/01/93	07/01/94	12/01/94	09/29/96	06/01/97	01/27/98	07/13/98	01/25/99	07/12/99
Detected Volatile Organics																
1,1,1-Trichloroethane	200	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	- -	µg/L	700	190 J	150 J	ND	47.0 J	13.0 J	45.0 J	ND	ND	6.70	ND	ND	1.00	330
1,1-Dichloroethene	7	µg/L	***390***	ND	***88.0 J***	ND	ND	ND	ND	ND	ND	5.80	ND	ND	ND	***250***
1,2,4-Trichlorobenzene	70	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	- -	µg/L	ND	310 JB	380 JB	ND	160 JB	120	210 J	14.0	ND	ND	ND	ND	ND	ND
Benzene	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	81	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	86	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	70	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	***1,200***	***320***	***7,900***	***160***	***20,000***
Ethylbenzene	700	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
m-,p-Xylene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	5	µg/L	***330***	***120 JB***	***93.0 JB***	***400 JB***	ND	***48.0 JB***	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND	ND	ND
o-Xylene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
p-Isopropyltoluene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
tert-Butylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	1,000	µg/L	ND	70.0 JB	53.0 J	ND	17.0 J	ND	22.0 J	ND	ND	ND	ND	ND	ND	280
trans-1,2-Dichloroethene	100	µg/L	***23,000 T***	***8,600 T***	***8,800 T***	***26,000 T***	***2,700 T***	***1,200 T***	***4,600 T***	79.0 T	***3,200 T***	7.00	ND	ND	2.00 J	***240***
Trichloroethene	5	µg/L	***5,400***	***1,100***	***320***	ND	***50.0 J***	ND	ND	1.00 J	ND	***36.0***	***27.0***	***1,200***	***75.0***	***2,500***
Vinyl Chloride	2	µg/L	***890***	ND	ND	ND	ND	ND	***16.0 J***	ND	ND	***110***	***10.0***	***530***	2.00	***1,700***
Xylenes (total)	10,000	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Location ID: Date Collected:	EPA/SCDHEC M	Units	MW-21D 01/25/99	07/13/99	01/01/00	06/01/00	01/01/01	08/01/01	01/07/02	06/17/02	01/21/03	07/23/03	02/07/04	07/08/04	10/05/05	07/27/06
Detected Volatile Organics																
1,1,1-Trichloroethane	200	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	- -	µg/L	ND	7.00	ND	ND	ND	ND	ND	ND	ND	ND	3.00 J	4.00	2.00	ND
1,1-Dichloroethene	7	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	6.00 J	ND	ND	ND	1.00	ND
1,2,4-Trichlorobenzene	70	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.00 J	2.00 J	ND	ND
1,2,4-Trimethylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.00 J	ND	ND	ND
1,3,5-Trimethylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	81	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	7.00 J	ND	ND	ND	ND	ND
Chloroethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	86	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.90
Chloromethane	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	70	µg/L	***280***	***130***	***170***	***130***	***140***	***170***	***170***	***150***	***150***	***100***	***170***	***180***	***140***	ND
Ethylbenzene	700	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
m-,p-Xylene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene Chloride	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
o-Xylene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
p-Isopropyltoluene	- -	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
tert-Butylbenzene	- -	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	1,000	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.00	ND
Trichloroethene	5	µg/L	***470***	***530***	***290***	***200***	***160***	***200***	***200***	***190***	***180***	***120***	***110***	***96.0***	***78.0***	ND
Vinyl Chloride	2	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylenes (total)	10,000	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes:
1. Maximum Contaminant Levels (MCLs); if SCDHEC MCL not available, MCL developed by USEPA shown
Bold and Italicized values exceed MCLs
µg/L - micrograms per liter
J - The compound was identified; however, the associated numerical value is an estimated concentration
U - Compound not detected above reported sample quantitation limit.
B - Analyte was also detected in the associated method blank.
D - Compound quantitated using a secondary dilution.
E - Analyte exceeded calibration range.
ND - None detected.
Results in brackets are duplicate sample results.

Table 2-3
Surface-Water Sample Analytical Data

Feasibility Study Operable Unit 2
AVX Corporation
Myrtle Beach, South Carolina

Location ID:		SW-3	SW-3-2	SW-4	SW-5	SW-5-2	SW-6	SW-6-2	SW-7	SW-8	SW-9	SW-10	SW-11	SW-12	SW-13-1	SW-14-1	SW-15-1	SW-16-1	SW-17-1	SW-18-1	SW-19-1	SW-20-1	SW-21-1	SW-22-2
Sample Depth():																								
Date Collected:	Units	11/15/07	12/17/07	11/15/07	11/15/07	12/17/07	11/15/07	12/17/07	11/15/07	11/15/07	11/15/07	11/15/07	11/15/07	11/15/07	12/17/07	12/17/07	12/17/07	12/17/07	12/17/07	12/17/07	12/17/07	12/17/07	12/17/07	12/17/07
Volatile Organics																								
1,1,1,2-Tetrachloroethane	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
1,1,1-Trichloroethane	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	**0.400 J**	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
1,1,2,2-Tetrachloroethane	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
1,1,2-Trichloroethane	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
1,1-Dichloroethane	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
1,1-Dichloroethene	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
1,1-Dichloropropene	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
1,2,3-Trichlorobenzene	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
1,2,3-Trichloropropane	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
1,2,4-Trichlorobenzene	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
1,2,4-Trimethylbenzene	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
1,2-Dibromo-3-chloropropane	µg/L	25.0 U	20.0 U	50.0 U	50.0 U	20.0 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	20.0 U	5.00 U
1,2-Dibromoethane	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
1,2-Dichlorobenzene	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
1,2-Dichloroethane	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
1,2-Dichloropropane	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
1,3,5-Trimethylbenzene	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
1,3-Dichlorobenzene	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
1,3-Dichloropropane	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
1,4-Dichlorobenzene	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
2,2-Dichloropropane	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
2-Butanone	µg/L	125 U	100 U	250 U	250 U	100 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	**2.79 J**	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	100 U	25.0 U
2-Chlorotoluene	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
2-Hexanone	µg/L	25.0 U	20.0 U	50.0 U	50.0 U	20.0 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	20.0 U	5.00 U
4-Chlorotoluene	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
4-Methyl-2-pentanone	µg/L	25.0 U	20.0 U	50.0 U	50.0 U	20.0 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	20.0 U	5.00 U
Acetone	µg/L	125 U	100 U	250 U	250 U	100 U	**4.82 J**	25.0 U	**3.50 J**	**7.82 J**	**17.9 J**	**13.9 J**	**25.5**	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	100 U	25.0 U
Benzene	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
Bromobenzene	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
Bromochloromethane	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
Bromodichloromethane	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	**0.220 J**	**0.230 J**	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
Bromoform	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
Bromomethane	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
Carbon Disulfide	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	**0.330 J**	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
Carbon Tetrachloride	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
Chlorobenzene	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
Chloroethane	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
Chloroform	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	**0.140 J**	**0.150 J**	**0.140 J**	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
Chloromethane	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
cis-1,2-Dichloroethene	µg/L	**75.3**	**66.2**	**86.2**	**200**	**136**	**34.3**	**6.71**	**25.4**	**0.110 J**	**0.340 J**	**0.390 J**	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	**6.34**	**7.74**	**9.13**	**11.6**	**105**	1.00 U
cis-1,3-Dichloropropene	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
Dibromochloromethane	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	**0.170 J**	**0.220 J**	**0.260 J**	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
Dibromomethane	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
Dichlorodifluoromethane	µg/L	25.0 U	20.0 U	50.0 U	50.0 U	20.0 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	20.0 U	5.00 U
Diisopropyl ether (DIPE)	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
Ethylbenzene	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
Hexachlorobutadiene	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
Iodomethane	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
Isopropylbenzene	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
m-,p-Xylene	µg/L	10.0 U	8.00 U	20.0 U	20.0 U	8.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	8.00 U	2.00 U
Methyl tert-butyl ether	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	**1.59**	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
Methylene Chloride	µg/L	**1.10 J**	20.0 U	50.0 U	50.0 U	20.0 U	**0.350 J**	5.00 U	**0.380 J**	5.00 U	**0.380 J**	**0.230 J**	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	20.0 U	5.00 U
Naphthalene	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
n-Butylbenzene	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
n-Propylbenzene	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
o-Xylene	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
p-Isopropyltoluene	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
sec-Butylbenzene	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
Styrene	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
tert-Butylbenzene	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
Tetrachloroethene	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
Toluene	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
trans-1,2-Dichloroethene	µg/L	**0.800 J**	4.00 U	10.0 U	**2.10 J**	4.00 U	**0.160 J**	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
trans-1,3-Dichloropropene	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
trans-1,4-Dichloro-2-butene	µg/L	25.0 U	20.0 U	50.0 U	50.0 U	20.0 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	20.0 U	5.00 U
Trichloroethene	µg/L	**7.65**	**6.92**	**9.00 J**	**19.2**	**13.2**	**1.24**	1.00 U	**0.920 J**	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	**1.22**	**10.8**	1.00 U
Trichlorofluoromethane	µg/L	5.00 U	4.00 U	10.0 U	10.0 U	4.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U
Vinyl Chloride	µg/L	**2.70 J**	4.00 U	**3.20 J**	**8.20 J**	**4.92**	**5.76**	**1.46**	**3.79**	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	4.00 U	1.00 U

Table 2-3
Surface-Water Sample Analytical Data

Feasibility Study Operable Unit 2
AVX Corporation
Myrtle Beach, South Carolina

Notes:
Bold indicates that the compound was detected.
J = Indicates an estimated value.
U = The compound was analyzed for but not detected. The associated value is the compound quantitation limit.
µg/L = micrograms per liter

Table 3-1
Chemical-Specific ARARs, Criteria, Advisories, and Guidance

Feasibility Study Operable Unit 2
AVX Corporation
Myrtle Beach, South Carolina

Media/Authority	Requirements	Status	Requirement Synopsis	Anticipated Actions to Attain ARARs
Groundwater				
State Regulatory Requirements	South Carolina (SC) Water Quality Standards (SC Code Ann. Regs. 61-68), pursuant to the SC Pollution Control Act (SC Code of Laws Title 48, Chapter 1 et seq.)	Applicable	Establishes the state's official classified water uses for all waters of the state, establishes general rules and specific numeric and narrative criteria for protecting classified and existing water uses, and establishes procedures for classifying waters of the state. The water quality standards include uses of the waters, numeric and narrative criteria, and antidegradation rules.	Groundwater beneath the site (which is currently not used as drinking water source) is currently classified as GB (potential underground source of drinking water). Groundwater beneath waste disposal areas could be reclassified as GC (groundwaters not considered potential sources of drinking water) and of limited beneficial use. In addition, the area could be deed restricted to prohibiting the use of groundwater for drinking.
	South Carolina Safe Drinking Water Regulations (SC Code Ann. Regs. 61-58), pursuant to the SC Safe Drinking Water Act (SC Code of Laws Title 44, Chapter 58)	Relevant and Appropriate	State water quality standards with respect to drinking water. Provides maximum contaminant levels for constituents in public drinking water supplies. The SC Safe Drinking Water Act applies to all public water systems in the state.	Groundwater beneath the site (which is currently not used as drinking water) is currently classified as a potential underground source of drinking water even though public water is available and used as the local potable water source.
Federal Regulatory Requirements	USEPA - RCRA Groundwater Protection Standards/ Maximum Concentration Limits [40 CFR Part 264 Subpart F (264.94)]	Relevant and Appropriate	Standards are identified under Subpart F for setting a cleanup level for remediating groundwater contamination from a RCRA facility. 264.94 establishes three categories of federal groundwater protection standards considered by Superfund as potentially ARARs: MCLs, Alternate Concentration Limits (ACLs) and background.	These requirements are relevant and appropriate if exposure studies performed for the site indicate a risk level higher than acceptable levels using MCLs or MCLGs. Procedures for developing maximum concentration limits are outlined in RCRA Subpart F, Section 264.94. Groundwater is not currently used since public water is available.
	USEPA - Safe Drinking Water Act (Title 42 USC Chapter 6A)	Relevant and Appropriate	The SDWA authorizes the USEPA to set MCLs and MCLGs and a process for developing them. The SDWA applies to all public water systems in the US.	These requirements are relevant and appropriate if exposure studies performed for the site indicate a risk level higher than acceptable levels using MCLs or MCLGs. Groundwater is not currently used as a drinking water source because a public water supply is available.

Table 3-1
Chemical-Specific ARARs, Criteria, Advisories, and Guidance

Feasibility Study Operable Unit 2
AVX Corporation
Myrtle Beach, South Carolina

Media/Authority	Requirements	Status	Requirement Synopsis	Anticipated Actions to Attain ARARs
Federal Criteria, Advisories and Guidance	EPA Groundwater Protection Strategy	To be considered	The Groundwater Protection Strategy provides a common reference for preserving clean groundwater and protecting the public health against the effects of past contamination. Guidelines for consistency in groundwater protection programs focus on the highest beneficial use of a groundwater aquifer and defines three classes of groundwater.	Groundwater beneath the site (which is currently not used as drinking water) is classified as Class II (potential source of drinking water), which is protected at levels consistent with that for current sources of drinking water.
	USEPA National Recommended Water Quality Criteria (2006)	To be considered	EPA recommended standards for water used for human consumption or exposed to aquatic organisms	Although groundwater is not used as a drinking water source, these criteria may be considered to the extent that groundwater beneath the site could be used for drinking water purposes in the future.
	USEPA Regional Screening Levels (RSL) for Chemical Contaminants at Superfund Sites	To be considered	Provide non-enforceable, generic, risk-based contaminant concentrations to be used for site "screening."	Provides screening levels for constituents in tapwater. Even though groundwater is not used as a drinking water source in the area, groundwater is nonetheless considered as a potential source of drinking water and therefore these screening levels will be considered.
	Draft Interim Final OSWER Monitored Natural Attenuation Policy (OSWER Dir.9200.4-17) (12/1/97)	To be considered	Provides guidance on how EPA will implement national policy on use of monitored natural attenuation.	Decisions on use and efficacy of monitored natural attenuation will be consistent with guidance.
	EPA Carcinogen Assessment Group Potency Factors	To be considered	Carcinogenic effects present the most up to date information on cancer risk potency derived from the EPA's cancer assessment group.	Carcinogen potency factors are used to compute the individual incremental cancer risk resulting from exposure to certain compounds.
	EPA Human Health Assessment Cancer Slope Factors (CSFs)	To be considered	CSFs are developed by EPA for health effects assessments or evaluation by the Human Health Assessment Group.	The values present the most up to date cancer risk potency information. CSFs will be used to compute the individual cancer risk resulting from exposure to constituents of
	EPA Risk Reference Dose (RfDs)	To be considered	RfDs are considered to be levels unlikely to cause significant adverse health effects associated with a threshold mechanism of action in human exposure for a lifetime.	EPA RfDs are used to characterize risks due to noncarcinogens in various media. They are considered when developing target cleanup levels.

Table 3-1
Chemical-Specific ARARs, Criteria, Advisories, and Guidance

Feasibility Study Operable Unit 2
AVX Corporation
Myrtle Beach, South Carolina

Media/Authority	Requirements	Status	Requirement Synopsis	Anticipated Actions to Attain ARARs
Surface Water				
State Regulatory Requirements	SC Water Quality Standards (SC Code Ann. Regs. 61-68), pursuant to the SC Pollution Control Act (SC Code of Laws Title 48, Chapter 1 et seq.)	Applicable	Establishes the State's official classified water uses for all waters of the State, establishes general rules and specific numeric and narrative criteria for protecting classified and existing water uses, and establishes procedures for classifying waters of the State. The water quality standards include uses of the waters, numeric and narrative criteria, and antidegradation rules.	Withers Swash is classified as SFH - tidal saltwaters protected for shellfish harvesting. Suitable for primary and secondary contact recreation, crabbing, and fishing. Also suitable for the survival and propagation of a balanced indigenous aquatic community of marine fauna and flora. Surface water cannot be impacted to concentrations above levels that would be harmful to humans, fish or wildlife of the most sensitive populations. Contaminant source areas are not likely to cause these exceedances in surface water quality.
	South Carolina Safe Drinking Water Regulations (SC Code Ann. Regs. 61-58), pursuant to the SC Safe Drinking Water Act (SC Code of Laws Title 44, Chapter 58)	Relevant and Appropriate	State water quality standards with respect to drinking water. Provides maximum contaminant levels for constituents in public drinking water supplies. The SC Safe Drinking Water Act applies to all public water systems in the state.	These regulations are considered relevant and appropriate as surface water is considered potential source for drinking water, even though a public water supply is locally used.
	South Carolina NPDES Permit Regulations (SC Code Ann. Regs 61-9), pursuant to SC Pollution Control Act (SC Code of Law, Title 48, Chapter 1)	To be considered	State-mandated water quality standards with respect to state-wide surface waters and pollutant effluent discharge standards.	Treated groundwater that is discharged to surface water has to meet NPDES regulations for the state. Constituent concentration limits are based on estimated ambient water quality.
Federal Regulatory Requirements	US EPA Clean Water Act Ambient Water Quality Criteria (AWQC) (40 CFR 131)	Relevant and Appropriate	Remedial actions involving contaminated surface water or groundwater must consider the uses of the water and the circumstances of the release or threatened release.	The AWQC for constituents detected on site will be compared to the observed concentrations in the groundwater.
Federal Criteria, Advisories and Guidance	EPA Carcinogen Assessment Group Potency Factors	To be considered	Carcinogenic effects present the most up to date information on cancer risk potency derived from the EPA's cancer assessment group.	Carcinogen potency factors are used to compute the individual incremental cancer risk resulting from exposure to certain compounds.
	EPA Risk Reference Dose (RfDs)	To be considered	RfDs are considered to be levels unlikely to cause significant adverse health effects associated with a threshold mechanism of action in human exposure for a lifetime.	EPA RfDs are used to characterize risks due to noncarcinogens in various media. They are considered when developing target cleanup levels.
	USEPA National Recommended Water Quality Criteria (2006)	To be considered	EPA recommended standards for water used for human consumption or exposed to aquatic organisms	These criteria may be considered to the extent that groundwater discharging to surface water could affect surface water quality.

Table 3-2
Location-Specific ARARs, Criteria, Advisories, and Guidance

Feasibility Study Operable Unit 2
AVX Corporation
Myrtle Beach, South Carolina

Site Feature/ Authority	Requirements	Status/ System	Requirement Synopsis	Consideration in the RI/FS
Coastal Zones				
State Regulatory Requirements	South Carolina Coastal Zone Management Act (SC Code of Laws Title 48, Chapter 39).	Applicable	Provides for the protection and enhancement of the State's coastal resources.	All land and waters in Horry County are part of the "coastal zone" as defined in the law, and as such are subject to its provision. Remedial measures will be designed to mitigate adverse impacts on the protected areas.
Wetlands and Floodplains				
Local Regulatory Requirements	Horry County Code of Ordinances Chapter 9 Flood Damage Prevention and Control	Applicable	Regulations related to actions conducted at sites with the 100-year floodplain.	The site is located within a 100-year flood plain. Remedial measures will be designed to comply with local regulations.
State Regulatory Requirements	SC Department Of Health and Environmental Control Coastal Division Regulations (SC Code Ann. Reg 30-1 et seq.)	Applicable	Regulations to ensure the preservation and wise utilization of coastal resources. Regulates activities that may adversely affect wetlands.	Remedial measures will be designed to mitigate adverse impacts on protected functions and achieve no net loss.
Federal Regulatory Requirements	Clean Water Act, Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material (40 CFR Part 230.231)	Applicable	Under this requirement, no activity that adversely affects a wetland shall be permitted if a practicable alternative with lesser effects is available. Controls discharges of dredged or fill material to protect aquatic ecosystems	Remedial measures will be designed to mitigate adverse impacts on protected functions and achieve no net loss.
	Executive Order 11990; Statement of Procedures on Wetlands Protection (40 CFR Part 6, Appendix A)	Applicable	Action to avoid, whenever possible, the long- and short-term impacts on wetlands and to preserve and enhance wetlands. Plans for action in wetlands must be submitted for public review.	All practicable means will be used to minimize harm to the wetlands. Wetlands disturbed by remedial activities will be mitigated in accordance with requirements.

Table 3-2
Location-Specific ARARs, Criteria, Advisories, and Guidance

Feasibility Study Operable Unit 2
AVX Corporation
Myrtle Beach, South Carolina

Site Feature/ Authority	Requirements	Status/ System	Requirement Synopsis	Consideration in the RI/FS
Federal Regulatory Requirements	Fish and Wildlife Coordination Act (50 CFR 297)	Applicable	Any modification of a body of water requires consultation with the U.S. Fish and Wildlife Services and the appropriate state wildlife agency to develop measures to prevent, mitigate or compensate for losses of fish and wildlife. This requirement is addressed under CWA Section 404 requirements.	Impact on fish and wildlife will be incorporated into the planning and decision-making about remedial alternatives.
	Executive Order 11988, Statement of Procedures on Floodplain Management (40 CFR Part 6, Appendix A)	Applicable	Action to avoid, whenever possible, the long- and short-term impacts associated with the occupancy and modifications of floodplains development, wherever there is a practical alternative. Promotes the preservation and restoration of floodplains so that their natural and beneficial value can be realized	Floodplains disturbed during remediation activities will be restored to their original or an improved condition and function.
Endangered Species				
State Regulatory Requirements	Nongame and Endangered Species Conservation Act (SC Code of Laws Title 50, Chapter 15)	Applicable	Requires actions to ensure the continued existence of endangered or threatened species.	No endangered species have been identified at the Site, though several are listed for Horry County. Consultation with South Carolina Department of Natural Resources is recommended to ensure that remedial actions do not jeopardize the continued existence of endangered or threatened species.
Federal Regulatory Requirements	Endangered Species Act (50 CFR 402, 16 USC 1531 et seq., 50 CFR 200)	Applicable	Requires actions to ensure the continued existence of any endangered or threatened species. Also requires that their habitats will not be jeopardized by a site action	No endangered species have been identified at the Site, though several are listed for Horry County. Consultation with federal agencies is recommended to ensure that remedial actions do not jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy critical habitat.

Table 3-3
Action-Specific ARARs, Criteria, Advisories, and Guidance

Feasibility Study Operable Unit 2
AVX Corporation
Myrtle Beach, South Carolina

Media/Authority	Regulation	Status	Requirement	Action to be Taken to Attain ARARs
Air				
State Regulatory Requirements	South Carolina Air Pollution Control Regulations and Standards (SC Code Ann Reg 61-62)	Applicable	Prohibits emissions of any contaminant that may become injurious to human, plant or animal life.	Air emissions from remedial actions will meet the regulatory limits.
Federal Regulatory Requirements	National Emissions Standards for Hazardous Air Pollutants (40 CFR Part 61)	Applicable	Establishes air emissions limits for hazardous air pollutants.	Air emissions will meet all applicable standards.
Federal Criteria, Advisories and Guidance	USEPA Regional Screening Levels (RSL) for Chemical Contaminants at Superfund Sites	To be considered	Provide non-enforceable, generic, risk-based contaminant concentrations to be used for site "screening."	Provides screening levels for constituents in industrial and residential air. Screening levels will be considered for remedial actions involving treatment with air stripping.
Groundwater				
State Regulatory Requirements	SC Water Quality Standards (SC Code Ann Reg 61-68), pursuant to the SC Pollution Control Act (SC Code of Laws Title 48, Chapter 1 et seq.)	Applicable	Establishes the State's official classified water uses for all waters of the State, establishes general rules and specific numeric and narrative criteria for protecting classified and existing water uses, and establishes procedures for classifying waters of the State. The water quality standards include uses of the waters, numeric and narrative criteria, and antidegradation	All alternatives will comply with regulations that apply to groundwater.
	Groundwater Use and Reporting Regulation (SC Code Ann Reg 61-113, et seq.), promulgated pursuant to the Groundwater Use and Reporting Act (SC Code Ann. Sections 49-5-10 et seq.)	Applicable	Regulations to maintain, conserve and protect the groundwater resources of the State	Applicable if combined pumping of groundwater extraction wells is greater than 3 million gallons per month.
	Water Use Reporting and Coordination Regulations (SC Code Ann Reg 121-10)	Applicable	The purposes of these regulations are to establish procedures for the reporting of water use information to enable the Water Resources Commission to pursue an integrated State water resources policy and to provide information as to local and statewide use for private and public planning purposes.	Any action involving hydraulic control will comply with the regulation.
Federal Regulatory Requirements	RCRA Groundwater Protection (40 CFR 264)	Applicable - Implemented through RI regulations	Regulations include groundwater protection standard requirements for groundwater monitoring, detection monitoring and compliance monitoring and the corrective action program.	All alternatives will comply with the portions of the regulations which apply to installing groundwater monitoring wells and compliance monitoring.
Waste				
State Regulatory Requirements	SC Hazardous Waste Management Regulations (SC Code of Ann Reg 61-79)	Relevant and Appropriate	Establishes criteria for identifying and handling hazardous waste. Regulations apply to owners and operators of facilities that treat, store, or dispose of hazardous wastes.	Management and treatment of on-site remediation-derived waste will comply with these regulations.
	SC Hazardous Waste Management Location Standards (SC Code of Ann Reg 61-104)	Relevant and Appropriate	Contains requirements for landfill closure and post-closure care for the location of hazardous waste treatment, storage, and disposal facilities.	If hazardous waste will be generated and stored on site, these standards will apply.
Federal Regulatory Requirements	RCRA-Hazardous Waste Identification (40 CFR, Part 261)	Applicable - Implemented through RI regulations	Defines waste that are subject to regulation as hazardous waste under 40 CFR Parts 262-264.	If remedial alternatives require excavation of waste, management approaches for listed and characteristic waste, if encountered, will be met.

Table 3-3
Action-Specific ARARs, Criteria, Advisories, and Guidance

Feasibility Study Operable Unit 2
AVX Corporation
Myrtle Beach, South Carolina

Media/Authority	Regulation	Status	Requirement	Action to be Taken to Attain ARARs
Surface Water				
State Regulatory Requirements	South Carolina NPDES Permit Regulations (SC Code Ann Reg 61-9), pursuant to SC Pollution Control Act (SC Code of Law, Title 48, Chapter 1)	Applicable	State-mandated water quality standards with respect to state-wide surface waters and pollutant effluent discharge standards.	Water discharged to surface water during remedial activities will meet the substantive requirements of these rules.
State Regulatory Requirements	SC Water Quality Standards (SC Code Ann Reg 61-68), pursuant to the SC Pollution Control Act (SC Code of Laws Title 48, Chapter 1 et seq.)	Applicable	Establishes the State's official classified water uses for all waters of the State, establishes general rules and specific numeric and narrative criteria for protecting classified and existing water uses, and establishes procedures for classifying waters of the State. The water quality standards include uses of the waters, numeric and narrative criteria, and antidegradation	Treated water discharged to surface water during remedial activities will meet the substantive requirements of these regulations.
Federal Regulatory Requirements	Federal NPDES Regulations (40 CFR Part 122)	Applicable	Federal water quality standards / pollutant effluent discharge standards.	Treated water discharged to surface water during remedial activities will meet the substantive requirements of these regulations.
	CWA Ambient Water Quality Criteria (AWQC), 40 CFR Part 122, 125, 129, 133 and 136	Relevant and Appropriate	Non-enforceable guidance used by states in conjunction with a designated use for a stream effluent to establish water quality standards. WQC levels for protection of human health from consuming fish and aquatic organisms have been developed for several contaminants. The standards are relevant and appropriate if state standards are no more stringent.	Applicable to any point-source discharges of wastewaters to waters of the United States. At this Site, it is applicable to discharge of treated waters from the groundwater treatment system, to any surface water body. Treated water will be the requirements of the regulation.
General				
State Regulatory Requirements	SC Underground Injection Control Regulations (SC Code Ann Reg 61-87)	Applicable	These regulations set forth the specific requirements for controlling underground injection in the State and include provisions for: the classification and regulation of injection wells; prohibiting unauthorized injection; protecting underground sources of drinking water from injection; classifying underground sources of drinking water; and, requirements for abandonment, monitoring, and reporting for existing injection wells used to inject wastes or contaminants.	All underground injection actions will comply with the regulations.
State Regulatory Requirements	SC Well Standards (SC Code Ann Reg 61-71)	Applicable	These regulations establish minimum standards for the construction, maintenance, and operation of the following wells: individual extraction and monitoring wells and boreholes to ensure that underground sources of drinking water are not contaminated and public health is protected.	All wells will be constructed adhering to the standards listed in this regulation.
Federal Regulatory Requirements	Federal UIC Regulations (40 CFR Parts 144 -148)	Applicable	These regulations set forth the federal requirements for controlling underground injections.	All underground injection actions will comply with the regulations.

Table 3-4
Risk-Based Remediation Goals Summary

Feasibility Study Operable Unit 2
AVX Corporation
Myrtle Beach, South Carolina

Groundwater - USEPA MCLs or SCDHEC Drinking Water Standards, unless otherwise noted

	Remedial Goal (µg/L)
cis-1,2-Dichloroethene	70
Methylene Chloride	5.0
Naphthalene[1]	0.14
trans-1,2-Dichloroethene	100
Trichloroethene	5.0
Vinyl chloride	2.0

Surface Water - SCDHEC Water Quality Criteria unless otherwise noted

	Groundwater Remedial Goal (µg/L)	**Water Quality Criteria for Consumption of Organisms Only[2] (µg/L)**	**Protection of Aquatic Life Acute[3] (µg/L)**	**Protection of Aquatic Life Chronic[3] (µg/L)**	**Human Based Goals[4] (Site-specific) (µg/L)**
cis-1,2-Dichloroethene	70	10,000[5]	1,100[6]	590[6]	7,300
Trichloroethene	5	30	440[7]	47[7]	1,500
Vinyl chloride	2	530	930[8]	930[8]	34

Notes:

1 USEPA Risk Based Screening Levels - November 2010. http://www.epa.gov/region9/superfund/prg/

2 Per regulation 61-69, surface waters that are unlisted (Withers Swash is not classified by name), the classification of the waterbody to which they are tributary apply. The coastal waters in Horry Country are classified as Shellfish Harvesting Waters.

3 There are no South Carolina surface water quality standards for these constituents for protection of aquatic life. The values presented are from the referenced sources.

4 Calculated health based goals for surface water based site-specific exposure assumptions assuming direct contact with water while wading

5 No value available for cis isomer of 1,2-dichloroethene. Value presented is for trans-1,2-dichloroethene.

6 Value presented is for total 1,2-dichloroethene.

7 Suter and Tsao (1996).

8 Michigan Department of Environmental Quality. Rule 57: Water Quality Values. Available at: http://www.michigan.gov/deq/0,1607,7-135-3313_3686_3728-11383--,00.html

USEPA = United States Environmental Protection Agency
SCDHEC = South Carolina Department of Health and Environmental Control
MCL = Maximum Contaminant Levels
RSL = Risk Screening Level

Table 4-1
Initial Screening of Potentially Applicable Technologies and Process Options for Groundwater

Feasibility Study Operable Unit 2
AVX Corporation
Myrtle Beach, South Carolina

General Response Action	Technology Type	Process Option	Description	Retained? (Yes/No)	Initial Screening
No Further Action	None	None	Not Applicable	Yes	Used as a baseline for comparison to other process options.
Institutional Controls	Access Restrictions	Deed Notification/ Restrictions	Uses legal actions to prevent groundwater use, control land use, and prohibit potable use of groundwater.	Yes	Potentially implementable. Access restrictions are usually used in conjunction with other technology types for remedial actions.
		Well Abandonment	Abandons existing irrigation wells to prevent further use of groundwater.	Yes	Potentially implementable.
Containment	Hydraulic Control	Groundwater Extraction	Use extraction wells to pump large volumes of water. Typically requires ex-situ treatment to meet discharge criteria.	Yes	Potentially implementable. Due to the extent of COPCs across multiple properties, groundwater extraction will potentially be used in conjunction with other technology types for remedial actions.
In-Situ Treatment	Attenuation	Monitored Natural Attenuation	Natural subsurface processes are allowed to reduce concentrations of constituents of potential concern (COPCs) to acceptable levels.	Yes	Potentially implementable. Monitored natural attenuation is usually used in conjunction with other technology types for remedial actions.
	Biological Treatment	Phytoremediation	Uses plants to potentially remove, transfer, stabilize, and destroy COPCs in soil and shallow groundwater.	No	Limitations to shallow groundwater depth and access to off-site areas will limit the effectiveness and implementability.
	Chemical/ Biological Treatment	Enhanced Anaerobic Bioremediation	The injection of a substrate to stimulate native microorganisms and degrade COPCs	Yes	Potentially implementable. In-situ bioremediation has been applied successfully at a variety of sites with similar characteristics. In addition, an in-situ bioremediation pilot test was completed with encouraging results.
	Chemical Treatment	Chemical Oxidation	Use of chemical oxidant (ozone, hydrogen peroxide, persulfate, and permanganate) to oxidize COPCs in situ.	No	Most effective in focused high concentration areas due to the short reaction kinetics. The extent of COPCs, the limited site access and the existing reducing conditions will limit the effectiveness of this technology. For some oxidants, gas generation is possible and management of that gas would be difficult due to the shallow depth to water. Oxidant-specific secondary water quality may be a concern.

Table 4-1
Initial Screening of Potentially Applicable Technologies and Process Options for Groundwater

Feasibility Study Operable Unit 2
AVX Corporation
Myrtle Beach, South Carolina

General Response Action	Technology Type	Process Option	Description	Retained? (Yes/No)	Initial Screening
In-Situ Treatment	Physical/Chemical Treatment	Permeable Reactive Barrier	Consists of a wall built below ground to intercept and treat groundwater containing COPCs. A PRB is built by excavating a narrow trench perpendicular to the path of the COPCs in groundwater. The PRB is filled with a reactive material such as zero valent iron that can destroy or mitigate the transport of COPCs while allowing the passage of water.	No	Constraints provided by existing off-site structures and access to all off-site areas may limit the constructible width and depth, reducing the effectiveness and implementability. If source mass can not be accurately estimated, the PRB can not be properly sized.
	Physical Treatment	Air Sparging	Injection of air below the groundwater table to physically strip volatile COPCs from groundwater. A low to moderate vacuum is applied to vadose zone extraction wells to capture volatilized COPCs for treatment. Depth of source COPCs and specific site geology must be considered. The resulting increase in oxygen concentration promotes aerobic biodegradation of aromatic hydrocarbons.	No	Pilot testing conducted in 1997 (Geraghty & Miller, Inc, 1997b) indicated shallow groundwater limited vacuum influence and the lithology is stratified. The parent volatile COPCs has limited aerobic biodegradation and naturally occurring reductive dechlorination would be disrupted by the increase in oxygen concentrations.
		Multi-phase Extraction	Utilizes vacuum pressure to physically remove COPCs contained in separate phase liquids and physically strip volatile COPCs from the subsurface.	No	Pilot testing conducted in 1997 (Geraghty & Miller, Inc, 1997b) indicated groundwater recovery rate was high and radius of influence was low.
Ex-Situ Treatment	Physical Treatment of Extracted Groundwater	Air Stripping	COPCs in extracted groundwater are removed with an air stripping treatment unit.	Yes	Potentially implementable.
		Granular Activated Carbon Adsorption	COPCs in extracted groundwater are treated by pumping it through a series of vessels contain activated carbon, to which the dissolved COPCs adsorb. Periodic replacement or regeneration of the carbon is required.	Yes	Potentially implementable.

Shading indicates that the process option was eliminated during the initial screening stage.

Table 4-2
Initial Screening of Potentially Applicable Technologies and Process Options for Surface Water

Feasibility Study Operable Unit 2
AVX Corporation
Myrtle Beach, South Carolina

General Response Action	Technology Type	Process Option	Description	Retained? (Yes/No)	Initial Screening
No Action	None	None	Not Applicable	Yes	Used as a baseline for comparison to other process options.
In-Situ Treatment	Attenuation	Monitored Natural Attenuation	Natural subsurface processes are allowed to reduce concentrations of COPCs to acceptable levels.	Yes	Potentially implementable. Monitored natural attenuation is usually used in conjunction with other technology types for remedial actions.
	Biological Treatment	Phytoremediation	Uses plants to potentially remove, transfer, stabilize, and destroy organic COPCs in shallow groundwater before it discharges into the surface water body.	Yes	Potentially implementable.

▨ Shading indicates that the process option was eliminated during the initial screening stage.

Table 5-1
Secondary Screening of Potentially Applicable Technologies and Process Options for Groundwater

Feasibility Study Operable Unit 2
AVX Corporation
Myrtle Beach, South Carolina

General Response Action	Technology Type	Process Option	Effectiveness	Implementability	Cost	Comments
No Further Action	None	None	--	High	NA*	Retain. Required by NCP and USEPA guidance as a baseline for comparison to other process options.
Institutional Controls	Access Restrictions	Deed Notification/ Restrictions	Moderate to high. Effective for protection of potential off-site receptors by reducing potential for exposure, but does not reduce COPC concentrations in groundwater.	High	Low	Retain.
		Well Abandonment	High. Abandoning irrigation wells will be effective in reducing potential exposure to COPCs in groundwater.	High	Low to moderate.	Retain.
Containment	Hydraulic Control	Groundwater Extraction	High. Extraction and treatment system currently in place on-site and effectively maintaining capture indicating extraction will be effective off-site	High.	Low to Moderate. Costs associated with O&M of 40-60 gpm system.	Retain.
In-Situ Treatment	Attenuation	Monitored Natural Attenuation	Moderate. Effective in identifying changing conditions.	High	Low to Moderate. Installation of additional wells may be needed.	Retain, typically useful in combination with other technologies
	Chemical/Biological Treatment	Enhanced Anaerobic Bioremediation	Moderate to high. Effective for remediation of dissolved COPCs. Predictive analysis indicates that cleanup can be achieved within 5 years of full implementation of the planned remedy.	Moderate to High. Installation of injection and monitoring infrastructure needed. Methane monitoring needed to protect potential receptors	Moderate to High. Capital costs high however life-cycle O&M costs moderate compared to other alternatives.	Retain. Effective and efficient treatment option for off-site groundwater.
Ex-Situ Treatment	Physical Treatment of extracted groundwater	Air Stripping	High. Extraction and treatment system currently in place in conjunction with groundwater extraction system and effectively treating water containing COPCs.	High.	Low to Moderate. Costs associated with O&M of the air stripper and treatment system.	Retain
		Granular Activated Carbon Adsorption	Moderate. Treatment efficiency is lower relative to air stripping at current rates. Air stripping treatment alternative currently in place in onsite areas	Moderate. Additional infrastructure needed.	Moderate to High. Additional infrastructure costs compared to air stripping. O&M costs higher for carbon at current extraction rates and VOC loading.	Higher installation and O&M costs associated with implementing carbon treatment.

* Indicates costs associated with no further action are nil, however, there are costs associated with properly decommissioning existing monitoring wells.

Shading indicates that the process option was eliminated during the screening stage.

Table 5-2
Secondary Screening of Potentially Applicable Technologies and Process Options for Surface Water

Feasibility Study Operable Unit 2
AVX Corporation
Myrtle Beach, South Carolina

General Response Action	Technology Type	Process Option	Effectiveness	Implementability	Cost	Comments
No Further Action	None	None	--	High	NA	Retain. Required by NCP and USEPA guidance as a baseline for comparison to other process options.
In-Situ Treatment	Attenuation	Monitored Natural Attenuation	Moderate. Effective in identifying changing conditions.	High	Low	Retain, typically useful in combination with other technologies
	Biological Treatment	Phytoremediation	Moderate. Effective for remediating shallow groundwater prior to surface water discharge and reduces groundwater discharge	Moderate. Will require access to the banks of the surface water body to intercept shallow groundwater containing COPCs before it discharges to the surface water body.	Moderate.	Retain.

