RECORD OF DECISION
SUMMARY OF REMEDIAL ALTERNATIVE SELECTION

AVX-Myrtle Beach Site/Operable Unit 2

Horry County, South Carolina
SCD 062 690 557

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL
BUREAU OF LAND AND WASTE MANAGEMENT
June 2012

RECORD OF DECISION
AVX-MYRTLE BEACH SITE/OPERABLE UNIT 2

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1.0 Site Name and Location

The AVX –Myrtle Beach Site is divided into two operable units. The facility property located at 801 17th Avenue South, Myrtle Beach, South Carolina is referred to as Operable Unit 1 (OU-1). The off-property groundwater and surface water contamination that has migrated from the AVX Facility is referred to as Operable Unit 2 (OU-2). OU-2 (Figure 1) is located east/northeast of the Facility property within an area of undeveloped, residential, and commercial properties in the City of Myrtle Beach. The AVX Corporation owns one parcel within OU-2, while homeowners and/or commercial property owners own the remaining properties. The Site's EPA ID number is SCD 062 690 557 and it is currently listed on CERCLIS.

2.0 Statement of Basis and Purpose

This Decision Document presents the Selected Remedy for the AVX-Myrtle Beach Site/Operable Unit 2, in Myrtle Beach, South Carolina, which was chosen in accordance with the Comprehensive Environmental Response Compensation and Liability Act (CERCLA), and to the extent practicable, the National Contingency Plan (NCP). The decision is based on the Administrative Record for the Site.

3.0 Assessment of the Site

The response action selected in the ROD is necessary to protect the public health and welfare or the environment from actual or threatened releases of hazardous substances into the environment.

4.0 Description of Selected Remedy

The Department has identified a combination of alternatives to address both the groundwater and surface-water that are contaminated with volatile organic compounds (VOC's) within OU-2.

- Groundwater contamination will be addressed by the injection of a carbon substrate, such as molasses, into the surficial aquifer to enhance the natural bioremediation process (enhanced anaerobic bioremediation). Once active treatment is completed, monitored natural attenuation will continue to monitor compliance with the groundwater remediation goals. Additionally, this remedy will be combined with deed restrictions on the parcel of property owned by AVX within OU-2 and other relevant properties if owners agree to the placement of such restrictions.

- Surface-water contamination will be addressed by the implementation of phytoremediation. Hybrid poplar trees will be planted along the banks of the surface-water body in the area of

likely discharge of contamination from groundwater to surface-water. Monitored natural attenuation will also be conducted to document the declining concentrations of contamination in surface-water.

5.0 Statutory Determination

The Selected Remedy attains the mandates of CERCLA 121 and to the extent practicable the NCP.

The remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to the remedial action, is cost effective, and utilizes permanent solutions. Alternative treatment technologies and resource recovery technologies were considered in the alternative selection for this site to the maximum extent practicable. The remedy also satisfies the statutory preference for treatment as a principal element of the remedy, which permanently and significantly reduces the toxicity, mobility, and volume of hazardous substances, pollutants or contaminants.

This remedy is expected to take more than five years for the concentrations of hazardous substances, pollutants, or contaminants to attain remedial action objectives and cleanup levels. Therefore, a policy review may be conducted within five years of construction completion to ensure that the remedy is, or will be, protective of human health and the environment.

6.0 Authorizing Signature

This ROD documents SCDHEC's selected remedy for contaminated groundwater and surface-water at the AVX-Myrtle Beach Site/Operable Unit 2.

Daphne G. Neel, Chief
Bureau of Land and Waste Management
South Carolina Department of Health and Environmental Control

6/5/12
Date

PART II – THE DECISION SUMMARY
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AVX-Myrtle Beach Site/OU-2 Decision Summary

1.0 Site Name, Location, and Description

The AVX –Myrtle Beach Site is an active manufacturing facility located at 801 17th Avenue South in Myrtle Beach, South Carolina. The facility property is referred to as Operable Unit 1 (OU-1) and the off property groundwater and surface-water contamination that has migrated from the facility property is referred to as AVX-Myrtle Beach Site/Operable Unit 2 (OU-2). OU-2 (Figure 1) is located within an area of undeveloped, residential, and commercial properties in the City of Myrtle Beach within Horry County. The largest single property in OU-2 is an undeveloped and partially wooded parcel located between 17th and 13th Avenue South previously owned by Horry Land Company and currently owned by the AVX Corporation. The remaining land in OU-2 includes residential properties, commercial properties and a few undeveloped parcels. Contaminated media within OU-2 consist of groundwater and surface-water contaminated with volatile organic compounds (VOCs).

2.0 Site History and Enforcement Activities

Aerovox Corporation, the predecessor to AVX, began operations at the facility in 1953. The facility has been in continuous use in the manufacturing of ceramic capacitors since that time. Until 1993, VOCs were used in the manufacturing process. In 1981, AVX discovered that shallow groundwater beneath the Facility was impacted by VOCs. AVX conducted assessment and some remediation of contaminated soil and groundwater without the Department's knowledge from 1981 until 1995.

In June 1995, AVX notified the Department of the existence of soil and groundwater contamination at the facility (OU-1). In 1996, the Department issued a Consent Order (Order) and required AVX to submit a work plan for an investigation and remediation of soil and groundwater. Beginning in 1997, a number of soil and groundwater samples were collected on the plant site as part of a Remedial Investigation (RI) under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). The samples collected indicated contamination of groundwater beneath the site with VOCs (primarily trichloroethylene). Additionally, the Order required AVX to update and continue to operate a groundwater treatment system, installed by AVX prior to the Order, under the Department's on-going review process.

In August 2006, the Department received groundwater data from a property owner near the AVX facility indicating the presence of VOC contamination similar to the contaminants found beneath the AVX property. Due to this new data, the Department requested that AVX submit a work plan to further investigate potential groundwater contamination beyond the AVX facility's existing monitoring wells. Since that time, AVX has installed a number of temporary and permanent groundwater monitoring wells to define the bounds of the off-site groundwater contamination (OU-2). Additionally, surface-water and soil gas samples have been collected from OU-2 to fully define the extent of VOC contamination.

3.0 Community Participation

Public participation activities prior to the issuance of this ROD have included numerous community meetings, distribution of fact sheets to local residents, maintenance of a website including site-specific information, and the publication of notices in the local Myrtle Beach newspaper, The Sun News.

The Administrative Record (AR), including the RI/FS Reports and Proposed Plan, was made available to the public at the Horry County Memorial Library-Socastee Branch at 141 SC Hwy 707-Connector in Myrtle Beach. The AR was last updated several weeks prior to the public meeting conducted to present the Proposed Plan for Site Remediation.

The public meeting to present the Proposed Plan for community acceptance was held on November 1, 2011 at the Lakewood Elementary School in Myrtle Beach. The meeting was well attended and covered by the media. The public comment period for the Proposed Plan ran from November 1, 2011 to December 2, 2011. The public response to the Plan has been positive. The Proposed Plan Fact Sheet, Proposed Plan, Public Meeting Power Point presentation, and transcript of the Public Meeting are attached as Appendix A. Further discussion is included in the Responsiveness Summary on page 20.

There was, however, some concern regarding the proposal for the use of institutional controls (deed notifications/restrictions) on property within OU-2. The Department made clear at the November 1, 2012 public meeting and in any subsequent discussions with the public that only AVX would be required to institute deed notifications and restrictions on property that is owned by AVX with OU-2. Any other property within OU-2, not owned by AVX, will have deed notifications and restrictions only if the property owner volunteers to place the restrictions.

4.0 Scope and Role of Operable Unit

The AVX Myrtle Beach Site has been divided into two operable units (OU). OU-1 is the AVX facility property located at 17th Avenue South where the manufacturing processes occurred. OU-1 contains the source areas for groundwater contamination as well as groundwater contamination. OU-2 is the off property groundwater contamination that has migrated from the AVX facility.

The 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 for the onsite contamination.
- Evaluation and selection of a remedial alternative for OU-2 can proceed without delay.
- Implementation of the remedy for OU-2 will have no adverse impact on the evaluation and implementation of a remedy for OU-1.

5.0 Site Characteristics

5.1 Overview of Site Characteristics

The AVX manufacturing facility (OU-1) is located at 801 17th Avenue South within the City of Myrtle Beach, Horry County, South Carolina. OU-2 is located to the east of the facility property (OU-1) in undeveloped, residential, and commercial properties (Figure 1). The largest single property in OU-2 is an undeveloped and partially wooded parcel located between 17th and 13th Avenue South owned by AVX. OU-2 consists of groundwater and surface water contamination associated with OU-1.

5.2 Site Topography and Drainage

The OU-2 area is relatively flat, with a gentle southwest to northeast slope (Figure 2). 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 through two additional small ponds and eventually discharges to the Atlantic Ocean.

5.3 Geology/Hydrogeology

Myrtle Beach is within the Atlantic Coastal Plain physiographic province. Bedrock is approximately 1400 to 1500 feet below sea level (Zack, 1977). The majority of overlying thickness of consolidated sediments is Cretaceous age and older marine margin deposits typically composed of 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 the Terrace Deposits (0 to 45 feet below ground surface) and the Peedee Formation (45 to 300 feet below ground surface). The Terrace Deposits are a Quaternary-aged sequence of marine terraces consisting of stratified sand, silt, and clay beds reflecting a beach and lagoon depositional environment. The Peedee Formation is a Cretaceous-aged marginal margin unit formed generally of stratified sand and clay with thin beds of calcite-cemented siltstone or fine-grained sandstone.

The depth-to-groundwater at OU-2 varies from about 5 to 10 feet below ground surface (bgs) and is found in the Terrace Deposits. Terrace Deposits form the shallow aquifer in Myrtle Beach, though this aquifer is generally not used as a potable water resource.

Groundwater flow in the Terrace Deposits trends across OU-2 generally toward the northeast, except where influenced by OU-1's groundwater pumping well DPW-4SD (Figure 3). 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 the deposits into separate hydrostatigraphic units. Monitoring wells in OU-2 are typically installed in the basal portion of the Terrace Deposit sands and are referred to as Lower Terrace Deposit wells.

The capture zone created by the pumping well (DPW-4SD) located on the facility property is interpreted to extend to the northeast across the OU-1/OU-2 boundary at least 750 feet northeastward of DPW-4SD. AVX has operated this groundwater capture and treatment system to provide hydraulic containment since the mid-1980's. This system will continue to operate unless a different remedial alternative is selected during the future evaluation of remedial alternatives for OU-1.

5.4 Nature and Extent of Contamination

Based on the Remedial Investigation results, the contaminants of concern (COCs) for OU-2 are trichloroethene (TCE) and its breakdown products (cis-1,2 dichloroethene and vinyl chloride). The affected environmental media within OU-2 include groundwater and surface water. There are no source areas within OU-2. Groundwater contamination has migrated from the AVX Facility property (OU-1) off-site to create the plume that is OU-2. Surface water has become contaminated, in a limited area, due to the discharge of groundwater to surface water.

5.4.1 Groundwater

The bulk of the off property (OU-2) groundwater contamination exists beneath the property owned by AVX and formerly referred to as the Horry Land Company property. Beyond this property, the prominent portion of the groundwater plume migrates northeast toward a flood control pond located on 11th Avenue South. This pond is part of the surface water drainage system referred to as Wither's Swash. Permanent groundwater monitoring wells within OU-2 are sampled routinely. The primary COCs detected in the monitoring wells include TCE and its breakdown products (Figure 4 and Figure 5).

A pilot study, to test the use of enhanced reductive dechlorination (ERD) as a possible remedial alternative for groundwater contamination, has been on-going within OU-2 since mid-2009. Concentrations of volatile organic compounds (VOCs) within OU-2 have been affected by the implementation of the pilot study. Generally, TCE concentrations have fallen in concentration across OU-2 while daughter products have increased. The initial 2007 concentration of TCE in monitoring well MW-23D, located in the most highly contaminated portion of OU-2, was 50,300ppb. The TCE concentration detected in this same well in 2011 was 2490 ppb. Based on the most recently annual groundwater monitoring data submitted in the 2011 Groundwater Monitoring Report, total VOCs in the OU-2 Terrace Deposit wells range from 237.6 ppb (this total includes some estimated values) to 8600 ppb (this total includes some estimated values). Figure 4 reflects the data collected during the 2011 Annual Groundwater sampling in addition to results from previous sampling events. Figure 5 shows groundwater data collected in January 2011, prior to the 2011 Annual Groundwater sampling event, from new wells installed to further define the extent of groundwater contamination within OU-2.

5.4.2 Surface Water

Sampling of surface water in Withers Swash has shown detectable concentrations of COCs that are consistent with discharge of COC-containing groundwater from the Terrace Deposits (Figure 6). 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. Surface-water samples

were collected at various points from the discharge point of Withers Swash as it leaves the AVX facility property to the ocean. Detections of site-related COCs were limited to a portion of Withers Swash beginning at the storm water run-off pond located between 11^{th} and 10^{th} Avenues and becoming undetectable downstream prior to Withers Swash Park.

Concentrations of VOCs detected in surface water were limited, with the highest concentration of TCE detected in sample SW-5 at 19 ppb and cis-1, 2-dichloroethene at 200 ppb.

6.0 Current and Potential Future Site and Resource Uses

The current land use within Ou-2 is residential, commercial and some undeveloped properties. The expected future use is anticipated to remain the same. The AVX facility property (OU-1), which is connected to OU-2, is industrial and will most likely remain restricted to industrial use even after a remedy has been implemented.

All properties within OU-2 have access to a public water supply and the only use of groundwater in this area is by the use of irrigation wells. Surface-water is used for recreational purposes in this area, however, the area of surface-water contamination identified during the Remedial Investigation process is not in an area easily accessible to residents.

7.0 Summary of Site Risks

7.1 Human Health Risk Assessment

A human health risk assessment (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. Data collected for each media of concern (groundwater, surface water, and soil gas) were compared to United States Environmental Protection Agency (USEPA) Regional Screening Levels (RSLs) to identify constituents of potential concern (COPCs). The potential exposure scenarios evaluated for OU-2 included the following:

- *Groundwater*: Exposure to hypothetical construction workers. The assumption in preparing the HHRA is that the groundwater will not be used as a potable water supply.

- *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 residents/trespassers.
- *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 risk and non-cancer hazards. For cancer endpoints, the SCDHEC target excess cancer risk considered protective of health is 1×10^{-6}, and the USEPA target excess cancer 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 Hazard Index of 1.

The HHRA concluded, based on an assumption that shallow groundwater in the area will not be used as a potable water supply, that there is no expectation of harm to the public health with respect to the COPCs present in groundwater (including irrigation water), surface water, or soil gas (vapors).

8.0 Remedial Action Objectives

Remedial Action Objectives (RAOs) were developed based on a review of the characterization data, the conclusions of the HHRA, the Applicable or Relevant and Appropriate Requirements (ARARs), and the FS Work Plan. Because the HHRA determined that there is currently no unacceptable human health risk associated with groundwater, surface water and soil gas, the list of Chemicals of Concern (COCs) associated with OU-2 were developed based on the ARARs. The COC's for OU-2 are listed in the following discussions of the RAOs for each contaminated media.

8.1 Groundwater

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

- Restore the groundwater aquifer by reducing the concentrations of COCs in groundwater to below the Federal Maximum Contaminant Levels (MCL's) for drinking water.
- Prevent ingestion and dermal contact with groundwater containing COCs above the MCL's

TABLE 8.1

Remediation Goals for Groundwater
(USEPA MCL or SCDHEC Drinking Water Standard, unless otherwise noted)

Chemical of Concern (COC)	Remedial Goal (ppb)
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

Notes: [1] -USEPA Risk Based Screening Level.

8.2 Surface Water

The RAOs for surface water within OU-2 include the following:

- Mitigate the concentrations of COCs in surface water to below the SCDHEC Water Standards for Surface Water. If there is not a SCDHEC Water Standard established for a constituent, the USEPA MCL will be applied.

TABLE 8.2

Remediation Goals for Surface Water USEPA (MCLs)	
Chemical of Concern (COC)	**Remedial Goal (ppb)**
Cis-1,2-Dichloroethene	70
Trichloroethene	5.0
Vinyl Chloride	2.0

9.0 Remedial Alternatives

Based on information collected during the previous investigations, a Feasibility Study (FS) was conducted to identify, develop, and evaluate cleanup options and remedial alternatives to address the surface water and groundwater contamination. The FS process used the information regarding the nature and extent of contamination and associated potential human health risks determined during the remedial investigation and associated studies to develop potential remedial alternatives and evaluate their overall protection of human health and the environment. Both surface water and groundwater were considered in the FS analysis. Each remedial alternative evaluated by the Department is listed below in Table 9-0.

TABLE 9.0

Remedial Alternatives for Contaminated Surface-Water and Groundwater		
Surface-Water Alternatives	SW-1	No Action
	SW-2	Limited Action: Surface-water sampling to monitor natural degradation and the affects of groundwater treatment (sampling estimated at 30 years).
	SW-3	Phytoremediation: Planting hybrid poplar trees at the groundwater/surface water interface in addition to sampling surface-water to monitor natural degradation (monitoring estimated at 30 years)

Groundwater Alternatives	OGW-1	No Action	
	OGW-2	Limited Action: Institutional controls and monitored natural attenuation (monitoring estimated at 30 years).	
	OGW-3	Active Treatment	a: Hydraulic Containment: Institutional controls, extraction wells/air stripper, and monitored natural attenuation (treatment and monitoring estimated at a minimum of 30 years).
			b: Enhanced Anaerobic Bioremediation: Institutional controls, in-situ injection of a carbon substrate, and monitored natural attenuation (active treatment estimated at 5 years and additional monitoring estimated at 10 years).

9.1 Description of Surface Water Alternatives

9.1.1 Surface-Water Alternative SW-1: No Action

The no further action alternative provides a baseline for comparison with the other alternatives, and is included in the evaluation for consistency with the EPA guidance. No remedial activities beyond those that have already been conducted within OU-2 would occur at the site. Routine surface water sampling would not be implemented under this alternative.

The no further action alternative would not impact current land uses or expected future land uses at the site and the surface water remedial goals would not be addressed with this alternative. Since no action would be conducted the present value cost of this alternative is $0.

9.1.2 Surface-Water Alternative SW-2: Limited Action

This alternative does not actively reduce existing COC concentrations in surface water. Surface water samples would be collected on an annual basis for an estimated 30 years to monitor changes in surface water concentrations due to natural degradation and the affects of groundwater treatment.

The present value cost of this alternative is $31,000 based on 30 years of surface water monitoring.

9.1.3 Surface-Water Alternative SW-3: Active Remediation-Phytoremediation

This alternative provides protection to human health and the environment by the implementation of phytoremediation and long-term monitoring of surface-water concentrations. Phytoremediation utilizes the ability of plants, in this case hybrid poplar trees, to remove harmful chemicals from the environment and either store those chemicals within the plant or reduce the chemicals to less harmful

by-products. Use of phytoremediation at this site would diminish the source of future impacted surface water by preventing the infiltration of impacted shallow groundwater. Natural attenuation from natural processes would reduce the COC concentrations in surface water.

The present value cost of this alternative is $72,000 based on site preparation, tree planting, maintenance cost, and 30 years of surface water monitoring.

9.2 Description of Groundwater Remedial Alternatives

9.2.1 Groundwater Alternative OGW-1: No Further Action

The no further action alternative provides a baseline for comparison with the other alternatives, and is included in the evaluation for consistency with the EPA guidance. No remedial activities beyond those that have already been conducted within OU-2 would occur at the Site. Routine groundwater monitoring would not be implemented under this alternative.

The no further action alternative would not impact current land uses or expected future land uses at the Site, other than the need to properly abandon existing monitoring wells if their locations interfere with future land uses. Groundwater quality would not be affected other than through natural attenuation, which would not be monitored. The groundwater remedial goals would not be addressed with this alternative. Since no action would be conducted, the net present worth of this alternative is $0.

9.2.2 Groundwater Alternative OGW-2: Limited Action

This alternative would prevent and control potential exposure to groundwater through institutional controls (deed notifications/restrictions) on property owned by AVX, the abandonment of existing residential irrigation wells only on a voluntary basis, and monitoring the natural attenuation of constituents in groundwater.

This alternative would not impact current or expected future land uses, other than the need to maintain the monitoring well network. Groundwater quality would not be affected other than though natural attenuation, however, the dissolved phase constituent concentrations would be monitored. The total present value cost of this alternative is $872,000 based on monitoring for 30 years.

9.2.3 Groundwater Alternative OGW-3a: Active Treatment-Hydraulic Containment

This alternative would prevent and control potential exposure to groundwater through institutional controls (deed notifications/restrictions) on property owned by AVX, the abandonment of existing residential irrigation wells only on a voluntary basis, the hydraulic containment and treatment of groundwater by the use of extraction wells with an associated treatment system (air stripping), and monitoring the natural attenuation of constituents in groundwater.

Natural attenuation from naturally occurring subsurface processes would reduce the concentrations of COCs in groundwater, while the operation of a groundwater extraction and treatment system would prevent further migration of COCs in groundwater and accelerate the groundwater remediation process. Monitoring would be preformed to evaluate changes in COC concentrations within

groundwater. The timeframe for this alternative to achieve remedial goals is estimated to be a minimum of 30 years.

The present value cost of this alternative is $5,250,000 based on 30 years of treatment and groundwater monitoring.

9.2.4 Groundwater Alternative OGW-3b: Active Treatment-Enhanced Anaerobic Bioremediation

This alternative would prevent and control potential exposure to groundwater through institutional controls (deed notifications/restrictions) on property owned by AVX, the abandonment of existing residential irrigation wells only on a voluntary basis, the implementation of enhanced anaerobic bioremediation, and monitoring the natural attenuation of constituents in groundwater.

The COC concentrations in groundwater would be reduced through the implementation of enhanced anaerobic bioremediation, accelerating the groundwater remediation process, and preventing the future migration of surface-water infiltration of impacted groundwater. Methane vapor monitoring would be conducted and mitigation implemented, if needed. Additionally, the natural attenuation from natural subsurface processes would reduce any remaining COC concentrations in groundwater after the enhanced anaerobic bioremediation is complete. The estimated timeframe to achieve remedial goals is 15 years.

The present value cost of this alternative is $5,417,000 based on 5 years of active remediation and 10 additional years of groundwater monitoring.

10.0 Comparative Analysis of Alternatives

The National Contingency Plan (NCP) requires the Department to use eight (8) specific criteria to evaluate the different remediation alternatives individually and against each other in order to select a remedy. Two of these criteria, overall protection of human health and the environment and compliance with State and Federal regulations, are threshold criteria. If an alternative does not meet these two criteria, it cannot be considered as the remedy for the Site. Five of the criteria are balancing criteria: long-term effectiveness and permanence; reduction of toxicity, mobility, or volume of contaminants through treatment; short-term effectiveness; implementability; and cost. These criteria are used to weigh the strengths and weaknesses of the alternatives. Community acceptance is the modifying criteria and is carefully considered by the Department prior to the final remedy selection.