Shading indicates that the process option was eliminated during the screening stage.

Table 6-1
Screening of Remedial Alternative for Groundwater OGW-1: No Action

Feasibility Study Operable Unit 2
AVX Corporation
Myrtle Beach, South Carolina

Synopsis: Under this alternative, no further action would be taken to address constituents of concern (COPCs) in groundwater.

Effectiveness	Implementability	Cost
	Advantages	
There is presently limited public access to groundwater. Natural attenuation processes and groundwater flux through the site would continue to reduce concentrations of COPCs in groundwater.	Easily implemented.	No capital or O&M costs would be required.
	Disadvantages	
Would not reduce COPC mobility, toxicity, or volume in the short term. COPCs in groundwater would continue to migrate, potentially reaching downgradient surface water and other receptors. There is presently limited public access to groundwater through the irrigation wells. Limits future land use. It is not protective of ecological or human receptors. No monitoring would be done to evaluate risks or determine when remedial goals are met.	May require future remedial action	May defer and increase eventual future capital and O&M expenditures if future remediation is required

Conclusion: The No Action Alternative would not achieve the remedial action objectives; however, it is retained as a baseline for comparison to the remaining alternatives as is required by the NCP.

Table 6-2
Screening of Remedial Alternative for Groundwater OGW-2: Limited Action

Feasibility Study Operable Unit 2
AVX Corporation
Myrtle Beach, South Carolina

Synopsis: Under this alternative, the extent of groundwater constituents of concern (COPCs) would be registered on the property deed to notify property owners that use of the groundwater is prohibited. Monitored natural attenuation would be used to document the natural decline of COPCs via natural processes. Existing off-site irrigation wells would be abandoned to prevent the use of groundwater.

Effectiveness	Implementability	Cost
Advantages		
Would prevent receptor access through institutional controls including deed notification/ restrictions and abandonment of off-site irrigation wells. Natural attenuation processes would reduce COPC concentrations over time to achieve remedial goals. Provides long-term protection with institutional controls and well abandonment. Groundwater monitoring would determine when remedial goals are met.	Easily implemented. Conventional technology.	Low to moderate capital costs associated with potential monitoring well installation and well abandonment. Provides for long term planning of predictable monitoring costs.
Disadvantages		
No mass removal or reduction in COPC toxicity or volume in the short term. Does not reduce COPC mobility or prevent migration of COPCs in groundwater or the interception of surface water (Withers Swash) The time to achieve remedial goals will be longer than some active remediation alternatives.	May require additional monitoring wells to improve long term data resolution. May require installation of monitoring wells through residential areas.	Long-term operation and maintenance costs.

Conclusion: This alternative would be protective of human health and the environment by limiting exposure to COPCs in groundwater; however continued surface water infiltration will need to be addressed to protect human and ecological health. This alternative is retained for detailed analysis.

Table 6-3

Screening of Remedial Alternative for Groundwater OGW-3a: Active Remediation - Hydraulic Containment

Feasibility Study Operable Unit 2
AVX Corporation
Myrtle Beach, South Carolina

Synopsis: Under this alternative, deed restrictions/notifications and monitored natural attenuation would be combined with active groundwater recovery and associated treatment (via air stripping) to prevent further migration of constituents of concern (COPCs) in groundwater and reduce the overall time to achieve remedial action objectives. Treated groundwater would be discharged under an NPDES permit.

Effectiveness	Implementability	Cost
Advantages		
Would prevent receptor access through institutional controls including access/deed restrictions and abandonment of off-site irrigation wells. Would prevent further COPC migration or surface water discharge and accelerate groundwater clean-up through groundwater extraction and treatment. Natural attenuation processes would reduce COPC concentrations over time to achieve remedial goals. Provides long-term protection.	Conventional technology that is proven with site-related COPCs. Services and materials are readily available.	Moderate capital costs associated with installation of extraction wells and treatment system and abandoning existing irrigation wells.
Disadvantages		
The time to achieve remedial goals would likely be longer compared to other active remediation alternatives.	Life cycle duration requires long-term maintenance of infrastructure. May require installation of wells through residential areas.	Long-term operation and maintenance costs will be moderately high.

Conclusion: This alternative would be protective of human health and the environment by limiting exposure to COPCs in groundwater. The COPC mass and mobility would be reduced by removing, treating, and discharging treated groundwater. This alternative is retained for detailed analysis.

Table 6-4
Screening of Remedial Alternative for Groundwater OGW-3b: Active Remediation - Enhanced Anaerobic Bioremediation

Feasibility Study Operable Unit 2
AVX Corporation
Myrtle Beach, South Carolina

Synopsis: Under this alternative, deed restrictions/notifications, well abandonment, and monitored natural attenuation would be combined with in-situ enhanced anaerobic bioremediation to remediate the constituents of concern (COCs) in groundwater and reduce the overall time to achieve remedial action objectives. Injection wells would be placed in transects across the groundwater plume and an electron donor would be injected to create an anaerobic reactive zone.

Effectiveness	Implementability	Cost
Advantages		
Would prevent receptor access through institutional controls including access/deed restrictions and abandonment of off-site irrigation wells. Would control future off-site COC mobility and reduce surface water discharge Would reduce COC mass and toxicity and decrease overall timeframe to achieve remedial goals. Provides long-term protection.	Conventional and proven technology. Pilot testing has already been done to refine well spacing and injection concentrations, volumes, and frequency.	
Disadvantages		
	Methane monitoring will be required and methane mitigation may be required in residential areas Numerous injection wells would need to be placed throughout residential areas.	High capital and O&M costs for enhanced anaerobic bioremediation. Methane monitoring will be required and methane mitigation will be required in residential areas. Long-term monitoring costs.

Conclusion: This alternative would be protective of human health and the environment by limiting exposure to COCs in groundwater. The COC mass, toxicity, and mobility would be reduced by active remediation using enhanced anaerobic bioremediation. The timeframe to achieve remedial goals will be decreased. This alternative is retained for detailed evaluation.

Table 6-5
Screening of Remedial Alternative for Surface Water SW-1: No Action

Feasibility Study Operable Unit 2
AVX Corporation
Myrtle Beach, South Carolina

Synopsis: Under this alternative, no further action would be taken to address constituents of concern (COPCs) in surface water.

Effectiveness	Implementability	Cost
Advantages		
Natural attenuation processes would continue to reduce concentrations of COPCs in groundwater infiltrating the surface water bodies. Based on the risk assessment, there is currently no unacceptable human health risk and therefore no need to prevent receptor contact.	Easily implemented.	No capital or O&M costs would be required.
Disadvantages		
Would not reduce COPC mobility, toxicity, or volume in the short term. No monitoring would be done to evaluate risks or determine when remedial goals are met.	May require future remedial action	May defer and increase eventual future capital and O&M expenditures if future remediation is required

Conclusion: The No Action Alternative would achieve the remedial action objectives of mitigating COPC concentrations. It is retained as a baseline for comparison to the remaining alternatives as is required by the NCP.

Table 6-6
Screening of Remedial Alternative for Surface Water SW-2: Limited Action

Feasibility Study Operable Unit 2
AVX Corporation
Myrtle Beach, South Carolina

Synopsis: Under this alternative, monitored natural attenuation would be used to document the natural decline of constituents of concern (COPCs) via natural processes.

Effectiveness	Implementability	Cost
Advantages		
Natural attenuation processes would reduce COPC concentrations over time to achieve remedial goals.	Easily implemented.	Low costs associated with monitoring.
Surface water monitoring would determine when remedial goals are met.	Conventional technology.	Provides for long term planning of predictable monitoring costs.
Disadvantages		
No mass removal or reduction in COPC toxicity, mobility, or volume in the short term.		Long-term operation and maintenance costs.

Conclusion: This alternative would achieve the remedial action objectives of mitigating COPC concentrations. This alternative is retained for detailed analysis.

Table 6-7
Screening of Remedial Alternative for Surface Water SW-3: Active Remediation - Phytoremediation

Feasibility Study Operable Unit 2
AVX Corporation
Myrtle Beach, South Carolina

Synopsis: Under this alternative, the implementation of phytoremediation by planting trees along the banks of the surface water body would reduce groundwater discharge to surface water and reduce concentrations of constituents of concern (COPCs) in that groundwater discharge to surface water. Monitored natural attenuation would be used to document the natural decline of COPCs via natural processes.

Effectiveness	Implementability	Cost
Advantages		
Natural attenuation processes would reduce COPC concentrations over time to achieve remedial goals. Future discharge of COPCs in shallow groundwater to surface water would be reduced. Surface water monitoring would determine when remedial goals are met.	Conventional technology.	Provides for long term planning of predictable monitoring costs.
Disadvantages		
No reduction in COPC toxicity, mobility, or volume in the short term	Would require access to areas along the banks of the surface water bodies.	Moderate capital and O&M costs. Long-term operation and maintenance costs.

Conclusion: This alternative would achieve the remedial action objectives of mitigating COPC concentrations by reducing the source of COPCs discharging to surface water and allowing for reductions in concentrations over time through natural attenuation. This alternative is retained for detailed analysis.

Table 7-1
Summary of Selected Remedial Alternatives

Feasibility Study Operable Unit 2
AVX Corporation
Myrtle Beach, South Carolina

Remedial Alternative	Description	Media	COPCs
Remedial Alternative OGW-1	No Action	Groundwater	VOCs
Remedial Alternative OGW-2	MNA and Institutional Controls	Groundwater	VOCs
Remedial Alternative OGW-3a	Groundwater Extraction and Treatment, MNA, and Institutional Controls	Groundwater	VOCs
Remedial Alternative OGW-3b	Enhanced Anaerobic Bioremediation, MNA, and Institutional Controls	Groundwater	VOCs
Remedial Alternative SW-1	No Action	Surface Water	VOCs
Remedial Alternative SW-2	MNA	Surface Water	VOCs
Remedial Alternative SW-3	Phytoremediation and MNA	Surface Water	VOCs

Notes:
OGW = OU2 Groundwater Remedy
SW = Surface-Water Remedy
MNA = Monitored Natural Attenuation
COPC = constituent of potential concern
VOC = volatile organic compound

Table 7-2
Summary of Detailed and Comparative Analysis of Groundwater Remedial Action Alternatives

Feasibility Study Operable Unit 2
AVX Corporation
Myrtle Beach, South Carolina

Evaluation Criteria		Rating	Alternative OGW-1 No Action	Rating	Alternative OGW-2 Limited Action Institutional Controls, Well Abandonment, and MNA	Rating	Alternative OGW-3a Active Treatment - Hydraulic Containment Institutional Controls, Well Abandonment, MNA, and Groundwater Extraction & Treatment	Rating	Alternative OGW-3b Active Treatment - ERD Institutional Controls, Well Abandonment, MNA, and ERD
Threshold Criteria									
1)	Overall protection of human health and the environment	**0**	Does not provide overall protection of human health or the environment. Does not minimize, reduce, or control COPCs in groundwater or associated exposure risks. Groundwater RAOs would not be met.	**3**	Protective of human health and the environment by eliminating potential exposure to COPCs in groundwater and documenting removal of COPCs in groundwater by natural processes. Groundwater RAOs would be met by natural processes.	**5**	Protective of human health and the environment by eliminating potential exposure to COPCs in groundwater. Prevents future COPC migration and controls potential discharge of COPCs from groundwater to surface water, removes COPC mass, and prevents exposure to COPCs in groundwater. Groundwater RAOs would be met.	**5**	Protective of human health and the environment by eliminating potential exposure to COPCs in groundwater. Prevents future COPC migration and controls potential discharge of COPCs from groundwater to surface water, destroys COPCs in groundwater, and prevents exposure to COPCs in groundwater. Methane vapor monitoring would be conducted and mitigation implemented, if needed. Groundwater RAOs would be met.
2)	Compliance with ARARs	**0**	Does not comply with chemical-specific ARARs. No action- or location-specific ARARs.	**3**	Complies with ARARs by preventing completion of an exposure pathway for off-site groundwater and documents declining concentrations.	**5**	Complies with ARARs.	**5**	Complies with ARARs.
Balancing Criteria									
3)	Long-term effectiveness and permanence	**0**	Not effective or permanent. Potential exposure risks associated with COPCs in groundwater would remain with no controls or long-term management plan.	**3**	Groundwater monitoring indicates complete destruction of COPCs through reductive dechlorination may be occurring. The off-site groundwater remediation goals may be met through this mechanism.	**5**	Effective and permanent for removal of COPCs from groundwater and eliminating human health risks.	**5**	Effective and permanent for removal of COPCs from groundwater and eliminating human health risks. Remedial response objectives anticipated to be met (following active ERD for 5 years and 10 additional years MNA). Institutional controls may be lifted after drinking water standards are met.
4)	Reduction of mobility, toxicity, or volume	**0**	Natural attenuation processes may reduce mobility, toxicity, or volume of COPCs in groundwater, although monitoring of these processes would not be performed.	**2**	Does not provide a treatment component; however, monitoring indicated reductive dechlorination of COPCs in groundwater may be occurring that will reduce mobility, toxicity, and volume of COPCs in groundwater over time. Does not prevent the migration of COPCs in groundwater or potential interception of COPCs in surface water at Withers Swash.	**4**	Reduces mobility, toxicity, and volume of COPCs in groundwater.	**5**	Reduces mobility, toxicity, and volume of COPCs in groundwater. COPCs will be destroyed in-situ.
5)	Short-term effectiveness	**5**	No activities would be implemented that would present potential short-term exposure risks to human health or the environment.	**4**	Limited activities (abandoning irrigation wells, monitoring of existing wells) result in minimal short-term exposure risks and impacts to workers, adjacent populations, or the environment that would be managed through engineering controls.	**3**	Limited construction activities (abandoning irrigation wells, installation of extraction wells, additional monitoring wells, and groundwater treatment system) results in limited short-term exposure risks and impacts to workers, adjacent populations, or the environment that would be managed through engineering controls.	**3**	Construction and treatment activities (installation of additional monitoring and injection wells followed by periodic injection activities, vapor monitoring, and mitigation) result in limited short-term exposure risks and impacts to workers, adjacent populations, or the environment that would be managed through engineering controls.
6)	Implementability	**2**	Technically feasible because no technical components are necessary. However, not administratively feasible due to a lack of monitoring or protection of human health or the environment.	**3**	MNA monitoring of existing wells and establishment of institutional controls is highly implementable. Administrative feasibility is lower as potential groundwater discharge to surface water would continue.	**4**	Technically and administratively feasible. Requires installation of treatment system and potentially additional monitoring wells.	**3**	Technically and administratively feasible. Requires installation of injection wells and establishment of injection programs, as well as with associated vapor monitoring/mitigation that would require access to multiple properties. Pilot testing has been completed and has shown that the technology is favorable for implementation.
7)	Cost	**5**	Capital Costs: $0 Total O&M Costs:$0 Periodic Costs: $0 Total Present Value Cost: $0	**4**	Capital Costs: $44,251 Total O&M Costs (30 years): $1,869,634 Periodic Costs: $0 Total Present Value Cost: $872,000	**3**	Capital Costs: $969,040 Total O&M Costs (30 years): $9,671,117 Periodic Costs: $0 Total Present Value Cost: $5,250,000	**2**	Capital Costs: $1,150,764 Total O&M Costs (IRZ for maximum 5 years, MNA for 10 additional years): $5,306,573 Periodic Costs: $53,021 Total Present Value Cost: $5,417,000
Modifying Criteria									
8)	State Acceptance	**0**	Likely not acceptable.	**3**	Likely acceptable; does not prevent the migration of COPCs in groundwater or potential interception of COPCs to surface water at Withers Swash.	**5**	Likely acceptable. Conventional and proven technology.	**5**	Likely acceptable. Conventional and proven technology that will destroy the COPCs.
9)	Community Acceptance	**0**	Likely not acceptable.	**3**	Likely acceptable; does not prevent the migration of COPCs in groundwater or potential interception of COPCs to surface water at Withers Swash.	**5**	Likely acceptable. Conventional and proven technology.	**4**	Likely acceptable. Conventional and proven technology. Would require access to residential properties
Screening Totals									
		12		**28**		**39**		**37**	

Notes:

All costs are estimated to an accuracy of +50 percent to -30 percent (USEPA, 2000)

ARAR = applicable or relevant and appropriate requirement
COPC = constituent of potential concern
ERD = enhanced reductive dechlorination
GW = groundwater
MNA = monitored natural attenuation
O&M = operation and maintenance
RAO = remedial action objective
USEPA = United States Environmental Protection Agency

Ratings categories for Threshold and Balancing Criteria (Excluding Cost):
(0) None
(1) Low
(2) Low to moderate
(3) Moderate
(4) Moderate to high
(5) High

Table 7-3
Summary of Comparative Analysis of Groundwater Remedial Alternative Costs

Feasibility Study Operable Unit 2
AVX Corporation
Myrtle Beach, South Carolina

Remedial Acton Alternative	Description	Present Value 30 year Life Cycle ($)
Remedial Action Alternative OGW-1	No Action	$0
Remedial Action Alternative OGW-2	Limited Action: MNA and Institutional Controls.	$872,000
Remedial Action Alternative OGW-3a	Active Remediation: Hydraulic Control, MNA, and Institutional Controls.	$5,250,000
Remedial Action Alternative OGW-3b	Active Remediation: ERD, MNA, and Institutional Controls.	$5,417,000

Notes:

Assumes a project life of 30 years. A 7% discount rate was applied per *A Guide to Developing and Documenting Cost Estimates During the* Feasibility Study, EPA 540-R-00-002 OSWER 9355.0-75; July 2000

All costs are rounded to the nearest $1000

All costs are based on an accuracy of +50/-30% (USEPA, 2000)

OGW = OU2 Groundwater

MNA = monitored natural attenuation

ERD = enhanced reductive dechlorination

Table 7-4
Summary of Detailed and Comparative Analysis of Surface-Water Remedial Action Alternatives

Feasibility Study Operable Unit 2
AVX Corporation
Myrtle Beach, South Carolina

Evaluation Criteria		Rating	Alternative SW-1 No Action	Rating	Alternative SW-2 Limited Action	Rating	Alternative SW-3 Active Remediation – Phytoremediation
Threshold Criteria							
1)	Overall protection of human health and the environment	0	Does not minimize, reduce, or control COPC concentrations in surface water. Surface-water RAOs would not be met.	3	Does not actively reduce existing COPC concentrations in surface water, but does provide measures to monitor changes in surface-water concentrations due to natural degradation. Surface-water RAOs would be met.	5	Actively reduces existing COPC concentrations at the groundwater/surface-water interface. Provides measures to monitor changes in surface-water concentrations due to natural degradation. Surface-water RAOs would be met.
2)	Compliance with ARARs	0	Does not comply with ARARs.	4	Complies with ARARs.	5	Complies with ARARs.
Balancing Criteria							
3)	Long-term effectiveness and permanence	0	Not effective or permanent. Potential future exposure associated COPCs in surface water would remain with no controls or long-term management plan.	4	Monitoring of surface water will document the natural attenuation processes and will achieve long-term effectiveness and permanence.	5	Monitoring of surface water will document the success of the phytoremediation component and the natural attenuation processes. Will achieve long-term effectiveness and permanence.
4)	Reduction of mobility, toxicity, or volume	0	Natural attenuation processes may reduce mobility, toxicity, or volume of COPCs that could potentially enter surface water, although monitoring of these processes would not be performed.	4	Natural attenuation processes will reduce mobility, toxicity, or volume of COPCs and will be monitored.	5	Interception COPCs in shallow groundwater before discharge to surface water and monitored natural attenuation processes will reduce mobility, toxicity, or volume of source area impacts and will be monitored.
5)	Short-term effectiveness	5	No current exposure pathways that present exposure risks. No on-site activities during the construction and implementation phase would present exposure risks to the community, workers, or the environment.	4	No current exposure pathways that present exposure risks. Includes minor activities (periodic surface-water monitoring), which may present exposure risks to the community, workers, or the environment. Monitoring activities will be conducted by trained workers.	3	No current exposure pathways that present exposure risks. Includes activities (hybrid poplar planting, periodic surface-water monitoring), which may present exposure risks to the community, workers, or the environment. All activities will be conducted by trained workers.
6)	Implementability	2	Technically feasible because no technical components are necessary. However, not administratively feasible due to lack of monitoring.	4	Technically and administratively feasible. Does not prevent potential future discharge of COPCs from groundwater to surface water.	4	Technically and administratively feasible, reduces potential future discharge of COPCs from groundwater to surface water. Access to properties for phytoremediation plots may affect administrative feasibility.
7)	Cost	5	Capital Costs: $0 Total O&M Costs:$0 Periodic Costs: $0 Total Present Value Cost: $0	4	Capital Costs: $0 Total O&M Costs:$71,300 Periodic Costs: $0 Total Present Value Cost: $31,000	3	Capital Costs: $11,800 Total O&M Costs:$109,900 Periodic Costs: $0 Total Present Value Cost: $72,000
Modifying Criteria							
8)	State Acceptance	0	Likely not acceptable.	3	Likely acceptable, as there is no current exposure pathway resulting in human health risks exceeding risk levels.	4	Likely acceptable.
9)	Community Acceptance	0	Likely not acceptable.	3	Likely acceptable, as there is no current exposure pathway resulting in human health risks exceeding risk levels.	4	Likely acceptable.
Screening Totals							
		12		27		30	

Notes:
All costs are estimated to an accuracy of +50 percent to -30 percent (USEPA, 2000)
ARAR = applicable or relevant and appropriate requirement
COPC = constituents of potential concern
GW = groundwater
RAO = remedial action objective
O&M = operation and maintenance

Ratings categories for Threshold and Balancing Criteria (Excluding Cost):
(0) None
(1) Low
(2) Low to moderate
(3) Moderate
(4) Moderate to high
(5) High

Table 7-5
Summary of Comparative Analysis of Surface-Water Remedial Action Alternative Costs

Feasibility Study Operable Unit 2
AVX Corporation
Myrtle Beach, South Carolina

Remedial Action Alternative	Description	Present Value 30-year Life-Cycle ($)
Remedial Action Alternative SW-1	No Action	$0
Remedial Action Alternative SW-2	Limited Action	$31,000
Remedial Action Alternative SW-3	Active Remediation – Phytoremediation	$72,000

Notes:

Assumes a project life of 30 years. A 7% discount rate was applied per *A Guide to Developing and Documenting Cost Estimates* During the Feasibility Study, EPA 540-R-00-002 OSWER 9355.0-75; July 2000.

Costs are rounded to the nearest $1,000.

Costs are based on an accuracy of +50/-30% (USEPA, 2000).

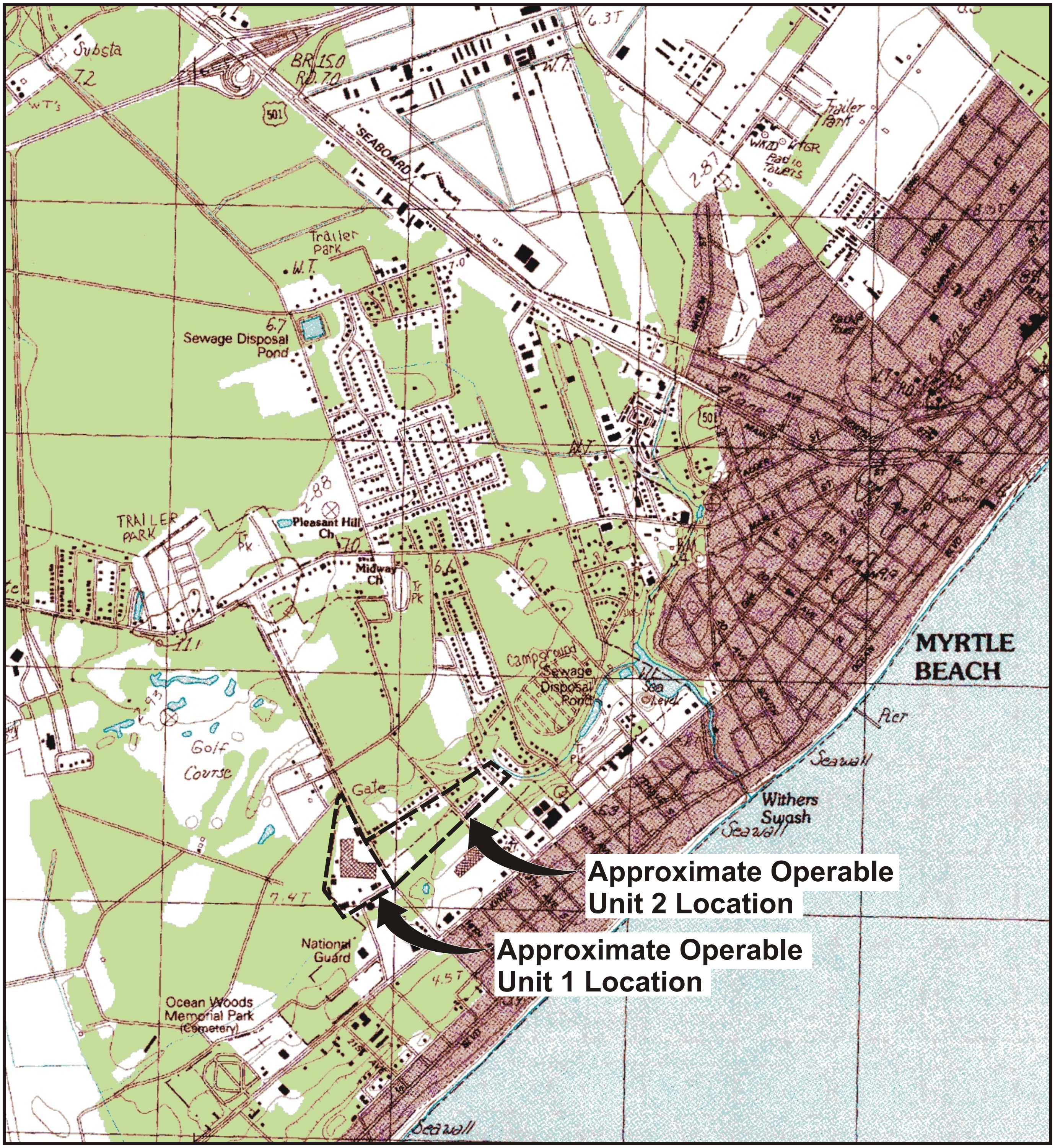
SW = Surface-Water Remedy

NA = not applicable

USEPA = United States Environmental Protection Agency

ARCADIS

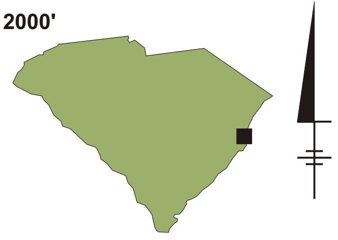
Figures



REFERENCE: BASE MAP USGS 7.5 MIN. QUAD., MYRTLE BEACH, SOUTH CAROLINA, PHOTOREVISED 1984.

2000' 0 2000'

Approximate Scale: 1" = 2000'



Area Location

AVX CORPORATION
MYRTLE BEACH FACILITY
MYRTLE BEACH, SOUTH CAROLINA

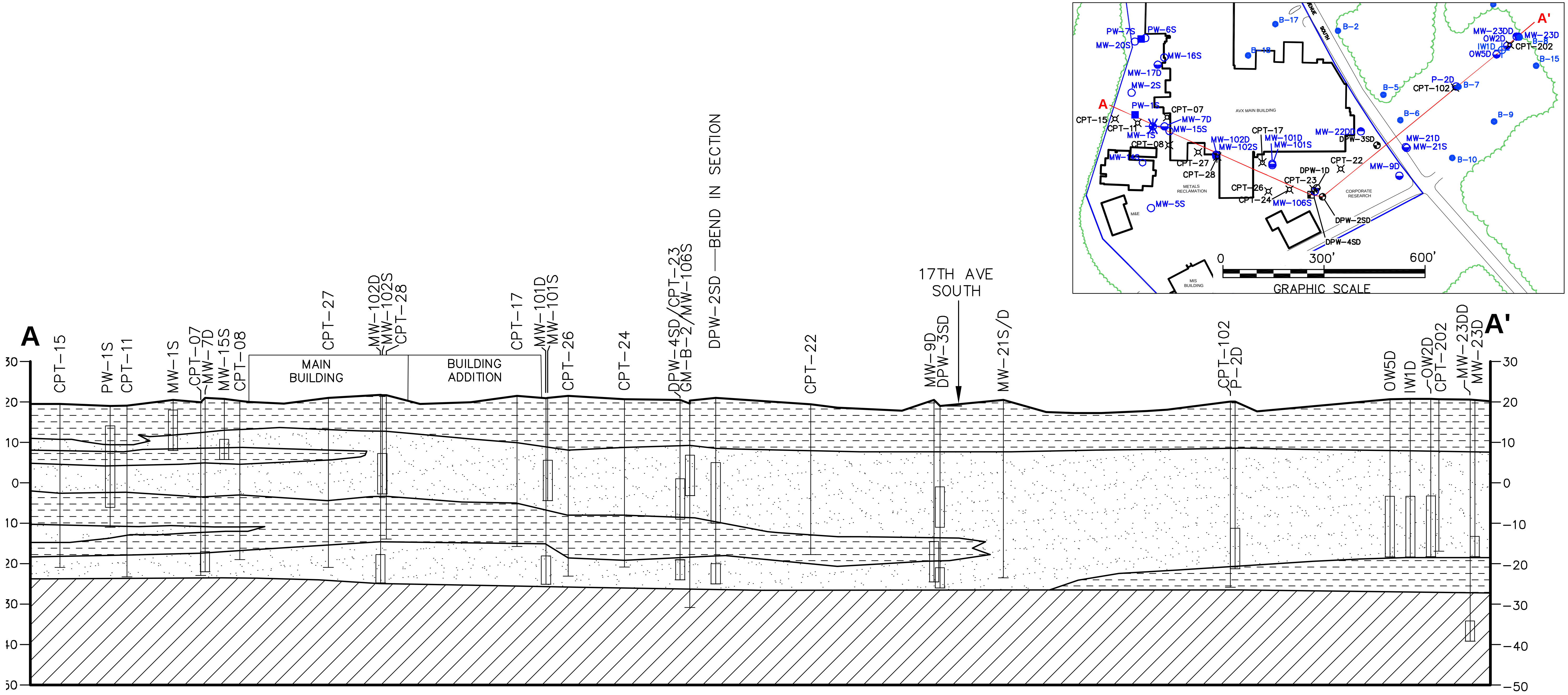
FEASIBILITY STUDY - OPERABLE UNIT 2

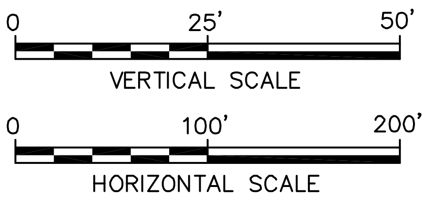
OPERABLE UNIT LOCATION MAP

ARCADIS

FIGURE
1-1

01/18/2011 SYRACUSE, NY-ENV/CAD-141, DJHOWES
B0007393/0000/00006/CDR/07393N02.CDR





LEGEND:

MW-15S	WELL ID
▯	WELL SCREEN
⊥	BOTTOM OF BORING
░	SAND, VARYING BETWEEN FINE-TO-COARSE AND FINE WITH OCCASIONAL THIN SILT INTERBEDS, FORMING MULTIPLE FINING-UPWARD SEQUENCES. SHELL FRAGMENTS ARE COMMON IN COARSE BEDS
▤	BEDDED SILT AND/OR CLAY, OCCASIONAL ORGANIC MATTER AND PARTINGS OF SAND
▨	PEEDEE FORMATION. INTERBEDDED SAND AND SILT OR CLAY; CALCITE-CEMENTED SILTSTONE AT TOP OF UNIT

NOTE:

1. FT AMSL = FEET ABOVE MEAN SEA LEVEL
2. SCREENED INTERVALS OF MW-21S AND MW-21D NOT AVAILABLE.
3. WATER TABLE DEPICTS APRIL 14, 2010 MEASUREMENTS. WELLS PW-1 AND DPW-4SD WERE PUMPING AT THE TIME OF MEASUREMENT.

AVX CORPORATION
MYRTLE BEACH FACILITY
MYRTLE BEACH, SOUTH CAROLINA
FEASIBILITY STUDY
OPERABLE UNIT 2

CROSS SECTION A - A'

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FIGURE
2-1

CITY:SYR DIV/GROUP:85 DB:A.Schilling, P.Lister, A.Schilling LD:A.Schilling PIC:(Opt) PM:MH TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACT\B0007393\0000\00006\DWG\FS\07393V01.DWG LAYOUT: 2-1SAVED: 10/14/2010 10:47 AM ACADVER: 18.0S (LMS TECH) PAGESETUP: ---PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 10/14/2010 10:56 AM BY: SCHILLING, ADAM
XREFS: 07393X01 IMAGES: PROJECTNAME: ---

CITY:Syracuse DIV/GROUP:EnvCAD DB:A.Schilling LD:A.Schilling PM:W.Popham TM: M.Hanish LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACT\B0007393\0000\00006\DWG\FS07393W02.DWG LAYOUT: 2-2 SAVED: 10/14/2010 10:59 AM ACADVER: 18.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 10/15/2010 3:24 PM BY: SCHILLING, ADAM
XREFS: 07393X01 07393X00 IMAGES: 07393X03.jpg PROJECTNAME: ----

LEGEND:

○	LOCATION OF MONITORING WELL SCREENED IN THE UPPER TERRACE DEPOSITS
◒	LOCATION OF MONITORING WELL SCREENED IN THE LOWER TERRACE DEPOSITS
◒	LOCATION OF MONITORING WELL SCREENED IN THE PEEDEE FORMATION
◐	LOCATION OF MONITORING WELL SCREENED IN THE UPPER & LOWER TERRACE DEPOSITS
■	LOCATION OF PUMPING WELL SCREENED IN THE UPPER TERRACE DEPOSITS
▣	LOCATION OF PRODUCTION WELL SCREENED IN THE UPPER & LOWER TERRACE DEPOSITS
⊕	LOCATION OF INJECTION WELL SCREENED IN THE LOWER TERRACE DEPOSITS
	CARMIKE WELL
✳	LOCATION OF FORMER MONITORING WELL THAT WAS ABANDONED OR DESTROYED
▲	LOCATION OF SOIL VAPOR EXTRACTION WELL (CURRENTLY USED FOR GROUNDWATER ELEVATION MONITORING)
(14.38)	GROUNDWATER ELEVATION (FEET ABOVE MEAN SEA LEVEL [AMSL])
7 —	GROUNDWATER ELEVATION CONTOUR (FEET AMSL) DASHED WHERE INFERRED
(NA)	NOT APPLICABLE

NOTES:

1. AERIAL PHOTOGRAPH OBTAINED FROM THE SOUTH CAROLINA DEPARTMENT OF NATURAL RESOURCES WEBSITE (2007).
2. LOCATION OF ROADS ARE APPROXIMATE.
3. THE FORMER CORPORATE RESEARCH BUILDING HAS BEEN DEMOLISHED.
4. * WATER LEVELS IN PUMPING WELLS PW-1S, PW-7S AND DPW-4SD NOT CONTOURED EXPLICITLY.

0 300' 600'
GRAPHIC SCALE

AVX CORPORATION
MYRTLE BEACH FACILITY
MYRTLE BEACH, SOUTH CAROLINA
FEASIBILITY STUDY
OPERABLE UNIT 2

POTENTIOMETRIC SURFACE - LOWER TERRACE DEPOSIT NOVEMBER 7, 2008

ARCADIS

FIGURE
2-2

CITY:Syracuse GROUP:EnvCAD DB:A.Schilling, R.Bassett, A.Schilling LD: A.Schilling PM: W.Popham TM:M.Hanish LYR:(Opt)ON=*;OFF=REF, (FRZ)
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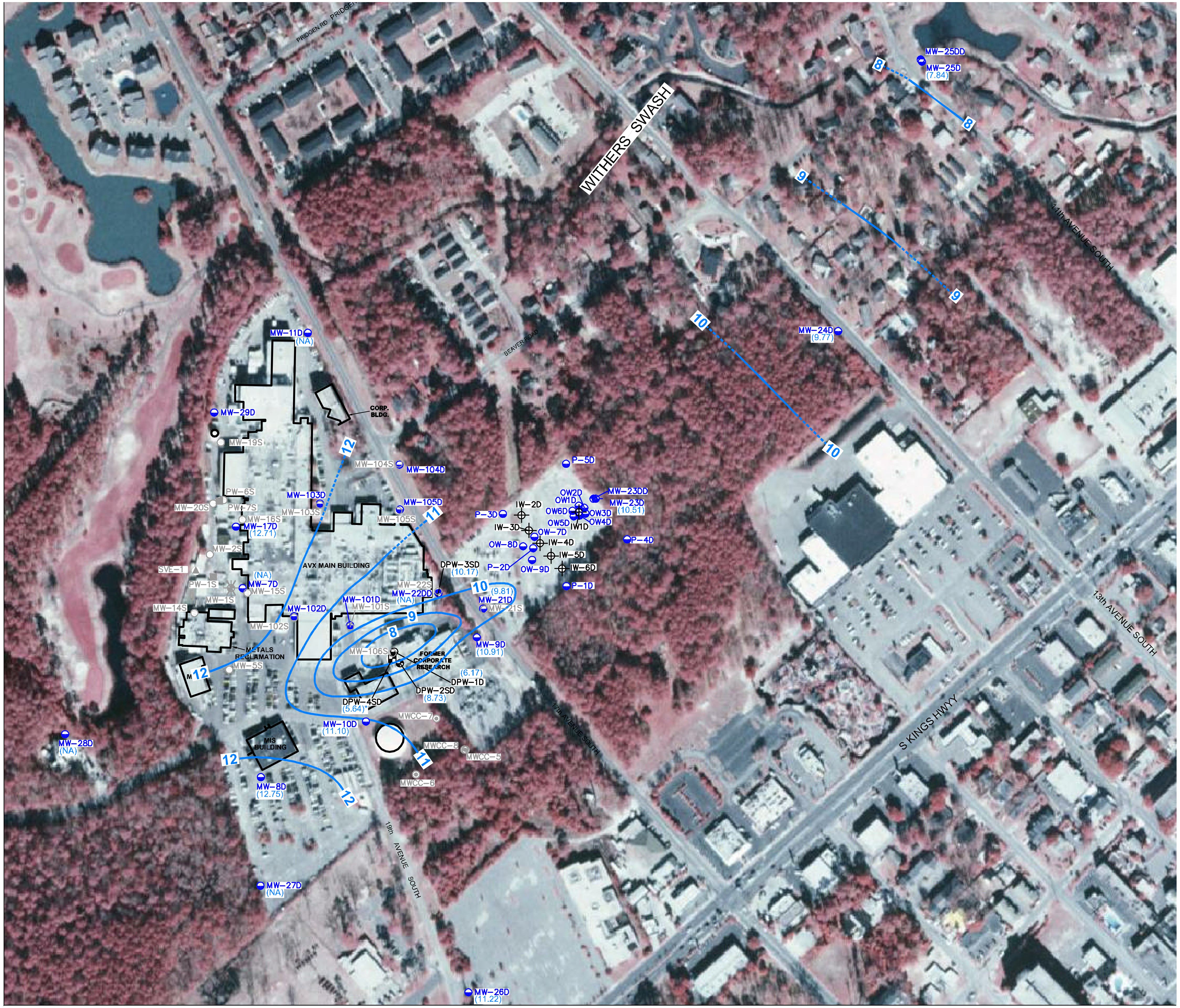
07393X00



LEGEND:

- ○ LOCATION OF MONITORING WELL SCREENED IN THE UPPER TERRACE DEPOSITS
- ◒ LOCATION OF MONITORING WELL SCREENED IN THE LOWER TERRACE DEPOSITS
- ◒ LOCATION OF MONITORING WELL SCREENED IN THE PEEDEE FORMATION
- ◕ LOCATION OF MONITORING WELL SCREENED IN THE UPPER & LOWER TERRACE DEPOSITS
- ■ LOCATION OF PUMPING WELL SCREENED IN THE UPPER TERRACE DEPOSITS
- ▩ LOCATION OF PRODUCTION WELL SCREENED IN THE UPPER & LOWER TERRACE DEPOSITS
- ⌖ LOCATION OF INJECTION WELL SCREENED IN THE LOWER TERRACE DEPOSITS
- ◎ CARMIKE WELL
- ✳ LOCATION OF FORMER MONITORING WELL THAT WAS ABANDONED OR DESTROYED
- ▲ LOCATION OF SOIL VAPOR EXTRACTION WELL (CURRENTLY USED FOR GROUNDWATER ELEVATION MONITORING)
- (10.17) GROUNDWATER ELEVATION (FEET ABOVE MEAN SEA LEVEL [AMSL])
- 12 —— GROUNDWATER ELEVATION CONTOUR (FEET AMSL) DASHED WHERE INFERRED
- NA NOT AVAILABLE
- * NOT USED IN CONTOURING

NOTES:

1. AERIAL PHOTOGRAPH OBTAINED FROM THE SOUTH CAROLINA DEPARTMENT OF NATURAL RESOURCES WEBSITE (2007).
2. LOCATION OF ROADS ARE APPROXIMATE.
3. THE FORMER CORPORATE RESEARCH BUILDING HAS BEEN DEMOLISHED.
4. * WATER LEVELS IN PUMPING WELLS PW-1S, PW-7S AND DPW-4SD NOT CONTOURED EXPLICITLY.