The following section of the ROD profiles the relative performance of each alternative against the evaluation criteria, noting how each compares to the other options under consideration.

10.1 Overall Protection of Human Health and the Environment

Overall protection of Human Health and the environment addresses whether each alternative provides adequate protection of human health and the environment and describes how risks posed through each

exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, and institutional controls.

10.1.1 Groundwater Alternatives

Alternative OGW-1, the no further action alternative, does not provide adequate protection, because no groundwater monitoring or active remediation would be conducted to reduce the levels of contamination.

Alternative OGW-2, providing monitored natural attenuation, institutional controls, and well abandonment is more protective than Alternative 1. This alternative would continue to monitor the reduction of constituent concentrations in groundwater and limit any potential exposure through deed notifications/restrictions on AVX owned property and well abandonment (where agreed upon by residents). However, no active remediation would be conducted.

Alternative OGW-3a would be more protective of human health and the environment than OGW-1 and OGW-2 due to the addition of groundwater extraction and treatment. The removal of contaminant mass from groundwater would prevent future COC migration, control potential discharge of COCs from groundwater to surface water, and prevent exposure to COCs in groundwater.

Alternative OGW-3b would be the most protective of human health and the environment. In addition to institutional controls, well abandonment, and monitoring natural attenuation of COCs in groundwater, this alternative would implement the active treatment process of enhanced anaerobic bioremediation. This alternative would be similar to OGW-3a in that it would prevent future COC migration, control potential discharge of COCs from groundwater to surface water, destroy COCs in groundwater, and prevent exposure to COCs in groundwater, however, with this remedy the reduction of COCs would occur in a shorter time-frame.

10.1.2 Surface-Water Alternatives

Alternative SW-1, the no action alternative, does not provide adequate protection, because no surface water monitoring or active remediation would be conducted to reduce the levels of contamination.

Alternative SW-2 would not actively reduce the existing COC concentrations in surface water, but would provide measures to monitor changes in surface water concentrations due to natural degradation.

Alternative SW-3 is the most protective of human health and the environment. This remedy would actively reduce COC concentrations at the groundwater/surface water interface and monitor changes in surface water concentrations due to natural degradation and treatment.

10.2 Compliance with State and Federal Regulations

Each of the alternatives is evaluated with respect to the ability to comply with applicable state, federal and local environmental and health regulations. All regulations that might require consideration are

identified and referred to as Applicable or Relevant and Appropriate Requirements (ARARs). ARARs are further broken into the three categories of chemical-specific, location-specific and action-specific.

10.2.1 Groundwater Alternatives

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

Alternative OGW-2 would, over a long period of time, comply with chemical-specific ARARs by monitoring natural attenuation processes. Additionally, this alternative would reduce the completion of the exposure pathway for groundwater by the use of deed notifications/restrictions on some properties within OU-2.

Alternatives OGW-3a and OGW-3b would comply with chemical-specific ARARs for COCs in groundwater by the destruction of COCs and by minimizing potential exposure, within some parts of OU-2, through the use of institutional controls. Because both theses alternatives use active remedies, they would comply with ARARs in a shorter time-frame than OGW-2, however, OGW-3a would take longer to achieve compliance than OGW-3b.

10.2.2 Surface-Water Alternatives

Alternative SW-1 would not comply with chemical-specific ARARs for surface water because no further action would be taken to address existing COC concentrations in surface water.

Both alternatives SW-2 and SW-3 would comply with chemical-specific ARARs for surface water by documenting natural attenuation of COC concentrations exceeding the chemical-specific ARARs. SW-3 would have the added benefit of implementation of the phytoremediation component to reduce the time to reach compliance.

10.3 Long-Term Effectiveness and Permanence

Long-Term effectiveness and permanence refers to expected residual risk and ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup objectives have been met. This criteria includes the consideration of residual risk that will remain onsite following remediation and the adequacy and reliability of controls.

10.3.1 Groundwater Alternatives

Long-term effectiveness and permanence would not be achieved with Alternative OGW-1, the No Action Alternative. Potential exposure risks associated with COCs in groundwater would remain with no controls or long-term management plan.

The use of institutional controls on AVX owned property would prevent some access to COCs in groundwater. Also, as natural attenuation processes reduce COC concentrations in groundwater, periodic groundwater monitoring would allow for a determination of when remedial goals are met.

Therefore, Alternative OGW-2 is marginally more acceptable than Alternative OGW-1 regarding this criterion.

Alternatives OGW-3a and OGW-3b would both provide effective and permanent removal of COCs from groundwater and be successful in eliminating human health risks. However, it is expected that Alternative OGW-3b would take significantly less time to achieve remedial goals.

10.3.2 Surface-Water Alternatives

Long-term effectiveness and permanence would not be achieved through Alternative SW-1, the No Action Alternative. Potential future exposure associated with COCs in surface water would remain with no controls or long-term management plan.

Both Alternatives SW-2 and SW-3 would monitor the natural attenuation processes in surface water and over time achieve long-term effectiveness and permanence. However Alternative SW-3, through the additional use of phytoremediation, would reduce the discharge of COCs in groundwater to surface water and therefore reduce the time to achieve long-term effectiveness and permanence.

10.4 Reduction of Contaminant Toxicity, Mobility, or Volume through Treatment

This factor evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.

10.4.1 Groundwater Alternatives

Natural attenuation mechanisms may result in reduction of COC 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. Therefore, Alternative OGW-1 is the least acceptable alternative regarding this criterion.

Active treatment of groundwater would not occur with Alternative OGW-2. However, concentrations would be monitored to determine the rate and extent of reductions through natural attenuation processes over time.

Alternative OGW-3a would, through the use of a groundwater extraction and treatment system, reduce mobility, toxicity and volume of COCs in groundwater.

By the use of enhanced reductive dechlorination and natural attenuation processes, Alternative OGW-3b would permanently reduce the mobility, toxicity, and volume of COCs in groundwater.

10.4.2 Surface-Water Alternatives

Although natural attenuation processes may result in the reduction of COC mobility, toxicity, or volume in surface water, monitoring of these processes would not be performed under the Alternative SW-1 (No Action Alternative).

While Alternative SW-2 does not provide an active treatment option, it would reduce the mobility, toxicity, and volume of COCs in surface water by natural attenuation processes. Monitoring activities would be conducted to document the attenuation.

Alternative SW-3 would permanently reduce the mobility, toxicity, and volume of COCs in surface water by the interception of COCs in shallow groundwater before discharge to surface water through the process of phytoremediation. Additionally, natural attenuation processes will further reduce COCs in surface water.

10.5 Short-Term Effectiveness

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.

10.5.1 Groundwater Alternatives

Alternative OGW-1 (No further action) would have no short-term effects on the community or remediation workers. Groundwater quality would gradually improve through natural attenuation, although it would not be monitored.

Adverse short-term impacts associated with the implementation of Alternative OGW-2 (monitored natural attenuation, institutional controls, and well abandonment) are not anticipated.

The limited construction activities (abandoning irrigation wells, installation of extraction wells, additional monitoring wells, and groundwater treatment system) associated with OGW-3acould result in limited short-term exposure risks and impacts to workers, adjacent populations, or the environment. Construction activities would be managed through engineering controls to minimize exposure.

Implementation of Alternative OGW-3b could result in minimal exposure risks to the community, workers and the environment. Construction and treatment activities (installation of additional monitoring and injection wells, periodic injection activities, and vapor monitoring) would be managed through engineering controls to minimize exposure. Should vapor monitoring of methane indicate a need, mitigation may be necessary in residential areas to control risks from methane production.

10.5.2 Surface-Water Alternatives

The No Action Alternative (SW-1) does not incorporate any implementation activities that would present exposure risks to the community, workers, or the environment.

Implementation of Alternative SW-2 could result in minimal exposure risk to the community, workers and the environment. This alternative includes periodic surface-water monitoring, which would be conducted by trained workers.

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

10.6 Implementability

The analysis of implementation considers the technical and administrative feasibility of implementation, as well as the availability of required materials and services. Implementability is further categorized into technical feasibility, administrative feasibility and availability criteria.

10.6.1 Groundwater Alternatives

Groundwater monitoring is an on-going activity at the Site, and continued monitoring and maintenance of the well network would be readily implementable with any of the alternatives. All of the Alternatives are implementable.

Alternative OGW-1 is technically feasible because no technical components are necessary. This alternative is also administratively feasible because no coordination with other parties is necessary.

Implementation of Alternative OGW-2 (MNA and institutional controls) is technically feasible and also administratively feasible as no coordination with other parties is necessary.

Alternatives OGW-3a and OGW-3b are both technically and administratively feasible. The technology used for both of these alternatives is conventional and proven. The administrative components can be easily coordinated, and the services and materials needed to implement these remedial alternatives are readily available.

10.6.2 Surface-Water Alternatives

The No Action Alternative (SW-1) is technically feasible and administratively feasible because of a lack of monitoring or other active measures.

Alternatives SW-2 and SW-3 are both technically and administratively feasible. However, SW-2 would not prevent potential future discharge of COCs from groundwater to surface water, whereas, SW-3 would reduce this potential discharge. Lastly, gaining access to properties for phytoremediation plots could affect the administrative feasibility of SW-3.

10.7 Cost

The cost analysis evaluated capital costs and annual operation and maintenance (O&M) cost. The total present value cost is the sum of initial capital costs and the discounted value of O&M costs over the lifespan of the remedy.

TABLE 10.7.1

Groundwater Alternatives Total Present Value Cost	
Alternative OGW-1/No Further Action	**$0**
Alternative OGW-2/Limited Action	**$872,000**
Alternative OGW-3a/Active Treatment-Hydraulic Containment	**$5,250,000**
Alternative OGW-3b/Active Treatment-ERD	**$5,417,000**

TABLE 10.7.2

Surface-Water Alternatives Total Present Value Cost	
Alternative SW-1/No Further Action	**$0**
Alternative SW-2/Limited Action	**$31,000**
Alternative SW-3/Active Remediation-Phytoremediation	**$72,000**

10.8 Community Acceptance

This criterion considers whether the local community agrees with the Department's preferred alternative. Comments received on the Proposed Plan are important indicators of community acceptance.

The Department presented the Proposed Plan for addressing OU-2 groundwater and surface-water contamination at the November 1, 2011 public meeting. During this meeting, the Department addressed all questions from the local community. Additionally, there were a small number of written comments submitted to the Department during the public comment period (those comments and responses are attached in Appendix A). There was no opposition to the Department's preferred alternatives for groundwater or surface water. There was, however, some concern from residents regarding the proposal of institutional controls such as deed restrictions/notifications and the abandonment of irrigation wells. The Department made it clear in all responses, that only AVX would be required to place institutional controls on property that is owned by AVX. Any institutional controls placed on other properties within the area of OU-2, or irrigation well abandonment performed within properties in the area of OU-2 will be only with the consent of the property owners. The Department's description of the selected remedy will be written to reflect this concern.

11.0 SELECTED REMEDY

The Department has selected enhanced anaerobic bioremediation with monitored natural attenuation as the alternative for the cleanup of groundwater contamination (Alternative OGW-3b) and phytoremediation with the addition of monitored natural attenuation for the cleanup of surface water contamination (Alternative SW-3). The groundwater alternative will include the placement of deed notifications/restrictions on property owned by AVX within the OU-2 area.

11.1 Description of Groundwater Remedy

The groundwater remedy, Alternative OGW-3b, consists of the following components:

- Access to groundwater will be limited by the placement deed restrictions/notifications on property owned by AVX and the abandonment of irrigation wells in the area of OU-2 with the consent of property owners
- COC concentrations will be reduced through the implementation of enhanced anaerobic bioremediation
- Groundwater will be monitored

The total estimated present worth cost of this alternative is $5,417,000.

Access to contaminated groundwater beneath property owned by AVX would be limited through deed notifications/restrictions. Additionally, any irrigation wells within the area of OU-2 would be abandoned provided property owners grant permission. The COC concentrations in groundwater would be reduced through the implementation of enhanced anaerobic bioremediation, accelerating the groundwater remediation process, and preventing the future migration of surface-water infiltration of impacted groundwater. Natural attenuation from natural subsurface processes would reduce any remaining COC concentrations in groundwater once the enhanced anaerobic bioremediation is completed. Monitoring would be performed to evaluate changes in COC concentrations within groundwater for risks to human health or the environment.

The enhanced anaerobic bioremediation system would consist of using a series of approximately 30 injection wells to deliver a carbon substrate, such as molasses, into the subsurface. The estimated time frame for the injections is four times per year at all 30 wells for 5 years. After the 5 years of injections, monitoring would be conducted for an additional 10 years.

Because the bioremediation process of VOCs can produce methane gas, methane vapor monitoring would also be conducted. It is currently 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.

This alternative provides the most protection of human health and the environment, and reduces the concentrations of COC in groundwater in a timely manner. It is implementable and although it is the highest in cost, it provides the most permanent removal of COCs and the shortest time for cleanup.

11.2 Description of Surface-Water Remedy

The surface-water remedy, SW-3, consists of the following components:

- Phytoremediation
- Monitored natural attenuation

The total estimated present worth cost of this alternative is $72.000.

Alternative SW-3 would implement phytoremediation by planting hybrid poplar tress along the banks of the surface-water body in the area of likely discharge of COCs from groundwater to surface-water. Monitored natural attenuation would also be conducted to document the declining concentrations of COCs. Phytoremediation is an accepted remedial alternative for VOCs in groundwater and the location within OU-2 that this remedy would be used is very suited for this application.

Installation of the phytoremediation componet will require property access, which could affect administrative feasibility. However, this alternative should not impact current or expected future land uses, other than the need to gain access to properties, plant the trees, and monitor surface water.

This alternative provides the most protection of human health and the environment, and reduces the potential future discharge of COCs in groundwater to surface water. It is implementable and although it is the highest in cost, it provides the shortest time for cleanup.

11.3 Expected Outcome of the Selected Remedy

The purpose of this response action is to control risk posed by direct contact with contaminated groundwater and surface water in OU-2. The groundwater component of the selected remedy will restore the aquifer to drinking water standards. The Remedial Goals for groundwater and surface water contaminants are based on the maximum Contaminant Levels (MCLs) established under the Safe Drinking Water Act.

The selected remedy is expected to prevent exposure to contaminated surface water and groundwater. Currently, there is very little human exposure to contaminated groundwater and surface water exceeding safe drinking water standards. Groundwater is not used as a source of drinking water within the area of OU-2 and the only exposure to groundwater is through the use of irrigation wells by a limited number of residents. Additionally, the extent of surface water contamination is limited and not within an area that is used for recreational purposes. Soil gas testing data across the site has shown that vapor intrusion of VOCs from the groundwater plume is not creating an indoor air risk to residents. During remediation, the groundwater and surface water will continue to be monitored. The time to reach clean-up levels is currently expected to be 15 years for groundwater with monitoring of surface water to continue on for an additional 15 years.

PART III- RESPONSIVENESS SUMMARY
RECORD OF DECISION
AVX-Myrtle Beach Site/OU-2 Decision Summary

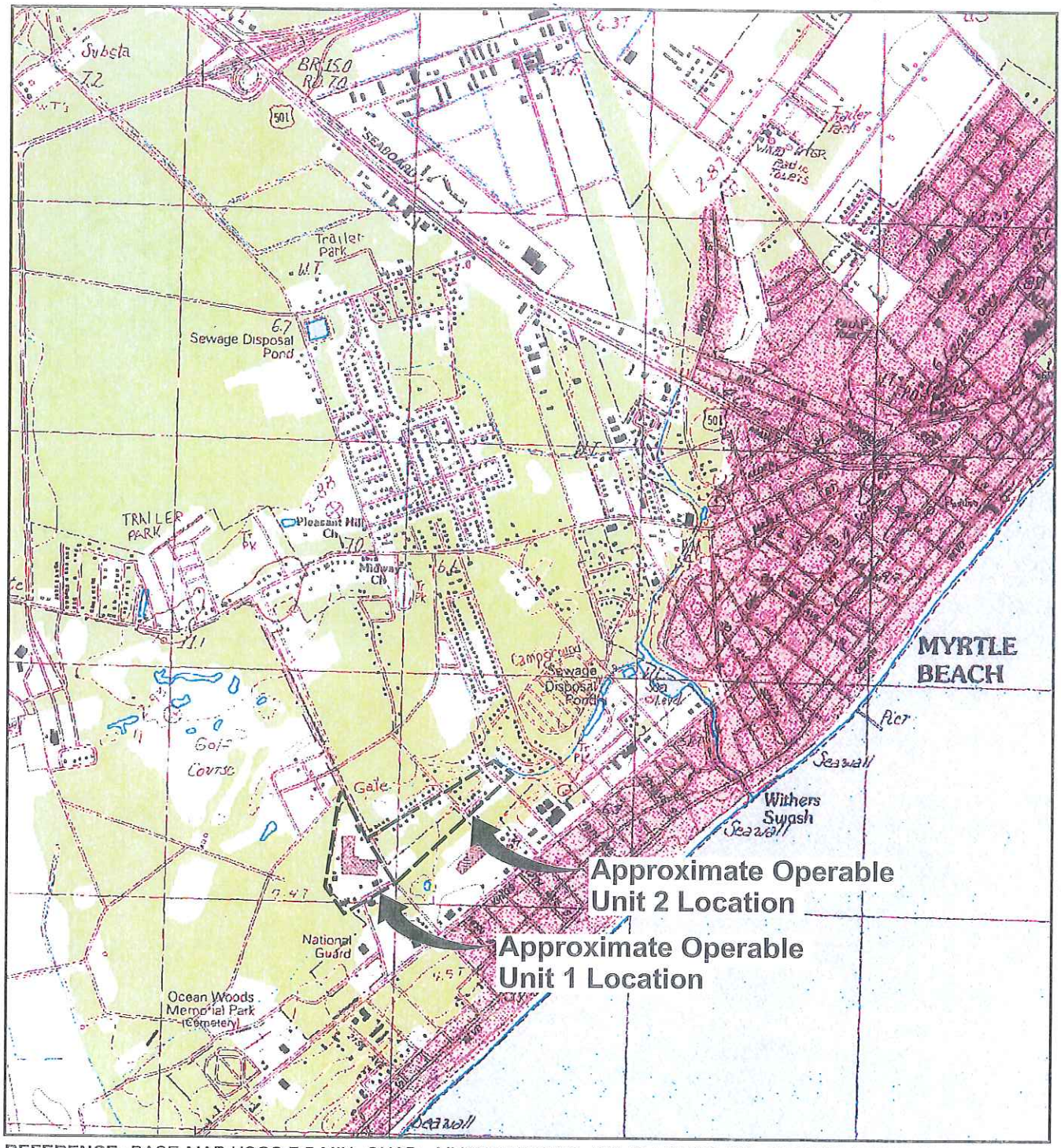
1.0 Stakeholder Issues and Lead Agency Responses

A fact sheet summarizing the Department's Proposed Plan (Plan) was mailed to residents and other interested parties on October 19, 2011, and a public meeting to present the Plan was held in Myrtle Beach on November 1, 2011. At the meeting, representatives of the Department presented the results of the Remedial Investigation, explained the remedial alternatives evaluated in the Feasibility Study, presented the Department's preferred alternatives for both groundwater and surface water, and received comments from the public.

During the public comment period, which ran from November 1, 2011 to December 2, 2011, there was no opposition to the Department's preferred groundwater or surface water remedies. However, there were recommendations on issues to consider during the clean-up phase of the project and concern from multiple individuals regarding the wording in the groundwater alternative in the discussion of deed notifications/restrictions. In all responses to the deed notifications/restrictions concern, the Department clarified that only AVX would be required to place deed notifications/restriction on property owned by the AVX Corporation within OU-2. Other property owners in the area of OU-2 might be requested to place restrictions on groundwater use on their deeds, however, their agreement to do so would be only on a voluntary basis. Additionally, irrigation wells on private property within

OU-2 would only be abandoned with the consent of the property owner. The wording in the description of the groundwater alternatives has been altered to more clearly state that, with the exception of the AVX Corporation, deed notifications/restrictions and irrigation well abandonment will be with the consent of property owners. Overall, response to the preferred alternatives was favorable. Copies of the written comments and responses received during the public comment period are attached at Appendix B.

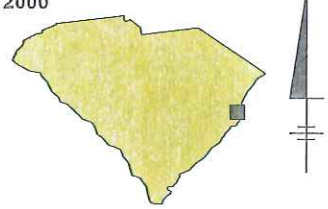
FIGURES



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
PRE-DESIGN INVESTIGATION INTERIM REPORT

SITE LOCATION MAP

ARCADIS

FIGURE 1

04/25/2011 SYR. JE, NY-ENV/CAD-141, DJHOWES
B0007394/0000/00002/CDR/07394N01.CDR

DHEC FIGURE 1

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)
- DIRECT PUSH SOIL AND/OR GROUNDWATER SAMPLING LOCATION

NOTES:

1. AERIAL PHOTOGRAPH OBTAINED FROM THE SOUTH CAROLINA DEPARTMENT OF NATURAL RESOURCES WEBSITE (2007).
2. ALL LOCATIONS ARE APPROXIMATE.
3. THE FORMER PDG BUILDING HAS BEEN DEMOLISHED.

0 300' 600'

GRAPHIC SCALE

AVX CORPORATION
MYRTLE BEACH FACILITY
MYRTLE BEACH, SOUTH CAROLINA
PRE-DESIGN INVESTIGATION INTERIM REPORT

INVESTIGATION LOCATION MAP

ARCADIS | FIGURE 2

DHEC FIGURE 2

CITY:SYRACUS...:Y DIV/GROUP:ENV/CADD DB:A. SCHILLING, R. BASSETT, P. LISTER LD:A. SCHILLING PM:W. POPHAM TM:M. HANISH
G:\ENV\CAD\SYRACUSE\ACTIVE\00073941\000\0000\2D\WG\07394B02.DWG LAYOUT: 2 SAVED: 4/26/2011 2:50 PM ACADVER: 18.0S (LMS TECH)
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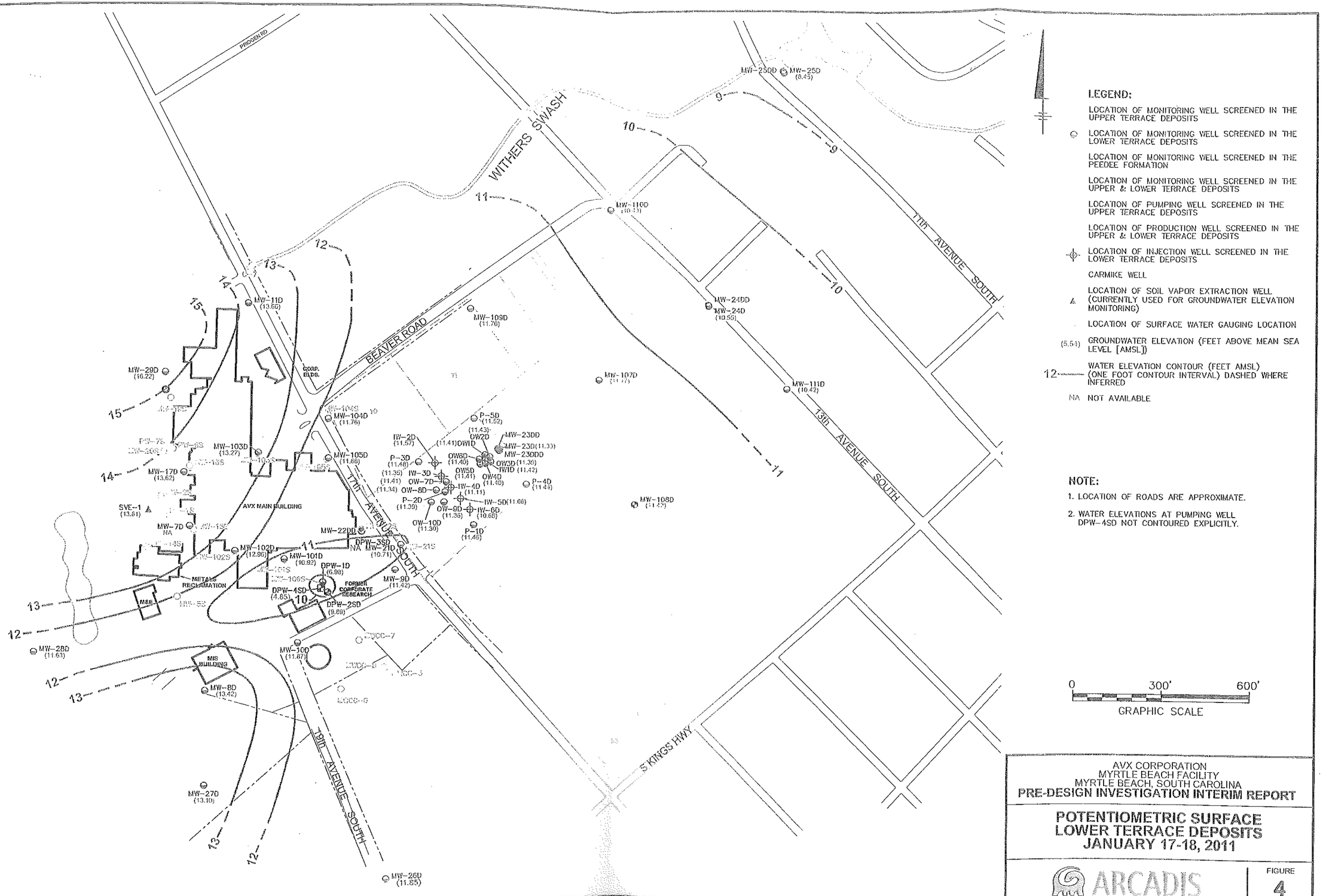
07394X00



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 SURFACE WATER GAUGING LOCATION
- (5.54) GROUNDWATER ELEVATION (FEET ABOVE MEAN SEA LEVEL [AMSL])
- 12 WATER ELEVATION CONTOUR (FEET AMSL) (ONE FOOT CONTOUR INTERVAL) DASHED WHERE INFERRED
- NA NOT AVAILABLE

NOTE:

1. LOCATION OF ROADS ARE APPROXIMATE.
2. WATER ELEVATIONS AT PUMPING WELL DPW-4SD NOT CONTOURED EXPLICITLY.

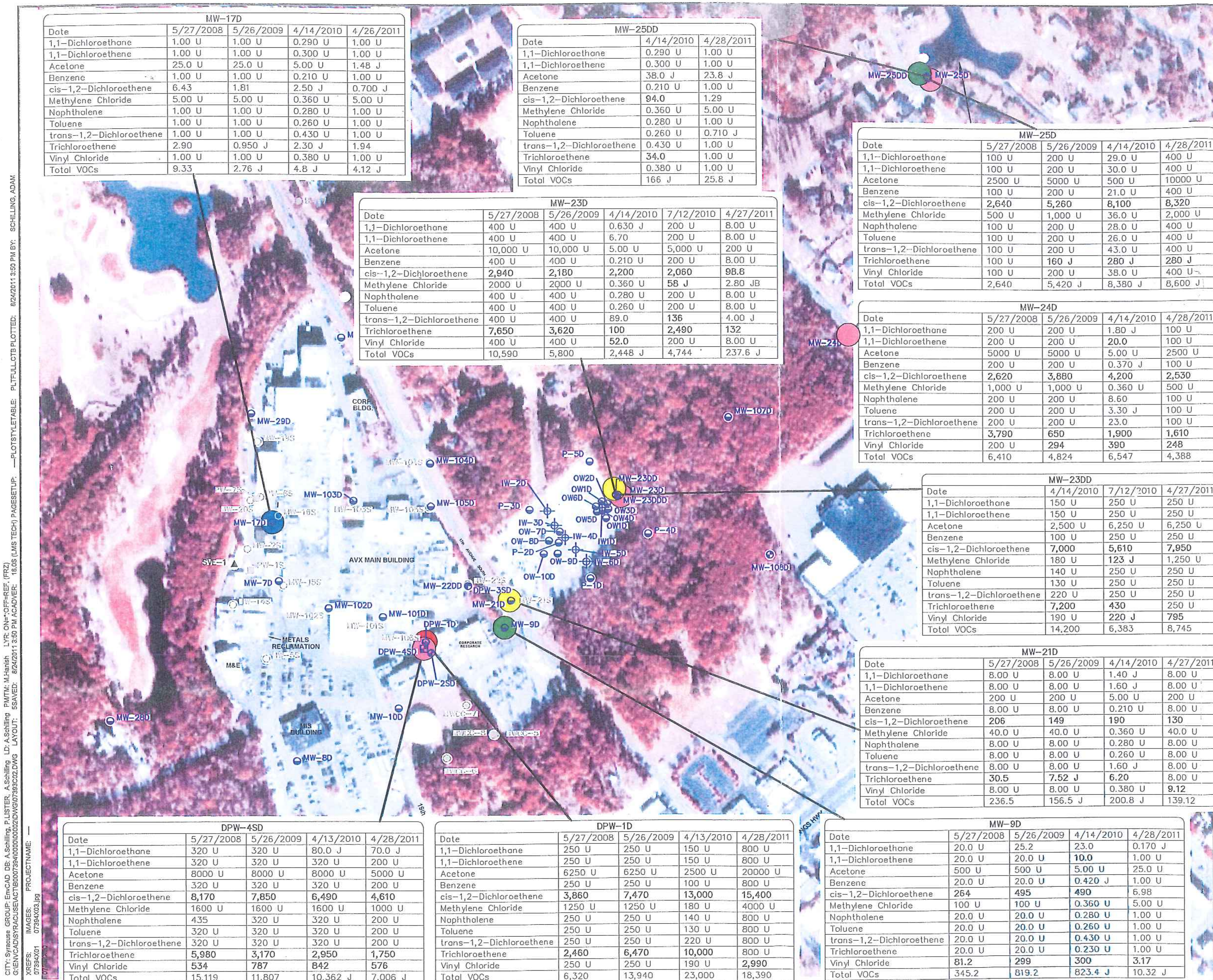
AVX CORPORATION
MYRTLE BEACH FACILITY
MYRTLE BEACH, SOUTH CAROLINA
PRE-DESIGN INVESTIGATION INTERIM REPORT

POTENTIOMETRIC SURFACE LOWER TERRACE DEPOSITS JANUARY 17-18, 2011

ARCADIS

FIGURE 4

DHEC FIGURE 3



MW-17D				
Date	5/27/2008	5/26/2009	4/14/2010	4/26/2011
1,1-Dichloroethane	1.00 U	1.00 U	0.290 U	1.00 U
1,1-Dichloroethene	1.00 U	1.00 U	0.300 U	1.00 U
Acetone	25.0 U	25.0 U	5.00 U	1.48 J
Benzene	1.00 U	1.00 U	0.210 U	1.00 U
cis-1,2-Dichloroethene	6.43	1.81	2.50 J	0.700 J
Methylene Chloride	5.00 U	5.00 U	0.360 U	5.00 U
Naphthalene	1.00 U	1.00 U	0.280 U	1.00 U
Toluene	1.00 U	1.00 U	0.260 U	1.00 U
trans-1,2-Dichloroethene	1.00 U	1.00 U	0.430 U	1.00 U
Trichloroethene	2.90	0.950 J	2.30 J	1.94
Vinyl Chloride	1.00 U	1.00 U	0.380 U	1.00 U
Total VOCs	9.33	2.76 J	4.8 J	4.12 J

MW-25DD		
Date	4/14/2010	4/28/2011
1,1-Dichloroethane	0.290 U	1.00 U
1,1-Dichloroethene	0.300 U	1.00 U
Acetone	38.0 J	23.8 J
Benzene	0.210 U	1.00 U
cis-1,2-Dichloroethene	**94.0**	1.29
Methylene Chloride	0.360 U	5.00 U
Naphthalene	0.280 U	1.00 U
Toluene	0.260 U	0.710 J
trans-1,2-Dichloroethene	0.430 U	1.00 U
Trichloroethene	**34.0**	1.00 U
Vinyl Chloride	0.380 U	1.00 U
Total VOCs	166 J	25.8 J

MW-23D					
Date	5/27/2008	5/26/2009	4/14/2010	7/12/2010	4/27/2011
1,1-Dichloroethane	400 U	400 U	0.630 J	200 U	8.00 U
1,1-Dichloroethene	400 U	400 U	6.70	200 U	8.00 U
Acetone	10,000 U	10,000 U	5.00 U	5,000 U	200 U
Benzene	400 U	400 U	0.210 U	200 U	8.00 U
cis-1,2-Dichloroethene	**2,940**	**2,180**	**2,200**	**2,060**	**98.8**
Methylene Chloride	2000 U	2000 U	0.360 U	**58 J**	2.80 JB
Naphthalene	400 U	400 U	0.280 U	200 U	8.00 U
Toluene	400 U	400 U	0.260 U	200 U	8.00 U
trans-1,2-Dichloroethene	400 U	400 U	89.0	**136**	4.00 J
Trichloroethene	**7,650**	**3,620**	**100**	**2,490**	**132**
Vinyl Chloride	400 U	400 U	**52.0**	200 U	8.00 U
Total VOCs	10,590	5,800	2,448 J	4,744	237.6 J

MW-25D				
Date	5/27/2008	5/26/2009	4/14/2010	4/28/2011
1,1-Dichloroethane	100 U	200 U	29.0 U	400 U
1,1-Dichloroethene	100 U	200 U	30.0 U	400 U
Acetone	2500 U	5000 U	500 U	10000 U
Benzene	100 U	200 U	21.0 U	400 U
cis-1,2-Dichloroethene	**2,640**	**5,260**	**8,100**	**8,320**
Methylene Chloride	500 U	1,000 U	36.0 U	2,000 U
Naphthalene	100 U	200 U	28.0 U	400 U
Toluene	100 U	200 U	26.0 U	400 U
trans-1,2-Dichloroethene	100 U	200 U	43.0 U	400 U
Trichloroethene	100 U	**160 J**	**280 J**	**280 J**
Vinyl Chloride	100 U	200 U	38.0 U	400 U
Total VOCs	2,640	5,420 J	8,380 J	8,600 J

MW-24D				
Date	5/27/2008	5/26/2009	4/14/2010	4/28/2011
1,1-Dichloroethane	200 U	200 U	1.80 J	100 U
1,1-Dichloroethene	200 U	200 U	**20.0**	100 U
Acetone	5000 U	5000 U	5.00 U	2500 U
Benzene	200 U	200 U	0.370 J	100 U
cis-1,2-Dichloroethene	**2,620**	**3,880**	**4,200**	**2,530**
Methylene Chloride	1,000 U	1,000 U	0.360 U	500 U
Naphthalene	200 U	200 U	8.60	100 U
Toluene	200 U	200 U	3.30 J	100 U
trans-1,2-Dichloroethene	200 U	200 U	23.0	100 U
Trichloroethene	**3,790**	**650**	**1,900**	**1,610**
Vinyl Chloride	200 U	**294**	**390**	**248**
Total VOCs	6,410	4,824	6,547	4,388

MW-23DD			
Date	4/14/2010	7/12/2010	4/27/2011
1,1-Dichloroethane	150 U	250 U	250 U
1,1-Dichloroethene	150 U	250 U	250 U
Acetone	2,500 U	6,250 U	6,250 U
Benzene	100 U	250 U	250 U
cis-1,2-Dichloroethene	**7,000**	**5,610**	**7,950**
Methylene Chloride	180 U	**123 J**	1,250 U
Naphthalene	140 U	250 U	250 U
Toluene	130 U	250 U	250 U
trans-1,2-Dichloroethene	220 U	250 U	250 U
Trichloroethene	**7,200**	**430**	250 U
Vinyl Chloride	190 U	**220 J**	**795**
Total VOCs	14,200	6,383	8,745

MW-21D				
Date	5/27/2008	5/26/2009	4/14/2010	4/27/2011
1,1-Dichloroethane	8.00 U	8.00 U	1.40 J	8.00 U
1,1-Dichloroethene	8.00 U	8.00 U	1.60 J	8.00 U
Acetone	200 U	200 U	5.00 U	200 U
Benzene	8.00 U	8.00 U	0.210 U	8.00 U
cis-1,2-Dichloroethene	**206**	**149**	**190**	**130**
Methylene Chloride	40.0 U	40.0 U	0.360 U	40.0 U
Naphthalene	8.00 U	8.00 U	0.280 U	8.00 U
Toluene	8.00 U	8.00 U	0.260 U	8.00 U
trans-1,2-Dichloroethene	8.00 U	8.00 U	1.60 J	8.00 U
Trichloroethene	**30.5**	**7.52 J**	**6.20**	8.00 U
Vinyl Chloride	8.00 U	8.00 U	0.380 U	**9.12**
Total VOCs	236.5	156.5 J	200.8 J	139.12

DPW-4SD				
Date	5/27/2008	5/26/2009	4/13/2010	4/28/2011
1,1-Dichloroethane	320 U	320 U	80.0 J	70.0 J
1,1-Dichloroethene	320 U	320 U	320 U	200 U
Acetone	8000 U	8000 U	8000 U	5000 U
Benzene	320 U	320 U	320 U	200 U
cis-1,2-Dichloroethene	**8,170**	**7,850**	**6,490**	**4,610**
Methylene Chloride	1600 U	1600 U	1600 U	1000 U
Naphthalene	435	320 U	320 U	200 U
Toluene	320 U	320 U	320 U	200 U
trans-1,2-Dichloroethene	320 U	320 U	320 U	200 U
Trichloroethene	**5,980**	**3,170**	**2,950**	**1,750**
Vinyl Chloride	**534**	**787**	**842**	**576**
Total VOCs	15,119	11,807	10,362 J	7,006 J

DPW-1D				
Date	5/27/2008	5/26/2009	4/13/2010	4/28/2011
1,1-Dichloroethane	250 U	250 U	150 U	800 U
1,1-Dichloroethene	250 U	250 U	150 U	800 U
Acetone	6250 U	6250 U	2500 U	20000 U
Benzene	250 U	250 U	100 U	800 U
cis-1,2-Dichloroethene	**3,860**	**7,470**	**13,000**	**15,400**
Methylene Chloride	1250 U	1250 U	180 U	4000 U
Naphthalene	250 U	250 U	140 U	800 U
Toluene	250 U	250 U	130 U	800 U
trans-1,2-Dichloroethene	250 U	250 U	220 U	800 U
Trichloroethene	**2,460**	**6,470**	**10,000**	800 U
Vinyl Chloride	250 U	250 U	190 U	**2,990**
Total VOCs	6,320	13,940	23,000	18,390

MW-9D				
Date	5/27/2008	5/26/2009	4/14/2010	4/28/2011
1,1-Dichloroethane	20.0 U	25.2	23.0	0.170 J
1,1-Dichloroethene	20.0 U	20.0 U	**10.0**	1.00 U
Acetone	500 U	500 U	5.00 U	25.0 U
Benzene	20.0 U	20.0 U	0.420 J	1.00 U
cis-1,2-Dichloroethene	**264**	**495**	**490**	6.98
Methylene Chloride	100 U	100 U	0.360 U	5.00 U
Naphthalene	20.0 U	20.0 U	0.280 U	1.00 U
Toluene	20.0 U	20.0 U	0.260 U	1.00 U
trans-1,2-Dichloroethene	20.0 U	20.0 U	0.430 U	1.00 U
Trichloroethene	20.0 U	20.0 U	0.230 U	1.00 U
Vinyl Chloride	**81.2**	**299**	**300**	**3.17**
Total VOCs	345.2	819.2	823.4 J	10.32 J

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
- LOCATIONS 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)

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. DATA PRESENTED IN MICROGRAMS PER LITER (μg/L).
3. VOC – VOLATILE ORGANIC COMPOUNDS
4. BOLD VALUES INDICATE DETECTED CONCENTRATION EXCEEDS DRINKING WATER MAXIMUM CONTAMINANT LEVEL (MCL).
5. B – ANALYTE WAS ALSO DETECTED IN THE ASSOCIATED METH BLANK.
6. J – INDICATES AN ESTIMATED VALUE.
7. U – COMPOUND WAS ANALYZED FOR BUT NOT DETECTED. ASSOCIATED VALUE IS THE COMPOUND QUANTITATION LIMIT.
8. ND – VOCs WERE NOT DETECTED IN SAMPLE.

0 300' 600'

GRAPHIC SCALE

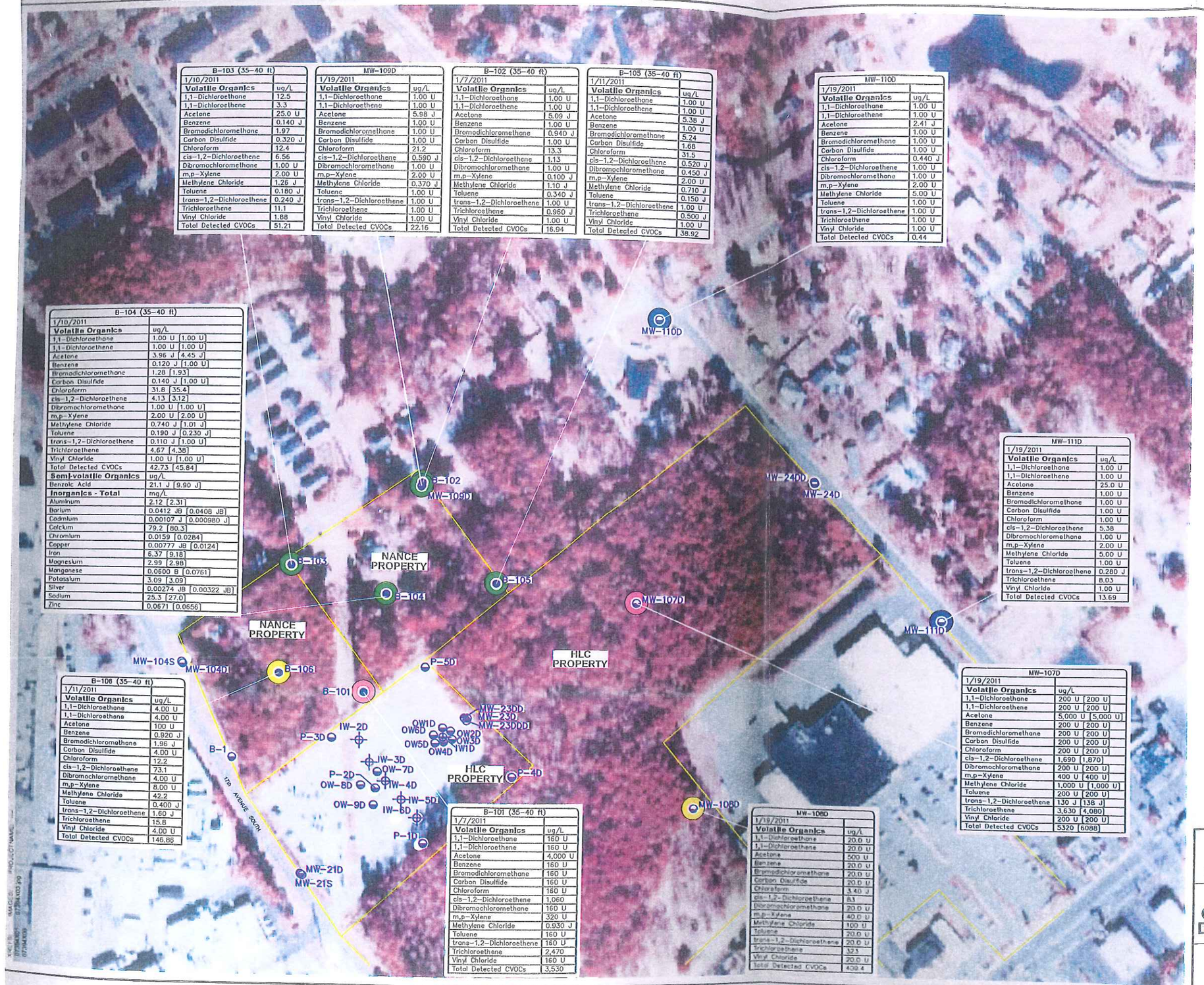
AVX CORPORATION
MYRTLE BEACH FACILITY
MYRTLE BEACH, SOUTH CAROLINA
2011 GROUNDWATER MONITORING REPORT

DETECTED VOCs IN LOWER TERRACE DEPOSIT GROUNDWATER

ARCADIS

FIGURE 5

DHEC FIGURE 4



B-103 (35-40 ft)	
1/10/2011	
Volatile Organics	ug/L
1,1-Dichloroethane	12.5
1,1-Dichloroethene	3.3
Acetone	25.0 U
Benzene	0.140 J
Bromodichloromethane	1.97
Carbon Disulfide	0.320 J
Chloroform	12.4
cis-1,2-Dichloroethene	6.56
Dibromochloromethane	1.00 U
m,p-Xylene	2.00 U
Methylene Chloride	1.26 J
Toluene	0.180 J
trans-1,2-Dichloroethene	0.240 J
Trichloroethene	11.1
Vinyl Chloride	1.88
Total Detected CVOCs	51.21

MW-109D	
1/19/2011	
Volatile Organics	ug/L
1,1-Dichloroethane	1.00 U
1,1-Dichloroethene	1.00 U
Acetone	5.98 J
Benzene	1.00 U
Bromodichloromethane	1.00 U
Carbon Disulfide	1.00 U
Chloroform	21.2
cis-1,2-Dichloroethene	0.590 J
Dibromochloromethane	1.00 U
m,p-Xylene	2.00 U
Methylene Chloride	0.370 J
Toluene	1.00 U
trans-1,2-Dichloroethene	1.00 U
Trichloroethene	1.00 U
Vinyl Chloride	1.00 U
Total Detected CVOCs	22.16