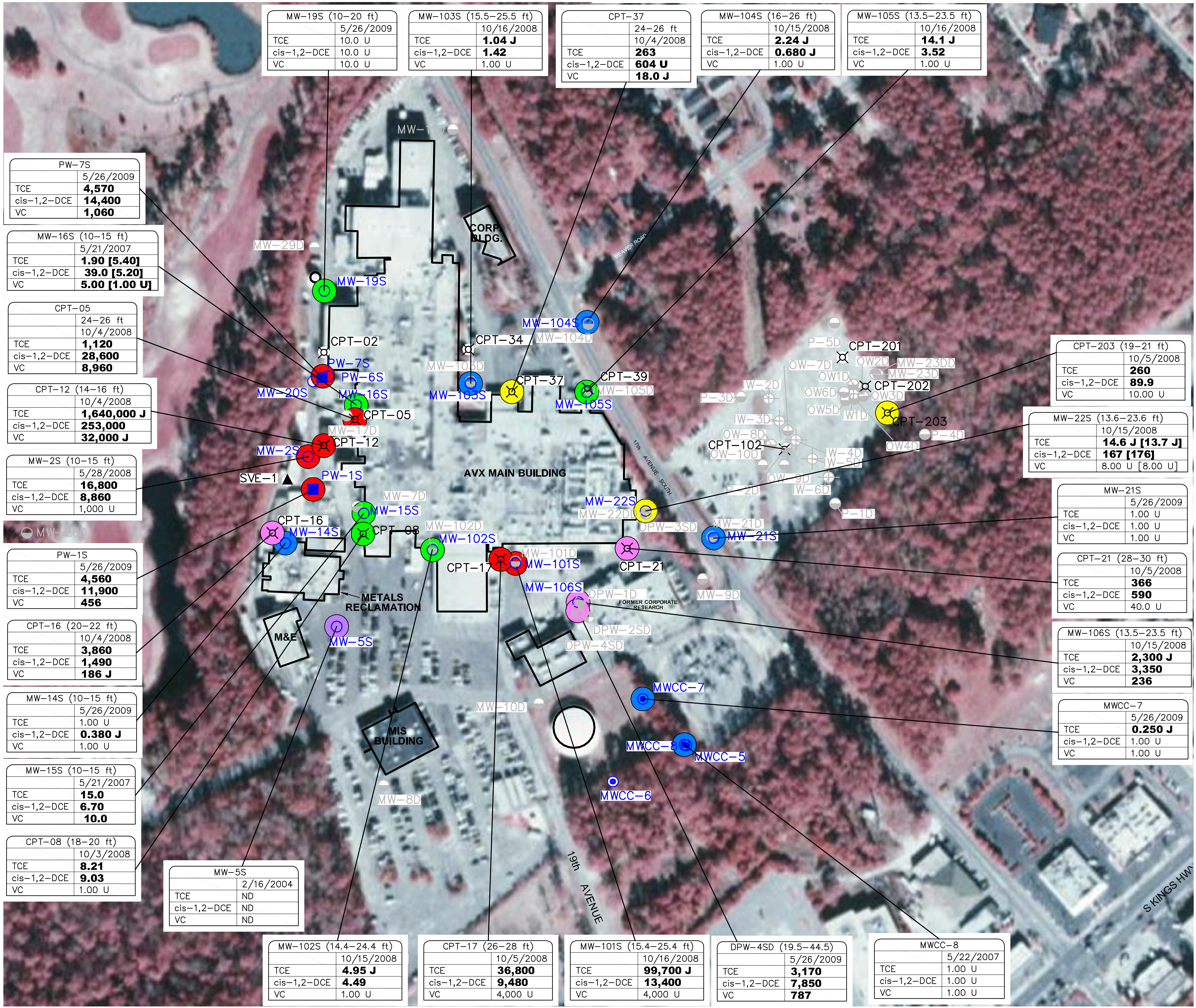
0 300' 600'
GRAPHIC SCALE

AVX CORPORATION
MYRTLE BEACH FACILITY
MYRTLE BEACH, SOUTH CAROLINA
FEASIBILITY STUDY
OPERABLE UNIT 2

POTENTIOMETRIC SURFACE - LOWER TERRACE DEPOSITS - MAY 26, 2009

ARCADIS

FIGURE
2-3



MW-19S (10–20 ft)	
	5/26/2009
TCE	10.0 U
cis–1,2–DCE	10.0 U
VC	10.0 U

MW-103S (15.5–25.5 ft)	
	10/16/2008
TCE	**1.04 J**
cis–1,2–DCE	**1.42**
VC	1.00 U

CPT-37	
	24–26 ft
	10/4/2008
TCE	**263**
cis–1,2–DCE	**604 U**
VC	**18.0 J**

MW-104S (16–26 ft)	
	10/15/2008
TCE	**2.24 J**
cis–1,2–DCE	**0.680 J**
VC	1.00 U

MW-105S (13.5–23.5 ft)	
	10/16/2008
TCE	**14.1 J**
cis–1,2–DCE	**3.52**
VC	1.00 U

PW-7S	
	5/26/2009
TCE	**4,570**
cis–1,2–DCE	**14,400**
VC	**1,060**

MW-16S (10–15 ft)	
	5/21/2007
TCE	**1.90 [5.40]**
cis–1,2–DCE	**39.0 [5.20]**
VC	**5.00 [1.00 U]**

CPT-05	
	24–26 ft
	10/4/2008
TCE	**1,120**
cis–1,2–DCE	**28,600**
VC	**8,960**

CPT-12 (14–16 ft)	
	10/4/2008
TCE	**1,640,000 J**
cis–1,2–DCE	**253,000**
VC	**32,000 J**

MW-2S (10–15 ft)	
	5/28/2008
TCE	**16,800**
cis–1,2–DCE	**8,860**
VC	1,000 U

PW-1S	
	5/26/2009
TCE	**4,560**
cis–1,2–DCE	**11,900**
VC	**456**

CPT-16 (20–22 ft)	
	10/4/2008
TCE	**3,860**
cis–1,2–DCE	**1,490**
VC	**186 J**

MW-14S (10–15 ft)	
	5/26/2009
TCE	1.00 U
cis–1,2–DCE	**0.380 J**
VC	1.00 U

MW-15S (10–15 ft)	
	5/21/2007
TCE	**15.0**
cis–1,2–DCE	**6.70**
VC	**10.0**

CPT-08 (18–20 ft)	
	10/3/2008
TCE	**8.21**
cis–1,2–DCE	**9.03**
VC	1.00 U

MW-5S	
	2/16/2004
TCE	ND
cis–1,2–DCE	ND
VC	ND

MW-102S (14.4–24.4 ft)	
	10/15/2008
TCE	**4.95 J**
cis–1,2–DCE	**4.49**
VC	1.00 U

CPT-17 (26–28 ft)	
	10/5/2008
TCE	**36,800**
cis–1,2–DCE	**9,480**
VC	4,000 U

MW-101S (15.4–25.4 ft)	
	10/16/2008
TCE	**99,700 J**
cis–1,2–DCE	**13,400**
VC	4,000 U

DPW-4SD (19.5–44.5)	
	5/26/2009
TCE	**3,170**
cis–1,2–DCE	**7,850**
VC	**787**

MWCC-8	
	5/22/2007
TCE	1.00 U
cis–1,2–DCE	1.00 U
VC	1.00 U

CPT-203 (19–21 ft)	
	10/5/2008
TCE	**260**
cis–1,2–DCE	**89.9**
VC	10.00 U

MW-22S (13.6–23.6 ft)	
	10/15/2008
TCE	**14.6 J [13.7 J]**
cis–1,2–DCE	**167 [176]**
VC	8.00 U [8.00 U]

MW-21S	
	5/26/2009
TCE	1.00 U
cis–1,2–DCE	1.00 U
VC	1.00 U

CPT-21 (28–30 ft)	
	10/5/2008
TCE	**366**
cis–1,2–DCE	**590**
VC	40.0 U

MW-106S (13.5–23.5 ft)	
	10/15/2008
TCE	**2,300 J**
cis–1,2–DCE	**3,350**
VC	**236**

MWCC-7	
	5/26/2009
TCE	**0.250 J**
cis–1,2–DCE	1.00 U
VC	1.00 U

LEGEND:

○	LOCATION OF MONITORING WELL SCREENED IN THE UPPER TERRACE DEPOSITS
◒	LOCATION OF MONITORING WELL SCREENED IN THE LOWER TERRACE DEPOSITS
◓	LOCATION OF MONITORING WELL SCREENED IN THE PEEDEE FORMATION
◔	LOCATION OF MONITORING WELL SCREENED IN THE UPPER & LOWER TERRACE DEPOSITS
■	LOCATION OF PUMPING WELL SCREENED IN THE UPPER TERRACE DEPOSITS
▨	LOCATION OF PRODUCTION WELL SCREENED IN THE UPPER & LOWER TERRACE DEPOSITS
⌖	LOCATION OF INJECTION WELL SCREENED IN THE LOWER TERRACE DEPOSITS
◉	CARMIKE WELL
▲	LOCATION OF SOIL VAPOR EXTRACTION WELL (CURRENTLY USED FOR GROUNDWATER ELEVATION MONITORING)
¤	LOCATION OF CPT BORING

TOTAL DETECTED VOC CONCENTRATION

🔴	>10,000 µg/L
🩷	1,000 – 10,000 µg/L
🟡	100 – 1,000 µg/L
🟢	10 – 100 µg/L
🔵	1 – 10 µg/L
🟣	ND – 1 µg/L

NOTES:

1. AERIAL PHOTOGRAPH OBTAINED FROM THE SOUTH CAROLINA DEPARTMENT OF NATURAL RESOURCES WEBSITE (2007).
2. THE FORMER CORPORATE RESEARCH BUILDING HAS BEEN DEMOLISHED.
3. DATA PRESENTED IN MICROGRAMS PER LITER (µg/L).
4. VOC – VOLATILE ORGANIC COMPOUNDS
5. BOLD VALUES INDICATE COMPOUND DETECTED ABOVE ANALYTICAL METHOD DETECTION LIMIT.
6. BRACKETED RESULTS INDICATE DUPLICATE SAMPLE.
7. J – INDICATES AN ESTIMATED VALUE.
8. U – COMPOUND WAS ANALYZED FOR BUT NOT DETECTED. ASSOCIATED VALUE IS THE COMPOUND QUANTITATION LIMIT.
9. cis–1,2–DCE – cis–1,2–DICHLOROETHENE
10. TCE – TRICHLOROETHENE
11. VC – VINYL CHLORIDE
12. ft.– FEET BELOW GROUND SURFACE
13. ND – NOT DETECTED

0 200' 400'

GRAPHIC SCALE

AVX CORPORATION
MYRTLE BEACH FACILITY
MYRTLE BEACH, SOUTH CAROLINA
FEASIBILITY STUDY
OPERABLE UNIT 2

GROUNDWATER ANALYTICAL RESULTS - UPPER TERRACE DEPOSITS

ARCADIS

FIGURE
2-4

CITY: Syracuse GROUP: EnvCAD DB: A.Schilling R. BASSETT A.Schilling LD: A.Schilling PM: W.Popham TM: M.HANISH LYR: ON=*;OFF=REF, (FRZ) PAGESETUP: --- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 10/15/2010 3:26 PM BY: SCHILLING, ADAM
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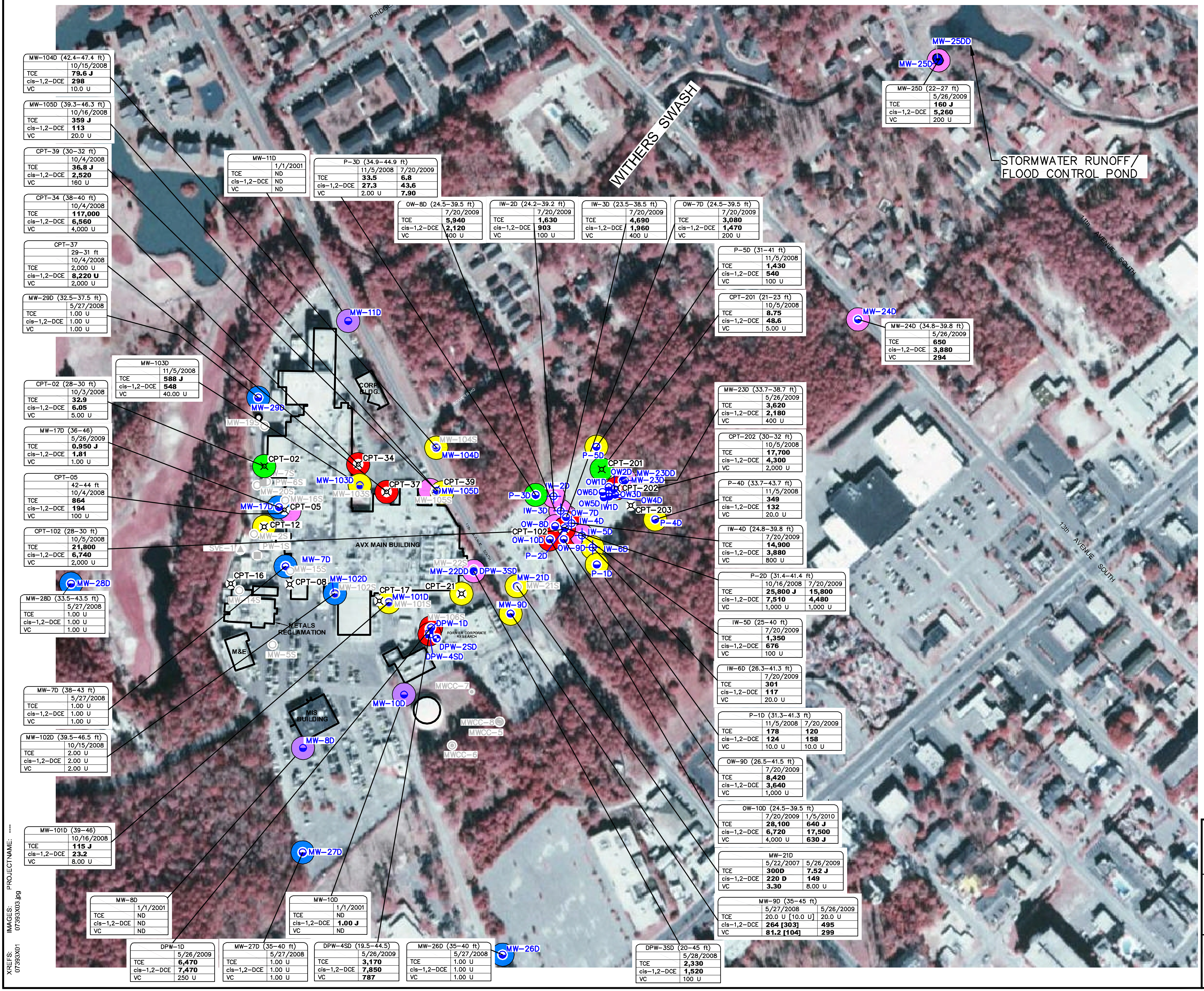
XREFS: 07393X01 IMAGES: 07393X03.jpg PROJECTNAME: ---



MW-104D (42.4–47.4 ft)	
	10/15/2008
TCE	**79.6 J**
cis–1,2–DCE	**298**
VC	10.0 U

MW-105D (39.3–46.3 ft)	
	10/16/2008
TCE	**359 J**
cis–1,2–DCE	**113**
VC	20.0 U

CPT-39 (30–32 ft)	
	10/4/2008
TCE	**36.8 J**
cis–1,2–DCE	**2,520**
VC	160 U

CPT-34 (38–40 ft)	
	10/4/2008
TCE	**117,000**
cis–1,2–DCE	**6,560**
VC	4,000 U

CPT-37	
	29–31 ft
	10/4/2008
TCE	2,000 U
cis–1,2–DCE	**8,220 U**
VC	2,000 U

MW-29D (32.5–37.5 ft)	
	5/27/2008
TCE	1.00 U
cis–1,2–DCE	1.00 U
VC	1.00 U

MW-103D	
	11/5/2008
TCE	**588 J**
cis–1,2–DCE	**548**
VC	40.00 U

CPT-02 (28–30 ft)	
	10/3/2008
TCE	**32.9**
cis–1,2–DCE	**6.05**
VC	5.00 U

MW-17D (36–46)	
	5/26/2009
TCE	**0.950 J**
cis–1,2–DCE	**1.81**
VC	1.00 U

CPT-05	
	42–44 ft
	10/4/2008
TCE	**864**
cis–1,2–DCE	**194**
VC	100 U

CPT-102 (28–30 ft)	
	10/5/2008
TCE	**21,800**
cis–1,2–DCE	**6,740**
VC	2,000 U

MW-28D (33.5–43.5 ft)	
	5/27/2008
TCE	1.00 U
cis–1,2–DCE	1.00 U
VC	1.00 U

MW-7D (38–43 ft)	
	5/27/2008
TCE	1.00 U
cis–1,2–DCE	1.00 U
VC	1.00 U

MW-102D (39.5–46.5 ft)	
	10/15/2008
TCE	2.00 U
cis–1,2–DCE	2.00 U
VC	2.00 U

MW-101D (39–46)	
	10/16/2008
TCE	**115 J**
cis–1,2–DCE	**23.2**
VC	8.00 U

MW-8D	
	1/1/2001
TCE	ND
cis–1,2–DCE	ND
VC	ND

MW-10D	
	1/1/2001
TCE	ND
cis–1,2–DCE	**1.00 J**
VC	ND

DPW-1D	
	5/26/2009
TCE	**6,470**
cis–1,2–DCE	**7,470**
VC	250 U

MW-27D (35–40 ft)	
	5/27/2008
TCE	1.00 U
cis–1,2–DCE	1.00 U
VC	1.00 U

DPW-4SD (19.5–44.5)	
	5/26/2009
TCE	**3,170**
cis–1,2–DCE	**7,850**
VC	**787**

MW-26D (35–40 ft)	
	5/27/2008
TCE	1.00 U
cis–1,2–DCE	1.00 U
VC	1.00 U

DPW-3SD (20–45 ft)	
	5/28/2008
TCE	**2,330**
cis–1,2–DCE	**1,520**
VC	100 U

MW-11D	
	1/1/2001
TCE	ND
cis–1,2–DCE	ND
VC	ND

P-3D (34.9–44.9 ft)		
	11/5/2008	7/20/2009
TCE	**33.5**	**6.8**
cis–1,2–DCE	**27.3**	**43.6**
VC	2.00 U	**7.90**

OW-8D (24.5–39.5 ft)	
	7/20/2009
TCE	**5,940**
cis–1,2–DCE	**2,120**
VC	400 U

IW-2D (24.2–39.2 ft)	
	7/20/2009
TCE	**1,630**
cis–1,2–DCE	**903**
VC	100 U

IW-3D (23.5–38.5 ft)	
	7/20/2009
TCE	**4,690**
cis–1,2–DCE	**1,960**
VC	400 U

OW-7D (24.5–39.5 ft)	
	7/20/2009
TCE	**3,080**
cis–1,2–DCE	**1,470**
VC	200 U

P-5D (31–41 ft)	
	11/5/2008
TCE	**1,430**
cis–1,2–DCE	**540**
VC	100 U

CPT-201 (21–23 ft)	
	10/5/2008
TCE	**8.75**
cis–1,2–DCE	**48.6**
VC	5.00 U

MW-23D (33.7–38.7 ft)	
	5/26/2009
TCE	**3,620**
cis–1,2–DCE	**2,180**
VC	400 U

CPT-202 (30–32 ft)	
	10/5/2008
TCE	**17,700**
cis–1,2–DCE	**4,300**
VC	2,000 U

P-4D (33.7–43.7 ft)	
	11/5/2008
TCE	**349**
cis–1,2–DCE	**132**
VC	20.0 U

IW-4D (24.8–39.8 ft)	
	7/20/2009
TCE	**14,900**
cis–1,2–DCE	**3,880**
VC	800 U

P-2D (31.4–41.4 ft)		
	10/16/2008	7/20/2009
TCE	**25,800 J**	**15,800**
cis–1,2–DCE	**7,510**	**4,480**
VC	1,000 U	1,000 U

IW-5D (25–40 ft)	
	7/20/2009
TCE	**1,350**
cis–1,2–DCE	**676**
VC	100 U

IW-6D (26.3–41.3 ft)	
	7/20/2009
TCE	**301**
cis–1,2–DCE	**117**
VC	20.0 U

P-1D (31.3–41.3 ft)		
	11/5/2008	7/20/2009
TCE	**178**	**120**
cis–1,2–DCE	**124**	**158**
VC	10.0 U	10.0 U

OW-9D (26.5–41.5 ft)	
	7/20/2009
TCE	**8,420**
cis–1,2–DCE	**3,640**
VC	1,000 U

OW-10D (24.5–39.5 ft)		
	7/20/2009	1/5/2010
TCE	**28,100**	**640 J**
cis–1,2–DCE	**6,720**	**17,500**
VC	4,000 U	**630 J**

MW-21D		
	5/22/2007	5/26/2009
TCE	**300D**	**7.52 J**
cis–1,2–DCE	**220 D**	**149**
VC	**3.30**	8.00 U

MW-9D (35–45 ft)		
	5/27/2008	5/26/2009
TCE	20.0 U [10.0 U]	20.0 U
cis–1,2–DCE	**264 [303]**	**495**
VC	**81.2 [104]**	**299**

MW-25D (22–27 ft)	
	5/26/2009
TCE	**160 J**
cis–1,2–DCE	**5,260**
VC	200 U

MW-24D (34.8–39.8 ft)	
	5/26/2009
TCE	**650**
cis–1,2–DCE	**3,880**
VC	**294**

LEGEND:

○	LOCATION OF MONITORING WELL SCREENED IN THE UPPER TERRACE DEPOSITS
◒	LOCATION OF MONITORING WELL SCREENED IN THE LOWER TERRACE DEPOSITS
◓	LOCATION OF MONITORING WELL SCREENED IN THE PEEDEE FORMATION
◕	LOCATION OF MONITORING WELL SCREENED IN THE UPPER & LOWER TERRACE DEPOSITS
■	LOCATION OF PUMPING WELL SCREENED IN THE UPPER TERRACE DEPOSITS
▣	LOCATION OF PRODUCTION WELL SCREENED IN THE UPPER & LOWER TERRACE DEPOSITS
⌖	LOCATION OF INJECTION WELL SCREENED IN THE LOWER TERRACE DEPOSITS
◉	CARMIKE WELL
▲	LOCATION OF SOIL VAPOR EXTRACTION WELL (CURRENTLY USED FOR GROUNDWATER ELEVATION MONITORING)
⊠	LOCATION OF CPT BORING

TOTAL DETECTED VOC CONCENTRATION

●	>10,000 μg/L
●	1,000 – 10,000 μg/L
●	100 – 1,000 μg/L
●	10 – 100 μg/L
●	1 – 10 μg/L
●	ND – 1 μg/L

NOTE:

1. AERIAL PHOTOGRAPH OBTAINED FROM THE SOUTH CAROLINA DEPARTMENT OF NATURAL RESOURCES WEBSITE (2007).
2. THE FORMER CORPORATE RESEARCH BUILDING HAS BEEN DEMOLISHED.
3. DATA PRESENTED IN MICROGRAMS PER LITER (μg/L).
4. VOC – VOLATILE ORGANIC COMPOUNDS
5. BOLD VALUES INDICATE COMPOUND DETECTED ABOVE ANALYTICAL METHOD DETECTION LIMIT.
6. D – COMPOUND QUANTITATED USING A SECONDARY DILUTION.
7. J – INDICATES AN ESTIMATED VALUE.
8. U – COMPOUND WAS ANALYZED FOR BUT NOT DETECTED. ASSOCIATED VALUE IS THE COMPOUND QUANTITATION LIMIT.
9. BRACKETED RESULTS INDICATE DUPLICATE SAMPLE.
10. cis–1,2–DCE – cis–1,2–DICHLOROETHENE
11. TCE – TRICHLOROETHENE
12. VC – VINYL CHLORIDE
13. ft. – FEET BELOW GROUND SURFACE
14. ND – NOT DETECTED

0 300' 600'

GRAPHIC SCALE

AVX CORPORATION
MYRTLE BEACH FACILITY
MYRTLE BEACH, SOUTH CAROLINA
FEASIBILITY STUDY
OPERABLE UNIT 2

GROUNDWATER ANALYTICAL RESULTS - LOWER TERRACE DEPOSITS

ARCADIS

FIGURE
2-5

CITY:SYRACUSE, NY GROUP: ENVCAD DB: A.Schilling R. BASSETT A.Schilling LD: A.Schilling PM: W.Popham TM: M.Hanish LYR: ON=*;OFF=REF, (FRZ)
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XREFS: 07393X01 07393XDL IMAGES: 07393X03.jpg PROJECTNAME: ----

LEGEND:

● IRRIGATION WELLS SAMPLED BY THE SCDHEC

NOTES:

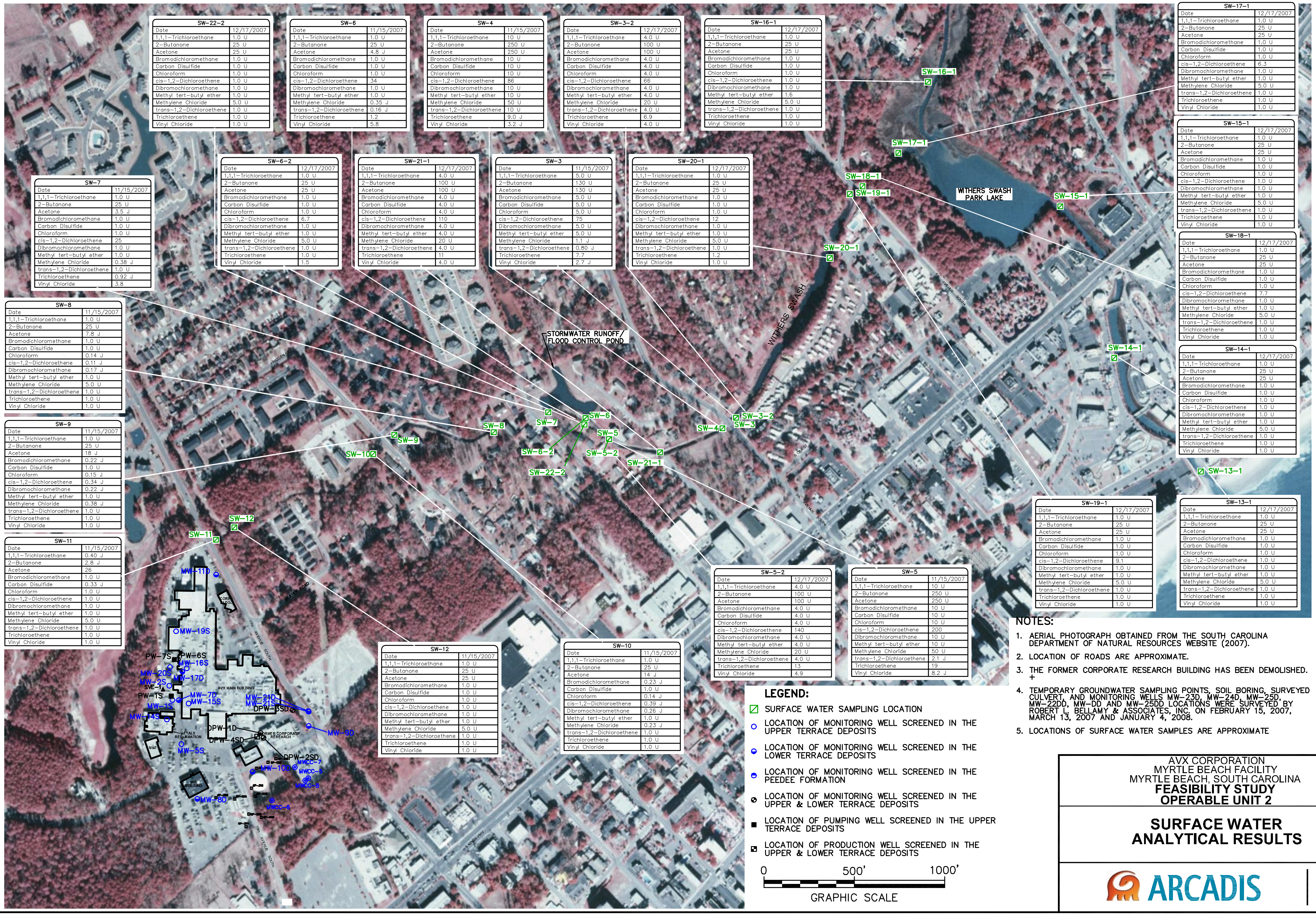
1. AERIAL PHOTOGRAPH OBTAINED FROM THE SOUTH CAROLINA DEPARTMENT OF NATURAL RESOURCES WEBSITE (2007).
2. LOCATION OF ROADS ARE APPROXIMATE.
3. THE FORMER CORPORATE RESEARCH BUILDING HAS BEEN DEMOLISHED.
4. LOCATIONS OF IRRIGATION WELLS ARE APPROXIMATE.

AVX CORPORATION
MYRTLE BEACH FACILITY
MYRTLE BEACH, SOUTH CAROLINA
FEASIBILITY STUDY
OPERABLE UNIT 2

IRRIGATION WELL LOCATIONS

ARCADIS

FIGURE
2-6



SW-22-2	
Date	12/17/2007
1,1,1-Trichloroethane	1.0 U
2-Butanone	25 U
Acetone	25 U
Bromodichloromethane	1.0 U
Carbon Disulfide	1.0 U
Chloroform	1.0 U
cis-1,2-Dichloroethene	1.0 U
Dibromochloromethane	1.0 U
Methyl tert-butyl ether	1.0 U
Methylene Chloride	5.0 U
trans-1,2-Dichloroethene	1.0 U
Trichloroethene	1.0 U
Vinyl Chloride	1.0 U

SW-6	
Date	11/15/2007
1,1,1-Trichloroethane	1.0 U
2-Butanone	25 U
Acetone	4.8 J
Bromodichloromethane	1.0 U
Carbon Disulfide	1.0 U
Chloroform	1.0 U
cis-1,2-Dichloroethene	34
Dibromochloromethane	1.0 U
Methyl tert-butyl ether	1.0 U
Methylene Chloride	0.35 J
trans-1,2-Dichloroethene	0.16 J
Trichloroethene	1.2
Vinyl Chloride	5.8

SW-4	
Date	11/15/2007
1,1,1-Trichloroethane	10 U
2-Butanone	250 U
Acetone	250 U
Bromodichloromethane	10 U
Carbon Disulfide	10 U
Chloroform	10 U
cis-1,2-Dichloroethene	86
Dibromochloromethane	10 U
Methyl tert-butyl ether	10 U
Methylene Chloride	50 U
trans-1,2-Dichloroethene	10 U
Trichloroethene	9.0 J
Vinyl Chloride	3.2 J

SW-3-2	
Date	12/17/2007
1,1,1-Trichloroethane	4.0 U
2-Butanone	100 U
Acetone	100 U
Bromodichloromethane	4.0 U
Carbon Disulfide	4.0 U
Chloroform	4.0 U
cis-1,2-Dichloroethene	66
Dibromochloromethane	4.0 U
Methyl tert-butyl ether	4.0 U
Methylene Chloride	20 U
trans-1,2-Dichloroethene	4.0 U
Trichloroethene	6.9
Vinyl Chloride	4.0 U

SW-16-1	
Date	12/17/2007
1,1,1-Trichloroethane	1.0 U
2-Butanone	25 U
Acetone	25 U
Bromodichloromethane	1.0 U
Carbon Disulfide	1.0 U
Chloroform	1.0 U
cis-1,2-Dichloroethene	1.0 U
Dibromochloromethane	1.0 U
Methyl tert-butyl ether	1.6
Methylene Chloride	5.0 U
trans-1,2-Dichloroethene	1.0 U
Trichloroethene	1.0 U
Vinyl Chloride	1.0 U

SW-17-1	
Date	12/17/2007
1,1,1-Trichloroethane	1.0 U
2-Butanone	25 U
Acetone	25 U
Bromodichloromethane	1.0 U
Carbon Disulfide	1.0 U
Chloroform	1.0 U
cis-1,2-Dichloroethene	6.3
Dibromochloromethane	1.0 U
Methyl tert-butyl ether	1.0 U
Methylene Chloride	5.0 U
trans-1,2-Dichloroethene	1.0 U
Trichloroethene	1.0 U
Vinyl Chloride	1.0 U

SW-7	
Date	11/15/2007
1,1,1-Trichloroethane	1.0 U
2-Butanone	25 U
Acetone	3.5 J
Bromodichloromethane	1.0 U
Carbon Disulfide	1.0 U
Chloroform	1.0 U
cis-1,2-Dichloroethene	25
Dibromochloromethane	1.0 U
Methyl tert-butyl ether	1.0 U
Methylene Chloride	0.38 J
trans-1,2-Dichloroethene	1.0 U
Trichloroethene	0.92 J
Vinyl Chloride	3.8

SW-6-2	
Date	12/17/2007
1,1,1-Trichloroethane	1.0 U
2-Butanone	25 U
Acetone	25 U
Bromodichloromethane	1.0 U
Carbon Disulfide	1.0 U
Chloroform	1.0 U
cis-1,2-Dichloroethene	6.7
Dibromochloromethane	1.0 U
Methyl tert-butyl ether	1.0 U
Methylene Chloride	5.0 U
trans-1,2-Dichloroethene	1.0 U
Trichloroethene	1.0 U
Vinyl Chloride	1.5

SW-21-1	
Date	12/17/2007
1,1,1-Trichloroethane	4.0 U
2-Butanone	100 U
Acetone	100 U
Bromodichloromethane	4.0 U
Carbon Disulfide	4.0 U
Chloroform	4.0 U
cis-1,2-Dichloroethene	110
Dibromochloromethane	4.0 U
Methyl tert-butyl ether	4.0 U
Methylene Chloride	20 U
trans-1,2-Dichloroethene	4.0 U
Trichloroethene	11
Vinyl Chloride	4.0 U

SW-3	
Date	11/15/2007
1,1,1-Trichloroethane	5.0 U
2-Butanone	130 U
Acetone	130 U
Bromodichloromethane	5.0 U
Carbon Disulfide	5.0 U
Chloroform	5.0 U
cis-1,2-Dichloroethene	75
Dibromochloromethane	5.0 U
Methyl tert-butyl ether	5.0 U
Methylene Chloride	1.1 J
trans-1,2-Dichloroethene	0.80 J
Trichloroethene	7.7
Vinyl Chloride	2.7 J

SW-20-1	
Date	12/17/2007
1,1,1-Trichloroethane	1.0 U
2-Butanone	25 U
Acetone	25 U
Bromodichloromethane	1.0 U
Carbon Disulfide	1.0 U
Chloroform	1.0 U
cis-1,2-Dichloroethene	12
Dibromochloromethane	1.0 U
Methyl tert-butyl ether	1.0 U
Methylene Chloride	5.0 U
trans-1,2-Dichloroethene	1.0 U
Trichloroethene	1.2
Vinyl Chloride	1.0 U

SW-15-1	
Date	12/17/2007
1,1,1-Trichloroethane	1.0 U
2-Butanone	25 U
Acetone	25 U
Bromodichloromethane	1.0 U
Carbon Disulfide	1.0 U
Chloroform	1.0 U
cis-1,2-Dichloroethene	1.0 U
Dibromochloromethane	1.0 U
Methyl tert-butyl ether	1.0 U
Methylene Chloride	5.0 U
trans-1,2-Dichloroethene	1.0 U
Trichloroethene	1.0 U
Vinyl Chloride	1.0 U

SW-18-1	
Date	12/17/2007
1,1,1-Trichloroethane	1.0 U
2-Butanone	25 U
Acetone	25 U
Bromodichloromethane	1.0 U
Carbon Disulfide	1.0 U
Chloroform	1.0 U
cis-1,2-Dichloroethene	7.7
Dibromochloromethane	1.0 U
Methyl tert-butyl ether	1.0 U
Methylene Chloride	5.0 U
trans-1,2-Dichloroethene	1.0 U
Trichloroethene	1.0 U
Vinyl Chloride	1.0 U

SW-14-1	
Date	12/17/2007
1,1,1-Trichloroethane	1.0 U
2-Butanone	25 U
Acetone	25 U
Bromodichloromethane	1.0 U
Carbon Disulfide	1.0 U
Chloroform	1.0 U
cis-1,2-Dichloroethene	1.0 U
Dibromochloromethane	1.0 U
Methyl tert-butyl ether	1.0 U
Methylene Chloride	5.0 U
trans-1,2-Dichloroethene	1.0 U
Trichloroethene	1.0 U
Vinyl Chloride	1.0 U

SW-8	
Date	11/15/2007
1,1,1-Trichloroethane	1.0 U
2-Butanone	25 U
Acetone	7.8 J
Bromodichloromethane	1.0 U
Carbon Disulfide	1.0 U
Chloroform	0.14 J
cis-1,2-Dichloroethene	0.11 J
Dibromochloromethane	0.17 J
Methyl tert-butyl ether	1.0 U
Methylene Chloride	5.0 U
trans-1,2-Dichloroethene	1.0 U
Trichloroethene	1.0 U
Vinyl Chloride	1.0 U

SW-9	
Date	11/15/2007
1,1,1-Trichloroethane	1.0 U
2-Butanone	25 U
Acetone	18 J
Bromodichloromethane	0.22 J
Carbon Disulfide	1.0 U
Chloroform	0.15 J
cis-1,2-Dichloroethene	0.34 J
Dibromochloromethane	0.22 J
Methyl tert-butyl ether	1.0 U
Methylene Chloride	0.38 J
trans-1,2-Dichloroethene	1.0 U
Trichloroethene	1.0 U
Vinyl Chloride	1.0 U

SW-11	
Date	11/15/2007
1,1,1-Trichloroethane	0.40 J
2-Butanone	2.8 J
Acetone	26
Bromodichloromethane	1.0 U
Carbon Disulfide	0.33 J
Chloroform	1.0 U
cis-1,2-Dichloroethene	1.0 U
Dibromochloromethane	1.0 U
Methyl tert-butyl ether	1.0 U
Methylene Chloride	5.0 U
trans-1,2-Dichloroethene	1.0 U
Trichloroethene	1.0 U
Vinyl Chloride	1.0 U

SW-12	
Date	11/15/2007
1,1,1-Trichloroethane	1.0 U
2-Butanone	25 U
Acetone	25 U
Bromodichloromethane	1.0 U
Carbon Disulfide	1.0 U
Chloroform	1.0 U
cis-1,2-Dichloroethene	1.0 U
Dibromochloromethane	1.0 U
Methyl tert-butyl ether	1.0 U
Methylene Chloride	5.0 U
trans-1,2-Dichloroethene	1.0 U
Trichloroethene	1.0 U
Vinyl Chloride	1.0 U

SW-10	
Date	11/15/2007
1,1,1-Trichloroethane	1.0 U
2-Butanone	25 U
Acetone	14 J
Bromodichloromethane	0.23 J
Carbon Disulfide	1.0 U
Chloroform	0.14 J
cis-1,2-Dichloroethene	0.39 J
Dibromochloromethane	0.26 J
Methyl tert-butyl ether	1.0 U
Methylene Chloride	0.23 J
trans-1,2-Dichloroethene	1.0 U
Trichloroethene	1.0 U
Vinyl Chloride	1.0 U

SW-5-2	
Date	12/17/2007
1,1,1-Trichloroethane	4.0 U
2-Butanone	100 U
Acetone	100 U
Bromodichloromethane	4.0 U
Carbon Disulfide	4.0 U
Chloroform	4.0 U
cis-1,2-Dichloroethene	140
Dibromochloromethane	4.0 U
Methyl tert-butyl ether	4.0 U
Methylene Chloride	20 U
trans-1,2-Dichloroethene	4.0 U
Trichloroethene	13
Vinyl Chloride	4.9

SW-5	
Date	11/15/2007
1,1,1-Trichloroethane	10 U
2-Butanone	250 U
Acetone	250 U
Bromodichloromethane	10 U
Carbon Disulfide	10 U
Chloroform	10 U
cis-1,2-Dichloroethene	200
Dibromochloromethane	10 U
Methyl tert-butyl ether	10 U
Methylene Chloride	50 U
trans-1,2-Dichloroethene	2.1 J
Trichloroethene	19
Vinyl Chloride	8.2 J

SW-19-1	
Date	12/17/2007
1,1,1-Trichloroethane	1.0 U
2-Butanone	25 U
Acetone	25 U
Bromodichloromethane	1.0 U
Carbon Disulfide	1.0 U
Chloroform	1.0 U
cis-1,2-Dichloroethene	9.1
Dibromochloromethane	1.0 U
Methyl tert-butyl ether	1.0 U
Methylene Chloride	5.0 U
trans-1,2-Dichloroethene	1.0 U
Trichloroethene	1.0 U
Vinyl Chloride	1.0 U

SW-13-1	
Date	12/17/2007
1,1,1-Trichloroethane	1.0 U
2-Butanone	25 U
Acetone	25 U
Bromodichloromethane	1.0 U
Carbon Disulfide	1.0 U
Chloroform	1.0 U
cis-1,2-Dichloroethene	1.0 U
Dibromochloromethane	1.0 U
Methyl tert-butyl ether	1.0 U
Methylene Chloride	5.0 U
trans-1,2-Dichloroethene	1.0 U
Trichloroethene	1.0 U
Vinyl Chloride	1.0 U

LEGEND:

- 🟩 SURFACE WATER SAMPLING LOCATION
- ○ LOCATION OF MONITORING WELL SCREENED IN THE UPPER TERRACE DEPOSITS
- ◓ LOCATION OF MONITORING WELL SCREENED IN THE LOWER TERRACE DEPOSITS
- ◒ LOCATION OF MONITORING WELL SCREENED IN THE PEEDEE FORMATION
- ◍ LOCATION OF MONITORING WELL SCREENED IN THE UPPER & LOWER TERRACE DEPOSITS
- ■ LOCATION OF PUMPING WELL SCREENED IN THE UPPER TERRACE DEPOSITS
- ⊠ LOCATION OF PRODUCTION WELL SCREENED IN THE UPPER & LOWER TERRACE DEPOSITS

0 500' 1000'

GRAPHIC SCALE

NOTES:

1. AERIAL PHOTOGRAPH OBTAINED FROM THE SOUTH CAROLINA DEPARTMENT OF NATURAL RESOURCES WEBSITE (2007).
2. LOCATION OF ROADS ARE APPROXIMATE.
3. THE FORMER CORPORATE RESEARCH BUILDING HAS BEEN DEMOLISHED. +
4. TEMPORARY GROUNDWATER SAMPLING POINTS, SOIL BORING, SURVEYED CULVERT, AND MONITORING WELLS MW-23D, MW-24D, MW-25D, MW-22DD, MW-DD AND MW-25DD LOCATIONS WERE SURVEYED BY ROBERT L. BELLAMY & ASSOCIATES, INC. ON FEBRUARY 15, 2007, MARCH 13, 2007 AND JANUARY 4, 2008.
5. LOCATIONS OF SURFACE WATER SAMPLES ARE APPROXIMATE

AVX CORPORATION
MYRTLE BEACH FACILITY
MYRTLE BEACH, SOUTH CAROLINA
FEASIBILITY STUDY
OPERABLE UNIT 2

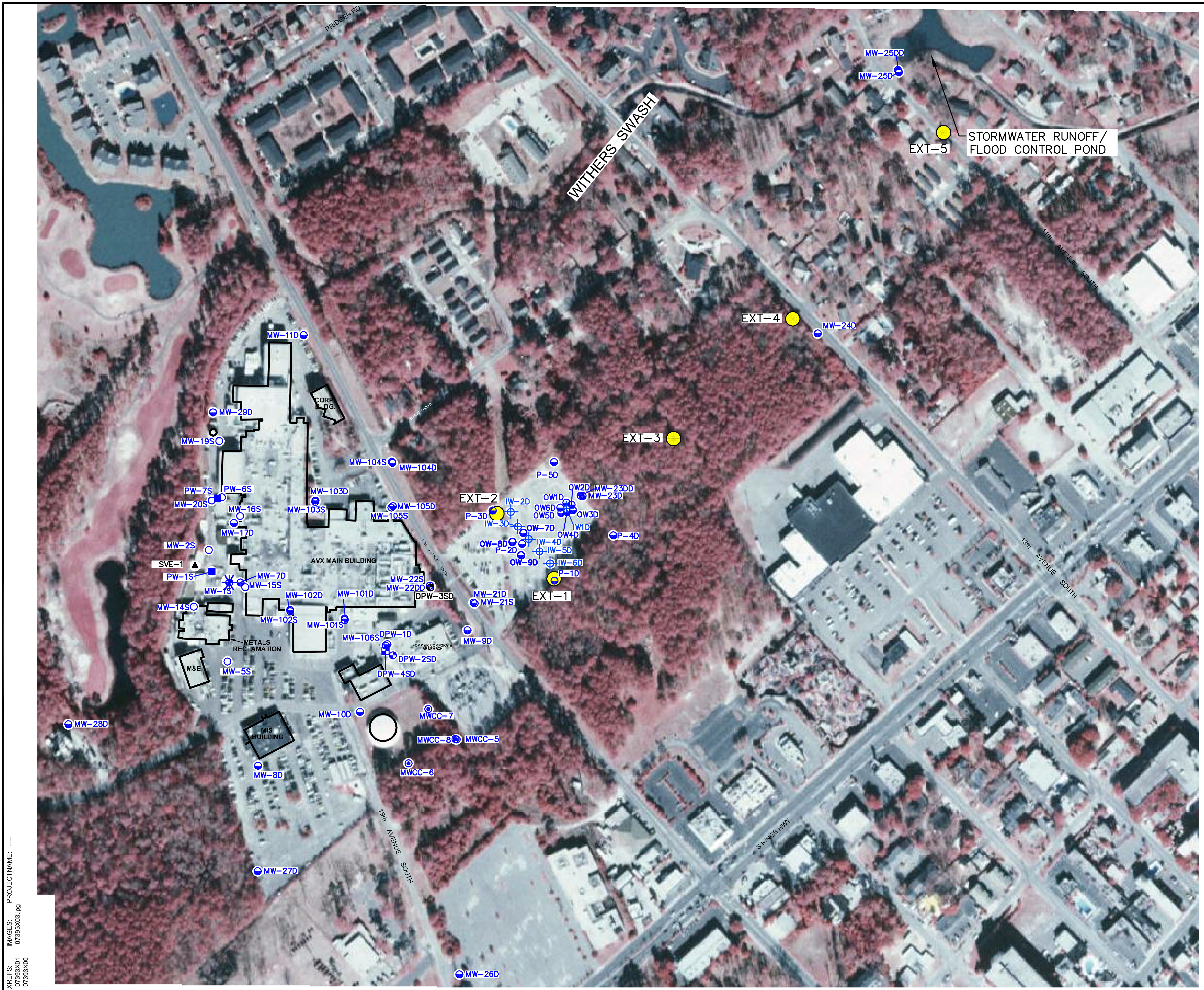
SURFACE WATER ANALYTICAL RESULTS

ARCADIS

FIGURE
2-7

CITY:Syracuse DIV/GROUP:EnvCAD DB:A.Schilling LD:A.Schilling PM:W.Popham TM:M.Harish LYR:ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACT\B0073930000\00006\DWG\FS\07393C01.DWG LAYOUT: 2-7 SAVED: 10/15/2010 3:28 PM ACADVER: 18.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 10/15/2010 3:28 PM BY: SCHILLING, ADAM
XREFS: 07393X01 07393X00 IMAGES: 07393X03.jpg PROJECTNAME: ----

CITY:Syracuse DIV/GROUP:EnvCAD DB: A.Schilling E.Krahmer A.Schilling LD:A.Schilling PM:W.Popham TM:M.Hanish LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACT\B0007393\0000\00006\DWG\FS\07393W10.DWG LAYOUT: 7-1 SAVED: 10/14/2010 10:47 AM ACADVER: 18.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 10/14/2010 11:28 AM BY: SCHILLING, ADAM
XREFS: 07393X01 07393X00 IMAGES: 07393X03.jpg PROJECTNAME: ----



LEGEND:

○	LOCATION OF MONITORING WELL SCREENED IN THE UPPER TERRACE DEPOSITS
◒	LOCATION OF MONITORING WELL SCREENED IN THE LOWER TERRACE DEPOSITS
◒	LOCATION OF MONITORING WELL SCREENED IN THE PEEDEE FORMATION
◕	LOCATION OF MONITORING WELL SCREENED IN THE UPPER & LOWER TERRACE DEPOSITS
■	LOCATION OF PUMPING WELL SCREENED IN THE UPPER TERRACE DEPOSITS
▣	LOCATION OF PRODUCTION WELL SCREENED IN THE UPPER & LOWER TERRACE DEPOSITS
⊕	LOCATION OF INJECTION WELL SCREENED IN THE LOWER TERRACE DEPOSITS
✳	LOCATION OF FORMER MONITORING WELL THAT WAS ABANDONED OR DESTROYED
▲	LOCATION OF SOIL VAPOR EXTRACTION WELL (CURRENTLY USED FOR GROUNDWATER ELEVATION MONITORING)
●	POTENTIAL EXTRACTION WELL

NOTES:

1. AERIAL PHOTOGRAPH OBTAINED FROM THE SOUTH CAROLINA DEPARTMENT OF NATURAL RESOURCES WEBSITE (2007).
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3. THE FORMER CORPORATE RESEARCH BUILDING HAS BEEN DEMOLISHED.

0 300' 600'
GRAPHIC SCALE

AVX CORPORATION
MYRTLE BEACH FACILITY
MYRTLE BEACH, SOUTH CAROLINA
FEASIBILITY STUDY
OPERABLE UNIT 2

PRELIMINARY GROUNDWATER EXTRACTION WELL LOCATIONS

ARCADIS

FIGURE
7-1

CITY:SYR DIV/GROUP:85 DB:EAK LD:AMS PIC:(Opt) PM:(Reqd) TM:(Opt) LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACT\B0007393\0000\00006\DWG\FS\07393W09.DWG LAYOUT: 7-2 SAVED: 10/14/2010 10:47 AM ACADVER: 18.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 10/14/2010 11:27 AM BY: SCHILLING, ADAM
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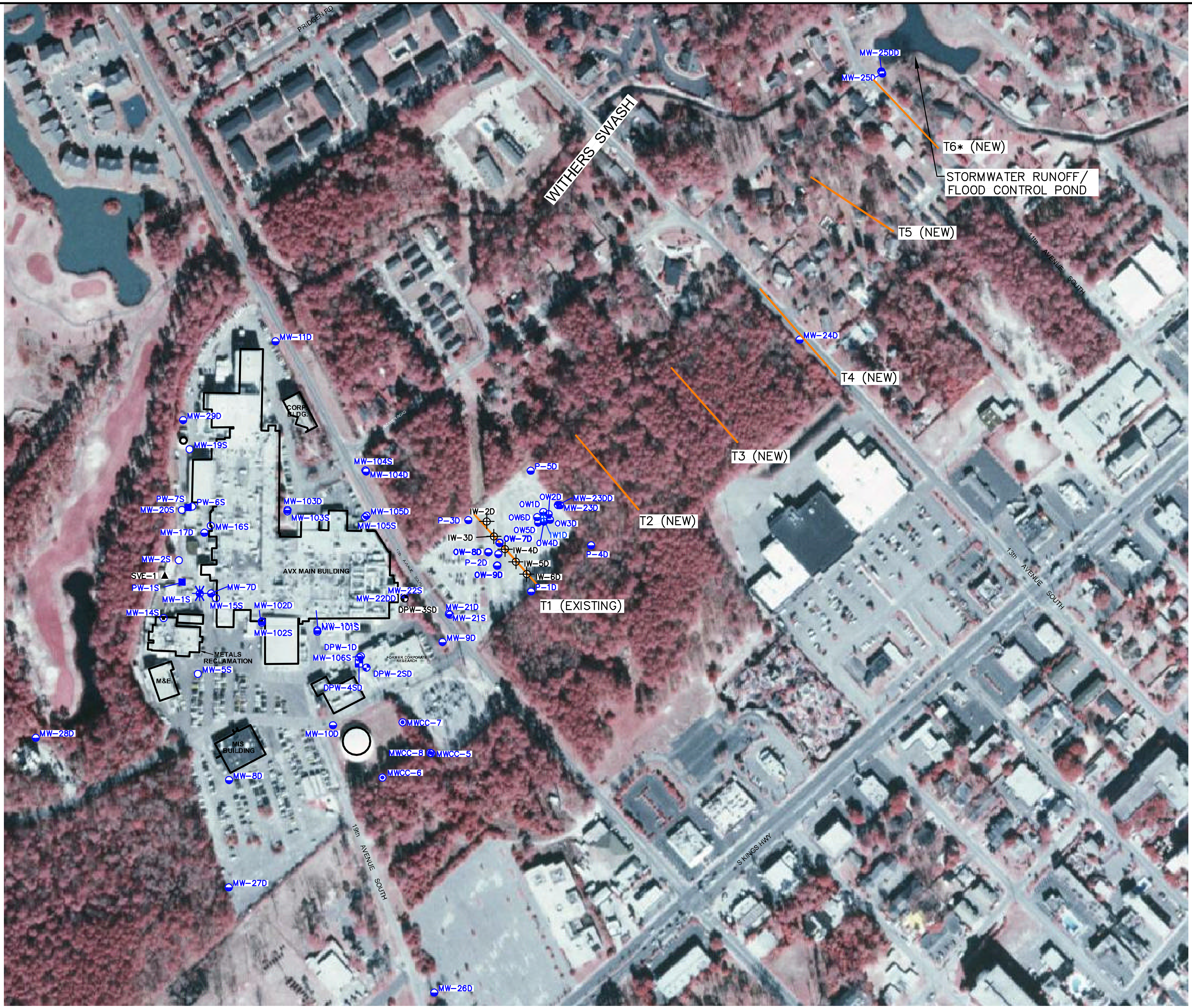


LEGEND:

- ○ LOCATION OF MONITORING WELL SCREENED IN THE UPPER TERRACE DEPOSITS
- ◒ LOCATION OF MONITORING WELL SCREENED IN THE LOWER TERRACE DEPOSITS
- ◓ LOCATION OF MONITORING WELL SCREENED IN THE PEEDEE FORMATION
- ◑ LOCATION OF MONITORING WELL SCREENED IN THE UPPER & LOWER TERRACE DEPOSITS
- ■ LOCATION OF PUMPING WELL SCREENED IN THE UPPER TERRACE DEPOSITS
- ▣ LOCATION OF PRODUCTION WELL SCREENED IN THE UPPER & LOWER TERRACE DEPOSITS
- ⊕ LOCATION OF INJECTION WELL SCREENED IN THE LOWER TERRACE DEPOSITS
- ✳ LOCATION OF FORMER MONITORING WELL THAT WAS ABANDONED OR DESTROYED
- ▲ LOCATION OF SOIL VAPOR EXTRACTION WELL (CURRENTLY USED FOR GROUNDWATER ELEVATION MONITORING)
- — PRELIMINARY INJECTION WELL TRANSECT LOCATION
- * T6 MAY BE EXCLUDED DUE TO PROXIMITY TO SURFACE WATER BODY

NOTES:

1. AERIAL PHOTOGRAPH OBTAINED FROM THE SOUTH CAROLINA DEPARTMENT OF NATURAL RESOURCES WEBSITE (2007).
2. LOCATION OF ROADS ARE APPROXIMATE.
3. THE FORMER CORPORATE RESEARCH BUILDING HAS BEEN DEMOLISHED.

0 300' 600'
GRAPHIC SCALE

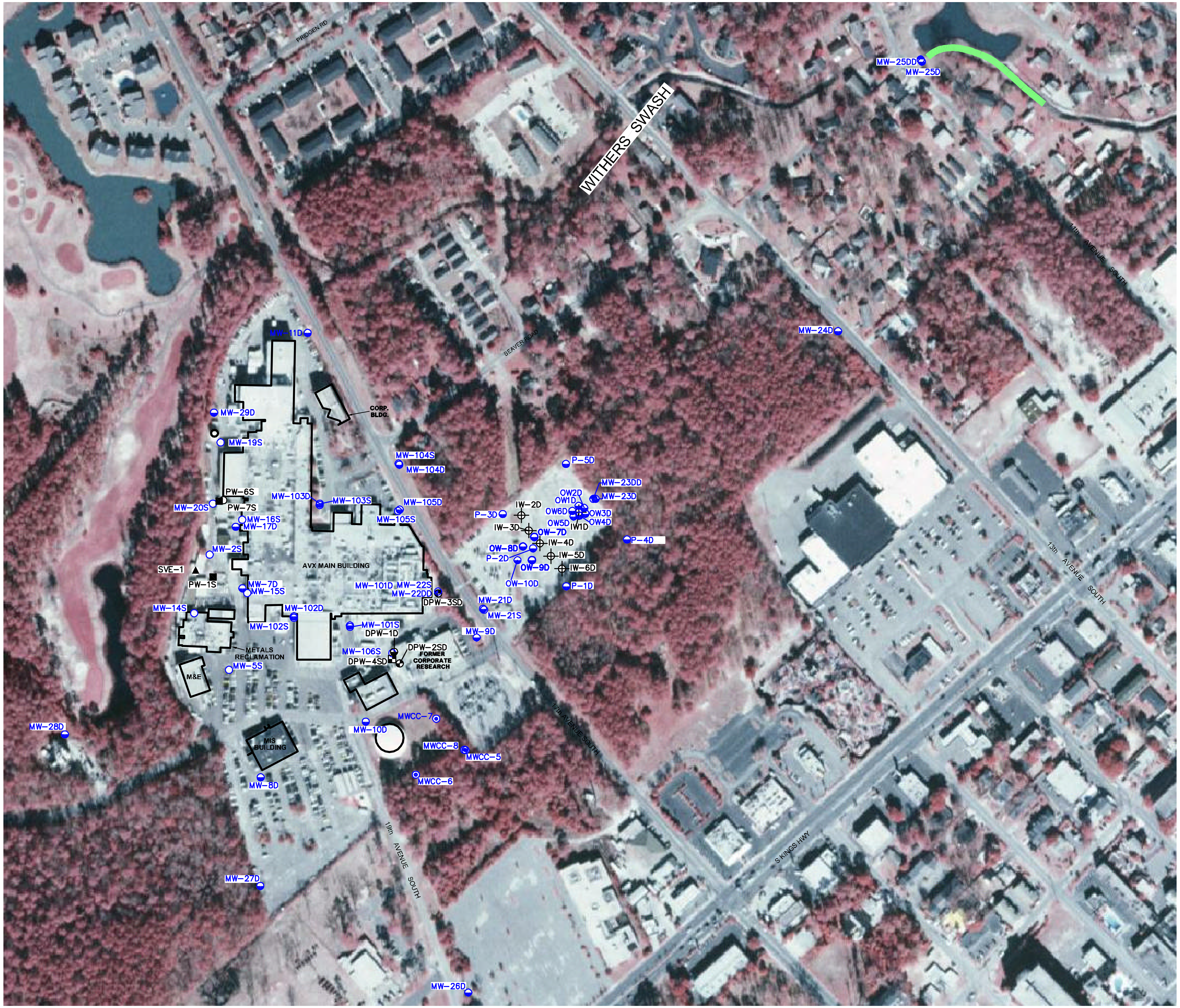
AVX CORPORATION
MYRTLE BEACH FACILITY
MYRTLE BEACH, SOUTH CAROLINA
FEASIBILITY STUDY
OPERABLE UNIT 2

PRELIMINARY ERD INJECTION WELL TRANSECT LOCATIONS

ARCADIS

FIGURE
7-2

CITY: Syracuse GROUP:EnvCAD DB: A.Schilling, P. LISTER, A.Schilling LD: A.Schilling PM: W.Popham TM: M.Hanish LYR: ON=*;OFF=REF, (FRZ)
G:\ENVCAD\SYRACUSE\ACT\B0007393\0000\00006\DWG\FS\07393B08.DWG LAYOUT: 7-3 SAVED: 10/14/2010 10:47 AM ACADVER: 18.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 10/14/2010 11:34 AM BY: SCHILLING, ADAM
XREFS: 07393X01 07393X00 IMAGES: 07393X03.jpg PROJECTNAME: ---



LEGEND:

- ○ LOCATION OF MONITORING WELL SCREENED IN THE UPPER TERRACE DEPOSITS
- ◒ LOCATION OF MONITORING WELL SCREENED IN THE LOWER TERRACE DEPOSITS
- ◒ LOCATION OF MONITORING WELL SCREENED IN THE PEEDEE FORMATION
- ◕ LOCATION OF MONITORING WELL SCREENED IN THE UPPER & LOWER TERRACE DEPOSITS
- ■ LOCATION OF PUMPING WELL SCREENED IN THE UPPER TERRACE DEPOSITS
- ▨ LOCATION OF PRODUCTION WELL SCREENED IN THE UPPER & LOWER TERRACE DEPOSITS
- ⌖ LOCATION OF INJECTION WELL SCREENED IN THE LOWER TERRACE DEPOSITS
- ◉ CARMIKE WELL
- ▲ LOCATION OF SOIL VAPOR EXTRACTION WELL (CURRENTLY USED FOR GROUNDWATER ELEVATION MONITORING)
- 🟩 PROPOSED PHYTOREMEDIATION BUFFER

NOTE:

1. AERIAL PHOTOGRAPH OBTAINED FROM THE SOUTH CAROLINA DEPARTMENT OF NATURAL RESOURCES WEBSITE (2007).
2. LOCATION OF ROADS ARE APPROXIMATE.
3. THE FORMER CORPORATE RESEARCH BUILDING HAS BEEN DEMOLISHED.

0 300' 600'
GRAPHIC SCALE

AVX CORPORATION
MYRTLE BEACH FACILITY
MYRTLE BEACH, SOUTH CAROLINA
FEASIBILITY STUDY
OPERABLE UNIT 2

PRELIMINARY PHYTOREMEDIATION PLANTING LOCATIONS

ARCADIS

FIGURE
7-3

ARCADIS

Appendix A

Human Health Risk Assessment for Operable Unit 2

ARCADIS
Infrastructure, environment, buildings

Imagine the result

AVX Corporation

Appendix A

Human Health Risk Assessment for Operable Unit 2

Myrtle Beach, South Carolina

November 2010
Revised February 2011

Tables

Figures

Attachments

Summary

A Human Health Risk Assessment (HHRA) was performed to evaluate the potential exposure and risks associated with constituents of potential concern (COPCs) detected in groundwater, surface water, and soil gas near to and to the northeast of the AVX Corporation (AVX) facility located on 17th Avenue South in Myrtle Beach, South Carolina. This HHRA is specific to Operable Unit 2 (OU-2), which encompasses an area to the northeast of 17th Avenue South and is situated between the AVX facility and the stormwater control pond on Withers Swash (see Figure A-1 in the body of the text). The HHRA is based on existing conditions and presumed future land-use conditions. The HHRA concluded there is no expectation of harm to public health with respect to the COPCs present in groundwater (including irrigation water), surface water, soil gas (vapors).

The first step in the HHRA was to compare the data to the United States Environmental Protection Agency-developed screening levels to identify the COPC. Then, exposures to the identified COPCs were evaluated.

The potential exposure scenarios quantitatively evaluated included the following (by media):

- *Groundwater*: Exposure to hypothetical construction workers.
- *Irrigation Water*: Hypothetical exposure to child and adult residents during use to fill wading pools, swimming pools, and/or irrigation of plants in a greenhouse.
- *Surface Water*: Hypothetical exposure to adolescent trespassers.
- *Vapors*: Hypothetical exposure, within buildings, to workers and hypothetical future adult and child residents within OU-2.

OU-2-specific exposure assumptions were used in conjunction with peer-reviewed toxicity values to characterize excess lifetime cancer risks and non-cancer hazards. The underlying assumption in preparing the HHRA was that the groundwater will not be used as a potable water supply. In light of the foregoing, the results of the analysis were below or within the conservative federal and state risk-based levels of concern. Therefore, there is no expectation of harm to public health with respect to the COPCs present in groundwater (including irrigation water), surface water, and soil gas.

Acronyms and Abbreviations

1,1,1-TCA	1,1,1-trichloroethane
AST	aboveground storage tank
AVX	AVX Corporation
bgs	below ground surface
CalEPA	California Department of Environmental Protection Agency
cis-1,2-DCE	cis-1,2-dichloroethene
cm^2	square centimeters
COPC	constituent of potential concern
CSF	cancer slope factor
CSM	conceptual site model
ELCR	excess lifetime cancer risk
EPC	exposure point concentration
FS	*Feasibility Study Operable Unit 2*
HHRA	*Human Health Risk Assessment for Operable Unit 2*
HI	hazard index
HLC	Horry Land Company
HQ	hazard quotient
IRIS	Integrated Risk Information System
kg	kilogram
L/hour	liters per hour

NOAA	National Oceanic and Atmospheric Administration
NOAEL	no observed adverse effect level
OU	operable unit
RBSL	risk-based screening level
RfC	reference concentration
RfD	reference dose
RME	reasonable maximum exposure
RSL	Regional Screening Level
SCDHEC	South Carolina Department of Health and Environmental Control
site	the portion of the AVX facility referred to as AVX MB1 and located on 17th Avenue South in the City of Myrtle Beach, Horry County, South Carolina
TCE	trichloroethene
UCL	upper confidence limit
USEPA	United States Environmental Protection Agency
UST	underground storage tank
VC	vinyl chloride
VF	volatilization factor
VOC	volatile organic compound

1. Introduction

The following presents the *Human Health Risk Assessment for Operable Unit 2* (HHRA), which evaluates the potential exposure and risks associated with constituents detected in groundwater, surface water, and soil gas near the AVX Corporation (AVX) facility located on 17th Avenue South in Myrtle Beach, South Carolina. Following discussions with South Carolina Department of Health and Environmental Control (SCDHEC) representatives in October 2010, two operable units (OUs) were created, including OU-1 for on-site media and OU-2 for off-site media. The on-site portion of the AVX facility includes the older portion of the operations (sometimes referred to as AVX MB1) and surrounding land which has historically been referred to as the “site”.

The location of the OUs is presented on Figure A-1.

Two OUs were created because:

- Potential changes in the on-site (OU-1) building use/configuration may allow for evaluation and potential selection of other remedial alternatives that are currently not feasible.

- Evaluation and selection of a remedial alternative for the off-site area (OU-2) can proceed without delay.

As a measure of on-site control (within OU-1), the current on-site groundwater extraction and treatment system will continue to operate and provide proven capture for chlorinated volatile organic compounds (VOCs) in groundwater beneath the area of OU-1 until such time that additional remedial alternative evaluations can be completed taking into account potential future changes in building use/configuration in OU-1.

As a result of the decisions described above, this HHRA is a companion to the *Feasibility Study Operable Unit 2* (FS), which focuses only on off-site media within OU-2. The purpose of this HHRA is to evaluate potential risks and hazards to human health associated with constituents detected in the sampled media. Included in this HHRA is an evaluation of potential risks that can be used to identify and evaluate potential remedial options and risk management strategies for the OU-2 area.

This HHRA provides a brief description of the data used and is organized as follows:

- *Section 2 – Site Characterization*: This section provides a description of OU-1 and OU-2 features and provides a brief history for context.

- *Section 3 – Constituent Characterization*: This section identifies and summarizes the occurrence of constituents in groundwater, surface water, and soil gas and identifies constituents of potential concern (COPCs) for the HHRA.

- *Section 4 – Exposure Assessment*: This section identifies the potential human exposure scenarios relevant to this HHRA.

- *Section 5 – Toxicity Assessment*: This section identifies toxicity values used to estimate excess lifetime cancer risk (ELCR) and non-cancer hazard for the COPCs.

- *Section 6 – Risk Characterization*: This section presents the estimated human health risks associated with the identified COPCs and the relevant human exposure scenarios.

- *Section 7 – Conclusions*: This section summarizes the results of this HHRA.

- *Section 8 – References*: This section lists the sources of information cited in this HHRA.

2. Site Characterization

This section describes the OU-1 and OU-2 areas and history and provides information regarding the environmental setting and previous environmental investigations.

2.1 Site Description

The older portion of the manufacturing portion of the AVX facility (sometimes referred to as AVX-1 or AVX MB1, which has historically been referred to as the “site”) is located immediately adjacent to 17th Avenue South in the City of Myrtle Beach, Horry County, South Carolina (Figure A-1). The AVX facility is in an area referred to as the Grand Strand, a roughly 60-mile strip in North and South Carolina, bounded by the Atlantic Ocean and the Intracoastal Waterway. The center of the AVX facility is approximately 3,300 feet northwest of the ocean and 2.3 miles southeast of the Intracoastal Waterway.

The surrounding land use is as follows:

- The areas north, south, and east of the AVX facility are primarily residential or tourist-related commercial properties with a few undeveloped properties intermixed, primarily to the east. A parcel immediately south of the facility belongs to the City of Myrtle Beach and contains an unused deep water supply well and a large water storage tank. The former Carmike theater property to the south is now owned by AVX.

- The AVX facility is bordered to the west by a golf course, the approximately 69-acre property owned by AVX (sometimes referred to as the AVX-2 or AVX MB2 property), and properties once belonging to the Myrtle Beach Air Force Base.

- The property immediately northeast of the AVX facility (AVX MB1), across 17th Avenue South, is owned by the Horry Land Company (HLC). The majority of this property is undeveloped and wooded. A 3-acre portion of the HLC property is open space, formerly used as a parking lot.

The site (AVX MB1) contains several buildings, including a main manufacturing building, which is approximately 300,000 square feet (Figure A-1). Numerous smaller buildings surround the main plant.

2.2 Site Environmental History

The Aerovox Corporation, the predecessor to AVX, began operations at its facility in 1953 on land formerly part of the Myrtle Beach Air Force Base. Chlorinated VOCs were used at the facility up until 1993 in the manufacturing of ceramic capacitors. In 1981, AVX discovered that shallow groundwater beneath the older portion of the facility (AVX MB1) contained chlorinated VOCs, notably the solvents trichloroethene (TCE) and 1,1,1-trichloroethane (1,1,1-TCA).

Virgin and spent TCE had been stored in underground storage tanks (USTs) on the western side of the facility until 1983. The USTs were removed in 1983. After the USTs were removed, TCE was stored in aboveground storage tanks (ASTs) adjacent to the western side of the building. In 1986, AVX transitioned from using TCE to 1,1,1-TCA, continuing to use the former ASTs for storage of 1,1,1-TCA. Use of 1,1,1-TCA was discontinued in 1993.

AVX began investigation and remediation in 1981. A summary of the environmental activities are provided the body of the FS.

2.3 Hydrogeology

The hydrogeology in the vicinity of OU-1 and OU-2 is summarized in the body of the FS. The summary provides context to this HHRA, including a summary of the:

- Stratigraphy
- Surface water
- Hydrostratigraphy
- Groundwater flow

In addition, the conceptual site model (CSM) is provided in the body of the FS.

3. Constituent Characterization

This section discusses the groundwater, surface water, and soil gas data collected during the site investigations on and off the AVX property; the methodology used to evaluate the data; and the selection of COPCs. Detailed information describing the distribution of constituents observed in environmental media is also discussed in this section.

3.1 Selection of Constituents of Potential Concern

The first step of the HHRA process consists of compiling and evaluating investigation data to identify the HHRA dataset and then to select the COPCs. The selection of COPCs was based primarily on the magnitude of the measured concentrations in each of the relevant environmental medium. If the maximum detected concentration exceeded the screening level, then the constituent was retained as a COPC.

3.1.1 Data Evaluation

Groundwater, surface water, and soil gas samples have been collected in OU-2, as discussed in the main body of the FS and FS Work Plan (ARCADIS, 2008a; 2009; 2010). The data available for each medium were evaluated in accordance with United States Environmental Protection Agency (USEPA) guidance for risk assessments (USEPA, 1989; 1992; 2002). The data evaluation guidelines are summarized as follows:

- Constituents that were not detected in a medium were not included in the data evaluation for that medium.

- Analytical results reported as detected or estimated values were considered to be present at the reported value. Analytical results that are “U” qualified were non-detects.

3.1.2 Identification of Screening Levels

The COPCs quantitatively evaluated in the HHRA were those constituents detected in environmental media. The maximum detected constituent concentration in each medium was compared with the appropriate screening levels. Constituents detected at concentrations below the screening levels were not considered further in this HHRA. Those constituents present at concentrations greater than the risk-based screening levels (RBSLs), and those for which an RBSL is unavailable, were retained for further analysis.

The USEPA Regional Screening Levels (RSLs) (USEPA, 2010a) were used to screen groundwater. The non-carcinogenic RSLs were adjusted for a hazard quotient (HQ) of 0.1. The RSLs based on carcinogenic effects (using a target cancer risk of 1×10^{-6}) were used at the listed value. The screening levels are summarized in Table A-1.

Constituent concentrations observed in groundwater were compared to tap water RSLs, assuming ingestion of water under a future residential exposure scenario. Currently, the groundwater is not used as a potable water supply, and drinking water is supplied throughout the area by the municipal water district. The comparison of groundwater data to tap water RSLs can be used to indicate the need to potentially restrict the use of groundwater as a potable water supply in the future. Constituents present at concentrations greater than their RSL were identified as COPCs.

The tap water RSLs were used for screening both groundwater and surface-water data. Tap water RSLs provide a conservative method to eliminate constituents from further analysis for recreational use of surface water.

3.2 Groundwater

Groundwater samples collected between 2007 and 2010 were included in the HHRA dataset.

A total of 25 samples were collected from the east side of 17th Avenue South and analyzed primarily for VOCs (Table A-2). Benzene, naphthalene, and toluene were detected in 4 percent of the samples.

The maximum concentration of each constituent was compared to the tap water RSL. As presented in Table A-3, five constituents were detected in the groundwater samples within OU-2 at maximum concentrations exceeding the tap water RSLs, including cis-1,2-dichloroethene (cis-1,2-DCE), trans-1,2-dichloroethene, naphthalene, TCE, and vinyl chloride (VC). These constituents were identified as COPCs for groundwater within OU-2. Inclusion of naphthalene, which was detected in only 4 percent of the samples, presents a conservative evaluation of potential exposure and risk.

3.3 Surface Water

Surface-water samples were collected in 2007 and are all used in the HHRA. The data are summarized in Table A-4. Eleven constituents were detected in the surface-water samples. The surface-water sampling data were compared to the tap water RSLs. As presented in Table A-5, five constituents were detected at concentrations exceeding the RSL, including bromodichloromethane, dibromochloromethane, cis-1,2-DCE, TCE, and VC. These constituents were identified as COPCs in surface water.

3.4 Irrigation Water

The SCDHEC sampled seven irrigation wells in the OU-2 area. Five constituents: acetone, 2-butanone, cis-1,2-DCE, trans-1,2-dichloroethene, and TCE were detected in the irrigation wells. The data are presented in Table A-6.

Sampling information and a discussion of the sampling results are found in the *Additional Off-Site Groundwater and Surface-Water Investigation Report* (ARCADIS, 2008b). As presented in Table A-6, only cis-1,2-DCE and TCE were detected in irrigation wells above the tap water RSL, and these two constituents were identified as COPCs for irrigation well water.

3.5 Soil Gas

Eleven soil gas samples were collected as part of an off-site soil gas evaluation performed in 2007. Potential exposures to the COPCs in soil gas were evaluated in Appendix C of the *December 2007 Off-Site Soil Gas Sampling Investigation* (ARCADIS, 2009). The appendix summarized the evaluation of potential exposure to COPCs in soil gas by both worker and residential (adult and child) receptors within OU-2. The soil gas sampling data were used to evaluate exposure by selecting the maximum concentrations as exposure point concentrations (EPCs) for all samples. Soil gas sample, SG-11-2, was selected to be representative of the area, with the exception of SG-6. The results of the HHRA indicated that the risks were at or below an ELCR of 1×10^{-6}, and the non-cancer hazards were all below the regulatory benchmark of 1. The results are within the range of conservative federal and state risk-based levels, which are designed to be protective of public health. The calculated risks were slightly greater than an ELCR of 1×10^{-6} at SG-6. Therefore, the maximum detected soil gas concentrations measured at sampling point SG-6 were re-evaluated in this HHRA because there have been changes in the toxicity values recommended by USEPA Region 4 since the 2007 evaluation was performed.

Soil gas sampling point SG-6 was selected for re-evaluation because, at the time of the original evaluation, sample SG-6 was collected at a vacant property that could be redeveloped either as residential or commercial/industrial. Additionally, location SG-6 contained the highest soil gas concentrations of the COPCs. Five COPCs were detected in the soil gas sample collected at location SG-6: 1,1-dichloroethene, tetrachloroethene, 1,1,1-TCA, TCE, and VC.

4. Exposure Assessment

The purpose of the exposure assessment is to evaluate the ways receptors might be exposed to COPCs at locations within OU-2. Exposure can occur only when the potential exists for a receptor to contact COPCs or when there is a mechanism for COPCs to be transported to a receptor. Without exposure there is no risk; therefore, the exposure assessment is a critical component of the HHRA. The assessment of exposure includes characterization of the physical environment, identification of exposure pathways (including migration pathways, exposure points, and exposure routes), and identification of potentially exposed individuals and populations.