B-102 (35-40 ft)	
1/7/2011	
Volatile Organics	ug/L
1,1-Dichloroethane	1.00 U
1,1-Dichloroethene	1.00 U
Acetone	5.09 J
Benzene	1.00 U
Bromodichloromethane	0.940 J
Carbon Disulfide	1.00 U
Chloroform	13.3
cis-1,2-Dichloroethene	1.13
Dibromochloromethane	1.00 U
m,p-Xylene	0.100 J
Methylene Chloride	1.10 J
Toluene	0.340 J
trans-1,2-Dichloroethene	1.00 U
Trichloroethene	0.960 J
Vinyl Chloride	1.00 U
Total Detected CVOCs	16.94

B-105 (35-40 ft)	
1/11/2011	
Volatile Organics	ug/L
1,1-Dichloroethane	1.00 U
1,1-Dichloroethene	1.00 U
Acetone	5.38 J
Benzene	1.00 U
Bromodichloromethane	5.24
Carbon Disulfide	1.68
Chloroform	31.5
cis-1,2-Dichloroethene	0.520 J
Dibromochloromethane	0.450 J
m,p-Xylene	2.00 U
Methylene Chloride	0.710 J
Toluene	0.150 J
trans-1,2-Dichloroethene	1.00 U
Trichloroethene	0.500 J
Vinyl Chloride	1.00 U
Total Detected CVOCs	38.92

MW-110D	
1/19/2011	
Volatile Organics	ug/L
1,1-Dichloroethane	1.00 U
1,1-Dichloroethene	1.00 U
Acetone	2.41 J
Benzene	1.00 U
Bromodichloromethane	1.00 U
Carbon Disulfide	1.00 U
Chloroform	0.440 J
cis-1,2-Dichloroethene	1.00 U
Dibromochloromethane	1.00 U
m,p-Xylene	2.00 U
Methylene Chloride	5.00 U
Toluene	1.00 U
trans-1,2-Dichloroethene	1.00 U
Trichloroethene	1.00 U
Vinyl Chloride	1.00 U
Total Detected CVOCs	0.44

B-104 (35-40 ft)	
1/10/2011	
Volatile Organics	ug/L
1,1-Dichloroethane	1.00 U [1.00 U]
1,1-Dichloroethene	1.00 U [1.00 U]
Acetone	3.96 J [4.45 J]
Benzene	0.120 J [1.00 U]
Bromodichloromethane	1.28 [1.93]
Carbon Disulfide	0.140 J [1.00 U]
Chloroform	31.8 [35.4]
cis-1,2-Dichloroethene	4.13 [3.12]
Dibromochloromethane	1.00 U [1.00 U]
m,p-Xylene	2.00 U [2.00 U]
Methylene Chloride	0.740 J [1.01 J]
Toluene	0.190 J [0.230 J]
trans-1,2-Dichloroethene	0.110 J [1.00 U]
Trichloroethene	4.67 [4.38]
Vinyl Chloride	1.00 U [1.00 U]
Total Detected CVOCs	42.73 [45.84]
Semi-volatile Organics	ug/L
Benzoic Acid	21.1 J [9.90 J]
Inorganics - Total	mg/L
Aluminum	2.12 [2.31]
Barium	0.0412 JB [0.0408 JB]
Cadmium	0.00107 J [0.000980 J]
Calcium	79.2 [80.3]
Chromium	0.0159 [0.0284]
Copper	0.00777 JB [0.0124]
Iron	6.37 [9.18]
Magnesium	2.99 [2.98]
Manganese	0.0600 B [0.0761]
Potassium	3.09 [3.09]
Silver	0.00274 JB [0.00322 JB]
Sodium	25.3 [27.0]
Zinc	0.0671 [0.0656]

B-108 (35-40 ft)	
1/11/2011	
Volatile Organics	ug/L
1,1-Dichloroethane	4.00 U
1,1-Dichloroethene	4.00 U
Acetone	100 U
Benzene	0.920 J
Bromodichloromethane	1.98 J
Carbon Disulfide	4.00 U
Chloroform	12.2
cis-1,2-Dichloroethene	73.1
Dibromochloromethane	4.00 U
m,p-Xylene	8.00 U
Methylene Chloride	42.2
Toluene	0.400 J
trans-1,2-Dichloroethene	1.60 J
Trichloroethene	15.8
Vinyl Chloride	4.00 U
Total Detected CVOCs	146.86

B-101 (35-40 ft)	
1/7/2011	
Volatile Organics	ug/L
1,1-Dichloroethane	160 U
1,1-Dichloroethene	160 U
Acetone	4,000 U
Benzene	160 U
Bromodichloromethane	160 U
Carbon Disulfide	160 U
Chloroform	160 U
cis-1,2-Dichloroethene	1,060
Dibromochloromethane	160 U
m,p-Xylene	320 U
Methylene Chloride	0.930 J
Toluene	160 U
trans-1,2-Dichloroethene	160 U
Trichloroethene	2,470
Vinyl Chloride	160 U
Total Detected CVOCs	3,530

MW-111D	
1/19/2011	
Volatile Organics	ug/L
1,1-Dichloroethane	1.00 U
1,1-Dichloroethene	1.00 U
Acetone	25.0 U
Benzene	1.00 U
Bromodichloromethane	1.00 U
Carbon Disulfide	1.00 U
Chloroform	1.00 U
cis-1,2-Dichloroethene	5.38
Dibromochloromethane	1.00 U
m,p-Xylene	2.00 U
Methylene Chloride	5.00 U
Toluene	1.00 U
trans-1,2-Dichloroethene	0.280 J
Trichloroethene	8.03
Vinyl Chloride	1.00 U
Total Detected CVOCs	13.69

MW-107D	
1/19/2011	
Volatile Organics	ug/L
1,1-Dichloroethane	200 U [200 U]
1,1-Dichloroethene	200 U [200 U]
Acetone	5,000 U [5,000 U]
Benzene	200 U [200 U]
Bromodichloromethane	200 U [200 U]
Carbon Disulfide	200 U [200 U]
Chloroform	200 U [200 U]
cis-1,2-Dichloroethene	1,690 [1,870]
Dibromochloromethane	200 U [200 U]
m,p-Xylene	400 U [400 U]
Methylene Chloride	1,000 U [1,000 U]
Toluene	200 U [200 U]
trans-1,2-Dichloroethene	130 J [138 J]
Trichloroethene	3,630 [4,080]
Vinyl Chloride	200 U [200 U]
Total Detected CVOCs	5320 [6088]

MW-108D	
1/19/2011	
Volatile Organics	ug/L
1,1-Dichloroethane	20.0 U
1,1-Dichloroethene	20.0 U
Acetone	500 U
Benzene	20.0 U
Bromodichloromethane	20.0 U
Carbon Disulfide	20.0 U
Chloroform	3.40 J
cis-1,2-Dichloroethene	83
Dibromochloromethane	20.0 U
m,p-Xylene	40.0 U
Methylene Chloride	100 U
Toluene	20.0 U
trans-1,2-Dichloroethene	20.0 U
Trichloroethene	323
Vinyl Chloride	20.0 U
Total Detected CVOCs	409.4

LEGEND:

- LOCATION OF MONITORING WELL SCREENED IN THE LOWER TERRACE DEPOSITS
- LOCATION OF MONITORING WELL SCREENED IN THE PEEDEE FORMATION
- DIRECT PUSH GROUNDWATER AND/OR SOIL SAMPLING LOCATIONS
- LOCATION OF INJECTION WELL SCREENED IN THE LOWER TERRACE DEPOSITS

CVOC CONCENTRATION IN LOWER TERRACE DEPOSIT GROUNDWATER (CIRCLE)

- >10,000 (µg/L)
- >1,000 – 10,000 (µg/L)
- >100 – 1,000 (µg/L)
- >10 – 100 (µg/L)
- >1 – 10 (µg/L)
- NOT DETECTED OR </=1.0 (µg/L)

NOTES:

1. AERIAL PHOTOGRAPH OBTAINED FROM THE SOUTH CAROLINA DEPARTMENT OF NATURAL RESOURCES WEBSITE (2007).
2. J – INDICATES AN ESTIMATED VALUE.
3. U – THE COMPOUND WAS ANALYZED FOR BUT NOT DETECTED. THE ASSOCIATED VALUE IS THE COMPOUND QUANTITATION LIMIT.
4. B – LABORATORY BLANK CONTAMINATION DETECTED.
5. BRACKETED RESULTS INDICATE RESULTS OF DUPLICATE ANALYSIS.
6. ALL RESULTS PRESENTED IN MICROGRAMS PER LITER (µg/L) EXCEPT FOR INORGANIC RESULTS FOR B-104 WHICH ARE PRESENTED IN MILLIGRAMS PER LITER (mg/L).
7. B-104 (35-40 ft) WAS THE ONLY SAMPLE ANALYZED FOR INORGANICS AND SEMI-VOLATILE COMPOUNDS PER THE APPROVED WORK PLAN.
8. CVOCs – CHLORINATED VOLATILE ORGANIC COMPOUNDS.
9. PROPERTY LINES AND ALL LOCATIONS ARE APPROXIMATE.

0 200' 400'

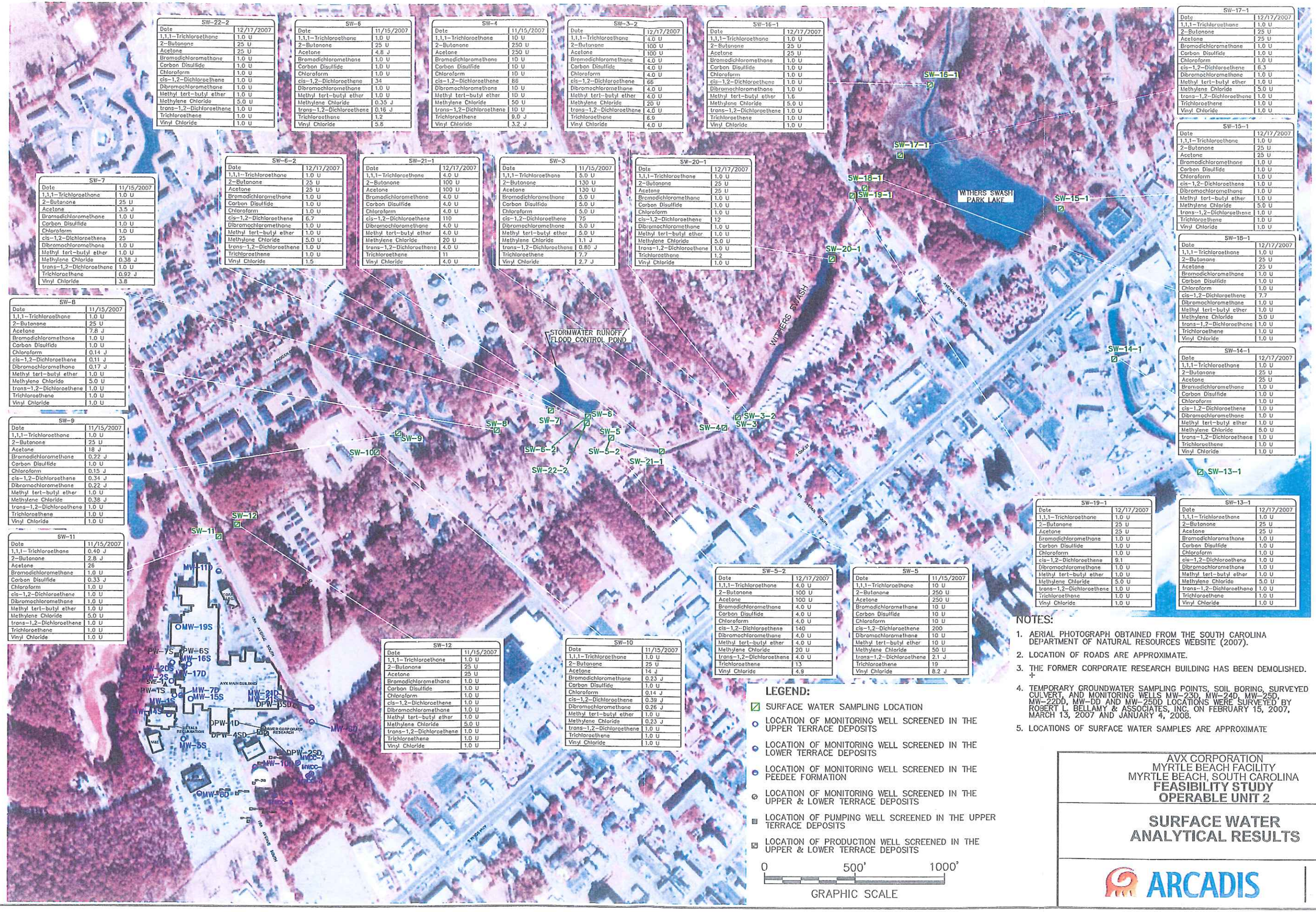
GRAPHIC SCALE

AVX CORPORATION
MYRTLE BEACH FACILITY
MYRTLE BEACH, SOUTH CAROLINA
PRE-DESIGN INVESTIGATION INTERIM REPORT

VOC, SVOC, AND METALS CONCENTRATIONS IN LOWER TERRACE DEPOSIT GROUNDWATER JANUARY 2011

ARCADIS | FIGURE 8

DHEC FIGURE 5



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	66
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-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-18-18	
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-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-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

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

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

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

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

SURFACE WATER ANALYTICAL RESULTS

ARCADIS

FIGURE 2-7

DHEC FIGURE 6

CITY:Syracuse DIV/GROUP:EnvCAD DB:A.Schilling LD:A.Schilling PM:W.Popham TM:M.Hanish LYR:ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACTIVE\07393\000\0008\GIS\MXD\F5\07393C01.DWG LAYOUT: 2-7 SAVED: 10/15/2010 3:28 PM ACADVER: 18.0S (LMS TECH) PAGESETUP: ---
XREFS: 07393X01 07393X00 IMAGES: 07393X01a.jpg PROJECTNAME: ---

APPENDIX A

D H E C

PROMOTE PROTECT PROSPER

South Carolina Department of Health and Environmental Control

Proposed Plan and Public Meeting

AVX-Myrtle Beach Site/Operable Unit 2 (OU-2)

801 17th Avenue South, Myrtle Beach, South Carolina

October 2011

Summary

The South Carolina Department of Health and Environmental Control (DHEC) has evaluated cleanup alternatives for the OU-2 off-site groundwater and surface water contamination at the AVX-Myrtle Beach Site located in Myrtle Beach. DHEC has drafted a Proposed Plan that summarizes the cleanup alternatives that were evaluated for this site and identifies DHEC's preferred alternative.

Detailed information about environmental investigations and activities at the Site can be found in the Focused Feasibility Study and other documents contained in the Administrative Record file.

Next Steps

DHEC will hold a public meeting to discuss the Site and cleanup alternatives, answer questions, and hear comments from interested citizens. Written comments on the Proposed Plan will be accepted through December 2, 2011.

DHEC will select a final cleanup alternative after review and consideration of all comments received. DHEC may modify its preferred alternative or select a different alternative based on new information or public comments. Comments on any or all of the cleanup alternatives are encouraged.

Summary of DHEC's Preferred Remedy for OU-2 (Groundwater Alternative OGW-3B and Surface-Water Alternative SW-3 of the Proposed Plan)

These alternatives involve cleanup of impacted groundwater and surface water using a combination of the following:

- **Injecting a carbon substrate, such as molasses, into the ground to stimulate the breakdown of contaminants in groundwater.**
- **Operation of an extraction well to control migration of groundwater contamination.**
- **Groundwater monitoring.**
- **Planting hybrid poplar trees to assist in cleanup of groundwater at groundwater/surface water discharge point (phytoremediation).**
- **Surface-water monitoring.**

Public Meeting

When: November 1, 2011

Where: Lakewood Elementary School
1675 Highway 396
Myrtle Beach, South Carolina 29575

Time: 6:00 PM – 7:30 PM

After a brief presentation, DHEC staff will answer questions and listen to your comments.

Public Comment Period

Comments will be accepted on the Proposed Plan through **December 2, 2011.** Please submit written comments or questions to:

Carol Minsk, Project Manager
DHEC-L&WM
2600 Bull Street
Columbia, SC 29201
E-mail: minskcc@dhec.sc.gov
Phone: (803) 896-4032

Additional Information

See the Proposed Plan and Focused Feasibility Study on DHEC's Website at:

www.dhec.sc.gov/environment/AVX

The **Administrative Record** may be reviewed at the following locations:

Horry County Memorial Library-Socastee Branch
141 SC Hwy 707-Connector
Myrtle Beach, South Carolina

DHEC Bureau of Land & Waste Management
Freedom of Information Office
8911 Farrow Road - Columbia, SC
Phone: (803) 898-3817
Hours: Monday – Friday, 8:30a.m. - 5:00p.m.

D H E C

PROMOTE PROTECT PROSPER

South Carolina Department of Health and Environmental Control

Proposed Plan for Site Remediation

AVX –Myrtle Beach Site/Operable Unit 2

801 17th Avenue South, Myrtle Beach, South Carolina

October 2011

ANNOUNCEMENT OF PROPOSED PLAN

The South Carolina Department of Health and Environmental Control (DHEC or the Department) recently completed an evaluation of cleanup alternatives to address groundwater and surface water contamination at the AVX-Myrtle Beach Site - Operable Unit 2 (the Site) in Myrtle Beach, South Carolina. Operable Unit 2 (OU-2) includes the off property groundwater and surface water contamination. Operable Unit 1 (OU-1), which will be addressed in a separate Feasibility Study (FS) process at a later date, includes the contamination on the AVX facility property. This Proposed Plan identifies DHEC's Preferred Alternative for cleaning up the OU-2 groundwater and surface water and provides the reasoning for this preference. In addition, this Plan includes summaries of other cleanup alternatives evaluated. These alternatives were identified based on information gathered during environmental investigations conducted by AVX pursuant to Consent Order 96-43-HW, dated December 1996, between AVX and the Department.

The Department is presenting this Proposed Plan to inform the public of our activities and to gain your input. This Proposed Plan summarizes information that can be found in greater detail in the Feasibility Study Operable Unit 2 (FS) report dated February 2011 and other documents contained in the Administrative Record file. The Department encourages the public to review these documents to gain a comprehensive understanding of the Site and activities that have been conducted.

The Department will select a final remedy after reviewing and considering comments submitted during the 30-day public comment period. The Department may modify the Preferred Alternative or select another response action presented in this Plan based on new information or public comments.

DHEC's Preferred Cleanup Summary

DHEC's preferred groundwater remedial alternative for OU-2 is Alternative OGW-3b and the preferred surface-water alternative is Alternative SW-3. These options involve using a combination of the following:

- Injection into the ground of a carbon substrate, such as molasses, to stimulate the breakdown of contaminants in the groundwater by a natural process.
- Operation of an extraction well to control migration of groundwater contamination.
- Groundwater monitoring.
- Implementation of phytoremediation by planting hybrid poplar trees along the banks of the surface-water body.
- Surface-water monitoring.

MARK YOUR CALENDAR

❑ **PUBLIC MEETING:**

When: **November 1, 2011**
Where: **Lakewood Elementary School**
1675 Highway 396
Myrtle Beach, South Carolina 29575
Time: **6:00 to 7:30 PM**

DHEC will hold a meeting to explain the Proposed Plan and all of the alternatives presented in the Feasibility Study. After the Proposed Plan presentation, DHEC will respond to your questions. Oral and written comments will also be accepted at the meeting.

❑ **PUBLIC COMMENT PERIOD:**

DHEC will accept written comments on the Proposed Plan during the public comment period until **December 2, 2011**. Submit your written comments to:

Carol Minsk, Project Manager
DHEC-L&WM
2600 Bull St.
Columbia, SC 29201
Minskcc@dhec.sc.gov

❑ **FOR MORE INFORMATION:**

Call: **Carol Minsk,** Project Manager, 803-896-4032

See: The Public Notice at DHEC's website:
www.dhec.sc.gov/environment/lwm/public_notice.asp
OR
The Proposed Plan and the Feasibility Study for OU-2 at DHEC's website:
www.dhec.sc.gov/environment/AVX

View: The Administrative Record at the following locations:

- Horry County Memorial Library – Socastee Branch
  141 SC Hwy 707-Connector
  Myrtle Beach, South Carolina

- DHEC's Bureau of Land & Waste Management
  8911 Farrow Road - Columbia, SC
  Contact: Freedom of Information Office: (803) 898-3817
  Hours: Monday - Friday: 8:30a.m. - 5:00p.m.

SITE HISTORY

The AVX Corporation Myrtle Beach Facility is located at 801 17th Avenue South in Myrtle Beach, South Carolina. OU-2 is located adjacent to OU-1 within an area of undeveloped, residential, and commercial properties in the City of Myrtle Beach. Aerovox Corporation, the predecessor to AVX, began operations at the Facility in 1953. Chlorinated volatile organic compounds (VOC's) were used at this location in the manufacturing of ceramic capacitors until 1993. In 1981, AVX discovered that shallow groundwater beneath the Facility was impacted by VOC's. AVX conducted assessment and some remediation of contaminated soil and groundwater without the Department's knowledge from 1981 until 1995.

In June 1995, AVX notified the Department of the existence of soil and groundwater contamination at the Facility (OU-1). In 1996, the Department issued a consent order and required AVX to submit a work plan for an investigation and remediation of soil and groundwater. Beginning in 1997, a number of soil and groundwater samples were collected on the plant site in the process of conducting a Remedial Investigation (RI) under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). The samples collected indicated contamination of groundwater beneath the site with VOC's (primarily trichloroethylene). Additionally, the consent order required AVX to update and continue to operate a groundwater treatment system, installed by AVX prior to the Consent Order, under the Department's on-going review process.

In August 2006, the Department received groundwater data from a property owner, near the AVX facility, indicating the presence of VOC contamination similar to the contaminants found beneath the AVX property. Due to this new data, the Department requested AVX submit a work plan to further investigate potential groundwater contamination beyond the AVX facility's existing monitoring wells. Since that time, AVX has installed a number of temporary and permanent groundwater monitoring wells to define the bounds of the off-site groundwater contamination (OU-2). Additionally, surface water and soil gas samples have been collected from OU-2 to fully define the extent of VOC contamination.

The groundwater and surface water data collected in the study of OU-2 was evaluated in a Feasibility Study (FS). The FS uses the information collected during the Remedial Investigation and associated studies to develop and evaluate potential remedial alternatives and their overall protection of human health and the environment. Both groundwater and surface water were considered in the FS.

SITE CHARACTERISTICS

Operable Unit 2 (OU-2) is the off-property groundwater and surface water contamination that has migrated from the AVX facility (OU-1). Figure 1 shows the approximate boundary of OU-2 as defined by data collected during investigations conducted since 2006. The largest single property in OU-2 is an undeveloped and partially wooded parcel located between 17th and 13th Avenue South formerly referred to as the Horry Land Company (HLC) property.

Sources

No sources for VOC contamination are known to exist within OU-2. The sources for groundwater contamination detected within OU-2 are located on the AVX facility property (OU-1). The most likely source areas are located beneath the AVX main building. The Department chose to divide the AVX site into two operable units so that further investigation of the on-site source areas could be conducted, at a future date, once additional building demolition has been completed.