An exposure pathway is defined by the following four elements:

1. A source and mechanism of constituent release to the environment.

2. An environmental transport medium for the released constituent.

3. A point of potential contact by the receptor with the medium containing the constituent (the exposure point).

4. A route of exposure to the receptor at the exposure point (i.e., ingestion, inhalation, or dermal contact).

The purpose of the exposure assessment is to identify and evaluate the ways a population may be exposed to COPCs. This typically involves estimating concentrations along potential pathways between sources and receptors. This usually is accomplished using site-specific data and, when necessary, mathematical modeling.

The exposure pathway CSM provides the framework of the HHRA. It characterizes the primary and secondary potential sources and release mechanisms and identifies the primary exposure points, receptors, and exposure routes. Exposure points are places or “points” where exposure could potentially occur, and exposure routes are the means by which COPCs may be taken up by the receptor (ingestion, inhalation, and dermal contact). The elements of the CSM are discussed below and summarized on Figure A-2.

4.1 Potential Receptors

This section identifies the potential receptors that are present in the area surrounding the OU-2 area and could be exposed to COPCs in groundwater, surface water, irrigation water, and/or soil gas.

Groundwater is not used as a potable water supply, and an ordinance is in place in Myrtle Beach that restricts groundwater use as a potable water supply. Therefore, the exposure to groundwater in locations within OU-2 will not be evaluated assuming a drinking water exposure pathway.

The depth to groundwater within OU-2 varies seasonally from about 7 to 10 feet below ground surface (bgs), with the result that depending on the type of construction project, a construction worker within OU-2 could potentially be exposed to COPCs in groundwater. The adult construction worker could be exposed to COPCs in the groundwater through ingestion, dermal contact, and inhalation exposures.

Surface water flows near a residential neighborhood. Residents could wade in the surface-water features. The most likely receptor is an adolescent, aged 7 to 16 years, who would occasionally wade in the surface water. The potential exposure of this receptor is evaluated in this HHRA. The wader will primarily be exposed to COPCs through the dermal and inhalation exposure pathways. Incidental ingestion of surface water is not expected to be a significant route of exposure.

Several irrigation wells were identified by the SCDHEC in the OU-2 area. The exact use of the water is unknown. However, the irrigation well water could be used to water lawns and plants or for recreational purposes, such as use in a swimming pool or a wading pool. The most likely receptor is a young child, aged 0 to 2 years, who may play in a wading pool, and an older child, aged 2 to 6 years, who may play in a larger swimming pool. Adults are also assumed to be exposed to irrigation water in a swimming pool. Finally, a small residential greenhouse is located in the area; therefore, the irrigation well water could be used to water plants in a greenhouse. The most likely receptor is an adult, who may work in the greenhouse.

VOCs were found in groundwater. The potential for exposure through the vapor intrusion exposure pathway was evaluated previously (ARCADIS, 2009) and is evaluated here for a resident and worker exposure within OU-2 to provide an updated evaluation of this exposure pathway. The mist likely resident receptors are children, aged 0 to 6 years, and adults. The most likely worker receptors are adults.

In summary, the potential receptors for this risk assessment include:

Young child (0 to 2 years old)	Irrigation water – wading pool
Older child (2 to 6 years old)	Irrigation water – swimming pool
Child (0 to 6 years old)	Soil gas – indoor air
Adolescent (7 to 16 years old)	Surface water – wading
Adult (18 to 48 years old)	Soil gas – indoor air; irrigation water – swimming pool; off-site groundwater (worker)

4.2 Exposure Point Concentrations

A statistical approach was used to identify the most appropriate representative concentrations for the COPCs in most cases. Consistent with USEPA methodology, both the mean and upper confidence limit (UCL) concentrations were calculated using ProUCL, the statistical software available from the USEPA (version 4.00.05; USEPA, 2010b). Non-detected values were treated following the software protocol. When duplicate samples were collected, the maximum concentration detected in the parent sample or duplicate sample was used. If both samples were non-detected values, the lowest detection limit was used in the derivation of the UCL. The UCL concentrations were selected using the output from the ProUCL software. ProUCL printouts are included in Attachment A-1.

The 95 percent UCL, for example, is a statistical value calculated to estimate the mean concentration with 95 percent confidence that the true arithmetic mean concentration for the set of environmental data assessed will be less than the UCL. The high level of confidence (e.g., 95 percent) is used to compensate for the uncertainty involved in representing the conditions within OU-2 with a finite number of samples. In accordance with USEPA guidance, if the 95 percent UCL is greater than the maximum detected concentration, the maximum detected concentration was identified as the EPC. Table A-7 presents the EPCs used in this HHRA. Due to the limited number of detections for some of the media, the maximum concentration was used to evaluate risk for several of the exposure pathways.

The EPC for the irrigation well water exposure scenarios was not chosen based on a ProUCL-based calculation. This is because the number of samples with detected concentrations was less than the minimum number recommended by the USEPA (2010b) to use ProUCL. Although, the ProUCL software is not ideally suited to calculate the 95 percent UCL with fewer than five detected concentrations, the statistical calculation using fewer than five data points can nonetheless provide an approximation of the 95 percent UCL. Therefore, ProUCL was used to calculate a 95 percent UCL concentration for both cis-1,2-dichloroethene and trichloroethene. The results were a 95 percent UCL of 845 micrograms per liter (µg/L) for cis-1,2-dichloroethene and 537 µg/L for trichloroethene. These calculated exposure point concentrations are less than the average concentration of these analytes within the wells with the three highest concentrations. This three well average concentration is 1,769 µg/L and 763 µg/L for cis-1,2-dichloroethene and trichloroethene, respectively. The comparison to the ProUCL 95 percent UCL approximation provides another line of evidence that the average VOC concentrations used in the risk assessment, as outlined above, provide a conservative evaluation of potential exposure and risk.

4.3 Physical and Chemical Properties

The environmental fate and transport of the COPCs are dependent on their physical and chemical properties, the environmental transformation processes affecting them, and the media through which they are migrating. The physical and chemical properties that were used to evaluate potential exposure to the COPCs detected in environmental media within OU-2 were compiled for each of the COPCs. The physical and chemical properties, including molecular weight, water solubility, Henry’s Law constant, diffusivity in air and water, permeability coefficient (Kp), and the organic-carbon partition coefficient (Koc) for COPCs are presented in Table A-8.

Input parameters and the resulting Volatilization Factor (VF) can be found in Table A-16.

4.3.1 Volatilization Factor for Groundwater and Surface Water

Emissions via volatilization from water, either ponded groundwater in an excavation or surface water, were estimated following USEPA (1988) guidance. The VF equation can be found in Table A-9. The VF was calculated assuming that there was a mass transfer from the surface water to the air directly above the water. The mass transfer of the constituent is assumed to be driven by molecular diffusion. It was assumed that emission would occur from a 1 square meter source area. The annual wind speed for

North Myrtle Beach, South Carolina was obtained from the National Oceanic and Atmospheric Administration (NOAA; 2010) and the mean annual average wind speed was calculated using the NOAA data.

4.3.2 Vapor Intrusion into Buildings

The evaluation of the vapor intrusion exposure pathway was accomplished using the USEPA vapor intrusion model, which was developed based on the equations derived by Johnson and Ettinger (1991). The USEPA model was used to evaluate potential migration of COPCs in groundwater to indoor as indicated by soil gas data. The specific assumptions used for the OU-2 area are:

- Depth below grade to soil gas sample was assumed to be 4 feet, or 122 centimeters. The soil gas samples with the maximum concentrations were collected at a depth of 3 feet to 4 feet. Therefore, the bottom screen depth of the soil gas sample points was used as the soil gas depth in the model runs.

- An average subsurface soil temperature of 18 degrees Celsius was estimated based on SCDHEC (2003) guidance.

- A soil type of sand was selected to represent the soils within OU-2 as a conservative measure. This was a conservative assumption in that the soil gas sampling points were screened in lower permeable materials like clay and silty clay. As a result, the assessment may overestimate the migration of soil gas into a building.

4.3.3 Dermal Absorption of Constituents of Potential Concern in Water

The USEPA (2004) recommends a non-steady-state approach to estimate the dermally absorbed dose from water (groundwater, irrigation water, or surface water) for organic COPCs. The non-steady-state approach evaluates the absorption of COPCs from water through the skin as a function of the constituent-specific permeability coefficient (Kp), the thickness of the skin, and the duration of exposure. Permeability parameters for COPCs are provided in Table A-10.

4.4 Exposure Assumptions

The potential for exposure to COPCs in environmental media within the OU-2 area is limited. Groundwater is not used as a potable water supply, and therefore, contact with groundwater is expected to be limited. Therefore, the likelihood of most of the exposures evaluated in this HHRA is limited.

A construction worker may contact groundwater in excavations. Adolescent trespassers may occasionally wade in the surface-water bodies in the OU-2 area. Adult and child residents could be exposed through the incidental ingestion of water, dermal contact with groundwater, and inhalation of volatile COPCs. Individuals using the groundwater for irrigation purposes could use the water to fill swimming pools, wading pools, or when using the water in a greenhouse could be exposed to the COPCs through incidental ingestion, dermal contact, or inhalation of vapor phase volatile COPCs. The other potential exposure scenario involves the migration of COPCs present in soil gas through the soil and into buildings. Details regarding each potential exposure scenario are provided in the following subsections.

This HHRA is based on evaluation of reasonable maximum exposure (RME) scenarios and assumptions. The USEPA (1992; 1989) defines the concept of RME (using the term High End Exposure scenario) as a potential estimate of the individual exposure for those persons at the upper end of an exposure distribution. In this HHRA, the RME evaluation has been constructed with reasonable maximum input values that are consistent with the risk evaluation envisioned by the USEPA. RME assumptions were estimated for each potential exposure pathway using standard default assumptions (USEPA, 1997a; 1991; 1989) and site-specific information. Values for the receptor-specific exposure parameters are summarized in Table A-11 and are discussed in the following subsections. The EPCs that are discussed above are presented in Table A-7.

A conservative assumption underlying all of the risk calculations is that the constituent concentrations remain constant over the entire period of exposure. The effects of attenuation processes that reduce the concentrations over time are not considered.

4.4.1 Operable Unit 2 Worker

Soil gas sample SG-6 was collected from a vacant property in the OU-2 area. If the property were developed for commercial or industrial purposes, a hypothetical industrial or commercial worker within OU-2 could be exposed to COPCs migrating into a building. The exposure assumptions for this potential receptor are included in Table A-11 and are summarized as follows:

- Averaging time of 25,550 days (70 years x 365 days per year) for cancer effects; and averaging time of 9,125 days (25 years x 365 days per year) for non-cancer effects (USEPA, 1991)
- Adult body weight of 70 kilograms (kg) (USEPA, 1991)
- Exposure duration of 25 years (USEPA, 1991)
- Exposure frequency of 250 days per year for outdoor exposure (5 workdays per week for 50 weeks per year) (USEPA, 1991)

These exposure assumptions are standard USEPA default assumptions that are intended to represent an RME designed to overestimate potential future risk in most cases.

4.4.2 Hypothetical Future Construction Worker

Construction workers may hypothetically be present at locations within OU-2 in the future to work on new construction or excavation activities; therefore, this exposure scenario was evaluated based on a hypothetical construction project. The invasive excavation work of the construction project was assumed to take 6 months during 1 year to complete. Due to the shallow nature of the groundwater, the construction worker was assumed to contact groundwater during a construction project, although exposure to COPCs is unlikely because of the greater depths to COPCs in groundwater. The OU-2 groundwater EPCs were used to evaluate these exposure scenarios. The exposure assumptions for this potential receptor are included in Table A-11 and are summarized as follows:

- Averaging time of 25,550 days (70 years x 365 days per year) for cancer effects; and averaging time of 180 days (26 weeks x 7 days per week) for non-cancer effects (USEPA, 1991)
- Adult body weight of 70 kg (USEPA, 1991)
- Exposure duration of 1 year (USEPA, 2002)
- Exposure frequency of 130 days per year (5 workdays per week for 26 weeks) (USEPA, 2002)

- Incidental groundwater ingestion rate of 0.005 liters per day (professional judgment)

- Exposed skin surface area of 3,300 square centimeters (cm^2), which is the sum of the mean values for hands, forearms, and face for an adult (USEPA, 2002)

4.4.3 Current/Future Operable Unit 2 Resident

The area surrounding the AVX property contains both residential and non-residential properties. Residential exposure in OU-2 can occur through contact with surface water, use of irrigation water, and through the inhalation of vapors, potentially containing COPCs, migrating from the subsurface into a home.

Groundwater in the Myrtle Beach area is not used as a potable water supply. There is a restriction on use of groundwater as a potable water supply throughout Myrtle Beach. Therefore, drinking water exposures were not evaluated in this HHRA. VOCs present in groundwater could volatilize and migrate into homes, although there is little to no potential for this in current residential areas in the OU-2 area (ARCADIS, 2009). Nonetheless, at one location that is currently vacant (near historical soil gas sampling point SG-6; ARCADIS, 2009), somewhat elevated concentrations of volatile COPCs were observed in soil gas, and therefore, the vapor intrusion exposure pathway is evaluated assuming a hypothetical residence is constructed in the vicinity of this soil gas sampling point.

Individuals living in the OU-2 area in the vicinity of the AVX property, however, could contact COPCs in surface water or through the use of irrigation water. Hypothetical exposure to COPCs in water could occur through incidental ingestion, dermal contact, and/or inhalation of vapors. It was assumed for this analysis that exposure to COPCs in groundwater could occur through the use of groundwater from an irrigation water well. Thus, the irrigation water well data were used in this evaluation. It was assumed that the water could be used for watering plants in a greenhouse or filling a swimming pool or a small wading pool used by children in the summer. For the purposes of this HHRA, it was assumed that, hypothetically, a child would play in a wading pool filled with irrigation well water, and as they got older, they would swim in a swimming pool also filled with irrigation well water in their backyard. The exposure assumptions for these potential receptors are included in Table A-11 and are summarized as follows:

- Averaging time of 25,550 days (70 years x 365 days per year) for cancer effects, and averaging time of 2,190 days (6 years x 365 days per year) for non-cancer effects for a child resident, 3,650 days (10 years x 365 days per year) for non-cancer effects for an adolescent trespasser, and 10,950 days (30 years x 365 days per year) for non-cancer effects for an adult resident (USEPA, 1991)

- Average body weight of 15 kg for a child resident (assumed to be 0 to 6 years old), 45 kg for an adolescent trespasser, and 70 kg for an adult resident (USEPA, 1991)

- Exposure duration of 6 years for a child resident, 10 years for an adolescent trespasser, and 30 years for an adult resident (USEPA, 1991)

- Exposure frequency of 90 days per year (USEPA, 1991) for the wading pool and swimming exposure scenarios

- Exposure frequency of 40 days per year (USEPA, 1991) for the adolescent trespasser wading exposure scenario

- Incidental water ingestion rate of 0.05 liters per hour (L/hour) by a young child assuming a 1-hour exposure period per day in a wading pool filled with irrigation water

- Incidental water ingestion rate of 0.050 L/hour by an older child and adult swimming in a swimming pool filled with irrigation water assuming a 1-hour exposure period per day

- Incidental water ingestion rate of 0.005 L/hour by an adult working in a greenhouse while using the irrigation water assuming a 1-hour exposure period per day

- Incidental water ingestion rate of 0.010 L/hour by an adolescent wading in surface water

- Adult skin surface area of 5,700 cm^2 while using the groundwater in a greenhouse

- Adolescent skin surface area of 5,500 cm^2 while wading in surface water

- Young child skin surface area of 6,600 cm^2 while wading in a wading pool
- Adult skin surface area of 18,000 cm^2 and an older child skin surface area of 6,600 cm^2 while swimming in a swimming pool

5. Toxicity Assessment

This section discusses the two general categories of toxic effects (non-carcinogenic and carcinogenic) and constituent-specific toxicity values used to calculate potential risks for these two types of toxic effects. Toxicity values for potential non-carcinogenic and carcinogenic effects are identified from available databases. For this HHRA, toxicity values were obtained from the RSL website (USEPA, 2010a), which used the following sources, in the priority in which they were consulted below consistent with the USEPA (2003) guidance:

1. USEPA's Integrated Risk Information System (IRIS) (USEPA, 2010c)
2. Provisional Peer Reviewed Toxicity Values derived by USEPA's Superfund Health Risk Technical Support Center for the USEPA Superfund program
3. Agency for Toxic Substances and Disease Registry minimal risk levels
4. California Environmental Protection Agency (CalEPA)/Office of Environmental Health Hazard Assessment's toxicity values (CalEPA, 2010)
5. USEPA Superfund program's Health Effects Assessment Summary Tables (USEPA, 1997b)

The USEPA (2009) does not recommend using oral toxicity values to derive inhalation toxicity values. As a conservative measure, the oral non-cancer toxicity values for cis-1,2-DCE and trans-1,2-DCE were used as the basis for evaluating inhalation exposures. Similarly, the inhalation non-cancer toxicity value for TCE was used to evaluate oral exposures. In most risk assessments, non-cancer effects via inhalation or oral exposures (as identified above) to these COPCs would not be assessed due to a lack of appropriate dose-response values. In this case, alternative toxicity values were derived to provide a more protective health risk assessment.

5.1 Non-Carcinogenic Effects

For many non-carcinogenic effects, protective mechanisms must be overcome before an effect is manifested. Therefore, a finite dose (threshold), below which adverse effects will not occur, exists for non-carcinogens. Depending on the dose, a single compound might elicit several adverse effects in the exposure route, the duration of exposure, and the susceptibility of the individual. Constituents may exhibit their toxic effects at the point of application or contact (local effect) or at other sites (systemic effects) after they have been absorbed into and distributed throughout the body. Most constituents can produce more than one type of toxic effect, depending on the dose and the susceptibility of the exposed individual or receptor. The goal of toxicity studies for application in this HHRA is to identify the most sensitive toxic effect and the exposure levels that are expected to be safe. The potential for non-carcinogenic effects is estimated by comparing a calculated exposure dose with a reference dose (RfD) for each individual constituent. The RfD represents a daily exposure level that is designed to be protective of human health, even for sensitive individuals or subpopulations. The reference concentration (RfC) is a comparable level that represents an air concentration designed to be protective of human health, including sensitive individuals and subpopulations.

For a given constituent, the dose or concentration that elicits no adverse effect when evaluating the most sensitive response in the most sensitive species studied is referred to as the “no observed adverse effect level” (NOAEL). The NOAEL is used to establish non-cancer toxicity values (called RfDs or RfCs). The RfD represents a daily exposure level that is not expected to cause adverse non-carcinogenic health effects. Chronic RfDs are used to assess long-term exposures ranging from 7 years to a lifetime. Subchronic RfDs are typically used to evaluate the potential for adverse health effects associated with exposure to constituents over a shorter time period up to 7 years and were used in the construction worker exposure scenarios. However, in accordance with the USEPA Region 4 guidance (USEPA, 2000), chronic toxicity values were used to evaluate the potential for adverse health effects for children.

For the COPCs in the OU-2 area, Table A-12 presents the RfDs used to assess oral and dermal exposure, and Table A-13 presents the RfCs used to evaluate inhalation exposure. These tables also present the target sites associated with the non-carcinogenic toxicity values for each constituent varying with the exposure route. USEPA confidence values and uncertainty factors associated with the RfDs also are listed (USEPA, 2010a). The uncertainty factor represents areas of uncertainty inherent in the extrapolation from the available data. The confidence levels (low, medium, high) assess the degree of confidence in the extrapolation of available data. These levels account for data deficiencies or uncertainties, such as individual sensitivity and variability, interspecies variability (if animal data are used), database deficiency, and the extrapolation between exposure doses/durations.

5.2 Carcinogenic Effects

Cancer induction in humans and animals by chemicals proceeds through a complex series of reactions and processes. Carcinogenic constituents may produce tumors at the point of application or contact, or they may produce tumors in other tissues after they have been distributed throughout the body. Some constituents are associated only with one or two tumor types, while others may cause tumors at many different sites.

Constituents are classified as known, probable, or possible human carcinogens based on a USEPA weight-of-evidence scheme in which they are systematically evaluated for their ability to cause cancer in humans or laboratory animals. The USEPA classification scheme (USEPA, 1989) contains five classes based on the weight of available evidence. These classifications were updated in the USEPA’s 2005 cancer guidelines and the classification is now presented as a narrative. Classifications are updated in the USEPA IRIS files as constituents are reviewed. However, the older classifications are often retained for reference. These are presented in Tables A-14 and A-15.

Constituents in Classes A, B1, and B2 generally are evaluated as carcinogens in HHRAs; however, Class C carcinogens may be evaluated on a case-by-case basis (USEPA, 1989).

For carcinogens, the current regulatory guidelines (USEPA, 1989) use an extremely conservative approach in which it is assumed that any level of exposure could cause cancer. Based on this assumption, the USEPA’s default approach extrapolates from laboratory animal data using a mathematical model known as the linear multi-stage model. This model plots a line through the zero point and, based on the slope of this dose-response line, assigns a risk level for increasingly smaller doses of a particular compound. The 95 percent UCL for the slope of this line, called the cancer slope factor (CSF), is used to calculate the probability of an effect associated with a given dose. The USEPA’s slope factors, thus, are determined by a methodology that is likely to overestimate real risk. An even greater problem may lie in the USEPA assumption of dose and response additivity for carcinogenic effects.

For the COPCs in OU-2, Table A-14 presents the carcinogenic toxicity values for oral and dermal exposure, and Table A-15 presents the carcinogenic toxicity values for inhalation exposure to the COPCs in the OU-2 area. The carcinogenic toxicity value used in the calculation of potential cancer risks is the CSF, which is derived from the conservative assumption that any dose level has a possibility of causing cancer. The inhalation unit risk factor for inhalation exposure is used in the indoor air models as the toxicity value. The cumulative dose, regardless of the particular exposure period, determines the risk; therefore, separate CSFs are not derived for subchronic and chronic exposure periods.

5.3 Dermal Toxicity Values and Dermal Absorption

Whenever possible, route-specific toxicity values have been used; however, the USEPA has not yet developed toxicity values for dermal exposures. For this reason, the oral toxicity values (RfD_o and CSF_o) and the oral absorption efficiency were used to derive adjusted toxicity values (RfD_a and CSF_a) (adjusted to the absorbed dose) for use in assessing dermal exposure (USEPA, 1989):

$$RfD_a = RfD_o \text{ x Oral Absorption Efficiency}$$

$$CSF_a = CSF_o \text{ / Oral Absorption Efficiency}$$

The adjusted toxicity values presented in Table A-12 (RfD_as) and Table A-14 (CSF_as) represent the theoretical toxicity of the orally absorbed dose of the constituent. An oral absorption efficiency factor (or relative absorption factor) describes the ratio of the absorbed fraction of a constituent from a particular exposure medium to the fraction absorbed from the dosing vehicle used in the toxicity study for that constituent. Oral absorption efficiency values are used in the derivations of the risk-based groundwater constituent concentrations to account for differences in the proportion of absorbed constituent in the groundwater compared to the proportion absorbed in the toxicity studies forming the bases of the toxicity reference values. Oral absorption efficiencies are constituent-specific because they depend on unique physical-chemical properties of each constituent. As a conservative measure, the oral absorption efficiencies were assumed to be equal to 1 (i.e., 100 percent absorption) for all COPCs via the inhalation pathways. Uncertainty is associated with the adjusted toxicity values and with the dermal risks derived using these values, due to the uncertainty in the oral toxicity values combined with the uncertainty in the oral absorption efficiency default and constituent-specific values. However, the calculated dermal risks are expected to be very conservative and, therefore, will overestimate human health risks.

Table A-10 presents the dermal absorption parameters for the COPCs. The permeability coefficient and non-steady-state dermal absorption parameters are used to estimate dermal uptake from water.

6. Risk Characterization

Potential risks to human health are evaluated quantitatively by combining calculated exposure levels and toxicity data. A distinction is made between non-carcinogenic and carcinogenic endpoints, and two general criteria are used to describe the HQ for non-carcinogenic effects and ELCR for COPCs evaluated as human carcinogens.

6.1 Hazard Quotient for Non-Cancer Hazard

Exposure doses are averaged over the expected exposure period to evaluate non-carcinogenic effects. The HQ is the ratio of the estimated exposure dose and the RfD. Thus, an HQ greater than 1 indicates that the estimated exposure level for that constituent exceeds the RfD or RfC. This ratio does not provide the probability of an adverse effect. Although an HQ less than 1 indicates that health effects should not occur, an HQ that exceeds 1 does not imply that health effects will occur, but that health effects are possible.

The sum of the HQs is the hazard index (HI). A limitation with the HI approach is that the assumption of dose additivity is applied to compounds that may induce different effects by different mechanisms of action. Consequently, the summing of HIs for a number of compounds that are not expected to induce the same type of effects or that do not act by the same mechanism, may overestimate the potential for toxic effects. Consistent with USEPA risk assessment guidelines for chemical mixtures, in the event that the total HI for an exposure scenario exceeds 1, it is incumbent on a risk assessor to segregate HQs by target organ/critical effect (USEPA, 1989). Therefore, if the calculated HI exceeds 1 as a consequence of summing several HQs for constituents not expected to induce the same type of effects or that do not act by the same mechanism, the HIs may be segregated by effect and mechanism of action to derive separate HIs for each target-organ/critical-effect group (USEPA, 1989).

6.2 Excess Lifetime Cancer Risk

The ELCR is an estimate of the potential increased risk of cancer that results from lifetime exposure, at specified average daily dosages, to COPCs detected in media in the OU-2 area. Estimated doses or intakes for each constituent are averaged over the hypothesized lifetime of 70 years. It is assumed that a large dose received over a short period is equivalent to a smaller dose received over a longer period, as long as the total doses are equal. The ELCR is calculated as the product of the exposure dose and the CSF or unit risk factor. The risk values provided in this HHRA indicate the potential increased risk, above that applying to the general population, which may result from the exposure scenarios described in the Exposure Assessment (Section 4). The risk estimate is considered to be an upper-bound estimate; therefore, it is likely that the true risk is far less than that predicted by the model. The USEPA considers ELCRs within and below the range of 10^{-6} to 10^{-4} as potentially acceptable cancer risks.

6.3 Estimated Operable Unit 2 Worker Exposure Scenario Risks and Hazards

The potential for exposure to vapors from indoor air resulting from vapor intrusion from soil gas was evaluated for the hypothetical future worker in OU-2 using the Screening-Level Johnson and Ettinger Model (1991) available from the USEPA. This is a very conservative model that utilizes default parameters to evaluate potential risks from vapor inhalation in indoor air. The exposure parameters were modified for worker exposure within OU-2.

Tables A-16 through A-18 presents the input parameters, constituent-specific information, and the results of the intermediate calculations for the vapor intrusion model. The results of the risk calculations are presented in Table A-19. The ELCR is 3 x 10^{-8}, which is well below the regulatory benchmarks. The calculated HI is 0.00008, which is well below the HI target of 1.

The cumulative risks and hazards for the worker within OU-2 are presented in Table A-34. The total ELCR was calculated to be 3 x 10^{-8}, and the HI was calculated to be 0.00008. The risks and hazards are well below the regulatory benchmarks.

6.4 Estimated Hypothetical Future Construction Worker Exposure Scenario Risks and Hazards

Construction workers within OU-2 could potentially contact groundwater within OU-2 and be exposed to COPCs in groundwater. The depth to groundwater within OU-2 varies seasonally from about 7 to 10 feet bgs with the result that depending on the type of construction project, contact with groundwater within OU-2 may not occur. The exposure assumptions used to evaluate hypothetical future construction worker exposure to groundwater are presented in Table A-11. The equations used in the risk characterization calculations are presented in Table A-9. The ELCR and non-cancer HI for construction workers are presented in Table A-20 for exposure to groundwater within OU-2. The ELCR was calculated to be 9 x 10^{-7}, which less than both the SCDHEC target risk of 1 x 10^{-6} and the USEPA target risk range of 10^{-6} to 10^{-4}. The calculated HI of 0.1 is less than the HI target of 1.

6.5 Estimated Hypothetical Resident Exposure Scenario Risks and Hazards

Current or future residents within OU-2 could contact COPCs in surface water or irrigation water. Exposure to COPCs in surface water could occur if an adolescent resident or trespasser were wading in the surface-water body. The irrigation water could be used to fill a wading pool, fill a swimming pool, or used for watering plants in a greenhouse. Finally, residents within OU-2 could be exposed to COPCs migrating from soil gas into a building, if a building was constructed in areas currently vacant, where relatively higher concentrations of volatile COPCs were observed in soil gas sampling location SG-6 (ARCADIS, 2009).

The exposure assumptions used to evaluate residential exposure are presented in Table A-11. The equations used to evaluate residential exposure to surface water or irrigation water are presented in Table A-9.

6.5.1 Current/Future Operable Unit 2 Adult Resident

The equations used to evaluate this exposure are found in Table A-9, which presents the general equations for groundwater exposure (assuming incidental ingestion, dermal contact, and inhalation).

The ELCR for adult resident exposure to irrigation groundwater used to fill a swimming pool is 3×10^{-6}, which is only slightly greater than the SCDHEC benchmark and at the low end of the USEPA target risk range, as seen in Table A-21. The calculated HI is 0.9, which is below the benchmark of 1. It should be noted these results represent conservative estimates of exposure as the concentrations of the COPCs in the swimming pool will decrease over time due to volatilization to ambient air and naturally occurring degradation processes that would act to reduce the COPC concentrations in the swimming pool.

If the resident within OU-2 were to use the irrigation water in a greenhouse, there is the potential for the individual to inhale vapors from water forming puddles on the floor of the greenhouse, as well as to ingest small quantities of the water or to get the water on their skin. VOCs were not found to bioconcentrate in fruit or vegetables, and therefore, ingestion of produce grown in the greenhouse was not quantitatively evaluated in this HHRA. The equations used to evaluate this exposure are found in Table A-9, which presents the general equations for groundwater and surface-water exposure (assuming incidental ingestion, dermal contact, and inhalation). The results are presented in Table A-22. The ELCR was calculated to be 6×10^{-7}, which is below the

SCDHEC and USEPA risk targets. The HI was calculated to be 0.2, which is below the regulatory benchmarks. The vapor intrusion exposure scenario was updated using the maximum soil gas concentration, as measured in soil gas sample probe SG-6 (ARCADIS, 2009). The data entry, chemical property, and the results of the intermediate calculations are presented in les A-234 through A-25. The results are presented in Table A-26. The calculated ELCR is 2 x 10^{-7}, which is less than the regulatory benchmarks. The calculated HI is 0.0003, which is less than the HI target of 1.

The cumulative risks and hazards for the adult resident within OU-2 are presented in Table A-34. It was assumed that the same individual would be exposed to COPCs present in irrigation well water while swimming in a pool, and using the water in a greenhouse, and in soil vapors migrating into a home. The calculated total ELCR was 4 x 10^{-6}. This is slightly greater than the SCDHEC target risk and at the low end of the USEPA target risk range. The total HI was calculated to be 1.. However, these calculations are conservative in that the irrigation well water concentrations in the swimming pool, which was the exposure scenario with the highest risk (3 x 10^{-6}) and hazard index (0.9), assumed that the COPC concentrations in the pool water would remain constant throughout the summer. In reality, the COPCs would volatilize and the concentrations would decrease over the summer months, thereby reducing the calculated risks to levels less than 1 x 10^{-6}.

6.5.2 Current/Future Operable Unit 2 Child Resident

A child resident within OU-2 was assumed to contact irrigation well water if it were used to fill a wading pool or a swimming pool. A child (ages 0 to 2 years old) was assumed to play in the wading pool, while a slightly older child (ages 2 to 6 years old) was assumed to swim in the larger swimming pool. The results for the child playing in the wading pool are found in Table A-27. The ELCR was calculated to be 5 x 10^{-7}, and the HI was calculated to be 2. The results for the older child swimming in a pool are presented in Table A-28. The ELCR and HI were calculated to be 9 x 10^{-7} and 2, respectively. Because this exposure scenario could apply to a single child, the ELCRs and HIs were added together to yield a cumulative ELCR of 1 x 10^{-6} and a cumulative HI of 4. The ELCR is equal to than the regulatory benchmark. The HI exceeds the benchmark of 1. Using the RfD for cis-1,2-DCE and the RfC for TCE to derive alternative toxicity values provides a conservative approach because the USEPA (2009) does not recommend this approach. Additionally, the calculation was conservative in that the irrigation well water concentrations in the wading pool or swimming pool assumed that the COPC concentrations in the pool water would remain constant throughout the summer. In reality, the COPCs would volatilize and the concentrations would decrease over the summer months, thereby reducing the calculated risks and hazards.

The vapor intrusion exposure scenario was updated using the maximum soil gas concentration, as measured in soil gas probe SG-6 for the child resident. The data entry, chemical property, and the results of the intermediate calculations are presented in Tables A-29 through A-31. The results are presented in Table A-32. The calculated ELCR is 3×10^{-8}, which is less than the regulatory benchmarks. The calculated HI is 0.0003, which is less than the HI benchmark of 1.

The cumulative risks and hazards for the child resident within OU-2 are presented in Table A-34. It was assumed that the same individual would be exposed to COPCs present in surface water while wading, in irrigation well water while playing in a wading pool and swimming in a pool, and in soil vapors migrating into a home. The calculated total ELCR was 1 x 10^{-6}. The total HI was calculated to be 4. The ELCR is at the low end of the target risk range, and the HI slightly exceeds the regulatory benchmark of 1, although this result is overly conservative because it assumes that the constituent concentrations remain constant over the summer, whereas it is expected that the concentrations would decrease through volatilization, thereby reducing the hazard index.

6.5.3 Current/Future Operable Unit 2 Adolescent Resident/Trespasser

Current or future residents within OU-2 could contact COPCs in surface water. Adolescents or older children ages 7 to 16 years are the most likely age-range of residents to be wading in surface water. Thus, exposure to COPCs in surface water could occur if the adolescent resident were wading in the surface-water body. As presented in Table A-33, the ELCR for adolescent trespasser exposure to surface water while wading is 1 x 10^{-7}, which is below the SCDHEC target risk of 1 x 10^{-6} and the USEPA target risk range of 10^{-6} to 10^{-4}. The calculated HI is 0.006, which is well below the target value of 1.

7. Conclusions

An HHRA was performed to evaluate whether constituent concentrations in groundwater, soil gas, or surface water pose a significant threat to human health based on existing conditions and presumed future land-use conditions. The data were compared to USEPA RSLs to identify COPCs. There is no expectation of harm to public health with respect to the COPCs present in soil gas, surface water, groundwater, and irrigation water.

The potential exposure scenarios quantitatively evaluated included the following (by media):

- *OU-2 Groundwater*: Exposure to hypothetical construction workers.
- *Surface Water*: Hypothetical exposure to adolescent residents/trespassers.
- *Irrigation Water*: Hypothetical exposure to child and adult residents during use to fill wading pools, swimming pools, and/or irrigation of plants in a greenhouse.
- *Vapors*: Hypothetical exposure, within buildings, to workers in OU-2 and hypothetical future adult and child residents.

OU-2-specific exposure assumptions were used in conjunction with peer-reviewed toxicity values to characterize ELCRs and non-cancer hazards. For cancer endpoints, the SCDHEC target risk considered protective of health is 1×10^{-6}, and the USEPA target risk range considered protective of health is 1×10^{-6} to 1×10^{-4}. For non-cancer endpoints, both the SCDHEC and the USEPA use a benchmark of 1.

Table A-34 summarizes the results of the risk and hazard calculations. For each receptor, the risks and hazards from each of the exposure scenarios were calculated and added together. The exposure scenarios and results are summarized below by potential receptor:

- *OU-2 Worker*: Hypothetical future OU-2 commercial or industrial workers were assumed to inhale COPCs migrating from the subsurface into buildings. The total ELCR was calculated to be 3×10^{-8}, and the HI was calculated to be 0.00008. The risks and hazards are well below the regulatory benchmarks.

- *Hypothetical OU-2 Construction Worker*: Hypothetical future OU-2 construction workers were assumed to contact groundwater during excavation activities. The groundwater in OU-2 varies seasonally from about 7 to 10 feet bgs, with the result that depending on the type of construction project, contact with groundwater in OU-2 may not occur. An ELCR of 9×10^{-7} was calculated, which is less than both the SCDHEC target risk of 1×10^{-6} and the USEPA target risk range of 10^{-6} to 10^{-4}. The calculated HI of 0.1 is less than the HI target of 1.

- *OU-2 Adult Resident*: Adult residents in OU-2 were hypothetically assumed to use irrigation well water to fill a swimming pool and use the irrigation well water in a greenhouse, and inhale soil vapors migrating into a home. The calculated total ELCR was 4×10^{-6}. This is slightly greater than the SCDHEC target risk, and at the low end of the USEPA target risk range. The total HI was calculated to be 1,.The calculation was conservative in that the irrigation well water concentrations in the swimming pool, which was the exposure scenario with the highest risk (3×10^{-6}) and HI (1), assumed that the COPC concentrations in the pool water would remain constant throughout the summer. Rather, COPCs will volatilize and the concentrations will decrease over the summer months, thus reducing the calculated risks.

- *OU-2 Child Resident*: Child residents in OU-2 were hypothetically assumed to swim in a swimming pool or play in a wading pool filled with irrigation well water, and inhale soil vapors migrating into a home. The calculated total ELCR was 1×10^{-6}. The ELCR is equal to the SCDHEC regulatory benchmark and at the low end of the USEPA target risk range. The total HI was calculated to be 4, which is slightly greater than the regulatory benchmark of 1. The exposure to irrigation well water in a wading or swimming pool contributed to the slightly elevated risks and hazards. The calculation was conservative in that the irrigation well water concentrations in the wading or swimming pool was assumed to remain constant throughout the summer. Rather, COPCs will volatilize and the concentrations will decrease over the summer months, thus reducing the calculated risks.

- *OU-2 Adolescent Resident/Trespasser:* Adolescents or older children ages 7 to 16 years were assumed to wade in surface water. The calculated ELCR for adolescent trespasser exposure to surface water while wading is 1×10^{-7}, which is below the SCDHEC target risk of 1×10^{-6} and the USEPA target risk range of 10^{-6} to 10^{-4}. The calculated HI is 0.006, which is well below the target value of 1.

The assumption in preparing this HHRA, is that the groundwater will not be used as a potable water supply. In light of the foregoing, the results of analysis are less than or within the conservative federal and state risk-based levels. Therefore, there is no expectation of harm to public health with respect to the COPCs present in soil gas, surface water, groundwater, and irrigation water in the OU-2 area.

8. References

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ARCADIS

Tables

Table A-1
Screening Levels for the Protection of Human Health
OU-2 Feasibility Study
AVX Corporation
Myrtle Beach, South Carolina

Constituent	CASN	Adjusted Tap Water Regional Screening Level (Tap Water RSL) [a] (mg/L)	
Volatile Organic Compounds			
Acetone	67-64-1	2.20E+00	n
Benzene	71-43-2	4.10E-04	c
Bromodichloromethane	75-27-4	1.20E-04	c
Carbon Disulfide	75-15-0	1.00E-01	n
Chloroethane	75-00-3	2.10E+00	n
Chloroform	67-66-3	1.90E-04	c
Chloromethane	74-87-3	1.90E-02	n
Dibromochloromethane	75-27-4	1.50E-04	c
1,1-Dichloroethane	75-34-3	2.40E-03	c
1,1-Dichloroethene	75-35-4	3.40E-02	n
cis-1,2-Dichloroethene	156-59-2	7.30E-03	n
trans-1,2-Dichloroethene	156-60-5	1.10E-02	n
Ethylbenzene	100-41-4	1.50E-03	c
Isopropylbenzene	98-82-8	6.80E-02	n
Methyl tert-butyl ether	1634-04-4	1.20E-02	c
Methylene Chloride	75-09-2	4.80E-03	c
Methyl ethyl ketone	78-93-3	7.10E-01	n
Naphthalene	91-20-3	1.40E-04	c*
n-Propylbenzene	103-65-1	1.30E-01	n
Toluene	127-18-4	2.30E-01	n
Tetrachloroethene	108-88-3	1.10E-04	c
1,1,1-Trichloroethane	71-55-6	9.10E-01	n
Trichloroethene	79-01-6	2.00E-03	c
1,2,4-Trimethylbenzene	95-63-6	1.50E-03	n
Vinyl chloride	75-01-4	1.60E-05	c
Xylenes, total	1330-20-7	2.00E-02	n

COPC	Constituent of Potential Concern
mg/kg	Milligrams per kilogram.
mg/L	Milligrams per liter.