Groundwater

The bulk of the off property groundwater contamination exists beneath the HLC property. Beyond the HLC property, the prominent portion of the groundwater plume migrates northeast toward a flood control pond located on 11th Avenue South. This pond is part of the surface water drainage system referred to as Wither's Swash. Permanent groundwater monitoring wells within OU-2 are sampled routinely. The primary constituents of concern (COCs) detected in the wells include trichloroethylene and the breakdown products associated with this compound (cis-1,2 dichloroethene and vinyl chloride).

Surface Water

Surface-water samples were collected from the discharge point of Withers Swash as it leaves the AVX facility property to the ocean. Detections of site-related COCs were limited to a portion of Withers Swash beginning at the storm water run-off pond located between 11th and 10th Avenues and becoming undetectable downstream prior to Withers Swash Park. The detections of COCs in surface water are consistent with the discharge of contaminated groundwater to the surface water and not from a migration of contamination in surface water from the AVX facility (OU-1).

SCOPE AND ROLE OF OPERABLE UNITS

The AVX Myrtle Beach Site has been divided into two operable units (OU). OU-1 is the AVX facility property located on 17th Avenue South where manufacturing processes occurred. OU-1 contains the source areas for

groundwater contamination as well as groundwater contamination. OU-2 is the off property groundwater contamination that has migrated from the AVX facility.

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

SUMMARY OF SITE RISKS

The area adjacent to the Site is zoned for industrial, commercial, and residential usage. The affected aquifer is a potential underground drinking water source. The primary exposure route would be contact or ingestion of affected groundwater containing contamination. Public water is available in this area, and seems to be used by the residents in the area.

It is the Department's current judgment that the Preferred Alternative identified in this Proposed Plan, or one of the other active measures considered in the Proposed Plan, is necessary to protect public health or the environment from actual or threatened releases of hazardous substances. Based on information collected during the previous investigations, a Feasibility Study (FS) was conducted to identify, develop, and evaluate cleanup options and remedial alternatives.

REMEDIAL ACTION OBJECTIVES

The remedial action objectives for the development and evaluation of alternatives for the Site are:

- Restore groundwater aquifer by reducing the concentrations of COCs in groundwater to below the Federal Maximum Contaminant Levels (MCL's) for drinking water.
- Prevent ingestion and dermal contact with groundwater containing COCs above the MCL's.
- Mitigate the concentrations of COCs in surface water to below the SCDHEC Water Standards for Surface Water and/or the USEPA Regional Screening Level (RSL) for tap water.

SUMMARY OF REMEDIAL ALTERNATIVES FOR GROUNDWATER

Groundwater Alternative OGW-1: No Further Action

The no further action alternative provides a baseline for comparison with the other alternatives, and is included in the evaluation for consistency with the EPA guidance. No remedial activities beyond those that have already been conducted with OU-2 would occur at the Site. Routine groundwater monitoring would not be implemented under this alternative.

The no further action alternative would not impact current land uses or expected future land uses at the site, other than the need to properly abandon existing monitoring wells if their locations interfere with future land uses. Groundwater quality would not be affected other than through natural attenuation, which would not be monitored. The groundwater remedial goals would not be addressed with this alternative. Since no action would be conducted, the net present worth of this alternative is $0.

Groundwater Alternative OGW-2: Limited Action

This alternative would prevent and control potential exposure to groundwater through institutional controls (deed notifications/restrictions), the abandonment of existing irrigation wells, and monitoring the natural attenuation of constituents in groundwater.

This alternative would not impact current or expected future land uses, other than the need to maintain the monitoring well network. Groundwater quality would not be affected other than though natural attenuation, however, the dissolved phase constituent concentrations would be monitored. The total present value cost of this alternative is $872,000 based on monitoring for 30 years.

Groundwater Alternative OGW-3a: Active Treatment-Hydraulic Containment

This alternative would provide protection to human health by preventing or controlling potential exposure to groundwater through institutional controls (deed notifications/restrictions), the abandonment of existing irrigation wells, the hydraulic containment and treatment of groundwater by the use of extraction wells with an associated treatment system (air stripping), and monitoring the natural attenuation of constituents in groundwater.

Natural attenuation from naturally occurring subsurface processes would reduce the concentrations of COCs in groundwater, while the operation of a groundwater extraction and treatment system would prevent further migration of COCs in groundwater and accelerate the groundwater remediation process. Monitoring would be preformed to evaluate changes in COC concentrations within

groundwater. The timeframe for this alternative to achieve remedial goals is estimated to be a minimum of 30 years.

The present value cost of this alternative is $5,250,000 based on 30 years of treatment and groundwater monitoring.

Groundwater Alternative OGW-3b: Active Treatment – Enhanced Anaerobic Bioremediation

This alternative would provide protection to human health by preventing or controlling potential exposure to groundwater through institutional controls (deed notifications/restrictions), the abandonment of existing irrigation wells, the implementation of enhanced anaerobic bioremediation, and monitoring the natural attenuation of constituents in groundwater.

The COC concentrations in groundwater would be reduced through the implementation of enhanced anaerobic bioremediation, accelerating the groundwater remediation process, and preventing the future migration of surface-water infiltration of impacted groundwater. Methane vapor monitoring would be conducted and mitigation implemented, if needed. Additionally, the natural attenuation from natural subsurface processes would reduce any remaining COC concentrations in groundwater after the enhanced anaerobic bioremediation is complete. The estimated timeframe to achieve remedial goals is 15 years.

The present value cost of this alternative is $5,417,000 based on 5 years of active remediation and 10 additional years of groundwater monitoring.

SUMMARY OF REMEDIAL ALTERNATIVES FOR SURFACE WATER

Surface-Water Alternative SW-1: No Action

The no further action alternative provides a baseline for comparison with the other alternatives, and is included in the evaluation for consistency with the EPA guidance. No remedial activities beyond those that have already been conducted within OU-2 would occur at the site. Routine surface water sampling would not be implemented under this alternative.

The no further action alternative would not impact current land uses or expected future land uses at the site and the surface water remedial goals would not be addressed with this alternative. Since no action is being conducted the present value cost of this alternative is $0.

Surface-Water Alternative SW-2: Limited Action

This alternative does not actively reduce existing COC concentrations in surface water. Surface water samples would be collected on an annual basis for an estimated 30 years to monitor changes in surface water concentrations due to natural degradation and the affects of groundwater treatment.

The present value cost of this alternative is $31,000 based on 30 years of surface water monitoring.

Surface-Water Alternative SW-3: Active Remediation – Phytoremediation

This alternative provides protection to human health and the environment by the implementation of phytoremediation and long-term monitoring of surface-water concentrations. Phytoremediation utilizes the ability of plants, in this case hybrid poplar trees, to remove harmful chemicals from the environment and either store those chemicals within the plant or reduce the chemicals to less harmful by-products. Use of phytoremediation at this site would diminish the source of future impacted surface water by preventing the infiltration of impacted shallow groundwater. Natural attenuation from natural processes would reduce the COC concentrations in surface water.

The present value cost of this alternative is $72,000 based on site preparation, tree planting, maintenance cost and 30 years of surface water monitoring.

EVALUATION OF ALTERNATIVES

The National Contingency Plan requires the Department to use specific criteria to evaluate the different remediation alternatives individually and against each other in order to select a remedy. This section of the Proposed Plan profiles the relative performance of each alternative against the criteria, noting how each compares to the other options under consideration. The criteria are discussed below:

1. Overall Protection of Human Health and the Environment

When evaluating alternatives in terms of overall protection of human health and the environment, consideration is given to the degree to which site-related risks are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

Groundwater Alternatives:

Alternative OGW-1, the no further action alternative, does not provide adequate protection, because no groundwater monitoring or active remediation would be conducted t reduce the levels of contamination.

Alternative OGW-2, providing monitored natural attenuation, institutional controls, and well abandonment is more protective than Alternative 1. This alternative would continue to monitor the reduction of constituent concentrations in groundwater and limit any potential exposure through deed notifications/restrictions and well abandonment. However, no active remediation would be conducted.

Alternative OGW-3a would be more protective of human health and the environment than OGW-1 or OGW-2 due to the addition of groundwater extraction and treatment. The removal of COPC mass from groundwater would prevent future COC migration, control potential discharge of COCs from groundwater to surface water and prevent exposure to COCs in groundwater.

Alternative OGW-3b would be the most protective of human health and the environment. In addition to institutional controls, well abandonment, and monitoring natural attenuation of COCs in groundwater, this alternative would implement the active treatment process of enhanced anaerobic bioremediation. This alternative would be similar to OGW-3a in that it would prevent future COC migration, control potential discharge of COCs from groundwater to surface water, destroy COCs in groundwater, and prevent exposure to COCs in groundwater, however, with this remedy the reduction of COCs would occur in a shorter time-frame.

Surface-Water Alternatives:

Alternative SW-1, the no further action alternative, does not provide adequate protection, because no surface water monitoring or active remediation would be conducted to reduce the levels of contamination.

Alternative SW-2 would not actively reduce existing COC concentrations in surface water, but would provide measures to monitor changes in surface water concentrations due to natural degradation.

Alternative SW-3 is the most protective of human health and the environment. This remedy would actively reduce COC concentrations at the groundwater/surface water interface and monitor changes in surface water concentrations due to natural degradation and treatment.

2. Compliance with State and Federal Regulations

Each of the alternatives is evaluated with respect to the ability to comply with applicable state, federal and local environmental and health regulations. All regulations that might require consideration are identified and referred to as Applicable or Relevant and Appropriate Requirements (ARARs). ARARs are further broken into the three categories of chemical-specific, location-specific and action-specific.

Groundwater Alternatives:

Alternative OGW-1 would not comply with chemical–specific ARARs for groundwater because no further action would be taken to control potential exposure pathways or address COC concentrations in groundwater. This alternative would also not comply with location–specific ARARs.

Alternative OGW-2 would prevent the completion of an exposure pathway for groundwater through the use of deed notifications/restrictions and irrigation well abandonment. Additionally, by monitoring the reduction of COC's through natural attenuation processes, this alternative would, over a long period of time, comply with chemical-specific ARARs.

Alternatives OGW-3a and OGW-3b would comply with chemical–specific ARARs for COCs in groundwater by the destruction of COCs and by minimizing potential exposure through the use of institutional controls. Additionally, through the use of active remedies, both alternatives would comply with ARARs in a shorter time-frame than OGW-2, however, OGW-3a would take longer to achieve compliance than OGW-3b.

Surface-Water Alternatives:

Alternative SW-1 would not comply with chemical-specific ARARs for surface water because no further action would be taken to address existing COC concentrations in surface water.

Alternative SW-2 would over a long period of time comply with chemical-specific ARARs for surface water by documenting natural attenuation of COC concentrations exceeding the chemical-specific ARARs.

Alternative SW-3 includes monitoring of the attenuation of surface water identified as having COC concentrations exceeding the chemical-specific ARARs following implementation of the phytoremediation component. This alternative would comply with chemical-specific ARARs by documenting these attenuation trends.

3. Long-term Effectiveness and Permanence

This factor considers the ability of an alternative to maintain protection of human health and the environment over time.

Groundwater Alternatives:

Long-term effectiveness and permanence would not be achieved with Alternative OGW-1, the No Action

Alternative. Potential exposure risks associated with COCs in groundwater would remain with no controls or long-term management plan.
Institutional controls and abandonment of irrigation wells would prevent access to COCs in groundwater. Also, as natural attenuation processes reduce COC concentrations in groundwater, periodic groundwater monitoring will allow for a determination of when remedial goals are met. Therefore, Alternative OGW-2 is marginally more acceptable than Alternative OGW-1 regarding this criterion.

Alternatives OGW-3a and OGW-3b would both provide effective and permanent removal of COCs from groundwater and be successful in eliminating human health risks. However, it is assumed that Alternative OGW-3b would take significantly less time to achieve remedial goals.

Surface-Water Alternatives:

Long-term effectiveness and permanence would not be achieved through Alternative SW-1, the No Action Alternative. Potential future exposure associated with COCs in surface water would remain with no controls or long-term management plan.

Both Alternative SW-2 and SW-3 would monitor the natural attenuation processes in surface water and over time achieve long-term effectiveness and permanence. However Alternative SW-3, through the additional use of phytoremediation, would reduce the discharge of COCs in groundwater to surface water and therefore reduce the time to achieve long-term effectiveness and permanence.

4. Reduction of Toxicity, Mobility or Volume through Treatment

This factor evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.

Groundwater Alternatives:

Natural attenuation mechanisms may result in reduction of COC 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. Therefore, Alternative OGW-1 is the least acceptable alternative regarding this criterion.

Active treatment of groundwater would not occur with Alternative OGW-2. However, concentrations would be monitored to determine the rate and extent of reductions through natural attenuation processes over time.

Alternative OGW-3a would, through the use of a groundwater extraction and treatment system, reduce mobility, toxicity and volume of COCs in groundwater.
By the use of enhanced reductive dechlorination and natural attenuation processes, Alternative OGW-3b would permanently reduce the mobility, toxicity, and volume of COCs in groundwater.

Surface-Water Alternatives:

Although natural attenuation processes may result in the reduction of COC mobility, toxicity, or volume in surface water, monitoring of these processes would not be performed under the Alternative SW-1 (No Action Alternative).

While Alternative SW-2 does not provide an active treatment option, it would reduce the mobility, toxicity, and volume of COCs in surface water by natural attenuation processes. Monitoring activities would be conducted to document the attenuation.

Alternative SW-3 would permanently reduce the mobility, toxicity, and volume of COCs in surface water by the interception of COCs in shallow groundwater before discharge to surface water through the process of phytoremediation. Additionally, natural attenuation processes will further reduce COCs in surface water.

5. Short-term Effectiveness

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.

Groundwater Alternatives:

Alternative OGW-1 (No further action) would have no short-term effects on the community or remediation workers. Groundwater quality would gradually improve through natural attenuation, although it would not be monitored.

Adverse short-term impacts associated with the implementation of Alternative OGW-2 (monitored natural attenuation, institutional controls, and well abandonment) are not anticipated.

The limited construction activities (abandoning irrigation wells, installation of extraction wells, additional monitoring wells, and groundwater treatment system) associated with OGW-3a would result in limited short-term exposure risks and impacts to workers, adjacent populations, or the environment. Construction activities would be managed through engineering controls to minimize exposure.

Implementation of Alternative OGW-3b would result in minimal exposure risks to the community, workers and the environment. Construction and treatment activities (installation of additional monitoring and injection wells, periodic injection activities, and vapor monitoring) would be managed through engineering controls to minimize exposure. Should vapor monitoring of methane indicate a need, mitigation may be necessary in residential areas to control risks from methane production.

Surface-Water Alternatives:

The No Action Alternative (SW-1) does not incorporate any implementation activities that would present exposure risks to the community, workers, or the environment.

Implementation of Alternative SW-2 would result in minimal exposure risk to the community, workers and the environment. This alternative includes periodic surface-water monitoring, which would be conducted by trained workers.

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

6. Implementability

The analysis of implementation considers the technical and administrative feasibility of implementation, as well as the availability of required materials and services. Implementability is further categorized into technical feasibility, administrative feasibility and availability criteria.

Groundwater Alternatives:

Groundwater monitoring is an on-going activity at the Site, and continued monitoring and maintenance of the well network would be readily implementable with any of the alternatives. All of the Alternatives are implementable.

Alternative OGW-1 is technically feasible because no technical components are necessary. This alternative is also administratively feasible because no coordination with other parties is necessary.

Implementation of Alternative OGW-2 (MNA and institutional controls) is technically feasible and also administratively feasible as no coordination with other parties is necessary.

Alternatives OGW-3a and OGW-3b are both technically and administratively feasible. The technology used for both these alternatives is conventional and proven. The administrative components can be easily coordinated, and the services and materials needed to implement these remedial alternatives are readily available.

Surface-Water Alternatives:

The No Action Alternative (SW-1) is technically feasible and administratively feasible because of a lack of monitoring or other active measures.

Alternatives SW-2 and SW-3 are both technically and administratively feasible. However, SW-2 would not prevent potential future discharge of COCs from groundwater to surface water, whereas, SW-3 would reduce this potential discharge. Lastly, gaining access to properties for phytoremediation plots could affect the administrative feasibility of SW-3.

7. Cost

The cost analysis evaluated capital costs and annual operation and maintenance (O&M) cost. The total present value cost is the sum of initial capital costs and the discounted value of O&M costs over the lifespan of the remedy.

Groundwater Alternatives Total Present Value Cost:

Alternative OGW-1	$0
Alternative OGW-2	$872,000
Alternative OGW-3a	$5,250,000
Alternative OGW-3b	$5,417,000

Surface-Water Alternatives Total Present Value Cost:

Alternative SW-1	$0
Alternative SW-2	$31,000
Alternative SW-3	$72,000

8. Community Response

Community acceptance of the preferred remedy will be evaluated after the public comment period ends. Public comments will be summarized and responses provided in the Responsiveness Summary Section of the Record of Decision document that will present the Department's final alternative selection. The Department may choose to modify the preferred alternative or select another based on public comments or new information.

SUMMARY OF THE DEPARTMENT'S PREFERRED ALTERNATIVE

Groundwater:

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

Alternative OGW-3B would combine the use of institutional controls, irrigation well abandonment, enhanced anaerobic bioremediation, and monitored natural attenuation.

Access to contaminated groundwater would be limited through deed notifications/restrictions and irrigation well abandonment. The COC concentrations in groundwater would be reduced through the implementation of enhanced anaerobic bioremediation, accelerating the groundwater remediation process, and preventing the future migration of surface-water infiltration of impacted groundwater. Natural attenuation from natural subsurface processes would reduce any remaining COC concentrations in groundwater once the enhanced anaerobic bioremediation is completed. Monitoring would be performed to evaluate changes in COC concentrations within groundwater for risks to human health or the environment.

The enhanced anaerobic bioremediation system would consist of using a series of approximately 30 injection wells, to deliver a carbon substrate, such as molasses, into the subsurface. The estimated time frame for the injections is four times a year at all 30 wells for 5 years. After the 5 years of injections, monitoring would be conducted for an additional 10 years.

Because the bioremediation process of VOCs can produce methane gas, methane vapor monitoring would also be conducted. It is currently 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.

This alternative provides the most protection of human health and the environment, and reduces the concentrations of COC in groundwater in a timely manner. It is implementable and although it is the highest in cost, it provides the most permanent removal of COCs and the shortest time for cleanup.

Surface-Water:

Alternative SW-3-Active Remediation-Phytoremediation

Alternative SW-3 would implement phytoremediation by planting hybrid poplar tress along the banks of the surface-water body in the area of likely discharge of COCs from groundwater to surface-water. Monitored natural attenuation would also be conducted to document the declining concentrations of COCs.

Phytoremediation is an accepted remedial alternative for VOCs in groundwater and the location within OU-2 that this remedy would be used is very suited for this application.

Installation of the phytoremediation componet will require property access, which could affect administrative feasibility. However, this alternative should not impact current or expected future land uses, other than the need to gain access to properties, plant the trees, and monitor surface water.

This alternative provides the most protection of human health and the environment, and reduces the potential future discharge of COCs in groundwater to surface water. It is implementable and although it is the highest in cost, it provides the shortest time for cleanup.

COMMUNITY PARTICIPATION

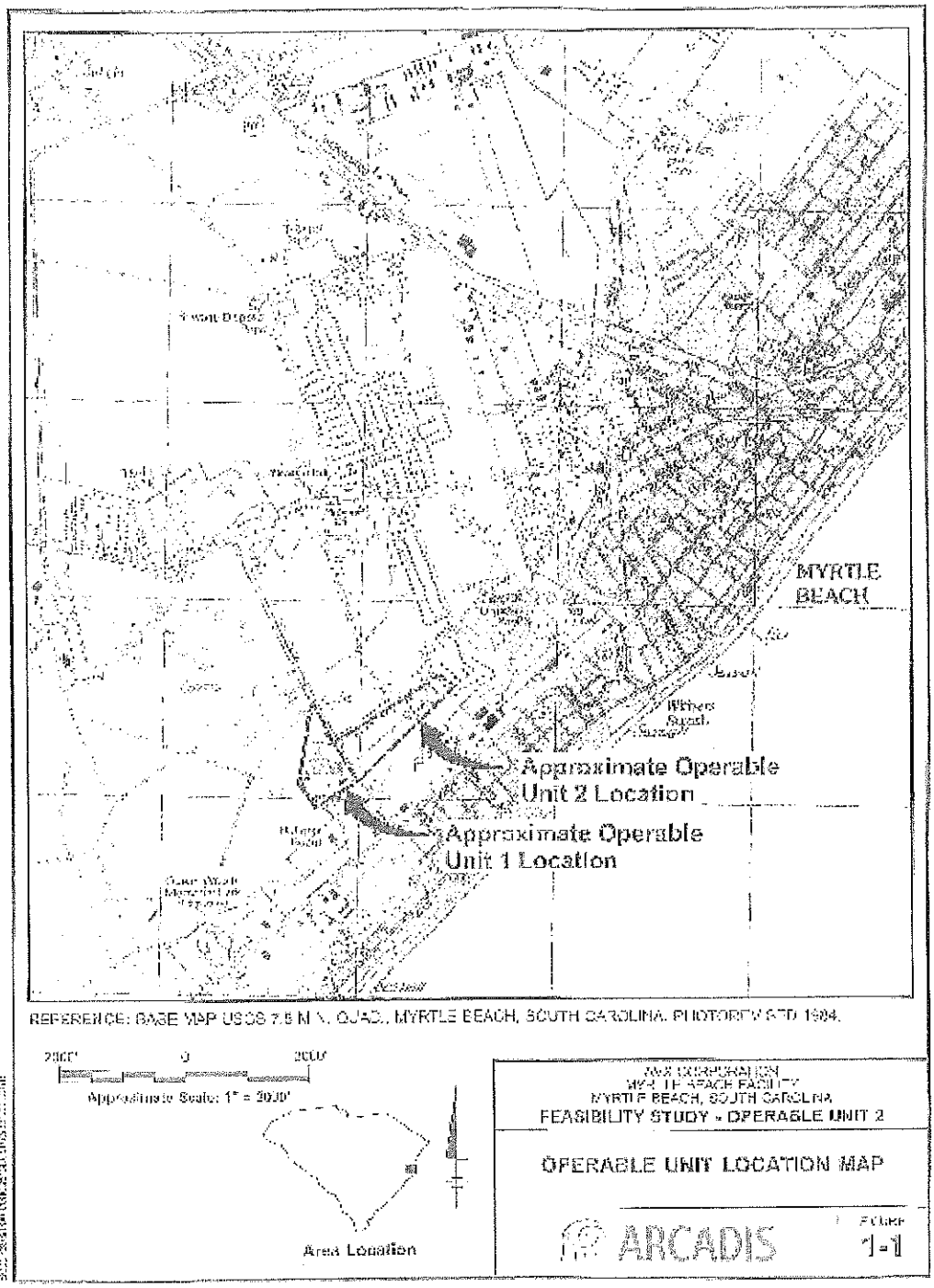
The Department will evaluate comments from the public before selecting a final alternative. A comment period has been established to allow the public an opportunity to submit written comments to the Department. The community is also invited to a public meeting where the Department will discuss the Feasibility Study results, present the preferred alternative, and accept comments on the remedial alternatives.