[a] The screening levels used were risk screening levels for the residential scenario from USEPA (2010a).

Screening levels based on non-cancer effects were adjusted by a factor of 10. For chemicals whose screening levels were based on cancer effects but the noncancer screening level was less than 10x the cancer level (tagged with c**), the non-cancer level was used after adjustment.

c = cancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; n = noncancer; m = Concentration may exceed ceiling limit;
s = Concentration may exceed saturation concentration (Csat).

Table A-2

Off-Site Groundwater Risk Assessment Dataset
OU-2 Feasibility Study
AVX Corporation
Myrtle Beach, South Carolina

Constituent [a]	CASN	Frequency of Detection (FOD) [b]				Detects			Detection Limits			Maximum Location	Mean [c]	Exposure Point Concentration [d]	
		number of detects / number of samples			FOD %	Min	-	Max	Min	-	Max				
						(mg/L)		(mg/L)	(mg/L)		(mg/L)		(mg/L)	(mg/L)	
Volatile Organic Compounds															
1,1-Dichloroethane	75-34-3	4	-	25	16.0	0.00063	-	0.002	0.00029	-	2.5	MW-21D(5/22/2007 10:05:00 AM)	–	0.0020	m
1,1-Dichloroethene	75-35-4	4	-	25	16.0	0.0016	-	0.02	0.0003	-	2.5	MW-24D(4/14/2010)	–	0.020	m
Acetone	67-64-1	3	-	25	12.0	0.00321	-	0.0714	0.005	-	62.5	MW-25DD(12/18/2007)	–	0.0714	m
Benzene	71-43-2	1	-	25	4.00	0.00037	-	0.00037	0.00021	-	2.5	MW-24D(4/14/2010)	–	0.00037	m
cis-1,2-Dichloroethene	156-59-2	21	-	25	84.0	0.02	-	8.1	0.00035	-	0.001	MW-25D(4/14/2010)	2.17	4.46	
Toluene	108-88-3	1	-	25	4.00	0.0033	-	0.0033	0.00026	-	2.5	MW-24D(4/14/2010)	–	0.00330	m
trans-1,2-Dichloroethene	156-60-5	4	-	25	16.0	0.0014	-	0.089	0.00043	-	2.5	MW-23D(4/14/2010)	–	0.0890	m
Trichloroethene	79-01-6	21	-	25	84.0	0.00437	-	50.5	0.00023	-	0.1	MW-23D	3.193	12.026	
Vinyl chloride	75-01-4	5	-	25	20.0	0.0019	-	0.39	0.00038	-	2.5	MW-24D(4/14/2010)	0.03622	0.0765	
Naphthalene	91-20-3	1	-	23	4.35	0.0086	-	0.0086	0.00028	-	2.5	MW-24D(4/14/2010)	–	0.00860	m

CASN	Chemical abstracts registry number.
mg/L	Milligrams per liter.

[a] Constituents detected at least once in at least in this medium are presented.
For duplicate samples, the highest detected value or the lowest detection limit were used.

[b] Frequency of detection (FOD) = number of detects / total number of samples analyzed.

[c] The mean was the Kaplan-Meyer mean, calculated using ProUCL 4.00.05.

[d] The exposure point concentration (EPC) was the upper confidence level on the mean (UCL) or the maximum concentration where the UCL was incalculable.
EPCs marked with "m" are based on the maximum detected concentration.
The UCLs were calculated using ProUCL 4.00.05. The UCL used is the one recommended by the software.

Table A-3
Selection Constituents of Potential Concern for Off-Site Groundwater
OU-2 Feasibility Study
AVX Corporation
Myrtle Beach, South Carolina

Constituent	Maximum Concentration [a]	Site Water Screening Levels [b]		Is Constituent a Groundwater COPC? [c]
	(mg/L)	(mg/L)		(YES, no)
Volatile Organic Compounds				
Acetone	7.14E-02	2.20E+00	n	no
Benzene	3.70E-04	4.10E-04	c	no
1,1-Dichloroethane	2.00E-03	2.40E-03	c	no
1,1-Dichloroethene	2.00E-02	3.40E-02	n	no
cis-1,2-Dichloroethene	8.10E+00	7.30E-03	n	**YES**
trans-1,2-Dichloroethene	8.90E-02	1.10E-02	n	**YES**
Naphthalene	8.60E-03	1.40E-04	c*	**YES**
Toluene	3.30E-03	2.30E-01	n	no
Trichloroethene	5.05E+01	2.00E-03	c	**YES**
Vinyl chloride	3.90E-01	1.60E-05	c	**YES**

COPC	Constituent of Potential Concern.
mg/L	Milligrams per liter.
NA	Not available or not applicable.
[a]	Maximum concentration in groundwater
[b]	Screening levels based on non-cancer effects were adjusted by a factor of 10. For constituents whose screening levels were based on cancer effects but the noncancer screening level was less than 100x the cancer level, the screening level is tagged with c*; c = cancer SL; n = noncancer SL.
[c]	Constituents detected with maximum concentrations greater than residential screening levels were considered COPCs.

Table A-4
Surface-Water Risk Assessment Dataset
OU-2 Feasibility Study
AVX Corporation
Myrtle Beach, South Carolina

Constituent [a]	CASN	Frequency of Detection (FOD) [b]				Detects			Detection Limits			Maximum Sample	Mean [c]	Exposure Point Concentration [d]
		number of detects / number of samples			FOD %	Min	-	Max	Min	-	Max			
						(mg/L)		(mg/L)	(mg/L)		(mg/L)		(mg/L)	(mg/L)
Volatile Organic Compounds														
1,1,1-Trichloroethane	71-55-6	1	-	23	4.35	0.0004	-	0.0004	0.001	-	0.01	SW-11(11/15/2007)	–	0.0004 m
2-Butanone	78-93-3	1	-	23	4.35	0.00279	-	0.00279	0.025	-	0.25	SW-11(11/15/2007)	–	0.00279 m
Acetone	67-64-1	6	-	23	26.1	0.0035	-	0.0255	0.025	-	0.25	SW-11(11/15/2007)	0.01052	0.01535
Bromodichloromethane	75-27-4	2	-	23	8.70	0.00022	-	0.00023	0.001	-	0.01	SW-10(11/15/2007)	–	0.00023 m
Carbon disulfide	75-15-0	1	-	23	4.35	0.00033	-	0.00033	0.001	-	0.01	SW-11(11/15/2007)	–	0.00033 m
Chloroform	67-66-3	3	-	23	13.0	0.00014	-	0.00015	0.001	-	0.01	SW-9(11/15/2007)	–	0.00015 m
cis-1,2-Dichloroethene	156-59-2	16	-	23	69.6	0.00011	-	0.2	0.001	-	0.001	SW-5(11/15/2007)	0.0336	0.05394
Dibromochloromethane	124-48-1	3	-	23	13.0	0.00017	-	0.00026	0.001	-	0.01	SW-10(11/15/2007)	–	0.00026 m
Methylene chloride	75-09-2	5	-	23	21.7	0.00023	-	0.0011	0.005	-	0.05	SW-3(11/15/2007)	0.00049 MD	0.000755
Methyl tert-butyl ether	1634-04-4	1	-	23	4.35	0.00159	-	0.00159	0.001	-	0.01	SW-16-1(12/17/2007)	–	0.00159 m
trans-1,2-Dichloroethene	156-60-5	3	-	23	13.0	0.00016	-	0.0021	0.001	-	0.01	SW-5(11/15/2007)	–	0.0021 m
Trichloroethene	79-01-6	9	-	23	39.1	0.00092	-	0.0192	0.001	-	0.001	SW-5(11/15/2007)	0.00361	0.0192 m
Vinyl chloride	75-01-4	7	-	23	30.4	0.00146	-	0.0082	0.001	-	0.004	SW-5(11/15/2007)	0.00235	0.0082 m

CASN	Chemical abstracts registry number.
mg/L	Milligrams per liter.
ND	Non-detects.

[a] Constituents detected at least once in at least in this medium are presented.
[b] Frequency of detection (FOD) = number of detects / total number of samples analyzed.
[c] The mean was the Kaplan-Meyer mean, calculated using ProUCL 4.00.05, unless it is marked as MD, then it is the mean detection.
[d] The exposure point concentration (EPC) was the upper confidence level on the mean (UCL) or the maximum concentration where the UCL was incalculable.
EPCs marked with "m" are based on the maximum detected concentration.
The UCLs were calculated using ProUCL 4.00.05. The UCL used is the one recommended by the software.

Table A-5
Selection of Constituents of Potential Concern for Surface Water
OU-2 Feasibility Study
AVX Corporation
Myrtle Beach, South Carolina

Constituent	Maximum Concentration [a] (mg/L)	Site Water Screening Levels [b] (mg/L)		Is Constituent a Surface Water COPC? [c] (YES, no)
Volatile Organic Compounds				
Acetone	2.55E-02	2.20E+00	n	no
Bromodichloromethane	2.30E-04	1.20E-04	c	**YES**
Carbon Disulfide	3.30E-04	1.00E-01	n	no
Chloroform	1.50E-04	1.90E-04	c	no
Dibromochloromethane	2.60E-04	1.50E-04	c	**YES**
cis-1,2-Dichloroethene	2.00E-01	7.30E-03	n	**YES**
trans-1,2-Dichloroethene	2.10E-03	1.10E-02	n	no
Methyl tert-butyl ether	1.59E-03	1.20E-02	c	no
Methylene Chloride	1.10E-03	4.80E-03	c	no
1,1,1-Trichloroethane	4.00E-04	9.10E-01	n	no
Trichloroethene	1.92E-02	2.00E-03	c	**YES**
Vinyl chloride	8.20E-03	1.60E-05	c	**YES**

COPC	Constituent of Potential Concern.
mg/L	Milligrams per liter.
NA	Not available or not applicable.
[a]	Maximum concentration in surface water.
[b]	Screening levels based on non-cancer effects were adjusted by a factor of 10. Screening levels were based on cancer effects (c) or non-cancer effects (n).
[c]	Constituents detected with maximum concentrations greater than residential screening levels were considered COPCs.

Table A-6
Irrigation Water Well Data
OU-2 Feasibility Study
AVX Corporation
Myrtle Beach, South Carolina

	Sample ID	USEPA RSL [a]		1210 Holly Park Circle	1219 Holly Park Circle	Sterling Village 1A	Sterling Village 1B	Sterling Village 3C	Sterling Village 3D	Bent Oak 01	1205 Beaver Rd Ext
Constituent	**Sample Date:**		**Units**	**06/02/08**	**06/02/08**	**12/08/07**	**12/08/07**	**12/08/07**	**12/08/07**	**12/08/07**	**12/08/07**
Volatile Organic Compounds											
Acetone		2,200	µg/L	<20	<20	400	<20	<20	<20	<20	<20
2-Butanone		710	µg/L	<10	<10	160	<10	<10	<10	<10	<10
cis-1,2-Dichloroethene		7.3	µg/L	**63**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**4,400**
trans-1,2-Dichloroethene		11	µg/L	5.8	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Trichloroethene		2.0	µg/L	**250**	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	**1,700**

Table A-6
Irrigation Water Well Data
OU-2 Feasibility Study
AVX Corporation
Myrtle Beach, South Carolina

Constituent	Sample ID Sample Date:	USEPA RSL [a]	Units	1206 Beaver Rd Ext 12/08/07	1207 Beaver Rd Ext 05/27/08	1117 9th Ave South 12/18/07	707 11th Ave South 12/18/07	707 11th Ave South (Duplicate) 12/18/07	713 11th Ave South 12/18/07	806 11th Ave South 12/18/07	610 13th Ave South 02/21/08
Volatile Organic Compounds											
Acetone		2,200	µg/L	<20	<20	<20	<20	<20	<20	<20	<20
2-Butanone		710	µg/L	<10	320	<10	<10	<10	<10	<10	<10
cis-1,2-Dichloroethene		7.3	µg/L	<5.0	<5.0	<5.0	**870**	**820**	<5.0	<5.0	<5.0
trans-1,2-Dichloroethene		11	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Trichloroethene		2.0	µg/L	<5.0	<5.0	<5.0	**360**	**320**	<5.0	<5.0	5.4

Note:	Only constituents detected once are presented in the table.
	Bold indicates constituent detected at a concentration exceeding the RSL.
µg/L	Micrograms per liter.
RSL	Regional screening level.
USEPA	United States Environmental Protection Agency.
<	Not detected at a concentration less than the listed reporting limit.
[a]	The tap water regional screening levels are presented herein USEPA (2010a). Screening levels based on non-cancer effects were adjusted by a factor of 10.

Table A-7
Exposure Point Concentrations
OU-2 Feasibility Study
AVX Corporation
Myrtle Beach, South Carolina

Constituent of Potential Concern (COPC)	CASN	COPC? [a]			Exposure Point Concentrations [c]			
		Off-Site Groundwater	Surface Water	Soil Gas [b]	Off-site Groundwater (mg/L)	Irrigation Water (mg/L)	Surface Water (mg/L)	Soil Gas (SG-6) (µg/m^3)
Volatile Organic Compounds								
Bromodichloromethane	75-27-4	no	**YES**	no	–	–	2.30E-04 m	–
Dibromochloromethane	75-27-4	no	**YES**	no	–	–	2.60E-04 m	–
1,1-Dichloroethene	75-35-4	no	no	**YES**	–	–	–	1.10E-01
cis-1,2-Dichloroethene	156-59-2	**YES**	**YES**	no	4.46E+00	1.77E+00 avg	5.39E-02	–
trans-1,2-Dichloroethene	156-60-5	**YES**	no	no	8.90E-02 m	–	–	–
Naphthalene	91-20-3	**YES**	no	no	8.60E-03 m	–	–	–
Tetrachloroethene	127-18-4	no	no	**YES**	–	–	–	8.60E+00
1,1,1-Trichloroethane	71-55-6	no	no	**YES**	–	–	–	3.00E+01
Trichloroethene	79-01-6	**YES**	**YES**	**YES**	1.20E+01	7.63E-01 avg	1.92E-02 m	4.40E+01
Vinyl chloride	75-01-4	**YES**	**YES**	**YES**	7.65E-02	–	8.20E-03 m	6.50E-01

Notes:

– =	Not detected/ not analyzed/ not applicable.
CASN =	Chemical abstracts registry number.
mg/kg =	Milligrams per kilogram.
mg/L =	Milligrams per liter.

[a] Constituent of Potential Concern.

[b] Soil Gas COPCs were identified in the Human Health Risk Assessment Off-Site Soil Gas Investigation (Appendix C in ARCADIS 2009).

[c] The exposure point concentration (EPC) was the upper confidence level on the mean (UCL) or the maximum concentration where the UCL was incalculable. EPCs marked with "m" are based on the maximum detected concentration. EPCs marked with "avg" are based on the average of the detected concentrations. The UCLs were calculated using ProUCL 4.00.05. The UCL used is the one recommended by the software.

Table A-8
Physical and Chemical Properties
OU-2 Feasibility Study
AVX Corporation
Myrtle Beach, South Carolina

Constituent	Molecular Weight (g/mol)	[ref]	Water Solubility (mg/L 25 °C)	[ref]	Vapor Pressure (mm Hg 25 °C)	[ref]	Henry's Law Constant (atm-m^3/mol) (25 °C)	[ref]	Diffusivity in Air (cm^2/sec)	[ref]	Diffusivity in Water (cm^2/sec)	[ref]	Koc (mL/g)	[ref]	Enthalpy of vaporization at boiling point, $\Delta H_{v,b}$ (cal/mol)	[ref]	Normal boiling point Tb (°K)		Critical temperature, Tc (°K)	
Volatile Organic Compounds																				
Bromodichloromethane	1.64E+02	*RSL*	3.03E+03	*RSL*	5.00E+01	*SCDM*	2.12E-03	*RSL*	5.63E-02	*RSL*	1.07E-05	*RSL*	3.18E+01	*RSL*	7.80E+03	*J&E*	3.63E+02	*SCDM*	5.86E+02	*J&E*
Dibromochloromethane	2.08E+02	*RSL*	2.70E+03	*RSL*	4.90E+00	*SCDM*	7.83E-04	*RSL*	3.66E-02	*RSL*	1.06E-05	*RSL*	3.18E+01	*RSL*	5.90E+03	*J&E*	4.16E+02	*SCDM*	6.78E+02	*J&E*
1,1-Dichloroethene	9.69E+01	*RSL*	2.42E+03	*RSL*	6.00E+02	*SCDM*	2.61E-02	*RSL*	8.63E-02	*RSL*	1.10E-05	*RSL*	3.18E+01	*RSL*	6.25E+03	*J&E*	3.05E+02	*SCDM*	5.76E+02	*J&E*
cis-1,2-Dichloroethene	9.69E+01	*RSL*	6.41E+03	*RSL*	2.03E+02	*SCDM*	4.08E-03	*RSL*	8.84E-02	*RSL*	1.13E-05	*RSL*	3.96E+01	*RSL*	7.19E+03	*J&E*	3.34E+02	*SCDM*	5.44E+02	*J&E*
trans-1,2-Dichloroethene	9.69E+01	*RSL*	4.52E+03	*RSL*	3.33E+02	*SCDM*	4.08E-03	*RSL*	8.76E-02	*RSL*	1.12E-05	*RSL*	3.96E+01	*RSL*	6.72E+03	*J&E*	3.21E+02	*SCDM*	5.17E+02	*J&E*
Naphthalene	1.28E+02	*RSL*	3.10E+01	*RSL*	8.50E-02	*SCDM*	4.40E-04	*RSL*	6.05E-02	*RSL*	8.38E-06	*RSL*	1.54E+03	*RSL*	1.04E+04	*J&E*	4.91E+02	*SCDM*	7.48E+02	*J&E*
Tetrachloroethene	1.66E+02	*RSL*	2.06E+02	*RSL*	1.86E+01	*SCDM*	1.77E-02	*RSL*	5.05E-02	*RSL*	9.46E-06	*RSL*	9.49E+01	*RSL*	8.29E+03	*J&E*	3.94E+02	*SCDM*	6.20E+02	*J&E*
1,1,1-Trichloroethane	1.33E+02	*RSL*	1.29E+03	*RSL*	1.24E+02	*SCDM*	1.72E-02	*RSL*	6.48E-02	*RSL*	9.60E-06	*RSL*	4.39E+01	*RSL*	7.14E+03	*J&E*	3.47E+02	*SCDM*	5.45E+02	*J&E*
Trichloroethene	1.31E+02	*RSL*	1.28E+03	*RSL*	7.35E+01	*SCDM*	9.85E-03	*RSL*	6.87E-02	*RSL*	1.02E-05	*RSL*	6.07E+01	*RSL*	7.51E+03	*J&E*	3.60E+02	*SCDM*	5.44E+02	*J&E*
Vinyl chloride	6.25E+01	*RSL*	8.80E+03	*RSL*	2.98E+03	*SCDM*	2.78E-02	*RSL*	1.07E-01	*RSL*	1.20E-05	*RSL*	2.17E+01	*RSL*	5.25E+03	*J&E*	2.59E+02	*SCDM*	4.32E+02	*J&E*
Vinyl chloride (child)	6.25E+01	*RSL*	8.80E+03	*RSL*	2.98E+03	*SCDM*	2.78E-02	*RSL*	1.07E-01	*RSL*	1.20E-05	*RSL*	2.17E+01	*RSL*	5.25E+03	*J&E*	2.59E+02	*SCDM*	4.32E+02	*J&E*

References [ref]:
J&E (USEPA 2003); RSL (USEPA 2010a); SCDM (USEPA 2004).

–	Not applicable.
atm-m^3/mol	Atmospheres × cubic meters per mole.
°C	Degrees Celsius.
cm^2/sec	Square centimeters per second.
calc'd	Calculated.
est'd	Estimated.
g/mol	Grams per mole.
Koc	Organic carbon partition coefficient (organics).
L/kg	Liters per kilogram.
mg/L	Milligrams per liter.
mL/g	Milliliters per gram.
mm Hg	Millimeters of mercury.

Table A-9
Risk and Hazard Equations for Exposure to Groundwater and Surface Water
OU-2 Feasibility Study
AVX Corporation
Myrtle Beach, South Carolina

ROUTE-SPECIFIC RISK/HAZARD:

Oral:

$$\mathrm{ELCR_o}\ \textit{or}\ \mathrm{HQ_o} = \frac{\mathrm{EPCgw} \times \mathrm{IRgw} \times \mathrm{EF} \times \mathrm{ED}}{\mathrm{BW} \times (\mathrm{AT_C}\ \textit{or}\ \mathrm{AT_{NC}}) \times ([1/\mathrm{CSF_o}]\ \textit{or}\ \mathrm{RfD_o})}$$

Dermal:

$$\mathrm{ELCR_d}\ \textit{or}\ \mathrm{HQ_d} = \frac{\mathrm{EPCgw} \times \mathrm{DA} \times \mathrm{SSAgw} \times \mathrm{EF} \times \mathrm{ED}}{\mathrm{BW} \times (\mathrm{AT_C}\ \textit{or}\ \mathrm{AT_{NC}}) \times ([1/\mathrm{CSF_a}]\ \textit{or}\ \mathrm{RfD_a})}$$

Inorganics:

$$\mathrm{DA}\ [0] = \frac{K_p \times \mathrm{ETgw}}{1000\ \mathrm{cm^3/L}}$$

Organics:

$$\mathrm{DA}\ [1] = \frac{2\ \mathrm{FA} \times K_p}{1000\ \mathrm{cm^3/L}} \times \sqrt{(6\,\tau \times \mathrm{ETgw}) / \pi} \qquad \text{if ETgw} \le t^*$$

or

$$\mathrm{DA}\ [2] = \frac{\mathrm{FA} \times K_p}{1000\ \mathrm{cm^3/L}} \times \left(\frac{\mathrm{ETgw}}{1 + B} + \frac{2\,\tau\,(1 + 3B + 3B^2)}{(1 + B)^2} \right) \qquad \text{if ETgw} > t^*$$

Inhalation:

$$\mathrm{ELCR_i}\ \textit{or}\ \mathrm{HQ_i} = \frac{\mathrm{EPC_i} \times \mathrm{ET} \times \mathrm{CF} \times \mathrm{EF} \times \mathrm{ED}}{\mathrm{VFsw} \times (\mathrm{AT_C}\ \textit{or}\ \mathrm{AT_{NC}}) \times ([1/\mathrm{IUR}]\ \textit{or}\ \mathrm{RfC})}$$

where:

$$\mathrm{VFsw} = \frac{(1000\ \mathrm{L/m^3})}{(1/k_l) + [1/(H_o \times k_g)]} \times \frac{\mathrm{SA}}{\mathrm{Hb} \times \mathrm{Wb} \times \mathrm{Um}}$$

TOTAL CANCER RISK: $\mathrm{ELCR} = \mathrm{ELCR_o} + \mathrm{ELCR_d} + \mathrm{ELCR_i}$

TOTAL NON-CANCER HAZARD: $\mathrm{HI} = \mathrm{HQ_o} + \mathrm{HQ_d} + \mathrm{HQ_i}$

Variable Definitions:

τ	Lag time for dermal absorption through the skin (hour) (Table A-10).
$\mathrm{AT_C}$	Averaging time for cancer effects (days) (Table A-11).
$\mathrm{AT_{NC}}$	Averaging time for non-cancer effects (days) (Table A-11).
B	Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (unitless) (Table A-10).
BW	Body weight (kg) (Table A-11).
CF	Conversion Factor 0.042 day/hour.
CSF	Cancer slope factor for oral ($\mathrm{CSF_o}$) and dermal (adjusted to an absorbed dose, $\mathrm{CSF_a}$) exposure (kg-day/mg [inverse mg/kg/day]) (Tables A-14).
DA	Dermal absorption factor (L/cm²/day), calculated using Equation [0], [1], or [2], as appropriate.
ED	Exposure duration (years) (Table A-11).
EF	Exposure frequency (days/year) (Table A-11).
ELCR	Excess lifetime cancer risk (unitless).
EPCgw	Exposure point concentration in groundwater (mg/L) (Table A-7).
ETgw	Exposure time for groundwater contact (hours/day) (Table A-11).
FA	Fraction of absorbed water (unitless) (Table A-10).

Table A-9
Risk and Hazard Equations for Exposure to Groundwater and Surface Water
OU-2 Feasibility Study
AVX Corporation
Myrtle Beach, South Carolina

H	Henry's law constant (atm-m³/mol) (Table A-8).
Hb	Height of mixing zone (2 m).
HI	Hazard index for non-cancer effects (unitless); sum of the HQs.
H_o	Dimensionless Henry's law constant (unitless); calculated as H_o = H/RT.
HQ	Hazard quotient for non-cancer effects (unitless).
IRgw	Incidental ingestion rate of groundwater (L/day) (Table A-11).
IUR	Inhalation Unit Risk (m³/mg) (Table A-15).
k_g	Gas-phase mass transfer coefficient (m/sec) ≈ $(8.3 \times 10^{-3}$ m/sec) × $[(18\ \text{g/mol})/\text{MW}]^{0.335} \times (T/298)^{1.005}$.
k_l	Liquid-phase mass transfer coefficient (m/sec) ≈ $(2.0 \times 10^{-5}$ m/sec) × (T/298) × $[(32\ \text{g/mol})/\text{MW}]^{1/2}$.
K_p	Permeability coefficient (cm/hour) (Table A-10).
MW	Molecular weight (g/mol) (Table A-8).
RfC	Reference concentration (mg/m3) (Table A-13).
RfD	Reference dose for oral (RfD_o) and dermal (adjusted to an absorbed dose, RfD_a), exposure (mg/kg/day) (Tables A-12).
R	Ideal gas constant (R = 8.206×10^{-5} atm-m^3/mol/K).
RT	Product of the universal gas constant (R = 8.206×10^{-5} atm-m^3/mol/K) and the relevant Kelvin temperature (T = 298.15 K); RT = 0.02447 atm-m^3/mol.
SA	Source area (1 m²).
SSAgw	Exposed skin surface area for groundwater contact (cm²) (Table A-11).
T	Absolute temperature (T = 298 K, assuming 25°C).
t*	Time required to reach steady state (hour) (Table A-10).
Um	Mean wind speed (m/sec).
VFsw	Volatilization factor from surface water (L/m³).
Wb	Width of mixing zone (1 m).

Table A-10
Dermal Absorption Parameters
OU-2 Feasibility Study
AVX Corporation
Myrtle Beach, South Carolina

Constituent of Potential Concern	Permeability Constant Kp (cm/hour) [a]		Non-Steady State Dermal Absorption Parameters [b]					DA_1hr [c] (L/cm²/event)
	Value	[Ref]	FA (unitless)	τ (hour)	t* (hour)	B (unitless)	Source	
Volatile Organic Compounds								
Bromodichloromethane	4.6E-03	DRA	1.0	0.88	2.12	0.0229	DRA	1.19E-05
Dibromochloromethane	3.2E-03	DRA	1.0	1.57	3.77	0.0178	DRA	1.11E-05
1,1-Dichloroethene	1.2E-02	DRA	1.0	0.37	0.89	0.0438	DRA	2.08E-05
cis-1,2-Dichloroethene	7.7E-03	calc	1.0	0.37	0.89	0.029	calc	1.33E-05
trans-1,2-Dichloroethene	7.7E-03	DRA	1.0	0.37	0.89	0.029	DRA	1.33E-05
Naphthalene	4.7E-02	DRA	1.0	0.56	1.34	0.205	DRA	9.72E-05
Tetrachloroethene	3.3E-02	DRA	1.0	0.91	2.18	0.163	DRA	8.70E-05
1,1,1-Trichloroethane	1.3E-02	DRA	1.0	0.60	1.43	0.0577	DRA	2.78E-05
Trichloroethene	1.2E-02	DRA	1.0	0.58	1.39	0.0529	DRA	2.53E-05
Vinyl chloride	5.6E-03	DRA	1.0	0.24	0.57	0.017	DRA	8.24E-06

References [ref]:

calc	Calculated value (USEPA 2004).
DRA	Dermal Risk Assessment Guidance (USEPA 2004). The B values are calculated but are consistent with values presented in the guidance.
cm	Centimeter.
L	Liter.

[a] Permeability coefficient for dermal contact with constituents in water (centimeters per hour).

[b] Absorption parameters for use in the non-steady state model for dermal contact with constituents in water.
τ = Lag time for dermal absorption through the skin.
B = Ratio of the permeability coefficient through the stratus corneum relative to the permeability coefficient across the viable epidermis.
FA = Fraction of absorbed water.
t* = Time required to reach steady state.

[c] Dermal absorption (DA) calculated according to equations presented in USEPA 2004 based on exposure time (ET) = 1 hour.

Table A-11
Receptor Exposure Parameters
OU-2 Feasibility Study
AVX Corporation
Myrtle Beach, South Carolina

			Resident				Off-Site Worker		Construction Worker		Adolescent Trespasser	
Parameter	**Symbol**	**units**	**Child**		**Adult**							
General Factors												
Averaging Time (cancer)	ATc	days	25,550	[a]	25,550	[a]	25,550	[a]	25,550	[a]	25,550	[a]
Averaging Time (noncancer)	ATnc	days	2,190	[a]	10,950	[a]	9,125	[a]	182	[a]	3,650	[a]
Body Weight	BW	kg	15	[2]	70	[1,2]	70	[1,2]	70	[1,2]	45	[e]
Exposure Frequency	EF	weeks/year	52	PJ	52	PJ	50	PJ	26	PJ	52	PJ
Exposure Frequency	EF	days/year	350	[1,2]	350	[1,2]	250	[1,2]	130	PJ	40	PJ
Exposure Duration	ED	years	6	[1,2]	30	[1,2]	25	[1,2]	1	PJ	10	PJ
Inhalation (Indoor Air)												
Exposure Time	ET	hour/day	24	PJ	24	PJ	8	PJ	8	PJ	–	
Conversion Factor		day/hour	0.042		0.042		0.042		0.042		–	
Groundwater - Ingestion (Oral)												
Groundwater Ingestion Rate	IRgw	L/day	–		–		–		0.005	PJ	–	
Groundwater - Dermal Contact												
Exposed Skin Surface Area	SSAgw	cm²	–		–		–		3,300		–	
Exposure Time; groundwater contact	ETgw	hours/day	–		–		–		2		–	
Irrigation Water - Ingestion (Oral) and Dermal Contact - greenhouse												
Incidental Irrigation Water Ingestion Rate	IRiw	L/hour	–		0.005	PJ	–		–		–	
Exposed Skin Surface Area	SSAiw	cm²	–		5,700	[4,c]	–		–		–	
Exposure Time	ETiw	hours/day	–		1	[3]	–		–		–	
Exposure Duration - greenhouse	EDiw	years	–		30	[1,2]	–		–		–	
Exposure Frequency	EFiw	days/year	–		52	PJ [b]	–		–		–	
Irrigation Water - Ingestion (Oral) and Dermal Contact - wading												
Incidental Irrigation Water Ingestion Rate	IRiwc	L/hour	0.05	PJ	–		–		–		–	
Exposed Skin Surface Area	SSAiwc	cm²	6,600	[3]	–		–		–		–	
Exposure Time	ETiwc	hours/day	1	PJ [e]	–		–		–		–	
Exposure Duration - wading	EDiwc	years	2	PJ	–		–		–		–	
Exposure Frequency	EFiwc	days/year	90	PJ [b]	–		–		–		–	
Irrigation Water - Ingestion (Oral) and Dermal Contact - swimming												
Incidental Irrigation Water Ingestion Rate	IRswim	L/hour	0.05	PJ	0.05	PJ	–		–		–	
Exposed Skin Surface Area - swimming	SSAswim	cm²	6,600	[3]	18,000	[3]	–		–		–	
Exposure Time - swimming	ETswim	hours/day	1	PJ	1	PJ	–		–		–	
Exposure Duration - swimming	EDswim	years	4	PJ	30	[1,2]	–		–		–	
Exposure Frequency	EFswim	days/year	90	PJ [b]	90	PJ [b]	–		–		–	
Surface Water - Ingestion (Oral) and Dermal Contact - wading												
Surface water Ingestion Rate	IRsw	L/hour	–		–		–		–		0.01	PJ
Exposed Skin Surface Area	SSAsw	cm²	–		–		–		–		5,500	[d]
Exposure Frequency	EFsw	days/year	–		–		–		–		40	PJ [b]
Exposure Time	ETsw	hours/day	–		–		–		–		1	PJ

References:

[1] USEPA 1989.
[2] USEPA 1991.
[3] USEPA 2004
[4] USEPA 1997a.

[a] The averaging time for cancer risk is the expected lifespan of 70 years expressed in days.
The averaging time for non-cancer hazard is the total exposure duration expressed in days.

[b] EF was set at 90 days/year for the toddler wader and child and adult swimmer resident receptors assuming three times a week for 30 weeks a year.
EFiw was set at 52 days per year for the off-site resident who worked in the greenhouse once a week.
EFsw was set at 40 days per year for the trespsaser receptor.

[c] SSA for the toddler wader and child and adult swimmer resident receptors assumes that the receptor is fully submerged in water.

[d] SSAsw assumes that the trespasser receptor is wearing a short-sleeved shirt and shorts but not shoes therefore the
SSAsw is the average surface area of head, feet, lower legs, hands, forearms.

[e] ETiw assumes that a young child spends 1 hour in the wading pool.

cm	Centimeter.	L	Liter.	PJ	Professional judgment (see text).
kg	Kilogram.	mg	Milligram.		

Table A-12
Non-Carcinogenic Toxicity Values for Oral and Dermal Exposure
OU-2 Feasibility Study
AVX Corporation
Myrtle Beach, South Carolina

	Oral RfD (mg/kg/day) [a]				Adjustment	Dermal RfD (mg/kg/day) [a,b]		Target Site/	Confidence Level/
Constituent	**Subchronic**	**[ref]**	**Chronic**	**[ref]**	**Factor [a]**	**Subchronic**	**Chronic**	**Critical Effect**	**Uncertainty Factor**
Volatile Organic Compounds									
Bromodichloromethane	8.0E-03	P	2.0E-02	I	1	8.0E-03	2.0E-02	kidney	medium/1000
Dibromochloromethane	7.0E-02	P	2.0E-02	I	1	7.0E-02	2.0E-02	liver	medium/1000
1,1-Dichloroethene	5.0E-02	c	5.0E-02	I	1	5.0E-02	5.0E-02	liver	medium/100
cis-1,2-Dichloroethene	1.0E-01	H	2.0E-03	I	1	1.0E-01	2.0E-03	kidney	low/3000
trans-1,2-Dichloroethene	2.0E-01	H	2.0E-02	I	1	2.0E-01	2.0E-02	blood	low/3000
Naphthalene	2.0E-01	cx	2.0E-02	I	1	2.0E-01	2.0E-02	WB	low/3000
Tetrachloroethene	1.0E-01	H	1.0E-02	I	1	1.0E-01	1.0E-02	liver	medium/1000
1,1,1-Trichloroethane	7.0E+00	I	2.0E+00	I	1	7.0E+00	2.0E+00	reduced body weight	low-medium/1000
Trichloroethene	1.7E-01	c	1.7E-01	Cr	1	1.7E-01	1.7E-01	CNS, eye	NA
Vinyl chloride	3.0E-03	c	3.0E-03	I	1	3.0E-03	3.0E-03	liver	medium/30

References [ref]:

C	CalEPA, Toxicity Criteria database (CalEPA 2010).
H	USEPA, Health Effects Summary Table (HEAST; USEPA 1997b).
I	USEPA, Integrated Risk Information System (IRIS; USEPA 2010c).
P	Provisional Peer Reviewed Toxicity Values (PPRTV) obtained from the National Center for Environmental Assessment (NCEA 2009) as referenced in USEPA Regional Screening Level Table (USEPA 2010a), or as obtained from the Superfund Health Risk Technical Support Center (SHRTSS 2009).
c	The chronic value is used if available.
mg/kg/day	Milligrams per kilogram per day.
NA	Not available.
NR	None reported.
r	route to route extrapolation.
RfD	Reference Dose.
WB	Whole body (includes increased mortality and changes to body weight).
x	The uncertainty factor for subchronic to chronic extrapolation was removed. Whole body (includes increased
[a]	Toxicity values were obtained following USEPA recommended hierarchy (USEPA 2003a)
[b]	The oral-to-dermal adjustment factor (oral absorption efficiency) as used to calculate the dermal RfD values, USEPA 2004. RfD (dermal) = RfD (oral) × Adjustment Factor (oral absorption efficiency).

Table A-13
Non-Carcinogenic Toxicity Values for Inhalation Exposure
OU-2 Feasibility Study
AVX Corporation
Myrtle Beach, South Carolina

Constituent	Inhalation RfC (mg/m^3) [a] Subchronic	[ref]	Chronic	[ref]	Target Site/ Critical Effect	Confidence Level/ Uncertainty Factor
Volatile Organic Compounds						
Bromodichloromethane	NA		NA		NA	NA
Dibromochloromethane	NA		NA		NA	NA
1,1-Dichloroethene	2.0E-01	c	2.0E-01	I	liver	NA/90
cis-1,2-Dichloroethene	3.5E-01	r	7.0E-03	r	NA	NA
trans-1,2-Dichloroethene	6.0E-02	c	6.0E-02	P	repiratory	low/3000
Naphthalene	3.0E-03	c	3.0E-03	I	nasal	medium/3000
Tetrachloroethene	2.7E-01	c	2.7E-01	A	NS	NA
1,1,1-Trichloroethane	5.0E+00	I	5.0E+00	I	liver	medium/100
Trichloroethene	6.0E-01	c	6.0E-01	C	CNS, eye	NA
Vinyl chloride	1.0E-01	c	1.0E-01	I	liver	medium/30

References [ref]:

A	Agency for Toxic Substances Disease Registry (ATDSR) (ATSDR 2010).
C	CalEPA, Toxicity Criteria database (CalEPA 2010).
I	USEPA, Integrated Risk Information System (IRIS; USEPA 2010c).
P	Provisional Peer Reviewed Toxicity Values (PPRTV) obtained from the National Center for Environmental Assessment (USEPA 2006) as referenced in USEPA Regional Screening Level Table (USEPA 2010a).

c	The chronic value is used if available.
CNS	Central nervous system.
mg/m^3	Milligrams per cubic meter.
NA	Not available.
NS	Nervous system.
RfC	Reference Concentration.
r	Oral reference dose used to extrapolate to calculate an RfC using a standard inhalation rate of 20 m^3/day and a body weight of 70 kilograms.
x	The uncertainty factor for subchronic to chronic extrapolation was removed.
[a]	Toxicity values were obtained following USEPA recommended hierarchy (USEPA 2003a).