The dates for the public comment period, the date, location, and time of the public meeting, and the locations of the Administrative Record files are provided on the first page of this Proposed Plan.

****

Technical Reports

- A **Remedial Investigation (RI)** identifies the potential sources of contamination; and determines what contaminants are at the site, and the extent of the contamination.
- A **Feasibility Study (FS)** considers various cleanup alternatives for the soil and groundwater.
- A **Proposed Plan (PP)** describes cleanup alternatives to address contamination.
- A **Record of Decision (ROD)** identifies the selected cleanup method.
- The **Remedial Design (RD)** is the development of specifications and drawings necessary for the construction and implementation of the ROD.


MYRTLE BEACH
Approximate Operable Unit 2 Location
Approximate Operable Unit 1 Location
REFERENCE: BASE MAP USGS 7.5 MIN. QUAD., MYRTLE BEACH, SOUTH CAROLINA, PHOTOREVISED 1994.
2000'
0
2000'
Approximate Scale: 1" = 2000'
Area Location
AMR CORPORATION
MYRTLE BEACH, SOUTH CAROLINA
FEASIBILITY STUDY - OPERABLE UNIT 2
OPERABLE UNIT LOCATION MAP
ARCADIS
FIGURE
1-1

USE THIS SPACE TO WRITE YOUR COMMENTS

Your input on the Proposed Plan for the AVX-Myrtle Bach Site is important. Comments provided by the public are valuable in helping DHEC select a final cleanup remedy.

You may use the space below to write your comments, then fold and mail. Comments must be postmarked by December 2, 2011. If you have any questions, please contact Carol Minsk at 803-896-4032. Additionally, you may also submit your questions and/or comments electronically to Minskcc@dhec.sc.gov by December 2, 2011.

AVX Superfund Site

Myrtle Beach Facility
Operable Unit 2

November 1, 2011

Proposed Plan Public Meeting

Carol Minsk

General Site History

- *Began operations at location in 1953*
- *Used chlorinated solvents until 1993*
- *In 1981 AVX began assessment and remediation of contaminated soil and groundwater without the Department's knowledge*
- *June 1995 AVX notified DHEC of contamination*
- *In 1996 DHEC issued a Consent Order*

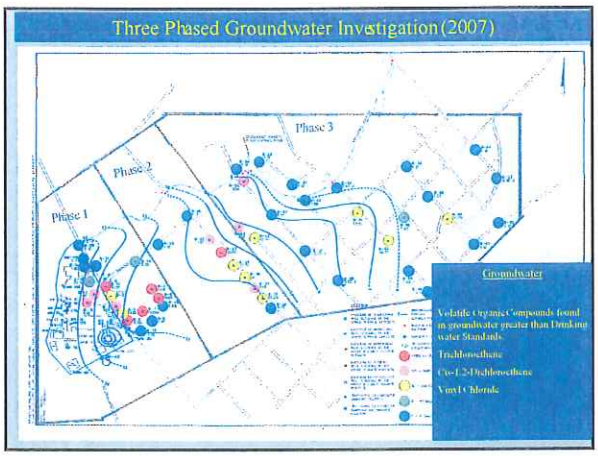
Why Two Operable Units ?

- *OU – 1 : AVX Facility.*
- *OU – 2: Off Property Groundwater and Surface Water Contamination*
- *The site was divided into two Operable Units so that the off-site contamination could be addressed as soon as possible.*
- *With the removal of buildings on the AVX Facility property, assessment of source areas beneath the buildings becomes feasible.*
- *Instead of waiting on the final assessment on-site, it was decided to address the off-site contamination now.*

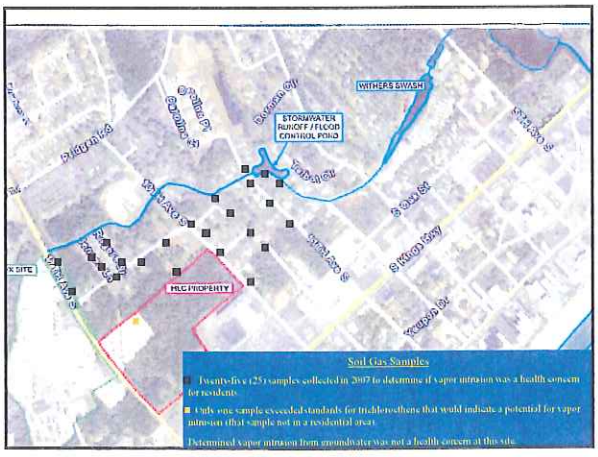
OU-2 Investigations

(August 2006 to March 2008)

- *August 2006 off-property groundwater contamination discovered.*
- *Three phased approach to groundwater sampling.*
- *Surface water sampling*
- *Soil gas sampling (Vapor Intrusion).*
- *Installation of monitoring well network and routine sampling.*


Three Phased Groundwater Investigation (2007)
Phase 1
Phase 2
Phase 3
Groundwater
Volatile Organic Compounds found in groundwater greater than Drinking water Standards
Trichloroethene
Cis-1,2-Dichloroethene
Vinyl Chloride


WITHERS SWASH
STORMWATER RUNOFF / FLOOD CONTROL POND
HLC PROPERTY
Surface Water Samples
Twenty Three (23) samples collected in 2007 from the AVX site to the Ocean
Data indicates small impact where groundwater discharges to surface water of site related VOC's
Trichloroethene, Cis-1,2-Dichloroethene, and Vinyl Chloride


WITHERS SWASH
STORMWATER RUNOFF / FLOOD CONTROL POND
HLC PROPERTY
Soil Gas Samples
Twenty-five (25) samples collected in 2007 to determine if vapor intrusion was a health concern for residents
Only one sample exceeded standards for trichloroethene that would indicate a potential for vapor intrusion (that sample not in a residential area)
Determined vapor intrusion from groundwater was not a health concern at this site


WITHERS SWASH
STORMWATER RUNOFF / FLOOD CONTROL POND
AVX SITE
HLC PROPERTY
OU-2 Groundwater Monitoring Well Network
Groundwater monitoring wells located off the AVX facility property

Feasibility Study Work Plan
(March 2008)

- *Identify and fill data gaps.*
- *Evaluate remedial technologies to be considered in the final FS document.*
- *Provide a work plan for the field testing of Enhanced Reductive Dechlorination (ERD) technology.*

Enhanced Reductive Dechlorination Pilot Study
(Work Plan Approved June 20 08- Report Submitted July 2010)

- *Molasses was the organic material injected during this study.*
- *Location off the study was in the most highly contaminated part of the off-property groundwater plume.*
- *Groundwater data from the OU-2 plume indicated ERD treatment would be appropriate for groundwater remediation The pilot study would confirm this opinion and provide valuable design information for the final remedy.*

Feasibility Study
Final Version Submitted February 2011
Approved May 2011

Feasibility Study provides:

1. *Remedial Action Objectives*
2. *Remedial Alternatives Screening*

Remedial Action Objectives

- *Prevent ingestion and dermal contact with groundwater contaminated above the federal Maximum Contaminant Levels (MCLs) for drinking water.*
- *Reduce the concentrations of contamination in groundwater to below the MCLs.*
- *Mitigate the concentrations of contamination in surface water.*

Remedial Alternatives

Groundwater

Alternative OGW-1: No Further Action

- *Baseline for comparison of alternatives*
- *No groundwater monitoring*
- *No land use controls*
- *Does not address remedial goals*
- *Treatment through Natural Attenuation, but no monitoring*

Alternative OGW-2 Limited Action

- *Natural processes would reduce contaminants in groundwater*
- *30 years of groundwater monitoring*
- *Institutional controls (deed notifications/restrictions)*
- *Abandonment of irrigation wells*
- *Cost $872,000*
- *Estimated Timeframe to Remedial Goals: 30+ years*

Alternative OGW-3a:
Active Treatment – Hydraulic Containment

- *Groundwater extraction and treatment*
- *30 years of groundwater monitoring*
- *Institutional controls (deed notifications/restrictions)*
- *Abandonment of irrigation wells*
- *Cost $5,250,000*
- *Estimated Timeframe to Remedial Goals: 30 years*

Alternative OGW-3b:
Active Treatment – ERD

- *5 years of active treatment of groundwater by enhanced reductive dechlorination*
- *15 years of groundwater monitoring*
- *Institutional controls (deed notifications/restrictions)*
- *Abandonment of irrigation wells*
- *Cost $5,417,000*
- *Estimated Timeframe to Remedial Goals: 15 years*

Remedial Alternatives

Surface Water

Alternative SW-1:
No Action

- *Baseline for comparison of alternatives*
- *No surface water monitoring*
- *Does not address remedial goals*
- *Treatment through natural attenuation, but no monitoring*

Alternative SW-2: Limited Action

- *Natural processes would reduce contaminants in surface water*
- *Surface water monitoring*
- *30 years of monitoring*
- *Cost $31,000*
- *Estimated Timeframe to Remedial Goals: 30 + years*

Alternative SW-3: Active Remediation

- *Phytoremediation-planting hybrid poplar trees to reduce contamination at the groundwater/surface water interface*
- *Natural attenuation processes*
- *Surface water monitoring*
- *30 years of monitoring*
- *Cost $72,000*
- *Estimated Timeframe to Remedial Goals: 30 years*

Proposed Plan

- *Document used to involve the public in the remedy selection process*
- *Presents DHEC's recommendation on how to best address contamination at the site*
- *Presents alternatives that were evaluated, and explains the reasons for the Preferred Alternative*
- *Proposed Plan and may be found on the DHEC website at: www.dhec.sc.gov/environment/AVX*
- *After all public comments have been considered the Department will write the Record of Decision for OU-2*

Evaluation Criteria

- *Overall Protection of Human Health and the Environment*
- *Compliance with State and Federal Regulations*
- *Long-Term Effectiveness and Permanence*
- *Reduction of Toxicity, Mobility, or Volume through Treatment*
- *Short Term Effectiveness*
- *Implementability*
- *Cost*
- *Community Acceptance*

Groundwater

Evaluation of Alternatives

Overall Protection of Human Health and the Environment

- *Alternative OGW-1 – Not Protective*
- *Alternative OGW-2 –Limits exposure (institutional controls, well abandonment) but no active remedy*
- *Alternative OGW-3a – Limits exposure and active remedy (pump and treat)*
- *Alternative OGW-3b – Limits exposure and active remedy (enhanced anaerobic bioremediation)*
- *Most Protective OGW-3a and OGW-3b*

Compliance with State and Federal Regulations

- *All Alternatives* ***Except Alternative OGW-1*** *would comply with State and Federal Regulations*
- *Permits will be necessary for both OGW-3a and 3b.*
- *OGW-2 would have the least permitting issues, but would also take the longest to reach remediation goals.*
- *Both OGW-3a and OGW 3b would comply with State and Federal regulations.*

Long-Term Effectiveness

- *Alternative OGW-1 would provide no long-term effectiveness or permanence.*
- *Alternative OGW-2 monitors groundwater contamination and is more protective than OGW-1 but would take a long time to reach clean-up goals.*
- *Alternatives OGW-3a and OGW-3b would both provide effective and permanent removal of groundwater contamination. However, it is assumed that Alternative OGW-3b would take significantly less time to achieve remedial goals. Therefore, OGW-3b would best meet this criteria.*

Reduction of Toxicity, Mobility or Volume Through Treatment

- *Alternative OGW-1 and OGW-2 do not result in direct reduction of contamination.*
- *Alternative OGW-3a would reduce mobility, toxicity and volume by extraction of contaminated groundwater.*
- *Alternative OGW-3b would reduce mobility, toxicity and volume by in-situ treatment of contaminated groundwater.*
- *OGW-3b would best meet this criteria by reduction of toxicity, mobility and volume of contamination while contamination remains in-situ.*

Short-Term Effectiveness

- *Alternative OGW-1 does nothing to reduce risk and therefore is not protective in the short-term.*
- *Alternative OGW-2 would result in minimal short-term risk(irrigation well abandonment, groundwater monitoring) during implementation of the remedy.*
- *Alternative OGW-3a and OGW-3b would result in limited short-term exposure to workers, adjacent populations and/or the environment during construction. However, these risk are easily controlled.*
- *Alternative OGW-3b is the most protective in the short-term because it reaches remedial goals in the shortest time-frame.*

Implementability

- *All alternatives are easily implementable.*
- *Alternative OGW-1 is implementable because it requires no materials, permits or coordination.*
- *Alternative OGW-2 requires limited coordination and would be easily implemented.*
- *Alternatives OGW-3a and OGW-3b would both be easy to implement. The required services and materials are easy to obtain and necessary permits can be obtained. However the pilot testing of the OGW-3b Alternative shows that this technology is favorable to site conditions.*

Cost

Alternative OGW-1 $0
Alternative OGW-2 $872,000
Alternative OGW-3a $5,250,000
Alternative OGW-3b $5,417,000

DHEC's Preferred Remedy Alternative OGW-3b Active Treatment -ERD

- *Institutional Controls (irrigation well abandonment, and deed notifications/restrictions.*
- *Active treatment by the use of Enhanced Reductive Dechlorination (ERD).*
- *Monitored natural attenuation.*
- *Costs $5,417,000*

Surface-water

Evaluation of Alternatives

Overall Protection of Human Health and the Environment

- *Alternative SW-1– Not Protective*
- *Alternative SW-2 –Provides measures to monitor surface-water contamination, but does not actively reduce concentrations.*
- *Alternative SW-3– Actively reduces existing contamination at the groundwater/surface-water interface.*
- *Alternative SW-3 would be the most protective.*

Compliance with State and Federal Regulations

- *Alternative SW-1 does not comply with regulations.*
- *Alternative SW-2 would over a long period of time comply with regulations by documenting natural attenuation of contaminant concentrations.*
- *Alternative SW-3 would implement phytoremediation and monitor surface water natural attenuation. This alternative would comply with regulations.*
- *Alternative SW-3 would enhance natural attenuation and reduce the time to reach remediation goals.*

Long-Term Effectiveness

- *Alternative SW-1 would not be effective or permanent.*
- *Alternative SW-2 monitors surface-water but takes a long time to reach remediation goals.*
- *Alternative SW-3 would achieve long-term effectiveness and permanence with the use of phytoremediation.*

Reduction of Toxicity, Mobility or Volume Through Treatment

- *Alternatives SW-1 or SW-2 do not result in direct reduction of contamination. However SW-2 would document natural attenuation processes.*
- *Alternative SW-3 would reduce toxicity, mobility and volume of surface-water contamination by the interception of contaminated groundwater before discharge to surface water through the process of phytoremediation.*
- *SW-3 would best meet this criteria by the active reduction of toxicity, mobility and volume of contamination through the use of phytoremediation.*

Short-Term Effectiveness

- *There are no current exposure pathways that present exposure risk to surface-water.*
- *Alternative SW-1 does nothing to reduce risk and is therefore not effective in the short-term.*
- *Alternative SW-2 would include only activities with minor exposure risk (periodic surface water monitoring).*
- *Alternative SW-3 would result in minimal short-term exposure (tree planting, periodic surface-water sampling). All activities would be preformed by trained workers.*

Implementability

- *All alternatives are implementable.*
- *Alternative SW-1 is implementable because it requires no materials, permits or coordination.*
- *Alternative SW-2 would require limited coordination and is easily implemented.*
- *Alternative SW-3 is both technically and administratively feasible. However, access to properties for phytoremediation plots may affect administrative feasibility.*

Cost

Alternative SW-1	*$0*
Alternative SW-2	*$31,000*
Alternative SW-3	*$72,000*

DHEC's Preferred Remedy
Alternative SW-3
Active Remediation-Phytoremediation

- *Active treatment by the use of phytoremediation.*
- *Monitored natural attenuation*
- *Costs $72,000*

Community Acceptance

- *Public Comment Period begins now and ends on December 2, 2011.*
- *Administrative Record is located at Horry County Memorial Library – Socastee Branch*
- *DHEC website contains Proposed Plan and Feasibility Study (www.dhec.sc.gov/environment/AVX).*

Question and Answer Session

Received 1/25/12

Southern Reporting, Inc.

Condensed Transcript
of
Public Meeting

11/1/2011

Proposed Plan for Site Remediation

COPY

Southern Reporting, Inc.
Phone: 803.749.8100
Fax: 803.749.9991
Email: Depos@southernreporting.net

Page 1

PUBLIC MEETING:

PROPOSED PLAN AND PUBLIC MEETING

AVX-Myrtle Beach Site/Operable Unit 2 (OU-2)
801 17the Avenue South, Myrtle Beach, SC

A public meeting was held and taken before Michele E. Starkey, Court Reporter and Notary Public in and for the State of South Carolina, commencing at the hour of 6:04 p.m., Tuesday, November 1 2011, at Lakewood Elementary School, 1675 Highway 396, Myrtle Beach, South Carolina.

Reported by

Michele E. Starkey

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APPEARANCES

DHEC: Bureau of Land & Waste Management
Division of Hydrogeology
Gary Stewart
Carol C. Minsk, Hydrogeologist
Pat Vincent
Lucas Berresford
Gary Stewart
2600 Bull Street
Columbia, SC 29201-1708

Also Present: Richelle Tolton
Adam Myrick
Larry Ragsdale
Matt Maxwell

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EXHIBITS

There were no exhibits marked during this meeting.

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MS. VINCENT: Thank you for coming out. We're here to tell you some information about how we would like to clean up the AVX site. The AVX site that we're here to discuss is located at 801 17th Avenue South.

The department is here for several purposes. First, we want to update you with some information about the site. Second, we want to have an opportunity in which we may discuss alternatives that they have reviewed for cleaning up the ground water and the surface water, and the area that we've identified as operable unit two, and Ms. Minsk will explain what that means. And third, we want to provide information on the clean-up alternatives that DHEC thinks at this time is the best option to clean up the site, and finally, we want to get comments from you guys so that we can see if that makes us change our decision. We're very interested in hearing the comments that you might have, any questions that you may have about the alternatives discussed, so that's why we're here today.

I'm Pat Vincent and I work with the state remediation section of the Bureau of Land and Waste Management of South Carolina DHEC, and I assisted in getting the mail out to you just a few weeks ago. I

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also helped in getting the publication in the newspaper on Sunday. And we have several representatives here from DHEC and I'd like to first introduce Carol Minsk. She is our lead project manager and our site spokesperson. And she has reviewed all the documents that would need to be reviewed in order to make some decisions regarding the technical decisions regarding the site, and the groundwater and surface water contamination.

We also have Lucas Berresford. He's also a site project manager and he supports Carol in her activities of looking over the documents. We have Gary Stewart here. He's our boss. He's our manager of our state remediation section. And we're pleased to have Larry Ragsdale and Matt Maxwell there in the back area. They are from our regional office, so they serve the community here directly.

Rochelle Tolton is here. She's our environmental community health liaison. What that -- as I understand it, she kind of helps all the different program areas to communicate information to you guys, who -- of whom we serve. We have Adam Myrick is here as well. He's with our media relations office, so DHEC is represented today.

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Before Ms. Minsk makes her presentation regarding the department's proposed plan for the operable unit two, I'd like to cover a few things with you. We do have a sign-in sheet and we ask that you sign that for us. That helps us in making sure you get information about the site in the future, and update any addresses that we may have for you.

Second, we want to let you know that there are documents that Ms. Minsk may discuss during the presentation. Copies of those are available to you locally at the Socastee branch of the Horry County Memorial Library. And the document that we call -- we call that administrative record, and the administrative record are documents that have helped -- we've reviewed to help make those technical decisions regarding the site clean-up.

If you'd like, you're also welcome to come to Columbia and review that same file along with some additional documents. And with our Columbia office, you do need to file a FOIA request, and if you have any questions about that, please see me. I will be glad to help you with that.

Third, I want to let you know we have a young lady to my left, and seated at the table. She is

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our court reporter today. She will be providing the department with a transcript of the meeting, and this will help us to make sure we have answered all your questions fully because you know how sometimes that can -- you thought you answered but you may not have completely answered a question when everything -- activities going on of that nature, so we want to make sure we do that. And we're also required to provide -- have the meeting transcribed.

Now, one of the things we want to make sure you're clear on, we have 30 days from today, that's December 2nd, in which we can receive comments from you and others about the -- our proposed plan and the alternative that we have selected. And so if you do have any comments, we do have Ms. Minsk's business card on the table and you're welcome to take that because it identifies how to get that to her with her address.

So, at the end of the presentation, we'll have a question and answer session. And please, we want you to ask the questions. We want to hear from you, so I'll go ahead and turn it over to Carol.

MS. MINSK: Okay. I may repeat some of the things that Pat said but I wanted to kind of make sure that I explained the purpose of this particular

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meeting. This site is a Superfund site, as you can see from my lovely power point here, or a CERCLA site. We have a process in that Superfund site. The way that process works is when we begin working on a site, we do a remedial investigation and that's where we discover the full nature and extent of contamination.

Once we've decided that that has been accomplished, we move on to the feasibility study phase. Feasibility study looks at all of the possible options for remediation at a site. It takes into consideration what would -- what would suit the type of contamination and the environment of that site, and looks at any feasible option. Thus the name, feasibility study. We are past the feasibility study point at this site. That's been submitted. We have approved that document.

The next phase is what you call the proposed plan. The proposed plan is where the regulatory agency writes a document with the purpose of submitting that to the public for review. We look at the feasibility study. We look at all of the proposed remedial alternatives and we choose which one, which one of those alternatives for each media we think would be most effective. We present that

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to the public, and as Pat said, we get your comments. So that's the purpose of this meeting. This is a required meeting in our program.

This is your meeting. This is the point where I will present to you--hopefully won't be too boring--why we chose what alternative we did, and then you ask whatever questions you want. Don't feel like, if you don't ask the question you want tonight, you can't get it answered. As she said, you can pick up my business card and you can call me anytime you want and we can discuss it. You can submit your questions in writing, however. We will respond to all of those comments at the end of the comment period before we move on to the next phase in the CERCLA process which will be the record of decision, and that's where we write the document that finalizes what remedy will be implemented at the site.

Once that's done, we move on to remedial design where that system is designed, and we review that and approve. If we agree with the design for that system, then we move on to remedial action. So just so you understand where we are in the process and what we're doing here today tonight. I would ask that we hold any questions to the end, unless I

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confuse you, which is possible and I would apologize in advance. But if one of my slides is confusing or something I say is confusing, feel free to stick up your hand and I'll try to clarify that.

So I will move on and begin with my power point at this point. So Lucas, there you go. Thanks. Okay. I'm going to go -- a lot of you, if you're familiar with the site, have already heard the general history before but I wanted to begin with this. And this is a general history for the whole site. I'm going to explain in a minute what in the world I mean by operable units, but I'm going to start. This is just generally the history for the site.