Table A-14
Carcinogenic Toxicity Values for Oral and Dermal Exposure
OU-2 Feasibility Study
AVX Corporation
Myrtle Beach, South Carolina

Constituent	Oral CSF [a] $(mg/kg/day)^{-1}$	[ref]	Adjustment Factor [b]	Dermal CSF [a] $(mg/kg/day)^{-1}$	Tumor Site	Weight of Evidence Classification [c]
Volatile Organic Compounds						
Bromodichloromethane	6.2E-02	I	1	6.2E-02	kidney	B2
Dibromochloromethane	8.4E-02	I	1	8.4E-02	liver	C
1,1-Dichloroethene	NA		1	NA	–	C
cis-1,2-Dichloroethene	NA		1	NA	–	D
trans-1,2-Dichloroethene	NA		1	NA	–	NA
Naphthalene	NA		1	NA	–	C
Tetrachloroethene	5.4E-01	C	1	5.4E-01	liver, kidney	B2
1,1,1-Trichloroethane	NA		1	NA	–	D
Trichloroethene	5.9E-03	C	1	5.9E-03	multiple sites	C-B2
Vinyl chloride	7.2E-01	I	1	7.2E-01	liver	A
Vinyl chloride (child)	1.5E+00	I	1	1.5E+00	liver	A

References [ref]:

C CalEPA, Toxicity Criteria database (CalEPA 2010).

I USEPA, Integrated Risk Information System (IRIS; USEPA 2010c).

– Not applicable.

CSF Cancer Slope Factor.

$(mg/kg/day)^{-1}$ Inverse milligrams per kilogram per day (risk per unit dose).

NA Not available.

[a] Toxicity values were obtained following USEPA recommended hierarchy (USEPA 2003a).

[b] The oral-to-dermal adjustment factor (oral absorption efficiency) as used to calculate the dermal CSFd values, USEPA 2004. CSF (dermal) = CSF (oral) / Adjustment Factor (oral absorption efficiency)

[c] USEPA cancer weight-of-evidence categories are as follows:

Group A: Human Carcinogen (sufficient evidence of carcinogenicity in humans)
Group B: Probable Human Carcinogen
B1 - limited evidence of carcinogenicity in humans
B2 - sufficient evidence of carcinogenicity in animals with inadequate or lack of evidence in humans
Group C: Possible Human Carcinogen (limited evidence of carcinogenicity in animals and inadequate or lack of human data)
Group D: Not Classifiable as to Human Carcinogenicity (inadequate or no evidence)
Group E: Evidence of Noncarcinogenicity for Humans (no evidence of carcinogenicity in adequate studies)

Table A-15
Carcinogenic Toxicity Values for Inhalation Exposure
OU-2 Feasibility Study
AVX Corporation
Myrtle Beach, South Carolina

Constituent	Inhalation Unit Risk [a] $(mg/m^3)^{-1}$	[ref]	Tumor Site	Weight of Evidence Classification [b]
Volatile Organic Compounds				
Bromodichloromethane	3.7E-02	I	–	B2
Dibromochloromethane	2.7E-02	I	liver	C
1,1-Dichloroethene	NA	I	–	C
cis-1,2-Dichloroethene	NA	I	–	D
trans-1,2-Dichloroethene	NA	I	–	NA
Naphthalene	3.4E-02	I	respiratory	C
Tetrachloroethene	5.9E-03	I	liver, kidney	B2
1,1,1-Trichloroethane	NA	I	–	D
Trichloroethene	2.0E-03	C	lung	C-B2
Vinyl chloride	4.4E-03	I	liver	A
Vinyl chloride (child)	8.8E-03	I	liver	A

References [ref]:

C	CalEPA, Toxicity Criteria database (CalEPA 2010).
I	USEPA, Integrated Risk Information System (IRIS; USEPA 2010c).

–	Not applicable.
$(mg/m^3)^{-1}$	Inverse milligrams per cubic meter.
NA	Not available.

[a] Toxicity values were obtained following USEPA recommended hierarchy (USEPA 2003a).

[b] USEPA cancer weight-of-evidence categories are as follows:

- Group A: Human Carcinogen (sufficient evidence of carcinogenicity in humans)
- Group B: Probable Human Carcinogen
  - B1 - limited evidence of carcinogenicity in humans
  - B2 - sufficient evidence of carcinogenicity in animals with inadequate or lack of evidence in humans
- Group C: Possible Human Carcinogen (limited evidence of carcinogenicity in animals and inadequate or lack of human data)
- Group D: Not Classifiable as to Human Carcinogenicity (inadequate or no evidence)
- Group E: Evidence of Noncarcinogenicity for Humans (no evidence of carcinogenicity in adequate studies)

Table A-16
Summary of Input Parameters
USEPA Spreadsheets for the Johnson and Ettinger Vapor Intrusion Model
Worker Exposure to Soil Gas Measured at SG-6
OU-2 Feasibility Study
AVX Corporation
Myrtle Beach, South Carolina

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Soil gas conc., C_g (μg/m^3)	OR	**ENTER** Soil gas conc., C_g (ppmv)	Constituent
75354	1.10E-01			1,1-Dichloroethene
127184	8.60E+00			Tetrachloroethene
71556	3.00E+01			1,1,1-Trichloroethane
79016	4.40E+01			Trichloroethene
75014	6.50E-01			Vinyl Chloride

MORE ↓

ENTER Depth to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** sampling depth below grade, L_s (cm)	**ENTER** Average soil temperature, T_S (^oC)	**ENTER** Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	**ENTER** User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	122	18	S		

MORE ↓

ENTER Vadose zone SCS soil type	Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	Vadose zone soil total porosity, n^V (unitless)	Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	**ENTER** Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
Lookup Soil Parameters				
S	1.66	0.375	0.054	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	**ENTER** Averaging time for noncarcinogens, AT_{NC} (yrs)	**ENTER** Exposure duration, ED (yrs)	**ENTER** Exposure frequency, EF (days/yr)	**ENTER** Exposure Time ET (hrs/days)
70	25	25	250	8

END

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
106.92	0.321	0.003	1.01E-07	0.998	1.00E-07	4,000	1.69E+04

Table A-17
Summary of Chemical Properties
USEPA Spreadsheets for the Johnson and Ettinger Vapor Intrusion Model
Worker Exposure to Soil Gas Measured at SG-6
OU-2 Feasibility Study
AVX Corporation
Myrtle Beach, South Carolina

CAS Number	Constituent	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^{o}C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^{o}K)	Critical temperature, T_C (^{o}K)	Unit risk factor, URF (μg/m^3)$^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
75354	1,1-Dichloroethene	8.63E-02	1.10E-05	2.61E-02	25	6,247	304.75	576.05	NA	2.0E-01 I	96.94
127184	Tetrachloroethene	5.05E-02	9.46E-06	1.77E-02	25	8,288	394.40	620.20	5.9E-06 C	2.7E-01 A	165.83
71556	1,1,1-Trichloroethane	6.48E-02	9.60E-06	1.72E-02	25	7,136	347.24	545.00	NA	5.0E+00 I	133.41
79016	Trichloroethene	6.87E-02	1.02E-05	9.85E-03	25	7,505	360.36	544.20	2.0E-06 C	6.0E-01 C	131.39
75014	Vinyl Chloride	1.07E-01	1.20E-05	2.78E-02	25	5,250	259.25	432.00	4.4E-06 I	1.0E-01 I	62.50

Table A-18
Intercalculations
USEPA Spreadsheets for the Johnson and Ettinger Vapor Intrusion Model
Worker Exposure to Soil Gas Measured at SG-6
OU-2 Feasibility Study
AVX Corporation
Myrtle Beach, South Carolina

CAS Number	Constituent	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Source vapor conc., C_{source} (μg/m^3)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (μg/m^3)	Unit risk factor, URF (μg/m^3)$^{-1}$	Reference conc., RfC (mg/m^3)
75354	1,1-Dichloroethene	6,339	2.02E-02	8.45E-01	1.40E-02	1.10E-01	9.95E+01	1.40E-02	2.81E+77	3.33E-03	3.67E-04	NA	2.0E-01
127184	Tetrachloroethene	9,472	1.21E-02	5.04E-01	8.16E-03	8.60E+00	9.95E+01	8.16E-03	2.89E+132	2.55E-03	2.19E-02	5.9E-06	2.7E-01
71556	1,1,1-Trichloroethane	7,798	1.25E-02	5.25E-01	1.05E-02	3.00E+01	9.95E+01	1.05E-02	1.36E+103	2.91E-03	8.74E-02	NA	5.0E+00
79016	Trichloroethene	8,458	6.99E-03	2.93E-01	1.11E-02	4.40E+01	9.95E+01	1.11E-02	2.28E+97	3.00E-03	1.32E-01	2.0E-06	6.0E-01
75014	Vinyl Chloride (adult)	4,910	2.28E-02	9.53E-01	1.73E-02	6.50E-01	9.95E+01	1.73E-02	2.55E+62	3.64E-03	2.36E-03	4.4E-06	1.0E-01

Table A-19
Summary of Results
USEPA Spreadsheets for the Johnson and Ettinger Vapor Intrusion Model
Worker Exposure to Soil Gas Measured at SG-6
OU-2 Feasibility Study
AVX Corporation
Myrtle Beach, South Carolina

CAS Number	Constituent	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
75354	1,1-Dichloroethene	NA	0.0000004
127184	Tetrachloroethene	1.1E-08	0.00002
71556	1,1,1-Trichloroethane	NA	0.000004
79016	Trichloroethene	2.2E-08	0.00005
75014	Vinyl Chloride	8.5E-10	0.000005
	TOTAL	3E-08	0.00008

Table A-20
Risk and Hazard Calculations for the Hypothetical Construction Worker from Exposure to Off-Site Groundwater
OU-2 Feasibility Study
AVX Corporation
Myrtle Beach, South Carolina

						CANCER RISK				Percent	NON-CANCER HAZARD				Percent
			DA			Route-Specific Risk			Calculated	Total	Route-Specific Hazard			Calculated	Total
Constituent	**EPCgw (mg/L)**		**[a] (L/cm²/day)**		**VFgw (L/m³)**	**Oral**	**Dermal**	**Inhalation**	**Risk**	**ELCR**	**Oral**	**Dermal**	**Inhalation**	**Hazard**	**HI**
						ELCRo	ELCRd	ELCRi	ELCR		HQo	HQd	HQi	HI	
Volatile Organic Compounds															
cis-1,2-Dichloroethene	4.46E+00		2.08E-05	[2]	1.74E-03	NA	NA	NA	NA		2.3E-03	3.1E-02	1.3E-03	3.5E-02	4%
trans-1,2-Dichloroethene	8.90E-02	m	2.08E-05	[2]	1.76E-03	NA	NA	NA	NA		2.3E-05	3.1E-04	1.3E-05	3.5E-04	<1%
Naphthalene	8.60E-03	m	1.41E-04	[2]	1.38E-03	NA	NA	1.7E-10	1.7E-10	<1%	2.2E-06	2.0E-04	2.3E-04	4.4E-04	<1%
Trichloroethene	1.20E+01		3.74E-05	[2]	1.51E-03	2.6E-08	6.4E-07	1.5E-08	6.8E-07	77%	3.6E-03	8.9E-02	1.8E-03	9.5E-02	66%
Vinyl chloride	7.65E-02		1.37E-05	[2]	2.20E-03	2.0E-08	1.8E-07	3.1E-10	2.0E-07	23%	1.3E-03	1.2E-02	1.0E-04	1.3E-02	2%
						Total ELCR			9E-07	100%	Total HI			0.1	100%

[a] The dermal absorption factor (DA) was calculated using Equation [0], [1], or [2], as indicated, from Table A-10.

—	Not applicable.	HQ	Hazard quotient.	mg/L	Milligrams per liter.
ELCR	Excess lifetime cancer risk.	L/cm^2/day	Liters per square centimeter per day.	NA	Not available.
EPCgw	Exposure point concentration in groundwater.	L/m^3	Liters per cubic meter.	VFsw	Volatilization factor for groundwater.
HI	Hazard index (sum of the HQs).				

Equations: (see Table A-9)

ELCRo = (EPCgw × 0.005 × 130 × 1 × CSFo) / (70 × 25,550)
ELCRd = (EPCgw × DA × 3,300 × 130 × 1 × CSFa) / (70 × 25,550)
ELCRi = (EPCgw × VFsw × 2 × 0.042 x 130 × 1 × IUR) / (25,550)

3.2 = Um = Mean annual wind speed (m/sec) for North Myrtle Beach, South Carolina (NOAA 2010).
HQo = (EPCgw × 0.005 × 130 × 1) / (70 × 182 × RfDo)
HQd = (EPCgw × DA × 3,300 × 130 × 1) / (70 × 182 × RfDa)
HQi = (EPCgw × VFsw × 2 × 0.042 × 130 × 1) / (182 × RfC)

Table A-21
Risk and Hazard Calculations for Hypothetical Current/Future Adult Resident from Exposure to Irrigation Water while Swimming
OU-2 Feasibility Study
AVX Corporation
Myrtle Beach, South Carolina

Constituent	EPCsw (mg/L)		DA [a] (L/cm²/day)		VFiw (L/m³)	CANCER RISK				Percent Total ELCR	NON-CANCER HAZARD				Percent Total HI
						Route-Specific Risk			Calculated Risk		Route-Specific Hazard			Calculated Hazard	
						Oral	Dermal	Inhalation			Oral	Dermal	Inhalation		
						ELCRo	ELCRd	ELCRi	ELCR		HQo	HQd	HQi	HI	
Volatile Organic Compounds															
cis-1,2-Dichloroethene	1.77E+00	avg	1.33E-05	[2]	1.74E-03	NA	NA	NA	NA		1.6E-01	7.5E-01	4.5E-03	9.1E-01	99%
Trichloroethene	7.63E-01	avg	2.53E-05	[1]	1.51E-03	3.4E-07	3.1E-06	1.0E-08	3.4E-06	100%	7.8E-04	7.1E-03	2.0E-05	7.9E-03	<1%
						Total ELCR			3E-06	100%	Total HI			0.9	100%

[a] The dermal absorption factor (DA) was calculated using Equation [0], [1], or [2], as indicated, from Table A-10.

–	Not applicable.	HQ	Hazard quotient.	mg/L	Milligrams per liter.
ELCR	Excess lifetime cancer risk.	L/cm²/day	Liters per square centimeter per day.	NA	Not available.
EPCsw	Exposure point concentration in surface water.	L/m^3	Liters per cubic meter.	VFiw	Volatilization factor for irrigation water.
HI	Hazard index (sum of the HQs).	m	EPC based on maximum.		

Equations: (see Table A-9)

ELCRo = (EPCsw × 0.05 × 1 × 90 × 30 × CSFo) / (70 × 25,550)

ELCRd = (EPCsw × DA × 18,000 × 90 × 30 × CSFa) / (70 × 25,550)

ELCRi = (EPCsw × VFsw × 1 × 0.042 × 90 × 30 × IUR) / (25,550)

3.2 = Um = Mean annual wind speed (m/sec) for North Myrtle Beach, South Carolina (NOAA 2010).

HQo = (EPCsw × 0.05 × 1 × 90 × 30) / (70 × 10,950 × RfDo)

HQd = (EPCsw × DA × 18,000 × 90 × 30) / (70 × 10,950 × RfDa)

HQi = (EPCsw × VFsw × 1 × 0.042 × 90 × 30) / (10,950 × RfC)

Table A-22
Risk and Hazard Calculations for an Adult Resident in a Greenhouse from Exposure to Irrigation Well Water
OU-2 Feasibility Study
AVX Corporation
Myrtle Beach, South Carolina

			DA			CANCER RISK				Percent	NON-CANCER HAZARD				Percent
	EPCiw		[a]		VFiw	Route-Specific Risk			Calculated	Total	Route-Specific Hazard			Calculated	Total
Constituent	(mg/L)		(L/cm^2/day)		(L/m^3)	Oral	Dermal	Inhalation	Risk	ELCR	Oral	Dermal	Inhalation	Hazard	HI
						ELCRo	ELCRd	ELCRi	ELCR		HQo	HQd	HQi	HI	
Volatile Organic Compounds															
cis-1,2-Dichloroethene	1.77E+00	avg	1.33E-05	[2]	1.74E-02	NA	NA	NA	NA		9.0E-03	1.4E-01	2.6E-02	1.7E-01	99%
Trichloroethene	7.63E-01	avg	2.53E-05	[1]	1.51E-02	2.0E-08	5.7E-07	5.9E-08	6.4E-07	100%	4.5E-05	1.3E-03	1.1E-04	1.5E-03	<1%
						Total ELCR			6E-07	100%	Total HI			0.2	100%

[a] The dermal absorption factor (DA) was calculated using Equation [0], [1], or [2], as indicated, from Table A-10.

–	Not applicable.	HI	Hazard index (sum of the HQs).	mg/L	Milligrams per liter.
avg	EPC based on the average concentration.	HQ	Hazard quotient.	NA	Not available.
ELCR	Excess lifetime cancer risk.	L/cm²/day	Liters per square centimeter per day.	VFiw	Volatilization factor for surface water.
EPCiw	Exposure point concentration in irrigation well water.	L/m^3	Liters per cubic meter.		

<u>Equations: (see Table A-9)</u>

ELCRo = (EPCsw × 0.005 × 1 × 52 × 30 × CSFo) / (70 × 25,550)
ELCRd = (EPCsw × DA × 5,700 × 52 × 30 × CSFa) / (70 × 25,550)
ELCRi = (EPCsw × VFsw × 1 × 0.042 × 52 × 30 × IUR) / (25,550)

0.32 = Um = Mean annual wind speed (m/sec) in the greenhouse (professional judgment).
HQo = (EPCsw × 0.005 × 1 × 52 × 30) / (70 × 10,950 × RfDo)
HQd = (EPCsw × DA × 5,700 × 52 × 30) / (70 × 10,950 × RfDa)
HQi = (EPCsw × VFsw × 1 × 0.042 × 52 × 30) / (10,950 × RfC)

Table A-23
Summary of Input Parameters
USEPA Spreadsheets for the Johnson and Ettinger Vapor Intrusion Model
Resident Exposure to Soil Gas Measured at SG-6
OU-2 Feasibility Study
AVX Corporation
Myrtle Beach, South Carolina

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Soil gas conc., C_g ($\mu g/m^3$)	OR	**ENTER** Soil gas conc., C_g (ppmv)	Constituent
75354	1.10E-01			1,1-Dichloroethene
127184	8.60E+00			Tetrachloroethene
71556	3.00E+01			1,1,1-Trichloroethane
79016	4.40E+01			Trichloroethene
75014a	6.50E-01			Vinyl Chloride (adult)

MORE ↓

ENTER Depth to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** sampling depth below grade, L_s (cm)	**ENTER** Average soil temperature, T_S (^oC)	**ENTER** Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	**ENTER** User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	122	18	S		

MORE ↓

ENTER Vadose zone SCS soil type	Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	Vadose zone soil total porosity, n^V (unitless)	Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	**ENTER** Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
Lookup Soil Parameters				
S	1.66	0.375	0.054	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	**ENTER** Averaging time for noncarcinogens, AT_{NC} (yrs)	**ENTER** Exposure duration, ED (yrs)	**ENTER** Exposure frequency, EF (days/yr)	**ENTER** Exposure Time ET (hrs/days)
70	30	30	350	24

END

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
106.92	0.321	0.003	1.01E-07	0.998	1.00E-07	4,000	1.69E+04

Table A-24
Summary of Chemical Properties
USEPA Spreadsheets for the Johnson and Ettinger Vapor Intrusion Model
Resident Exposure to Soil Gas Measured at SG-6
OU-2 Feasibility Study
AVX Corporation
Myrtle Beach, South Carolina

CAS Number	Constituent	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($\mu g/m^3)^{-1}$		Reference conc., RfC (mg/m^3)		Molecular weight, MW (g/mol)
75354	1,1-Dichloroethene	8.63E-02	1.10E-05	2.61E-02	25	6247	304.75	576.05	NA		2.00E-01	I	96.94
127184	Tetrachloroethene	5.05E-02	9.46E-06	1.77E-02	25	8288	394.40	620.20	5.90E-06	C	2.70E-01	A	165.83
71556	1,1,1-Trichloroethane	6.48E-02	9.60E-06	1.72E-02	25	7136	347.24	545.00	NA		5.00E+00	I	133.41
79016	Trichloroethene	6.87E-02	1.02E-05	9.85E-03	25	7505	360.36	544.20	2.00E-06	C	6.00E-01	C	131.39
75014a	Vinyl Chloride (adult)	1.07E-01	1.20E-05	2.78E-02	25	5250	259.25	432.00	4.40E-06	I	1.00E-01	I	62.5

Table A-25
Intercalculations
USEPA Spreadsheets for the Johnson and Ettinger Vapor Intrusion Model
Resident Exposure to Soil Gas Measured at SG-6
OU-2 Feasibility Study
AVX Corporation
Myrtle Beach, South Carolina

CAS Numb	Constituent	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vadose zone effective diffusion coefficient, D^{eff}_{V} (cm^2/s)	Source vapor conc., C_{source} (μg/m^3)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Exponent of equivalent foundation Peclet number, exp(Pe^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (μg/m^3)	Unit risk factor, URF (μg/m^3)$^{-1}$	Reference conc., RfC (mg/m^3)
75354	1,1-Dichloroethene	6,339	2.02E-02	8.45E-01	1.40E-02	1.10E-01	9.95E+01	1.40E-02	2.81E+77	3.33E-03	3.67E-04	NA	2.0E-01
127184	Tetrachloroethene	9,472	1.21E-02	5.04E-01	8.16E-03	8.60E+00	9.95E+01	8.16E-03	2.89E+132	2.55E-03	2.19E-02	5.9E-06	2.7E-01
71556	1,1,1-Trichloroethane	7,798	1.25E-02	5.25E-01	1.05E-02	3.00E+01	9.95E+01	1.05E-02	1.36E+103	2.91E-03	8.74E-02	NA	5.0E+00
79016	Trichloroethene	8,458	6.99E-03	2.93E-01	1.11E-02	4.40E+01	9.95E+01	1.11E-02	2.28E+97	3.00E-03	1.32E-01	2.0E-06	6.0E-01
75014a	Vinyl Chloride	4,910	2.28E-02	9.53E-01	1.73E-02	6.50E-01	9.95E+01	1.73E-02	2.55E+62	3.64E-03	2.36E-03	4.4E-06	1.0E-01

Table A-26
Summary of Results
USEPA Spreadsheets for the Johnson and Ettinger Vapor Intrusion Model
Resident Exposure to Soil Gas Measured at SG-6
OU-2 Feasibility Study
AVX Corporation
Myrtle Beach, South Carolina

CAS Number	Constituent	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
75354	1,1-Dichloroethene	NA	0.0000018
127184	Tetrachloroethene	5.3E-08	0.000078
71556	1,1,1-Trichloroethane	NA	0.000017
79016	Trichloroethene	1.1E-07	0.00021
75014	Vinyl Chloride	4.3E-09	0.000023
	TOTAL	2E-07	0.0003

Table A-27
Risk and Hazard Calculations for Hypothetical Current/Future Child Resident from Exposure to Irrigation Water while Playing in a Wading Pool
OU-2 Feasibility Study
AVX Corporation
Myrtle Beach, South Carolina

						CANCER RISK					NON-CANCER HAZARD				
			DA			Route-Specific Risk				Percent	Route-Specific Hazard				Percent
	EPCsw		[a]		VFiw				Calculated	Total				Calculated	Total
Constituent	(mg/L)		(L/cm²/day)		(L/m³)	Oral	Dermal	Inhalation	Risk	ELCR	Oral	Dermal	Inhalation	Hazard	HI
						ELCRo	ELCRd	ELCRi	ELCR		HQo	HQd	HQi	HI	
Volatile Organic Compounds															
cis-1,2-Dichloroethene	1.77E+00	avg	1.33E-05	[2]	1.74E-03	NA	NA	NA	NA		7.3E-01	1.3E+00	4.5E-03	2.0E+00	99%
Trichloroethene	7.63E-01	avg	2.53E-05	[1]	1.51E-03	1.1E-07	3.5E-07	6.8E-10	4.6E-07	100%	3.7E-03	1.2E-02	2.0E-05	1.6E-02	<1%
						Total ELCR			5E-07	100%	Total HI			2	100%

[a] The dermal absorption factor (DA) was calculated using Equation [0], [1], or [2], as indicated, from Table A-10.

–	Not applicable.	HQ	Hazard quotient.	mg/L	Milligrams per liter.
ELCR	Excess lifetime cancer risk.	L/cm²/day	Liters per square centimeter per day.	NA	Not available.
EPCsw	Exposure point concentration in surface water.	L/m^3	Liters per cubic meter.	VFiw	Volatilization factor for irrigation water.
HI	Hazard index (sum of the HQs).	m	EPC based on maximum.		

Equations: (see Table A-9)

3.2 = Um = Mean annual wind speed (m/sec) for North Myrtle Beach, South Carolina (NOAA 2010).

ELCRo = (EPCsw × 0.05 × 1 × 90 × 2 × CSFo) / (15 × 25,550)
ELCRd = (EPCsw × DA × 6,600 × 90 × 2 × CSFa) / (15 × 25,550)
ELCRi = (EPCsw × VFsw × 1 × 0.042 × 90 × 2 × IUR) / (25,550)

HQo = (EPCsw × 0.05 × 1 × 90 × 2) / (15 × 730 × RfDo)
HQd = (EPCsw × DA × 6,600 × 90 × 2) / (15 × 730 × RfDa)
HQi = (EPCsw × VFsw × 1 × 0.042 × 90 × 2) / (730 × RfC)

Table A-28
Risk and Hazard Calculations for Hypothetical Current/Future Child Resident from Exposure to Irrigation Water while Swimming
OU-2 Feasibility Study
AVX Corporation
Myrtle Beach, South Carolina

			DA			CANCER RISK				Percent	NON-CANCER HAZARD				Percent
	EPCsw		[a]		VFiw	Route-Specific Risk			Calculated	Total	Route-Specific Hazard			Calculated	Total
Constituent	(mg/L)		(L/cm^2/day)		(L/m^3)	Oral	Dermal	Inhalation	Risk	ELCR	Oral	Dermal	Inhalation	Hazard	HI
						ELCRo	ELCRd	ELCRi	ELCR		HQo	HQd	HQi	HI	
Volatile Organic Compounds															
cis-1,2-Dichloroethene	1.77E+00	avg	1.33E-05	[2]	1.74E-03	NA	NA	NA	NA		7.3E-01	1.3E+00	4.5E-03	2.0E+00	99%
Trichloroethene	7.63E-01	avg	2.53E-05	[1]	1.51E-03	2.1E-07	7.0E-07	1.4E-09	9.2E-07	100%	3.7E-03	1.2E-02	2.0E-05	1.6E-02	<1%
						Total ELCR			9E-07	100%	Total HI			2	100%

[a] The dermal absorption factor (DA) was calculated using Equation [0], [1], or [2], as indicated, from Table A-10.

–	Not applicable.	HQ	Hazard quotient.	mg/L	Milligrams per liter.
ELCR	Excess lifetime cancer risk.	L/cm^2/day	Liters per square centimeter per day.	NA	Not available.
EPCsw	Exposure point concentration in surface water.	L/m^3	Liters per cubic meter.	VFiw	Volatilization factor for irrigation water.
HI	Hazard index (sum of the HQs).	m	EPC based on maximum.		

<u>Equations: (see Table A-9)</u>

ELCRo = (EPCsw × 0.05 × 1 × 90 × 4 × CSFo) / (15 × 25,550)
ELCRd = (EPCsw × DA × 6,600 × 90 × 4 × CSFa) / (15 × 25,550)
ELCRi = (EPCsw × VFsw × 1 × 0.042 × 90 × 4 × IUR) / (25,550)

3.2 = Um = Mean annual wind speed (m/sec) for North Myrtle Beach, South Carolina (NOAA 2010).
HQo = (EPCsw × 0.05 × 1 × 90 × 4) / (15 × 1,460 × RfDo)
HQd = (EPCsw × DA × 6,600 × 90 × 4) / (15 × 1,460 × RfDa)
HQi = (EPCsw × VFsw × 1 × 0.042 × 90 × 4) / (1,460 × RfC)

Table A-29
Summary of Input Parameters
USEPA Spreadsheets for the Johnson and Ettinger Vapor Intrusion Model
Child Resident Exposure to Soil Gas Measured at SG-6
OU-2 Feasibility Study
AVX Corporation
Myrtle Beach, South Carolina

SG-SCREEN
Version 3.1; 02/04

Reset to Defaults

Soil Gas Concentration Data

ENTER Chemical CAS No. (numbers only, no dashes)	**ENTER** Soil gas conc., C_g (μg/m^3)	OR	**ENTER** Soil gas conc., C_g (ppmv)	Constituent
75354	1.10E-01			1,1-Dichloroethene
127184	8.60E+00			Tetrachloroethene
71556	3.00E+01			1,1,1-Trichloroethane
79016	4.40E+01			Trichloroethene
75014c	6.50E-01			Vinyl Chloride (child)

MORE ↓

ENTER Depth to bottom of enclosed space floor, L_F (15 or 200 cm)	**ENTER** sampling depth below grade, L_s (cm)	**ENTER** Average soil temperature, T_S (^{o}C)	**ENTER** Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	**ENTER** User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	122	18	S		

MORE ↓

ENTER Vadose zone SCS soil type Lookup Soil Parameters	Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	Vadose zone soil total porosity, n^V (unitless)	Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)		**ENTER** Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
S	1.66	0.375	0.054		

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	**ENTER** Averaging time for noncarcinogens, AT_{NC} (yrs)	**ENTER** Exposure duration, ED (yrs)	**ENTER** Exposure frequency, EF (days/yr)	**ENTER** Exposure Time ET (hrs/days)
70	6	6	350	24

END

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Floor-wall seam perimeter, X_{crack} (cm)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
106.92	0.321	0.003	1.01E-07	0.998	1.00E-07	4,000	1.69E+04

Table A-30
Summary of Chemical Properties
USEPA Spreadsheets for the Johnson and Ettinger Vapor Intrusion Model
Child Resident Exposure to Soil Gas Measured at SG-6
OU-2 Feasibility Study
AVX Corporation
Myrtle Beach, South Carolina

CAS Number	Constituent	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Unit risk factor, URF ($(\mu g/m^3)^{-1}$)	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)
75354	1,1-Dichloroethene	8.63E-02	1.10E-05	2.61E-02	25	6247	304.75	576.05	NA I	2.0E-01 I	96.94
127184	Tetrachloroethene	5.05E-02	9.46E-06	1.77E-02	25	8288	394.40	620.20	5.9E-06 I	2.7E-01 A	165.83
71556	1,1,1-Trichloroethane	6.48E-02	9.60E-06	1.72E-02	25	7136	347.24	545.00	NA I	5.0E+00 I	133.41
79016	Trichloroethene	6.87E-02	1.02E-05	9.85E-03	25	7505	360.36	544.20	2.0E-06 C	6.0E-01 C	131.39
75014c	Vinyl Chloride (child)	1.07E-01	1.20E-05	2.78E-02	25	5250	259.25	432.00	8.8E-06 I	1.0E-01 I	62.5

Table A-31
Intercalculations
USEPA Spreadsheets for the Johnson and Ettinger Vapor Intrusion Model
Child Resident Exposure to Soil Gas Measured at SG-6
OU-2 Feasibility Study
AVX Corporation
Myrtle Beach, South Carolina

CAS Numb	Constituent	Enthalpy of vaporization at ave. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil temperature, H'_{TS} (unitless)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Source vapor conc., C_{source} (μg/m^3)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Exponent of equivalent foundation Peclet number, exp(Pe^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ (μg/m^3)	Unit risk factor, URF (μg/m^3)$^{-1}$	Reference conc., RfC (mg/m^3)
75354	1,1-Dichloroethene	6,339	2.02E-02	8.45E-01	1.40E-02	1.10E-01	9.95E+01	1.40E-02	2.81E+77	3.33E-03	3.67E-04	NA	2.0E-01
127184	Tetrachloroethene	9,472	1.21E-02	5.04E-01	8.16E-03	8.60E+00	9.95E+01	8.16E-03	2.89E+132	2.55E-03	2.19E-02	5.9E-06	2.7E-01
71556	1,1,1-Trichloroethane	7,798	1.25E-02	5.25E-01	1.05E-02	3.00E+01	9.95E+01	1.05E-02	1.36E+103	2.91E-03	8.74E-02	NA	5.0E+00
79016	Trichloroethene	8,458	6.99E-03	2.93E-01	1.11E-02	4.40E+01	9.95E+01	1.11E-02	2.28E+97	3.00E-03	1.32E-01	2.0E-06	6.0E-01
75014c	Vinyl Chloride (child)	4,910	2.28E-02	9.53E-01	1.73E-02	6.50E-01	9.95E+01	1.73E-02	2.55E+62	3.64E-03	2.36E-03	8.8E-06	1.0E-01

Table A-32
Summary of Results
USEPA Spreadsheets for the Johnson and Ettinger Vapor Intrusion Model
Child Resident Exposure to Soil Gas Measured at SG-6
OU-2 Feasibility Study
AVX Corporation
Myrtle Beach, South Carolina

CAS Number	Constituent	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
75354	1,1-Dichloroethene	NA	0.0000018
127184	Tetrachloroethene	1.1E-08	0.000078
71556	1,1,1-Trichloroethane	NA	0.000017
79016	Trichloroethene	2.2E-08	0.00021
75014c	Vinyl Chloride (child)	1.7E-09	0.000023
	TOTAL	3E-08	0.0003

Table A-33
Risk and Hazard Calculations for Hypothetical Future Occasional Trespasser from Exposure to Surface Water while Wading
OU-2 Feasibility Study
AVX Corporation
Myrtle Beach, South Carolina

Constituent	EPCsw (mg/L)		DA [a] (L/cm^2/day)		VFsw (L/m^3)	CANCER RISK Route-Specific Risk Oral	Dermal	Inhalation	Calculated Risk	Percent Total ELCR	NON-CANCER HAZARD Route-Specific Hazard Oral	Dermal	Inhalation	Calculated Hazard	Percent Total HI
						ELCRo	ELCRd	ELCRi	ELCR		HQo	HQd	HQi	HI	
Volatile Organic Compounds															
Bromodichloromethane	2.30E-04	m	1.19E-05	[1]	1.33E-03	5.0E-11	3.3E-10	7.4E-12	3.8E-10	<1%	2.8E-07	1.8E-06	NA	2.1E-06	<1%
Dibromochloromethane	2.60E-04	m	1.11E-05	[1]	1.13E-03	7.6E-11	4.6E-10	5.2E-12	5.4E-10	<1%	3.2E-07	1.9E-06	NA	2.2E-06	<1%
cis-1,2-Dichloroethene	5.39E-02		1.33E-05	[2]	1.74E-03	NA	NA	NA	NA		6.6E-04	4.8E-03	6.1E-05	5.5E-03	93%
Trichloroethene	1.92E-02	m	2.53E-05	[1]	1.51E-03	3.9E-10	5.5E-09	3.8E-11	5.9E-09	5%	2.7E-06	3.8E-05	2.2E-07	4.1E-05	<1%
Vinyl chloride	8.20E-03	m	8.24E-06	[2]	2.20E-03	2.1E-08	9.3E-08	5.2E-11	1.1E-07	94%	6.7E-05	3.0E-04	8.2E-07	3.7E-04	6%
						Total ELCR			1E-07	100%	Total HI			0.006	100%

[a] The dermal absorption factor (DA) was calculated using Equation [0], [1], or [2], as indicated, from Table A-10.

ELCR	Excess lifetime cancer risk.	L/cm^2/day	Liters per square centimeter per day.	mg/L	Milligrams per liter.
EPCsw	Exposure point concentration in surface water.	L/m^3	Liters per cubic meter.	NA	Not available.
HI	Hazard index (sum of the HQs).	m	EPC based on maximum.	VFsw	Volatilization factor for surface water.
HQ	Hazard quotient.				

Equations: (see Table A-9).

ELCRo = (EPCsw × 0.01 × 1 × 40 × 10 × CSFo) / (45 × 25,550)

ELCRd = (EPCsw × DA × 5,500 × 40 × 10 × CSFa) / (45 × 25,550)

ELCRi = (EPCsw × VFsw × 1 × 0.042 × 40 × 10 × IUR) / (25,550)

3.2 = Um = Mean annual wind speed (m/sec) for North Myrtle Beach, South Carolina (NOAA 2010).

HQo = (EPCsw × 0.01 × 1 × 40 × 10) / (45 × 3,650 × RfDo)

HQd = (EPCsw × DA × 5,500 × 40 × 10) / (45 × 3,650 × RfDa)

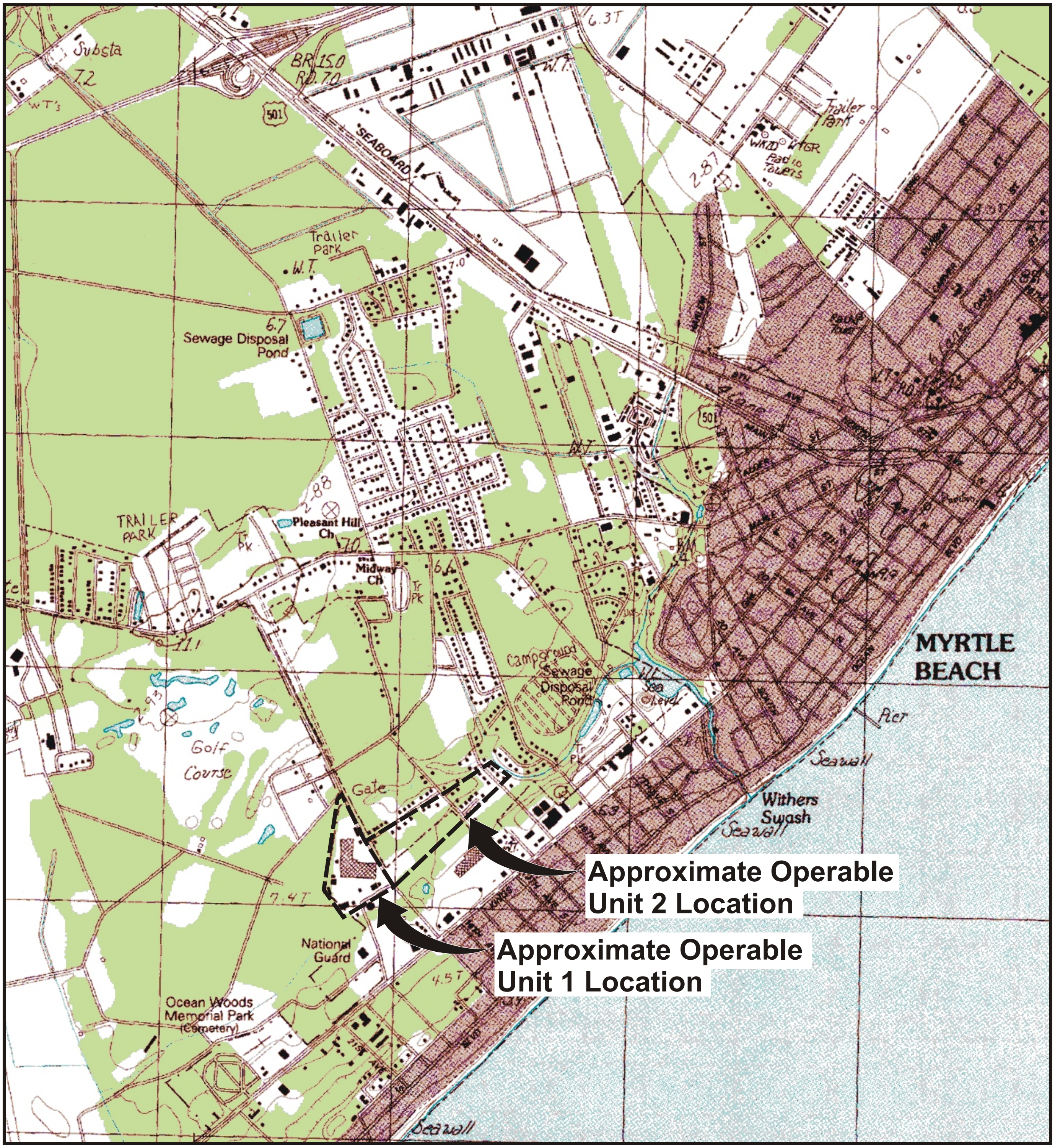
HQi = (EPCsw × VFsw × 1 × 0.042 × 40 × 10) / (3,650 × RfC)

Table A-34
Summary of Calculated Human Health Risks and Hazards
Feasibility Study
AVX Corporation
Myrtle Beach, South Carolina

RECEPTOR **Exposure Medium - Scenario**	**Calculation Table**	**Total Excess Lifetime Cancer Risk**	**Total Non-Cancer Hazard**
Hypothetical Current/Future Commercial/Industrial Worker			
Vapor Migration to Indoor Air	Table A-19	3E-08	0.00008
TOTAL SITE RISKS:		3E-08	0.00008
Hypothetical Off-Site Construction Worker			
Direct Contact with Off-Site Groundwater	Table A-20	9E-07	0.1
TOTAL SITE RISKS:		9E-07	0.1
Hypothetical Current/Future Adult Resident			
Irrigation Water - Swiming	Table A-21	**3E-06**	0.9
Irrigation Water - Use in a Greenhouse	Table A-22	6E-07	0.2
Vapor Migration to Indoor Air	Table A-26	2E-07	0.0003
TOTAL SITE RISKS:		**4E-06**	1
Hypothetical Current/Future Child Resident			
Irrigation Water - Wading Pool	Table A-27	5E-07	**2**
Irrigation Water - Swimming	Table A-28	9E-07	**2**
Vapor Migration to Indoor Air	Table A-32	3E-08	0.0003
TOTAL SITE RISKS:		1E-06	**4**
Hypothetical Current/Future Adolescent Trespasser			
Surface Water - Wading	Table A-33	1E-07	0.006
TOTAL SITE RISKS:		1E-07	0.006

ARCADIS

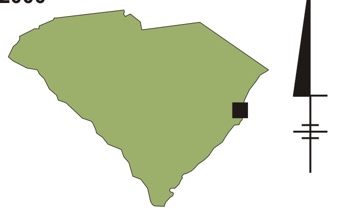
Figures



REFERENCE: BASE MAP USGS 7.5 MIN. QUAD., MYRTLE BEACH, SOUTH CAROLINA, PHOTOREVISED 1984.

2000' 0 2000'

Approximate Scale: 1" = 2000'



Area Location

AVX CORPORATION
MYRTLE BEACH FACILITY
MYRTLE BEACH, SOUTH CAROLINA

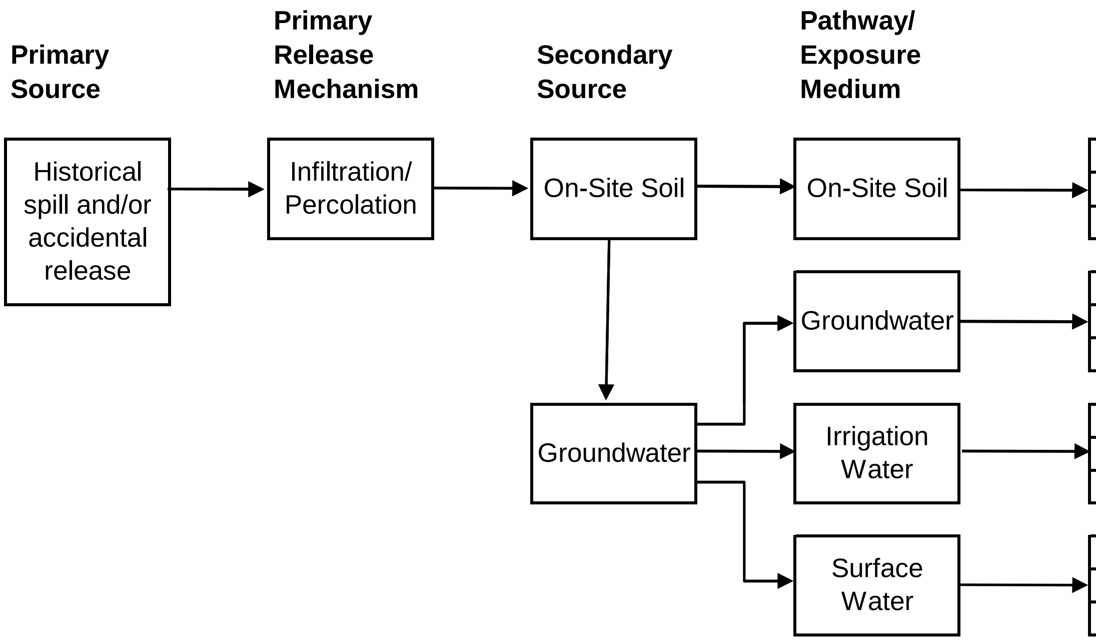
FEASIBILITY STUDY - OPERABLE UNIT 2

OPERABLE UNIT LOCATION MAP

ARCADIS

FIGURE
A-1

01/21/2011 SYRACUSE, NY-ENV/CAD-141, DJHOWES
B0007393/0000/00006/CDR/07393N03.CDR



Potential Receptors

Pathway/ Exposure Medium	Exposure Route	Current: Off-Site Adult and Child Resident	Current: Off-Site Adolescent Trespasser	Future: Off-Site Adult and Child Resident	Future: Off-Site Adolescent Trespasser	Future: Off-Site Construction Worker	Future: Off-Site Site Worker
On-Site Soil	Ingestion	NA	NA	NA	NA	NA	NA
	Dermal	NA	NA	NA	NA	NA	NA
	Inhalation	NA	NA	NA	NA	NA	NA
Groundwater	Ingestion	NA	NA	NA	NA	X	NA
	Dermal	NA	NA	NA	NA	X	NA
	Inhalation	X	NA	X	NA	X	X
Irrigation Water	Ingestion	X	NA	X	NA	NA	NA
	Dermal	X	NA	X	NA	NA	NA
	Inhalation	X	NA	X	NA	NA	NA
Surface Water	Ingestion	NA	X	X	X	NA	NA
	Dermal	NA	X	X	X	NA	NA
	Inhalation	NA	X	X	X	NA	NA

X = potential pathway.
NA = pathway not applicable.

ARCADIS

Conceptual Site Model
Potential Human Health Receptors
AVX Corporation
Myrtle Beach, South Carolina

Figure A-2

ARCADIS

Attachment A-1

ProUCL Output

Off-Site Groundwater

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	For ProUCL.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Result (cis-1,2-dichloroethene)

General Statistics

Number of Valid Data	25	Number of Detected Data	21
Number of Distinct Detected Data	21	Number of Non-Detect Data	4
		Percent Non-Detects	16.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	20	Minimum Detected	2.996
Maximum Detected	8100	Maximum Detected	9
Mean of Detected	2579	Mean of Detected	6.913
SD of Detected	2664	SD of Detected	1.746
Minimum Non-Detect	0.35	Minimum Non-Detect	-1.05
Maximum Non-Detect	1	Maximum Non-Detect	0

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	4
Number treated as Detected	21
Single DL Non-Detect Percentage	16.00%

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.847	Shapiro Wilk Test Statistic	0.896
5% Shapiro Wilk Critical Value	0.908	5% Shapiro Wilk Critical Value	0.908
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	2166	Mean	5.654
SD	2616	SD	3.353
95% DL/2 (t) UCL	3062	95% H-Stat (DL/2) UCL	5710231
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	1884	Mean in Log Scale	6.306
SD	2924	SD in Log Scale	2.143
95% MLE (t) UCL	2885	Mean in Original Scale	2170
95% MLE (Tiku) UCL	2870	SD in Original Scale	2613
		95% t UCL	3064
		95% Percentile Bootstrap UCL	3053
		95% BCA Bootstrap UCL	3170

Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	0.588	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	4390		
nu star	24.68		
A-D Test Statistic	0.751	**Nonparametric Statistics**	
5% A-D Critical Value	0.792	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.792	Mean	2170
5% K-S Critical Value	0.198	SD	2561
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	524.8
		95% KM (t) UCL	3068
Assuming Gamma Distribution		95% KM (z) UCL	3033
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	3056
Minimum	1E-12	95% KM (bootstrap t) UCL	3250
Maximum	8100	95% KM (BCA) UCL	3045
Mean	2166	95% KM (Percentile Bootstrap) UCL	3067
Median	674	95% KM (Chebyshev) UCL	4457
SD	2616	97.5% KM (Chebyshev) UCL	5447
k star	0.137	99% KM (Chebyshev) UCL	7392
Theta star	15827		
Nu star	6.844	Potential UCLs to Use	
AppChi2	2.085	95% KM (Chebyshev) UCL	4457
95% Gamma Approximate UCL	7110		
95% Adjusted Gamma UCL	7758		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Result (trichloroethene)

		General Statistics	
Number of Valid Data	25	Number of Detected Data	21
Number of Distinct Detected Data	20	Number of Non-Detect Data	4
		Percent Non-Detects	16.00%
Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	4.37	Minimum Detected	1.475
Maximum Detected	50500	Maximum Detected	10.83
Mean of Detected	3800	Mean of Detected	5.725
SD of Detected	10944	SD of Detected	2.586
Minimum Non-Detect	0.23	Minimum Non-Detect	-1.47
Maximum Non-Detect	100	Maximum Non-Detect	4.605
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	10
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	15
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	40.00%

UCL Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.37
5% Shapiro Wilk Critical Value	0.908

Data not Normal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method	
Mean	3194
SD	10091
95% DL/2 (t) UCL	6647
Maximum Likelihood Estimate(MLE) Method	N/A

MLE yields a negative mean

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	0.27
Theta Star	14100
nu star	11.32
A-D Test Statistic	0.927
5% A-D Critical Value	0.856
K-S Test Statistic	0.856
5% K-S Critical Value	0.206

Data follow Appr. Gamma Distribution at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics using Extrapolated Data	
Minimum	1E-12
Maximum	50500
Mean	3192
Median	160
SD	10092
k star	0.119
Theta star	26795
Nu star	5.957
AppChi2	1.618
95% Gamma Approximate UCL	11754
95% Adjusted Gamma UCL	12940

Note: DL/2 is not a recommended method.

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.973
5% Shapiro Wilk Critical Value	0.908

Data appear Lognormal at 5% Significance Level

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean	4.824
SD	3.3
95% H-Stat (DL/2) UCL	1829903
Log ROS Method	
Mean in Log Scale	4.858
SD in Log Scale	3.144
Mean in Original Scale	3193
SD in Original Scale	10091
95% t UCL	6646
95% Percentile Bootstrap UCL	7093
95% BCA Bootstrap UCL	9151

Data Distribution Test with Detected Values Only

Data Follow Appr. Gamma Distribution at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method	
Mean	3193
SD	9887
SE of Mean	2026
95% KM (t) UCL	6660
95% KM (z) UCL	6526
95% KM (jackknife) UCL	6646
95% KM (bootstrap t) UCL	18095
95% KM (BCA) UCL	7155
95% KM (Percentile Bootstrap) UCL	6983
95% KM (Chebyshev) UCL	12026
97.5% KM (Chebyshev) UCL	15847
99% KM (Chebyshev) UCL	23355

Potential UCLs to Use

95% KM (Chebyshev) UCL	12026

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Result (vinyl chloride)

General Statistics

Number of Valid Data	25	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	20
		Percent Non-Detects	80.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	1.9	Minimum Detected	0.642
Maximum Detected	390	Maximum Detected	5.966
Mean of Detected	148.2	Mean of Detected	3.487
SD of Detected	181.2	SD of Detected	2.477
Minimum Non-Detect	0.38	Minimum Non-Detect	-0.968
Maximum Non-Detect	2500	Maximum Non-Detect	7.824

Number treated as Non-Detect	25
Number treated as Detected	0
Single DL Non-Detect Percentage	100.00%

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Warning: There are only 5 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.819	Shapiro Wilk Test Statistic	0.87
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	115.6	Mean	2.557
SD	257.1	SD	2.675
95% DL/2 (t) UCL	203.6	95% H-Stat (DL/2) UCL	7463
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-1.47
		SD in Log Scale	3.17
		Mean in Original Scale	29.84
		SD in Original Scale	95.52
		95% t UCL	62.53
		95% Percentile Bootstrap UCL	62.94
		95% BCA Bootstrap UCL	86.2

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	0.305
Theta Star	485.3
nu star	3.055
A-D Test Statistic	0.397
5% A-D Critical Value	0.721
K-S Test Statistic	0.721
5% K-S Critical Value	0.375

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics using Extrapolated Data

Minimum	1E-12
Maximum	390
Mean	110
Median	108.2
SD	95.42
k star	0.153
Theta star	717.6
Nu star	7.666
AppChi2	2.543
95% Gamma Approximate UCL	331.6
95% Adjusted Gamma UCL	359.5

Note: DL/2 is not a recommended method.

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	36.22
SD	98.54
SE of Mean	23.57
95% KM (t) UCL	76.54
95% KM (z) UCL	74.98
95% KM (jackknife) UCL	72.46
95% KM (bootstrap t) UCL	164.3
95% KM (BCA) UCL	307.7
95% KM (Percentile Bootstrap) UCL	106.6
95% KM (Chebyshev) UCL	138.9
97.5% KM (Chebyshev) UCL	183.4
99% KM (Chebyshev) UCL	270.7

Potential UCLs to Use

95% KM (t) UCL	76.54
95% KM (Percentile Bootstrap) UCL	106.6

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Surface Water

```
                         General UCL Statistics for Data Sets with Non-Detects
              User Selected Options
                          From File   For ProUCL.wst
                     Full Precision   OFF
             Confidence Coefficient   95%
     Number of Bootstrap Operations   2000


Result (acetone)

                                                General Statistics
                         Number of Valid Data     23                        Number of Detected Data       6
                Number of Distinct Detected Data   6                        Number of Non-Detect Data    17
                                                                                 Percent Non-Detects  73.91%

                    Raw Statistics                              Log-transformed Statistics
                            Minimum Detected     3.5                                Minimum Detected   1.253
                            Maximum Detected    25.5                                Maximum Detected   3.239
                             Mean of Detected   12.24                                Mean of Detected   2.273
                               SD of Detected   8.504                                  SD of Detected   0.776
                          Minimum Non-Detect    25                                Minimum Non-Detect   3.219
                          Maximum Non-Detect    250                               Maximum Non-Detect   5.521

Note: Data have multiple DLs - Use of KM Method is recommended          Number treated as Non-Detect     23
For all methods (except KM, DL/2, and ROS Methods),                      Number treated as Detected      0
Observations < Largest ND are treated as NDs                    Single DL Non-Detect Percentage  100.00%

                           Warning:  There are only 6 Detected Values in this data
                 Note:  It should be noted that even though bootstrap may be performed on this data set
                        the resulting calculations may not be reliable enough to draw conclusions

          It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.


                                                 UCL Statistics
        Normal Distribution Test with Detected Values Only           Lognormal Distribution Test with Detected Values Only
                       Shapiro Wilk Test Statistic   0.931                      Shapiro Wilk Test Statistic   0.954
                    5% Shapiro Wilk Critical Value   0.788                   5% Shapiro Wilk Critical Value   0.788
          Data appear Normal at 5% Significance Level                  Data appear Lognormal at 5% Significance Level

              Assuming Normal Distribution                                   Assuming Lognormal Distribution
                          DL/2 Substitution Method                                   DL/2 Substitution Method
                                              Mean   29.28                                               Mean   2.911
                                                SD   34.32                                                 SD   0.928
                                   95% DL/2 (t) UCL   41.57                           95%  H-Stat (DL/2) UCL   45.74

          Maximum Likelihood Estimate(MLE) Method     N/A                                      Log ROS Method
            MLE method failed to converge properly                                      Mean in Log Scale   2.109
                                                                                          SD in Log Scale   0.569
                                                                                   Mean in Original Scale   9.603
                                                                                     SD in Original Scale   5.6
                                                                                                95% t UCL   11.61
                                                                             95% Percentile Bootstrap UCL   11.48
                                                                                   95% BCA Bootstrap UCL   11.62
```

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	1.266
Theta Star	9.667
nu star	15.19
A-D Test Statistic	0.232
5% A-D Critical Value	0.703
K-S Test Statistic	0.703
5% K-S Critical Value	0.335

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics using Extrapolated Data

Minimum	3.5
Maximum	25.5
Mean	12.28
Median	12.31
SD	4.056
k star	7.355
Theta star	1.669
Nu star	338.4
AppChi2	296.7
95% Gamma Approximate UCL	14
95% Adjusted Gamma UCL	14.13

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	10.52
SD	6.509
SE of Mean	2.719
95% KM (t) UCL	15.19
95% KM (z) UCL	15
95% KM (jackknife) UCL	15.62
95% KM (bootstrap t) UCL	17.32
95% KM (BCA) UCL	15.23
95% KM (Percentile Bootstrap) UCL	15.35
95% KM (Chebyshev) UCL	22.38
97.5% KM (Chebyshev) UCL	27.5
99% KM (Chebyshev) UCL	37.58

Potential UCLs to Use

95% KM (t) UCL	15.19
95% KM (Percentile Bootstrap) UCL	15.35

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Result (cis-1,2-dichloroethene)

General Statistics

Number of Valid Data	23	Number of Detected Data	16
Number of Distinct Detected Data	16	Number of Non-Detect Data	7
		Percent Non-Detects	30.43%

Raw Statistics

Minimum Detected	0.11
Maximum Detected	200
Mean of Detected	48.17
SD of Detected	58.91
Minimum Non-Detect	1
Maximum Non-Detect	1

Log-transformed Statistics

Minimum Detected	-2.207
Maximum Detected	5.298
Mean of Detected	2.552
SD of Detected	2.277
Minimum Non-Detect	0
Maximum Non-Detect	0

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.808	Shapiro Wilk Test Statistic	0.895
5% Shapiro Wilk Critical Value	0.887	5% Shapiro Wilk Critical Value	0.887
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	33.66	Mean	1.565
SD	53.57	SD	2.422
95% DL/2 (t) UCL	52.84	95% H-Stat (DL/2) UCL	1051
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	7.135	Mean in Log Scale	1.498
SD	79.91	SD in Log Scale	2.577
95% MLE (t) UCL	35.75	Mean in Original Scale	33.72
95% MLE (Tiku) UCL	40.23	SD in Original Scale	53.53
		95% t UCL	52.89
		95% Percentile Bootstrap UCL	51.74
		95% BCA Bootstrap UCL	56.31
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.434	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	111		
nu star	13.89		
A-D Test Statistic	0.306	Nonparametric Statistics	
5% A-D Critical Value	0.8	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.8	Mean	33.6
5% K-S Critical Value	0.228	SD	52.43
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	11.29
		95% KM (t) UCL	52.99
Assuming Gamma Distribution		95% KM (z) UCL	52.17
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	52.79
Minimum	1E-12	95% KM (bootstrap t) UCL	62.7
Maximum	200	95% KM (BCA) UCL	53.94
Mean	37.01	95% KM (Percentile Bootstrap) UCL	52.81
Median	11.6	95% KM (Chebyshev) UCL	82.81
SD	52.18	97.5% KM (Chebyshev) UCL	104.1
k star	0.163	99% KM (Chebyshev) UCL	145.9
Theta star	226.8		
Nu star	7.505	Potential UCLs to Use	
AppChi2	2.452	95% KM (BCA) UCL	53.94
95% Gamma Approximate UCL	113.3		
95% Adjusted Gamma UCL	123.6		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Result (methylene chloride)

General Statistics

Number of Valid Data	23	Number of Detected Data	5
Number of Distinct Detected Data	4	Number of Non-Detect Data	18
		Percent Non-Detects	78.26%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.23	Minimum Detected	-1.47
Maximum Detected	1.1	Maximum Detected	0.0953
Mean of Detected	0.488	Mean of Detected	-0.872
SD of Detected	0.348	SD of Detected	0.579
Minimum Non-Detect	5	Minimum Non-Detect	1.609
Maximum Non-Detect	50	Maximum Non-Detect	3.912

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	23
Number treated as Detected	0
Single DL Non-Detect Percentage	100.00%

Warning: There are only 4 Distinct Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.709	Shapiro Wilk Test Statistic	0.837
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	4.997	Mean	0.909
SD	6.936	SD	1.238
95% DL/2 (t) UCL	7.481	95% H-Stat (DL/2) UCL	11.33
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-0.872
		SD in Log Scale	0.529
		Mean in Original Scale	0.479
		SD in Original Scale	0.271
		95% t UCL	0.576
		95% Percentile Bootstrap UCL	0.58
		95% BCA Bootstrap UCL	0.593

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	1.491
Theta Star	0.327
nu star	14.91
A-D Test Statistic	0.686
5% A-D Critical Value	0.682
K-S Test Statistic	0.682
5% K-S Critical Value	0.359

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics using Extrapolated Data

Minimum	1E-12
Maximum	1.1
Mean	0.487
Median	0.433
SD	0.275
k star	0.465
Theta star	1.048
Nu star	21.37
AppChi2	11.87
95% Gamma Approximate UCL	0.876
95% Adjusted Gamma UCL	0.916

Note: DL/2 is not a recommended method.

Data Distribution Test with Detected Values Only

Data appear Lognormal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	0.488
SD	0.311
SE of Mean	0.155
95% KM (t) UCL	0.755
95% KM (z) UCL	0.744
95% KM (jackknife) UCL	0.78
95% KM (bootstrap t) UCL	2.882
95% KM (BCA) UCL	0.744
95% KM (Percentile Bootstrap) UCL	0.74
95% KM (Chebyshev) UCL	1.166
97.5% KM (Chebyshev) UCL	1.459
99% KM (Chebyshev) UCL	2.035

Potential UCLs to Use

95% KM (t) UCL	0.755
95% KM (% Bootstrap) UCL	0.74

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Result (trichloroethene)

General Statistics

Number of Valid Data	23	Number of Detected Data	9
Number of Distinct Detected Data	9	Number of Non-Detect Data	14
		Percent Non-Detects	60.87%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.92	Minimum Detected	-0.0834
Maximum Detected	19.2	Maximum Detected	2.955
Mean of Detected	7.794	Mean of Detected	1.601
SD of Detected	6.165	SD of Detected	1.161
Minimum Non-Detect	1	Minimum Non-Detect	0
Maximum Non-Detect	1	Maximum Non-Detect	0

Warning: There are only 9 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.921	Shapiro Wilk Test Statistic	0.843
5% Shapiro Wilk Critical Value	0.829	5% Shapiro Wilk Critical Value	0.829
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	3.354	Mean	0.205
SD	5.203	SD	1.342
95% DL/2 (t) UCL	5.217	95% H-Stat (DL/2) UCL	7.139
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	0.246
		SD in Log Scale	1.505
		Mean in Original Scale	3.513
		SD in Original Scale	5.132
		95% t UCL	5.351
		95% Percentile Bootstrap UCL	5.317
		95% BCA Bootstrap UCL	5.863
Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	0.905	Data appear Normal at 5% Significance Level	
Theta Star	8.614		
nu star	16.29		
A-D Test Statistic	0.565	**Nonparametric Statistics**	
5% A-D Critical Value	0.739	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.739	Mean	3.61
5% K-S Critical Value	0.285	SD	4.947
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	1.094
		95% KM (t) UCL	5.489
Assuming Gamma Distribution		95% KM (z) UCL	5.41
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	5.301
Minimum	0.92	95% KM (bootstrap t) UCL	6.095
Maximum	23.34	95% KM (BCA) UCL	7.53
Mean	10.51	95% KM (Percentile Bootstrap) UCL	6.549
Median	9.559	95% KM (Chebyshev) UCL	8.379
SD	6.86	97.5% KM (Chebyshev) UCL	10.44
k star	1.488	99% KM (Chebyshev) UCL	14.5
Theta star	7.064		
Nu star	68.45	Potential UCLs to Use	
AppChi2	50.41	95% KM (t) UCL	5.489
95% Gamma Approximate UCL	14.27	95% KM (Percentile Bootstrap) UCL	6.549
95% Adjusted Gamma UCL	14.6		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Result (vinyl chloride)

General Statistics

Number of Valid Data	23	Number of Detected Data	7
Number of Distinct Detected Data	7	Number of Non-Detect Data	16
		Percent Non-Detects	69.57%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	1.46	Minimum Detected	0.378
Maximum Detected	8.2	Maximum Detected	2.104
Mean of Detected	4.29	Mean of Detected	1.331
SD of Detected	2.229	SD of Detected	0.562
Minimum Non-Detect	1	Minimum Non-Detect	0
Maximum Non-Detect	4	Maximum Non-Detect	1.386

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Number treated as Non-Detect	20
Number treated as Detected	3
Single DL Non-Detect Percentage	86.96%

Warning: There are only 7 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.967	Shapiro Wilk Test Statistic	0.985
5% Shapiro Wilk Critical Value	0.803	5% Shapiro Wilk Critical Value	0.803
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1.784	Mean	0.0434
SD	2.099	SD	0.998
95% DL/2 (t) UCL	2.536	95% H-Stat (DL/2) UCL	2.942
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	0.105
		SD in Log Scale	1.039
		Mean in Original Scale	1.849
		SD in Original Scale	2.053
		95% t UCL	2.584
		95% Percentile Bootstrap UCL	2.608
		95% BCA Bootstrap UCL	2.749

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	2.463
Theta Star	1.742
nu star	34.48
A-D Test Statistic	0.134
5% A-D Critical Value	0.71
K-S Test Statistic	0.71
5% K-S Critical Value	0.313

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics using Extrapolated Data

Minimum	0.93
Maximum	10.69
Mean	6.118
Median	6.164
SD	2.951
k star	2.913
Theta star	2.1
Nu star	134
AppChi2	108.3
95% Gamma Approximate UCL	7.573
95% Adjusted Gamma UCL	7.692

Note: DL/2 is not a recommended method.

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	2.347
SD	1.731
SE of Mean	0.393
95% KM (t) UCL	3.021
95% KM (z) UCL	2.993
95% KM (jackknife) UCL	3.151
95% KM (bootstrap t) UCL	3.062
95% KM (BCA) UCL	4.181
95% KM (Percentile Bootstrap) UCL	3.932
95% KM (Chebyshev) UCL	4.059
97.5% KM (Chebyshev) UCL	4.8
99% KM (Chebyshev) UCL	6.255

Potential UCLs to Use

95% KM (t) UCL	3.021
95% KM (Percentile Bootstrap) UCL	3.932

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

ARCADIS

Appendix B

Groundwater Remedial Alternative Costing Detail

Activities: No Action

AVX-MB

TECH TOOL

		Sheet Total:	**$0**
Do not insert rows above this line			
	Incremental Cost		**Extended Cost**

Activities: Most Likely

AVX - MB

TECH TOOL

		Sheet Total: **$1,913,885**
Do not insert rows above this line		
	Incremental Cost	**Extended Cost**
Semi-Annual GW Monitoring	**$25,955**	**$778,637**
Well Abandonment	**$44,251**	**$44,251**
Institutional Controls	**$36,367**	**$1,090,997**
Do not insert rows below this line		

7%	Discount Rate		
106,572	Year 1		
62,321	Year 2		
62,321	Year 3	**NPV**	
62,321	Year 4		$872,000.00
62,321	Year 5		
62,321	Year 6		
62,321	Year 7		
62,321	Year 8		
62,321	Year 9		
62,321	Year 10		
62,321	Year 11		
62,321	Year 12		
62,321	Year 13		
62,321	Year 14		
62,321	Year 15		
62,321	Year 16		
62,321	Year 17		
62,321	Year 18		
62,321	Year 19		
62,321	Year 20		
62,321	Year 21		
62,321	Year 22		
62,321	Year 23		
62,321	Year 24		
62,321	Year 25		
62,321	Year 26		
62,321	Year 27		
62,321	Year 28		
62,321	Year 29		
62,321	Year 30		

Activities: P&T
AVX-MB
TECH TOOL

Sheet Total: **$10,640,158**

Do not insert rows above this line

	Incremental Cost	Extended Cost
P&T GWTS Well Install	**$81,515**	**$81,515**
P&T GWTS System Install	**$843,274**	**$843,274**
P&T GWTS System O&M	**$260,049**	**$7,801,483**
Semi-Annual GW Monitoring	**$25,955**	**$778,637**
Well Abandonment	**$44,251**	**$44,251**
Institutional Controls	**$36,367**	**$1,090,997**

Do not insert rows below this line

7%	Discount Rate
1,291,411	Year 1
322,371	Year 2
322,371	Year 3
322,371	Year 4
322,371	Year 5
322,371	Year 6
322,371	Year 7
322,371	Year 8
322,371	Year 9
322,371	Year 10
322,371	Year 11
322,371	Year 12
322,371	Year 13
322,371	Year 14
322,371	Year 15
322,371	Year 16
322,371	Year 17
322,371	Year 18
322,371	Year 19
322,371	Year 20
322,371	Year 21
322,371	Year 22
322,371	Year 23
322,371	Year 24
322,371	Year 25
322,371	Year 26
322,371	Year 27
322,371	Year 28
322,371	Year 29
322,371	Year 30
322,371	

NPV
$5,250,000.00

Activities: ERD
AVX-MB
TECH TOOL

Sheet Total: **$6,510,358**

Do not insert rows above this line

	Incremental Cost	Extended Cost
IRZ Well Network & Mixing System Installation	**$849,081**	**$849,081**
IRZ Injections	**$552,882**	**$2,764,408**
IRZ Operational and Performance Monitoring	**$110,140**	**$605,771**
Semi-Annual GW Monitoring	**$25,955**	**$389,319**
Well Abandonment	**$44,251**	**$44,251**
Institutional Controls	**$36,367**	**$545,498**
Vapor Mitigation System Installation	**$257,432**	**$257,432**
Vapor Mitigation System Inspection	**$80,126**	**$1,001,576**
ERD Well Abandonment	**$53,021**	**$53,021**

Do not insert rows below this line

7%	Discount Rate
1,956,234	Year 1
805,469	Year 2
805,469	Year 3
805,469	Year 4
805,469	Year 5
197,517	Year 6
142,447	Year 7
142,447	Year 8
142,447	Year 9
142,447	Year 10
102,384	Year 11
102,384	Year 12
102,384	Year 13
102,384	Year 14
102,384	Year 15
53,021	Year 16
0	Year 17
0	Year 18
0	Year 19
0	Year 20
0	Year 21
0	Year 22
0	Year 23
0	Year 24
0	Year 25
0	Year 26
0	Year 27
0	Year 28
0	Year 29
0	Year 30

NPV

$5,417,000.00

Appendix C

Surface-Water Remedial Alternative Cost Detail

Appendix C
Summary of Comparative Analysis of Surface-Water Remedial Alternative Costs

Feasibility Study for Operable Unit 2
AVX Corporation
Myrtle Beach, South Carolina

Remedial Alternative	Description	Remediation Costs					
		Capital Costs ($)	O&M Costs ($)	Periodic Costs ($)	Total Cost ($)	Time Frame for Remediation (Yrs)	Present Value Cost at 7% ($)
Remedial Alternative SW-1	No Action	NA	NA	NA	$0	NA	$0
Remedial Alternative SW-2	Limited Action	$0	$71,300	$0	$71,300	30	$31,000
Remedial Alternative SW-3	Active Remediation – Phytoremediation	$11,800	$109,900	$0	$121,700	30	$72,000

Notes:

Capital Costs, Indirect Costs, and Instumental Control Costs are included in Capital Costs Amount.

A 7% discount rate was applied per *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study,* EPA 540-R-00-002 OSWER 9355.0-75; July 2000.

Costs are rounded to the nearest $100.
Costs are based on an accuracy of +50/-30% (USEPA, 2000).
NA = not applicable
O&M = operations and maintenance
SVE = soil vapor extraction
USEPA = United States Environmental Protection Agency
Yrs = years

SURFACE-WATER REMEDIAL ALTERNATIVE COST ESTIMATE
LIMITED ACTION (Monitored Natural Attenuation) (SW-2)

Design Assumptions
Assumes surface water samples will be collected from three locations within Withers Swash annually for 10 years

	Quantity	Unit	Labor - D	Equipment	Materials	Cost Per Unit	Total	Reference
Capital Costs								
NA							$0	
	Capital Cost Subtotal:						$0	
	Total Indirect Cost:						$0	
	Capital and Indirect Cost Subtotal:						$0	
	Contingency (15%):						$0	
	Capital and Indirect Cost Total:						$0	
Operations and Maintenance - Annual								
Monitored Natural Attenuation	1	LUMP SUM				$2,000	$2,000	Estimate
	O&M Cost Subtotal:						$2,000	
	Contingency (15%):						$300	
	O&M Cost Total:						$2,300	

Present Worth Analysis : Alternative SW-2

Year	Capital Costs	Annual O&M Cost	Periodic Costs	Total Costs	Discount Factor at 7%	Total Present Value Costs at 7%
0	$ -	$ 2,300		$ 2,300	1.000	$ 2,300
1		$ 2,300		$ 2,300	0.935	$ 2,150
2		$ 2,300		$ 2,300	0.873	$ 2,009
3		$ 2,300		$ 2,300	0.816	$ 1,877
4		$ 2,300		$ 2,300	0.763	$ 1,755
5		$ 2,300		$ 2,300	0.713	$ 1,640
6		$ 2,300		$ 2,300	0.666	$ 1,533
7		$ 2,300		$ 2,300	0.623	$ 1,432
8		$ 2,300		$ 2,300	0.582	$ 1,339
9		$ 2,300		$ 2,300	0.544	$ 1,251
10		$ 2,300		$ 2,300	0.508	$ 1,169
11		$ 2,300		$ 2,300	0.475	$ 1,093
12		$ 2,300		$ 2,300	0.444	$ 1,021
13		$ 2,300		$ 2,300	0.415	$ 954
14		$ 2,300		$ 2,300	0.388	$ 892
15		$ 2,300		$ 2,300	0.362	$ 834
16		$ 2,300		$ 2,300	0.339	$ 779
17		$ 2,300		$ 2,300	0.317	$ 728
18		$ 2,300		$ 2,300	0.296	$ 680
19		$ 2,300		$ 2,300	0.277	$ 636
20		$ 2,300		$ 2,300	0.258	$ 594
21		$ 2,300		$ 2,300	0.242	$ 555
22		$ 2,300		$ 2,300	0.226	$ 519
23		$ 2,300		$ 2,300	0.211	$ 485
24		$ 2,300		$ 2,300	0.197	$ 453
25		$ 2,300		$ 2,300	0.184	$ 424
26		$ 2,300		$ 2,300	0.172	$ 396
27		$ 2,300		$ 2,300	0.161	$ 370
28		$ 2,300		$ 2,300	0.150	$ 346
29		$ 2,300		$ 2,300	0.141	$ 323
30		$ 2,300		$ 2,300	0.131	$ 302
TOTAL	**$ -**	**$ 71,300**	**$ -**	**$ 71,000**		**$ 31,000**

Interest Rate 7%

SURFACE-WATER REMEDIAL ALTERNATIVE COST ESTIMATE
PHYTOREMEDIATION AND MONITORED NATURAL ATTENUATION (SW-3)

Design Assumptions

Capital costs include minimal site preparation (such as clearing and grubbing and light grading), planting of polar trees at a density of 400 to 500 trees per acre and light fertilization. It is assumed that an irrigation system and fencing are not necessary. Limited argronomic sampling of existing soil to determine fertilizer requirements are also included.

Assumes O&M for the first 2 years includes quarterly inspections, pruning, fertilization/pesticide application of the phytoremediation component, and annual surface-water sampling from three locations.

Assumes O&M for 3+ years includes annual inspections, pruning, fertilization/pesticide application of the phytoremediation component, and annual surface-water sampling from three locations.

	Quantity	Unit	Labor - D	Equipment	Materials	Cost Per Unit	Total	Reference
Phytoremediation								
Site prep and tree installation/fertilization	0.2	ACRE				$50,000	$10,331	Estimate
						Capital Cost Subtotal:	$10,331	
						Total Indirect Cost:	$0	
						Capital and Indirect Cost Subtotal:	$10,300	
						Contingency (15%):	$1,500	
						Capital and Indirect Cost Total:	$11,800	
Operations and Maintenance - Quarterly to Annual								
Years 1 and 2 - Phytoremedation	0.2	ACRE				$10,000	$2,066	Estimate
Years 1 and 2 - Monitored Natural Attenuation	1	EVENT				$2,000	$2,000	Estimate
						Years 1 and 2 - O&M Cost Subtotal:	$4,100	
						Years 1 and 2 - Contingency (15%):	$600	
						Years 1 and 2 - O&M Cost Total:	$4,700	
Years 3-10 - Phytoremedation	0.2	ACRE				$5,000	$1,033	Estimate
Years 3-10 - Monitored Natural Attenuation	1	EVENT				$2,000	$2,000	Estimate
						Years 3+ - O&M Cost Subtotal:	$3,000	
						Years 3+ - Contingency (15%):	$500	
						Years 3+ - O&M Cost Total:	$3,500	
Years 10+ - Phytoremedation	0.2	ACRE				$0	$0	Estimate
Years 10+ - Monitored Natural Attenuation	1	EVENT				$2,000	$2,000	Estimate
						Years 3+ - O&M Cost Subtotal:	$2,000	
						Years 3+ - Contingency (15%):	$300	
						Years 3+ - O&M Cost Total:	$2,300	

Present Worth Analysis : Alternative SW-3

Year	Capital Costs	Annual O&M Cost	Periodic Costs	Total Costs	Discount Factor at 7%	Total Present Value Costs at 7%
0	$ 11,800	$ 7,000		$ 18,800	1.000	$ 18,800
1		$ 7,000		$ 7,000	0.935	$ 6,542
2		$ 7,000		$ 7,000	0.873	$ 6,114
3		$ 5,800		$ 5,800	0.816	$ 4,735
4		$ 5,800		$ 5,800	0.763	$ 4,425
5		$ 5,800		$ 5,800	0.713	$ 4,135
6		$ 5,800		$ 5,800	0.666	$ 3,865
7		$ 5,800		$ 5,800	0.623	$ 3,612
8		$ 5,800		$ 5,800	0.582	$ 3,376
9		$ 5,800		$ 5,800	0.544	$ 3,155
10		$ 2,300		$ 2,300	0.508	$ 1,169
11		$ 2,300		$ 2,300	0.475	$ 1,093
12		$ 2,300		$ 2,300	0.444	$ 1,021
13		$ 2,300		$ 2,300	0.415	$ 954
14		$ 2,300		$ 2,300	0.388	$ 892
15		$ 2,300		$ 2,300	0.362	$ 834
16		$ 2,300		$ 2,300	0.339	$ 779
17		$ 2,300		$ 2,300	0.317	$ 728
18		$ 2,300		$ 2,300	0.296	$ 680
19		$ 2,300		$ 2,300	0.277	$ 636
20		$ 2,300		$ 2,300	0.258	$ 594
21		$ 2,300		$ 2,300	0.242	$ 555
22		$ 2,300		$ 2,300	0.226	$ 519
23		$ 2,300		$ 2,300	0.211	$ 485
24		$ 2,300		$ 2,300	0.197	$ 453
25		$ 2,300		$ 2,300	0.184	$ 424
26		$ 2,300		$ 2,300	0.172	$ 396
27		$ 2,300		$ 2,300	0.161	$ 370
28		$ 2,300		$ 2,300	0.150	$ 346
29		$ 2,300		$ 2,300	0.141	$ 323
30		$ 2,300		$ 2,300	0.131	$ 302
TOTAL	**$ 11,800**	**$ 109,900**	**$ -**	**$ 122,000**		**$ 72,000**

Interest Rate 7%