The site began operation in 1953. They used chlorinated solvents, which are the contaminants of concern now, up until 1993. In '81, AVX began some assessment and remediation of contaminated soil and groundwater without the department's knowledge. They then self-reported to us in June of 1995 about that contamination, and in 1996 DHEC issued a consent order which AVX signed. All of the assessment that has occurred since that point has been under that consent order.

Why operable units. We decided in September of

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2010 in an AV -- in a meeting between the department, AVX, and their consultant Arcadis that it would probably be advantageous to divide this site into two operable units; one operable unit being the site facility property itself, and the groundwater contamination and surface water contamination that has migrated offsite. The reason we did that is there was mention at that meeting that some more buildings might be taken down at the AVX property. When we heard that, that sounded like a good opportunity to do some additional sampling onsite. That site is very tight. There's a lot of building, lot of piping, and so it's somewhat limited, some of the sampling, that has been able to be conducted onsite. But we didn't want to hold up the cleanup of the offsite contamination so we decided to go with operable unit one being the facility, and operable unit two being the offsite groundwater and surface water contamination.

So I hope that explains a reasoning for dividing the site up, and again, everything I'm talking about tonight from this point forward is in regards to OU-2. Refer to operable unit two as OU-2, the offsite groundwater and surface water contamination.

The next slide is just a brief history of the

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investigation of contamination from OU-2, the offsite groundwater contamination. I became project manager on this site in October of 2005. In 2006, in the summer of 2006, I got a request from the Horry Land Company for some well permits to do some sampling on their property across the street from the AVX facility. I said fine, go ahead, do it. I'll give you the permits but I want the data.

When they submitted the data back to me and we looked at the type of contamination that was present in that groundwater, it became pretty clear that that was associated with AVX. I contacted AVX at the time. They agreed to go out and do some groundwater sampling and see the extent that this plume might have migrated off the AVX site. And I have some maps I'm going to show you in a minute so hopefully this will become clearer.

They also, then, after the three phases of groundwater sampling, they did surface water sampling, did a soil gas sampling to ensure that vapor intrusion was not an indoor air issue. And vapor intrusion, for those that are unaware, is if you have a volatile organic chemical in groundwater, it can volatilize and migrate to the surface. If that were to migrate into homes, it could create an

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indoor air problem. So what we did is do a soil -- we did a soil gas analysis primarily in residential areas to see if there were any off-gassing of that plume. We were able to eliminate that as a pathway or a health concern for the residents.

After the groundwater sampling with temporary wells, we were then able to install permanent groundwater monitoring wells that exist now, and I'll have a map showing you those locations, so we're just going to go through the maps very quickly now just to give you an idea of where I'm talking about.

This was the groundwater sampling that was conducted in 2007, I believe. Yeah, it began January of 2007. It was done in three phases. The offsite sampling began closest to the AVX facility which is in the lower left-hand corner. You see phase one. It progressed out into phase two and into phase three. By the time phase three was completed, there was a very clear picture of where the groundwater contamination existed off site.

The purpose of this slide is to show you -- I didn't put all the surface water sample locations on this slide, and I didn't use the maps from the reports because they were very busy and I thought

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they'd be difficult to look at so I took a simpler map and just put some spots on it that were significant. Between the two yellow squares on this -- well, let me orient you first. Again, the AVX facility would be in the bottom left corner. You can barely see it because I've cut it off so that you can see all the surface water. All the blue's the surface water. Going from the corner, the AVX property all the way to the ocean in the bottom right-hand corner.

We did -- there were 23 samples collected in 2007, and of those 23 samples, only samples between the storm water retention pond on 11th Avenue and into Withers Swash had any indication of site-related contaminants, and only between the red arrows was there contamination that actually exceeded drinking water standards, so it was fairly limited and the contamination was most definitely the same chemicals that we're seeing in groundwater. This certainly, the data indicated that what was going on here was that the groundwater plume migrated to that point and then there was discharge of groundwater to surface water.

So this was comforting in that the surface water was limited in the area that it affected and that it

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was a direct result of discharge of groundwater and surface water.

This is a map that shows where the soil gas was -- samples were collected. Again, the soil gas was done to determine whether vapor intrusion was a health hazard for the residents. Most of the -- well, all but except a couple of the sample locations were in residential areas. Fortunately, of the 25 samples that were collected, only one sample exceeded the standards for trichloroethylene that would have indicated a vapor intrusion issue, and that sample was not in a residential area. It is the yellow square that's in the parking lot of what was formerly referred to as the Horry Land Company property. So that was very good news. We were able to tell the residents at that time that vapor intrusion was not a health concern for the site.

This map just shows, as it exists today, where monitoring wells exist off site. Some of them are bunched together. You'll see multiple circles on top of one another, so there's a very adequate monitoring well network off site now where routine sampling is conducted. Annual sampling is a requirement in addition to some other sampling that

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is done in connection with the pilot study that's occurred that I'll discuss in a few minutes. Okay.

The next step, after all of this investigation was completed, was to sit down and start to consider that we were ready to move to the feasibility study. But we -- I think that the department and AVX and Arcadis felt that there was still a few things that we wanted to work out before we wrote an FS so that we would know we were all in agreement on what should be in that FS.

So we worked out a feasibility study work plan. The purpose of that feasibility study work plan was to identify any data gaps that still existed that needed to be resolved before we went to the FS, to evaluate any technologies that we and/or AVX felt should be considered for the FS documents, and we looked at every conceivable technology that would have worked for VOCs and were able to narrow that down. We also decided that because of the groundwater data that we had already gotten from AVX for many years of sampling, and the off-site sampling that was conducted, that it was very evident that there was already a natural degradation of the VOCs in groundwater which made it quite possible that enhanced reductive dechlorination

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technology would be effective at this site.

So we were in agreement to go ahead and do a pilot test for this particular technology for two reasons. One, it would actually begin some remediation; and two, we would gather some very useful data for when we moved forward into the remedial process. And again, verified that it would be an effective technology to present in the FS.

So just to talk about the pilot study that was done a little bit, the work plan for that study was submitted in the feasibility study work plan. It was part of that plan. It was approved in June of 2008 and then a report for the pilot study was submitted to the department in July 2010. The study was done on the Horry Land Company property. Go ahead and go to the next slide, Lucas, and then we'll come back. Where the little red arrow is, that's the approximate location of the pilot study and that is the area that had the highest concentrations of contamination off site so it was a very good area to test this remedy. You can go back now.

Let's see.

MR. CLEMMONS: Is that the old parking lot area on 17th Avenue South?

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MS. MINSK: Yes, directly across the street from AVX. Yes. Let's see. Okay. The results from the pilot study, once we got the report in, did indicate -- and we have a lot of data that was submitted prior to the final report -- did indicate that this would be a very effective treatment. We saw degradation of TCE all the way down to ethene and ethane which are inert, naturally-occurring products, and so this was very encouraging. We saw very good and positive results from the pilot study, and at this point, we don't want to stop, since this is so effective at beginning remediation, so there's actually a work plan to do some further work with the pilot study that is sitting on my desk now, which I'll have a chance to read tomorrow once this public meeting is over.

So you can skip the map, Lucas, okay. The next step was the submittal of the feasibility study. The final version was submitted in July 2011, or 2011, and it was approved in May. The things, the primary content of the feasibility study is to define what the remedial action objectives are, and what the remedial alternative -- and to do a remedial alternative screening. So the remedial action objectives were, or are, at this time,

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prevent ingestion and dermal contact with groundwater contaminated above the federal maximum contaminant levels, or MCLs, for drinking water. Reduce the concentration of contamination in groundwater to below the MCLs for drinking water standards, and mitigate the concentrations of contamination in surface water.

The remedial alternatives, and since I have two forms of media, I'm going to discuss them separately so as not going to get too confusing, but the remedial alternatives for groundwater are, and this one, the no further action, this is a requirement. It's a standard for looking at alternatives at CERCLA sites. It's a baseline for comparison to other alternatives. The no action alternative is rarely if ever chosen. It's just a requirement. It has to be there.

So we'll go through each of these alternatives. There were four alternatives for groundwater and three alternatives for surface water. So I'll go through these quickly, and then the next step will be to go through them and analyze why we chose which one we did.

So, first alternative, OGW-1, or no further action. Again, a base line. It would include no

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groundwater monitoring, no land use controls. It would not address remedial goals, and only treatment would be just natural attenuation. And because we would not be doing any sampling, we'd never actually know if we reached the remedial goals.

Alternative OGW-2 was a limited action alternative. Natural processes would reduce contamination in groundwater, meaning there was no active treatment. There'd be 30 years of groundwater monitoring. There would be the implementation of institutional controls, and by institutional controls, I mean deed restrictions and notifications indicating that there was contaminated groundwater beneath a particular piece of property, and that it should not be used for drinking water purposes. This also includes the abandonment of irrigation wells to limit access or exposure to groundwater.

The cost -- and this cost is a present day cost. The way that this is calculated is you look at the activities that would occur under this alternative, primarily the 30 years of groundwater monitoring, and say well, for 30 years at today's cost, this is the cost of this remedy. It probably, with inflation and the increase in prices, would be more,

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but the costs we're looking at are present day costs, and we'll be comparing apples to apples. So when I look at costs from one remedy to another, it's all present day costs but not necessarily what it would cost ultimately. The estimated time frame to remedial goals for this particular remedy would be 30-plus years.

Next alternative is OGW-3a. This is an active treatment. It's hydraulic containment. What that is is just a pump and treat system. You would pump contaminated groundwater from the ground, run it through a treatment system, and then dispose of the clean water that's gone through the treatment system. The estimated time frame -- well, I'll get the estimated time frame. Thirty years of groundwater monitoring was anticipated to accompany this particular remedy. This would also include institutional controls. Again, that's deed notifications and restrictions on groundwater use on that property, the abandonment of irrigation wells. The cost for this particular remedy would be $5,250,000 based on today's costs, and the estimated time frame was approximately 30 years.

The last alternative looked at in the FS was OGW-3b. Again, an active treatment. And this is

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the ERD. This is the -- what the pilot study had already been conducted to determine if it would be effective. This would include five years of active treatment injections, again, enhanced reductive dechlorination. Another 15 years of groundwater monitoring. Institutional controls, again being the deed notifications and restrictions; abandonment of irrigation wells and a cost of $5,417,000, with an estimated time frame of 15 years.

I'm going to go through the remedial alternatives for surface water quickly and then I'll go back to groundwater in looking at the criteria. Surface water again included a no action alternative because that is required. This would include no surface water monitoring. It would not address remedial goals. Only treatment which is the -- what we call natural attenuation.

Alternative SW-2 is limited action. This would again, no active remediation. It would be just the reduction of contaminants through natural attenuation, but it would include surface water monitoring for a period of 30 years. The present day cost was $31,000, with an estimated time frame to remedial goals is 30-plus years.

Surface water 3 was an active remedy. This

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remedy--and I'll explain what this means in a few minutes--was phytoremediation, planting of hybrid poplar trees to reduce contamination in the groundwater prior to groundwater discharging to surface water. And as I had mentioned before, the surface water contamination that we have, based on our data, certainly appears that that surface water contamination originates from discharge of groundwater to surface water.

Natural attenuation processes would also be taken into consideration. Surface water monitoring would be conducted for a period of 30 years at a cost of $72,000. Estimated time frame I have here is 30 years, but the one thing I wanted to mention is that could be a lot less if you consider that this would be linked with an active groundwater remedy. Because obviously, cleaning up the groundwater that would discharge to surface water would limit contaminated groundwater that could discharge to surface water, so that 30 years could be significantly less.

Just -- I kind of talked about what the proposed plan was to begin with but I'm going to go over it again. It's a document used to involve the public in the remedy process. What we do is present what

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our recommendation for the best way to address contamination at the site. It would present the alternatives that were evaluated and explain the reasons for the preferred alternatives, the proposed plan to have a copy of it.

Unfortunately, we just don't have the capability of printing enough proposed plans and bringing them here because it's -- it's not an incredibly thick document but not knowing how many we would have needed to bring, it is posted on the DHEC Web site. And that is at the www.DHEC.sc.gov/environment/AVX. We absolutely encourage you to go read this document and absorb it. The FS is also in the same location, and if you would have any questions, again, call me. All the public comments will be considered by the department before we write the record of decision for operable unit two.

Now, when we look at the alternatives that I've already presented to you for groundwater and surface water, we have to look at them based on a certain set of criteria. And those eight criteria are, is the alternative overall protective of human health and the environment? Does it comply with state and federal regulations? Those are the two most important criteria. Those are the two criteria that

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must be met. They're called threshold criteria. Long-term effective and permanence. Reduction in toxicity. Mobility of volume through treatment. Short-term effectiveness. Implementability and cost are called the primary balancing criteria.

And they -- you look at every alternative and see which one comes out as being the most effective in those criteria. It doesn't have to be the most effective in each one of them, but it should come through the process as being the most effective overall in all of this criteria. And then we have community acceptance, and that's what we're here for now. That's what the proposed plan is all about. We have to take into consideration what the community feels about the alternatives and what we've proposed.

Now, I'll go through, in looking at the criteria I just explained and the alternatives already discussed, we go through and discuss each of those alternatives and each of the criteria. So for groundwater, of these alternatives, which are overall protective of human health and the environment, well, OGW-1, that was the no action, is not protective at all of human health and environment so that eliminates it. And again, this

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is an absolute critical criteria that must be met so that eliminates that.

Alternative OGW-2 limits exposure through the institution of controls and well abandonment but has no active remedy. Alternative OGW-3a limits exposure and includes an active remedy. That was the active remedy of pump and treat. I'm just going to stop saying the OGW part to speed things up. 3b limits exposure and includes an active remedy of enhanced anaerobic bioremediation, so the most protective of all four remedies would be 3a and 3b. They both meet the criteria.

Compliance with state and federal regulations. Again, another absolute criteria that must be met. All of the alternatives except one, being the no action, would comply with state and federal regulations. There would be some permits necessary for 3a and 3b but that really shouldn't be an issue. Two would have -- would have permitting issues but it would also take the longest to reach remediation goals. So ultimately, both 3a and 3b would comply with state and federal regulations most appropriately.

We'll go on to the balancing criteria. So for long-term effectiveness, alternative one would

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provide no long-term effectiveness or permanence because there is no action. Two monitors groundwater contamination and is more protective than one but would take a very long time to reach clean-up goals. 3a and 3b would both provide effective and permanent removal of groundwater contamination; however, it is assumed that 3b would take significantly less time to achieve those remedial goals. Therefore, it best meets the criteria.

Reduction in toxicity, mobility or volume through treatment. One and two do not result in direct reduction of contamination because neither one include treatment. 3a would reduce mobility, toxicity and volume by extraction of contaminated groundwater. 3b would reduce mobility, toxicity and volume by in situ treatment of contaminated groundwater. And by in situ, I mean in place, meaning with 3a, there would be -- the groundwater would be pumped to the surface and then treated and then there would have to be some disposal of that treated water, whereas 3b would be treated in place, which is much more efficient in the long run, so 3b would best meet this criteria by reduction of toxicity, mobility and volume contamination while

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that contamination remains in situ.

Short-term effectiveness. One does nothing to reduce risk, and therefore is not protective in the short term. Two would result in minimal short-term risk, and short term is a funny category. It includes not only how quickly you would reduce the contamination, but it also takes into consideration what type of risk would exist from the activities that occur from remediation. So if you're going to have a lot more activity in the area or construction, there's activities associated with creating the remedial system, are there risks associated with that, so that's what I'm saying when I say two would result in minimal short-term risk, meaning the process of abandoning the irrigation wells and the groundwater monitoring. And again, those would be conducted by professionals so that's a very minimal risk.

3a and 3b would result in limited short-term exposure to workers, adjacent populations and/or the environment during construction; however, these risks are very easily controlled. 3b is the most protective in the short term because it reaches remedial goals in the shortest time frame, and because all of the risks to workers are quite

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minimal. That really isn't that relevant.

Implementability. All of these alternatives would be easily implemented. One would be because there's no materials, there's no permits, there's no coordination, so there's really nothing to implement. You're doing nothing so that would be easy. Two requires limited coordination and could be easily implemented because all it is is just some groundwater sampling. 3a and 3b would both be easy to implement. The required services and materials are easy to obtain and necessary permits could be obtained. However, the pilot testing for 3b shows that this technology is favorable to site conditions, which gives it a bit of an edge over 3a.

Then again, to summarize the cost, which I've already mentioned once before, the no action would cost nothing. The monitoring of groundwater for a period of 30 years at today's cost was 872,000. The pump and treat and monitoring would be $5,250,000 at today's cost, and the ERD with the 15 years of monitoring would be 5,417,000.

So to summarize, then, DHEC's preferred alternative for groundwater would be 3b, the active treatment of ERD. This would include the institutional controls, well abandonment, and the

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deed notifications and restrictions. It would have the active treatment of enhanced reductive dechlorination and the monitored natural attenuation in addition. Again, cost, $5,417,000.

I'm going to go through the same thing for surface water now. So again, going through the criteria, overall protective of human health and environment. SW-1 is not protective because there is no action. Two provides measures to monitor surface water but does not actively reduce those concentrations. Three actively reduces existing contamination at the groundwater surface water interface; therefore, three would be the most protective.

Compliance with state and federal regulations. One does not comply with regulations. Two would over a long time period comply with regulations by documenting the natural attenuation process. Three would implement phytoremediation and monitor surface water natural attenuation; so therefore, this alternative would comply with regulations. So surface water three would enhance natural attenuation or reduce the time to reach remediation goals.

Long-term effectiveness. One would not be

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effective or permanent. Two monitors surface water but takes a long time to reach remediation goals. Three would achieve long-term effectiveness and permanence with the use of phytoremediation.

Reduction of toxicity, mobility or volume through treatment. One or two do not result in the direct reduction of contamination. However, two would document natural attenuation processes. Three would reduce toxicity, mobility and volume surface water contamination by the interception of contaminated groundwater before discharge to surface water through the process of phytoremediation; therefore, three would meet this criteria by the active reduction of toxicity, mobility and volume of contamination by the use of phytoremediation.

Short-term effectiveness. There are no current exposure pathways for surface water, so just in terms of the risk associated with the activities involved with this remedy. One does nothing to reduce risk, and therefore is not effective in the short term. Two would include only activities with minor exposure, the periodic sampling of surface water. Three would result in minimal short-term exposure, being the tree planting and periodic surface water sampling. Of course, all activities

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would be performed by trained workers.

Implementability. All alternatives are implementable. One because, again, there is no action. There's nothing to do so that's straightforward. Two would require limited coordination because it's only sampling. Three is implementable. There may be some issues with three in that there will have to be property access to plant trees, so it could possibly be an issue for implementation but we'll not know that until access is requested.

The cost for each of these, nothing for the no action. 31,000 in today's cost for the sampling only. 72,000 for sampling and the phytoremediation, the planting of the trees.

Our preferred alternative would be number three, the active remediation of phytoremediation. It would use an active treatment remedy. It would include monitoring natural attenuation, and again, a cost of $72,000. And just to -- before I go on to my last couple of slides, just because I know there will be questions about what phytoremediation is, I printed off today, and it's up here somewhere, a flyer that EPA has that's a citizen's guide to phytoremediation. I can just kind of explain my

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understanding of it very quickly, which probably will be quick, but if anybody is interested, I can certainly tell you where you can find this particular document to take a look at.

But the whole concept, and this is a proven concept, believe it or not, is that there are certain plants and trees that are very capable of taking up large volumes of water. And in the right environment, meaning the groundwater is shallow, the contamination is shallow, and where this groundwater would discharge to surface water, that would be the case, and the concentrations are low, and the concentrations are low at this point.

This could be a very useful, kind of what could be termed polishing remediation. Taking out that last bit of contamination that exists at the end of a plume. What the plant does is it takes a large volume of water up and the plant is able to process this water for its own use, and then get -- I'm sorry. I'm stumbling around. But it then is able to get rid of the contamination such as the VOCs just by the natural process of -- let's see what it says here. It changes into gas as is released into the air as the plant transpires, so this -- it would not be a concern for anyone that lived near these

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trees because the gases that would be released at that point would be inert, nothing that would be harmful to any individual. So again, I'll be happy to discuss that with anybody one on one if you feel the need.

Again, we're now to the last criteria, community acceptance, which is what we're here for tonight. Our public comment period begins now and ends December 2nd. The administrative record, as Pat indicated, is at the Socastee branch of the library. I updated that just week before last so I brought down the most recent material and put it into the administrative record. Our proposed plan and feasibility study, in addition to quite a few other documents, are on the DHEC Web site. If you were to have any questions about those documents, again, I would encourage you to call me. And you can pick up my business card. So we're going to go on to the question and answer portion.

MS. TOLTON: I'd like to interject, Carol. There's an easier web site to get to. It's a little bit shorter than the one, so it's www.scdhec.gov with a slash, AVX. It's a little bit shorter, SCDHEC, all one word, and then dot gov slash AVX.

MS. MINSK: Okay. Thank you, Rochelle. So

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we're at question and answer now, so I will do my best to answer your questions now. If I don't completely answer what you're asking me at this point, Pat is going to try to -- well, someone here will try to write down what you've asked, and if we don't sufficiently answer that tonight, we'll get back with you. When you have a question, if you would let Pat come to you with a microphone so the court reporter can pick up the question. If you state your name. Please state your name, sir.

MR. CLEMMONS: Thank you. I'm Alan Clemmons. I am state representative that represents this area as well as the rest of the city of Myrtle Beach. Just a few questions for clarification. Where you have analyzed costs, is there any economic cost factored in with regard to the economic impact to homeowners, property owners in the area due to the fact that they now have homes on contaminated soil that there will be deed restrictions which all impact the value of their properties? Or are those just hard costs of actually the work to remediate?

MS. MINSK: They are just the hard costs of the remediation processes that I explained, the sampling and/or the installation of the remediation system. That is it. That's all those costs

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contain.

MR. CLEMMONS: Does DHEC take into any consideration which alternatives would least impact the economic value, or I should say economic loss of the property owners that are affected by this pollution?

MS. MINSK: It's not one of the criteria. However, I think the remedy we have selected certainly would do that, because it is -- it takes the least amount of time to reach remediation goals which would be beneficial to the residents and their property. So I think ultimately we have done that in our preferred remedy but the criteria that we have to use to determine which remedy we're going to choose doesn't really include that component, other than, I guess, the short-term or long-term effectiveness.

MR. CLEMMONS: It seems to me that the cost criteria could also include the cost to the residents, not just the cost to the state. For what it's worth. I'm also curious about you mentioned that one reason that Alternative OGW-3b is preferred is that you don't have to deal with disposal of the treated waste water, that you can pump it back into the ground or it's --

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MS. MINSK: Released. It's never removed, yeah.

MR. CLEMMONS: Speaking for myself, I actually live less than a quarter of a mile from this site.

MS. MINSK: Okay.

MR. CLEMMONS: On property that's been in my family since the early 1800s.

MS. MINSK: Okay.

MR. CLEMMONS: And speaking for myself, I would rather see the pollution removed from the ground and disposed of rather than knowing that it's all still underfoot.

MS. MINSK: But ultimately it won't be because what this remedy does is break down the contamination into inert materials, so it goes -- it breaks down into what's ethene and ethane, which are naturally occurring which you would find in the ground anyway, so the contamination does get degraded and it is not -- it's no longer there. It is an effective treatment and would require a shorter time period.

MR. CLEMMONS: Okay. Thank you. Going back -- going now to the groundwater or the surface water treatment, the preferred alternative to plant

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trees --
MS. MINSK: Um-hum.
MR. CLEMMONS: -- to suck up all the bad stuff. With that alternative, as I understand it, the deed restrictions that are proposed would, even after remediation is complete, those would follow the title forever?
MS. MINSK: No.
MR. CLEMMONS: Okay. Please explain.
MS. MINSK: Those deed restrictions could be lifted and removed once the contamination was gone.
MR. CLEMMONS: Okay.
MS. MINSK: They would no longer be necessary.
MR. CLEMMONS: How would that occur? How would the lifting of those restrictions occur?
MS. MINSK: Gary, I am going to defer that one to you because you might be able to answer that better than me.
MR. STEWART: I'm not sure that I have a much better answer. Typically deed restrictions are put on in an agreement between two parties, typically between the state and a property owner. And it's an agreement, it's put on the deed, and it can't be removed from the deed unless the state

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agrees that the contamination has reached a low enough level that it's no longer a concern. And that's not a process that happens overnight, of course. It takes many years, 15 years, 20 years, 30 years, but at some point in time when those -- when those concentrations are reached that are acceptable, those deed restrictions can be lifted. DHEC is certainly more than willing to remove any restrictions when they're not necessary.
MR. CLEMMONS: Okay. So with regard to the deed restrictions that you're proposing, you're looking to the homeowners to voluntarily agree to deed restrict their property due to the contamination of the soil underneath? Is that what I'm hearing?
MS. MINSK: To groundwater, not soil. The soil is not contaminated. To groundwater contamination. And it may be -- I think the way that this will probably work would be there would be an approach and a request to say look, you've got groundwater contamination beneath your property. Let's negotiate if we can put a deed restriction on. If someone refuses, they can't be forced to. I would think, because the primary area of groundwater contamination off site, the worst of it is beneath

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what was referred to as the Horry County Land Company property, which I believe AVX currently owns, that property would certainly have a deed restriction on it. But we would not force residents necessarily to have the deed restrictions. I think it would be requested but not forced.
MR. CLEMMONS: Thank you very much.
MS. VINCENT: Does anyone else have any questions? Let me ask this first. Is the ringing bothering you to where we need to cut it off and just let you speak loudly?
MR. BYRD: I'm Larry Byrd. The deed restrictions themselves, do we know any kind of wording at all about groundwater -- what the deed restrictions would, quote, say or what it would restrict? And my second question, you're in 2011. Have there been any changes in the plume or in contamination levels?
MS. MINSK: The levels have actually decreased and that's because we have already started remediation with the pilot study, so the most recent data that I got in the 2011 groundwater report, these concentrations are lower than when we began. So we're already seeing a positive effect from the -- just from the pilot study injections that

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began remediation on a small scale. So then to go back to your deed restrictions question, let me think so that I can answer that best. I think, Gary, do you know a little bit better what the deed restriction wording would look like?
MR. STEWART: Typically the wording is that you agree not to conduct uses on the property that extract the groundwater. And in order to do that, you would have to get a permit from DHEC which hopefully would not fall through the cracks and be issued to you anyway, to install a well in a contaminated area, but the main thing -- two points, I guess I want to make.
As Carol said earlier, we're not going to be chasing people down saying sign this, sign this, sign this. We're not about doing that. And second thing is, that you'll have full use of your property, everything except installing a well and pulling out contaminated groundwater. We want the natural -- the remediation of the site to cleaning up the groundwater, and at the point that that's completed, you're free to install wells and use it for irrigation and whatever other purposes you feel necessary.
MS. VINCENT: Space on their property, the

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well, any monitoring wells or any of the work on their property as a whole. Restricting any of their use as we're doing this clean-up, can you give them an idea how much space that would take to have that monitoring well?

MS. MINSK: Well, we're not necessarily saying that any of these individuals will need a monitoring well. When we discuss deed restrictions, that doesn't include the installation of monitoring wells necessarily. It's just an agreement that's put on the deed that says I will not use the groundwater beneath this property for drinking water purposes. And again, like Gary said and like I said before, no resident will be forced to do this. I mean, we couldn't and we wouldn't force any resident to do that. It would be a volunteer situation, but again, the primary piece of property beneath which most of the contamination occurs would certainly have a deed restriction on that. Yes, ma'am.

MS. DUPRCEE: My name is Lyndia Duprcee and I have a granddaughter and her husband that's bought a home in Bent Oaks, and also two condos in Westwind, and my daughter and grandson, my other granddaughter and her children, so I have my whole family right there in that area. And I've been so

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concerned about it for years, and I've got them drinking all bottled water.

MS. MINSK: You don't need to do that.

MS. DUPRCEE: Is that right?

MS. MINSK: No, ma'am. You're on a --

MS. DUPRCEE: Their bath water and everything is good?

MS. MINSK: You're on a city water supply. Their water doesn't even come from this area. It comes from a city water supply that, to my understanding, pulls water out of the inlet waterway. The water is piped in. They're not drinking --

MS. DUPRCEE: Pridgen Road?

MS. MINSK: -- groundwater in that area. Also, to boot, to make you feel even more confident, there isn't groundwater contamination in that area. We have lots of data that shows the location of our groundwater contamination, and those communities are not involved in any way.

MS. DUPRCEE: Oh, well, thank you, because they could save money now.

MS. MINSK: So don't be buying bottled water. That's a waste. You don't need to do that. You can relax now.

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MS. DUPRCEE: Thank you very much.

MS. THOMPSON: I would like to ask a question. Is AVX still in business in Myrtle Beach?

MS. MINSK: AVX is still in business in Myrtle Beach, yes, ma'am.

MS. THOMPSON: Okay. Are they still using the stuff?

MS. MINSK: No, ma'am, they are not. As I said on one of my beginning slides, and I know it was long and boring and I apologize, but in one of the beginning slides is they stopped using these chemicals, I believe it was '93. It's been many years since they have used these particular chemicals.

And to make you feel better about any place that would use this type of chemical, they're much more heavily regulated today than they were in the past. And there's a lot of sites that have this particular chemical and similar chemicals in groundwater because they're solvents. They're used for cleaning. And they were used very extensively with less regulation in the past than they are today. But AVX is not using these chemicals now and they haven't since '93.

MS. THOMPSON: They must be using something

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because I live right there at that pond there on 17th Avenue South, and I've smelled it ten years ago. Twice I went out last week and I smelled the same thing that I smelled ten years ago.

MS. MINSK: Yeah. Unfortunately, I can't explain what you might have smelled but I do know that all chemicals of this nature are very heavily regulated these days, and that there is no way that they're using these chemicals without us being aware of that.

MS. VINCENT: Can you please state your name, please, for the court reporter?

MS. THOMPSON: Norma Thompson.

MS. VINCENT: And if you can repeat what they ask, Carol, since we don't have a mike. I want to make sure everyone can hear.

MS. MINSK: I'll try.

MS. CRELLIN: A few comments. One is my presence here should not be assumed to be community acceptance. Rose Crellin. Second, that the reason she might smell that, I'm not sure, is that AVX uses the stream that goes from the plant to the pond as a place it can discharge waste water that has been treated. And when there is a malfunction in the equipment where they're cleaning the TCE tainted

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groundwater, then some TCE can actually go down that stream and into the pond. That's in the records. They report monthly and they can be obtained by anybody. So I don't think that it happens very often but I know that that information is available, so.

Another comment is, I think this molasses treatment will lead to degradation to vinyl chloride, which is part of the process. I think we're all aware of that. And it leads to the release of methane, some places. Think we're aware of that. And it means that thousands of gallons of water and molasses will be pumped into the ground, and my concern is the pond she was mentioning. I think part of your process, I recommend, is that an analysis be done of what effect this proposal will have on the pond and the possibility of flooding additional contamination in the air or the surface water and any effect on the surrounding properties in that area, so I think that if that hasn't been done, and I think the city should participate but so far they haven't been very interested in all of this.

MR. MOORE: My time next.

MS. CRELLIN: I hope you are interested but

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the point that they come to the meetings does not mean that they're interested, and I think that pond is -- AVX has a NPDES --

MS. MINSK: NPDES.

MS. CRELLIN: Yes.

MS. MINSK: Natural pollution discharge elimination.

MS. CRELLIN: Right, to put that waste water in that stream, and has had that for decades, and no one seems to be concerned about it. And I'm sure that they only have a problem when it malfunctions, at this point. I would think originally it might have been a bigger use for them but now it's supposedly a malfunction situation, but anyway, it's a concern, and I think that you're doing this process, the fact that you not only have TCE but you have vinyl chloride and you have methane is a concern if it's all ending up in this pond. And the pond is -- needs to be dredged probably and hasn't been, so I think someone really needs to put an analysis into this before the thousands of gallons of water are put in there and end up in peoples' properties with those chemicals possibly in their homes. So that's my comment.

MS. MINSK: Well, I can't repeat all of

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that. But Rose, I think there were two issues primarily that you brought up that you -- that I could try to address. One would be AVX's NPDES permit, and you were saying it might be associated with the odor that the other resident has indicated that she smelled. And I would say that that is really very, very, very, very unlikely. The water that is pumped from the extraction well -- there's an extraction well on the property and it keeps any further contamination that's on the property from migrating off site. It's an efficient extraction well. We've certainly discovered that from a lot of the data that was gathered from the pilot study, and the effect of how far that well actually captures contamination.

But anyway, 40 gallons a minute. Yes, ma'am?

MS. THOMPSON: Where is that well at?

MS. MINSK: It's on the corner. If you give me a slide that's got a picture of AVX. Yeah, that's perfect. It is in this corner over here (pointing.)

MS. THOMPSON: Okay.

MS. MINSK: That's the AVX facility. That's 17th Avenue. That's South Kings Highway right here. South Kings Highway is here, that's 17th, that's the

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AVX facility right here.

MS. THOMPSON: And where was the well?

MS. MINSK: The well is onsite approximately somewhere in this area. In this area (pointing.) Okay. So to answer your question -- well, to respond to your comment, so that well pumps approximately 40 gallons a minute. It then goes through a treatment system called an air stripper. Water is just -- it migrates down through all these different surfaces in a tower that lets what's the volatiles that are in that water off gas, that are then discharged into the atmosphere. It's a very small volume. It's nothing that would be an air concern for any individual.

That water is then discharged through a pipe to a series of three ponds on the AVX property. And I took the tour. I want to say it was about 18 months ago, maybe a little longer, when the Bureau of Water from Department of Health and Environmental Control -- and I work for Bureau of Land and Waste Management but I went with the other bureau when they were looking at a renewal of that NPDES permit and I went with them so I would fully understand how the discharge to that works.

And you have another comment already?

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MS. CRELLIN: Well, yeah, it's correct that it goes to the three ponds, but if there's too much water for the ponds to maintain, then the water can go in the permit -- to the stream, and you have to just logically look at this because I know your staff have continually told me that there is no way that any water ever goes down that stream. Why would you have a permit, if you never had any water put down the stream? The fact that they have had that permit for decades and continue to re -- have it again every few years when they have to do it, renew it, means that they are using it. It's only used occasionally, as I said, and it's used when it malfunctions and the report on how much water is released into it regularly, and if there is TCE in it, they do report that also. So this is not something that, you know, well, I don't think and I don't think; this is actually documents you can look at and it's fact.

MS. MINSK: Okay. Let me finish, Rose, and maybe -- maybe we'll get to the bottom of it. But what happens then is after treatment, and once that water is treated, it is clean. It doesn't have TCE in it. It's clean --

MS. ROSE: Unless it malfunctions.

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MS. MINSK: It's then discharged through a pipe that's quite some distance from the treatment system over to the ponds. It runs through a pipe. It then discharges into the first pond, which if that pond overflows, discharges to the second pond, which if that pond overflows, discharges to the third pond, which if that pond were to overflow, would flow into the surface water body that would ultimately then wind its way back through the AVX property and then go off site and go into this surface water feature that you see here in blue.

But my point being, okay, we already have clean water that's discharged to the ponds. If there was the most minuscule amount of VOCs in that water, by the dilution of running through all three of those ponds and into that surface water body, it no longer exists by the time it gets to this surface water body because VOCs volatilize. Okay?

One, it's diluted. Two, if it's gone through that pipe, it's discharged from one pond to the other and it falls out. Okay? Any action on water with VOCs in it tends to allow them to volatilize into the atmosphere. It would no longer exist by the time it came out that third pond, if it came out that third pond.

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MS. CRELLIN: Well, it's --

MS. MINSK: So it's just not possible. It is my opinion, and of course, we all have our own opinions, that it would be my opinion based on the technical knowledge that I hold, that by the time it got to this surface water body that winds through your neighborhood, it does not exist. There is no TCE discharging off that property in that surface water.

MS. CRELLIN: You're finding TCE in the surface water --

MS. MINSK: That is from groundwater contamination discharging to surface water. And it is in a very limited area, which is right where our plume is flowing. There is direct evidence. This is where the plume flows, here's the surface water right at the end of it, this is where the bit of surface water contamination exists. It's quite limited.

MS. CRELLIN: Well, I mean, my concern is more the pond and the fact that you're going to use remediation and pilot safety for the people living in the area, given that it could flood, there will be methane, there will be vinyl chloride, there will be TCE and somebody needs to monitor the pond and

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the adequacy of the pond to respond to the remediation that you're planning here.

MS. MINSK: Okay. And I wrote down some notes on that too, okay. And I talked to you beforehand so I know you have some concerns about the possibility of the pond flooding because of injections. I would think that that would be unlikely. However, however, I can certainly make the consultant that will be writing the work plan and the design for that remediation system aware of your concerns. And I can make him justify why that would not happen, and he happens to be sitting behind you, so that can certainly -- you brought that up, he's heard that, okay?

MS. VINCENT: Carol, next question, please.

MS. TARTE: I'm Linda Tarte and I have a question about water pollution.

THE COURT REPORTER: Ma'am, I can't hear a word she's saying.

MS. MINSK: She can't hear you. Could you speak so the reporter can hear you? Or you can come up.

MS. TARTE: I'm Linda Tarte and I have a question about the water pollution.

MS. MINSK: Yes, ma'am.

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MS. TARTE: The treatment that's happening, is that what's happening sometimes when you go by there late, late at night and they have that tire -- that tower and the noise -- it makes sort of a noise? Is that what's happening?

MS. MINSK: Is that on the property on --

MS. TARTE: Yes, it's on the --

MS. MINSK: No, ma'am, that's not the treatment.

MS. TARTE: That's not the treatment?

MS. MINSK: No, ma'am.

MS. TARTE: Can you tell me if that's air pollution coming from there? Will they issue an air pollution permit?

MS. MINSK: Okay. Now, I will preface this with I work within DHEC in the Bureau of Land and Waste Management so I don't have anything to do with their air permit; however, I do know a lot of the individuals that work in the air permitting program. I've met them and spoken with them and been in meetings with them where they have discussed the air permits, so that would be a permitted discharge.

MS. TARTE: So that's a permitted air discharge coming out of the tower?

MS. MINSK: Yes, ma'am, from their

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manufacturing process.

MR. MAXWELL: Carol, I didn't hear you, ma'am. Did you say it was a visible emission?

MS. TARTE: I never noticed a visible. I would notice at night. I take care of my mother at night and I come by late at night and I would see it going on, and then I would lay down and go to bed and I could hear it running.

MS. MINSK: Okay. Matt works with the district. He may know a little bit more about this than I do.

MR. MAXWELL: Yeah. I've actually been there on some air quality inspections. That's why I was asking. If you thought you saw something visible, they don't actually have visible air quality emissions there. Chances are if you saw something of that nature, it's simply water vapor from an air chiller or something, so.

MS. TARTE: Well, I just noticed it happened after our other meetings and the tower, I think, was put up, and then I would notice it when I've come from Mother's, taking care of Mom, and I'd hear it at night, and then when I would lay down to go to sleep at night--I live in Bent Oaks--I could hear it, so at first I thought well, where is that noise

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coming from, but I would get in the car and go back and I would realize where it was coming from. And I didn't know if it was water treatment or if that was the pollution permit for the air.

MS. MINSK: It's the air. It has -- the treatment system for the water should be completely without any sound at all. And it's on the other side of the road.

MR. MAXWELL: Let me leave you a card, ma'am, and you can get together with me later on. I'll come over and meet you and we'll take a look at it.

MS. DUPRCEE: Ma'am, I had one other comment.

MS. MINSK: Sure.

MS. DUPRCEE: That stream that goes down 17 on the opposite side of AVX, there's no wildlife in there. There's no turtles, no pollywog, no nothing. Because my great-grandson, of course, we go try and find some, but across the street in the pond there at the end of Pridgen Road, there's a lot of turtles and a lot of wildlife, but that stream that goes down the street there has nothing in it.

MS. MINSK: Well, I --

MS. DUPRCEE: Nothing alive, anyway.

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MS. MINSK: Yeah. This is the area you're talking about. Lucas just brought up a map that shows that. And there have been --

MS. DUPRCEE: Oh, no, Pridgen Road.

MR. BERRESFORD: Pridgen Road's up here.

MS. DUPRCEE: Yes. Along Pridgen Road there's a creek like thing that goes all the way to Bent Oak and past Bent Oak. It's like a water drainage or something. Well, nothing lives in there. There's no wildlife in there.

MS. MINSK: There's no contamination associated with AVX in that surface water body. Why the wildlife --

MS. DUPRCEE: I don't know either.

MS. MINSK: -- don't appreciate it, I couldn't answer. I'm sorry.

MS. DUPRCEE: Okay. I was just wondering because --

MS. MINSK: But there is no contamination associated with AVX there.

MS. DUPRCEE: Okay.

MR. BERRESFORD: And even along this stream right here, up to this time, our samples haven't shown any.

MS. MINSK: Right. They were all clean.

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MS. VINCENT: Any other questions?

MR. CONNELL: Hey, Carol. As you know, I'm Gene Connell and I represent some of the property owners. Can you tell us tonight where the plume is and what properties that you would like to have deed restrictions on by going to the map?

MS. MINSK: We have not sat down and discussed locations for deed restriction at this point, so I don't know that I would have an answer for you. As already said, I would certainly expect the HCL property, which of course is not owned by Horry Land Company anymore, to have a deed restriction on it. Any other residents between that point and the storm water pond, I think we would have to sit down and discuss which of those sites -- which of those properties would be appropriate.

What was the other part of your question? I'm sorry.

MR. CONNELL: The other part of my question was can you tell us the location of the plume today, and just give us an idea, is that -- phase one, two and three the location of the plume?

MS. MINSK: Yeah, I would stick with that. I would stick -- at this point in time, I would stick with this being our definition of the plume.

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MR. CONNELL: And so would it be true that the deed restrictions would be in property owners in either phase one, two or three are the areas that you would ask for deed restrictions in?

MS. MINSK: I think a request for deed restrictions would be limited to the areas in one, two and three that show contamination.

MR. CONNELL: Okay. What are you doing about the vinyl chloride issue? It's my understanding that the MCL for vinyl chloride is two?

MS. MINSK: That is correct

MR. CONNELL: Is it your intention to clean up the whole area below the level of two for vinyl chloride?

MS. MINSK: Absolutely, yeah. When we state that the drinking water standards were the remedial action objectives, then that would include cleaning up vinyl chloride to below that drinking water standard. And this process, this remediation process that's been proposed would be effective with vinyl chloride, and the pilot study has shown that that is the case.

MR. CONNELL: The records show that the contamination started in the '80s, and we're now in

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2011 --

MS. MINSK: Well, I don't know when the contamination started. It very well might have started in the '50s

MR. CONNELL: Okay, fair enough. Your proposed clean-up says 15 years. Are we talking about 15 years from today's date or are we talking about 15 years from a date in the future? Can you tell us --

MS. MINSK: Fifteen years from the beginning of implementation of the remedy is the estimated timeframe for cleanup.

MR. CONNELL: When would that be? This is 2011. When will the remedy start and when would you expect the 15 years to end?

MS. MINSK: Okay. I can only guess when the remedy will start because there's a whole process of work plans and approvals that we would have to go through. We have to get through, obviously, this 30-day comment period before I can even begin to write the record of decision which states what remedy would be. Once that record of decision is written, then the remedial designed phase could begin. How long it would take to create that work plan and approve it, you know, I can go out on a

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limb and try to guess but it's a complete guess.

MR. CONNELL: Pretty much starting from 2011, we're talking about --

MS. MINSK: We're November 2011, okay, so I've got to wait until December before I can even write the ROD, so let's say I get the ROD done and approved by everybody's brother at DHEC by February. Okay. And then the consultant for AVX (Arcadis) would need to write a remedial design plan. Let's say that takes them a couple of months, March, April. Then we have to review it, May, June. I would say fall of -- my wild guess is fall of 2012.

MR. CONNELL: That's when you would start the remediation process?

MS. MINSK: That's my -- my guess. It could be earlier; it could be later.

MR. CONNELL: Then your best guess, based on the model, would be 2027 when it would be finished; is that right?

MS. MINSK: Fifteen years is the estimate, yeah. But it would be decreasing concentrations throughout that entire time period. So you're not looking at a static 15 years and then boom. You're looking at decreasing concentrations over the entire 15 years. And it could reach that goal earlier, it

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could take longer, because that is an estimate.
MR. CONNELL: But to reach the MCL of two, you think at least 15 years, maybe a little bit longer. Is that right?
MS. MINSK: I -- like I just already said, it could be less than 15 years, it could be slightly longer than 15 years. But as the TCE degrades, that doesn't necessary -- we don't have huge concentrations, high concentrations of vinyl chloride at this point in time. And natural degradation is already occurring, so I don't have an indication that vinyl chloride is going to skyrocket, by any mean. We already have fairly low concentration of vinyl chloride, but in the pilot study, we did see a complete breakdown to ethene and ethane, which is the breakdown beyond vinyl chloride.
MR. CONNELL: My understanding was it depends on what tests were done as to whether or not you can measure the vinyl chloride appropriately. Is that -- is there any --
MS. MINSK: No. The analysis that was done includes an analysis for vinyl chloride.
MR. CONNELL: And so operating unit number two, is this whole phase one, two and three, is

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that -- when I look at your plan on a map, I couldn't really tell if that's phase one, two or three or not. Is that OU-2 mean all phases one, two, three on the map we're seeing today?
MS. MINSK: OU-2 is defined as the offsite groundwater and surface water contamination.
MR. CONNELL: What area is that? Is that this area we're looking at right now?
MS. MINSK: Yeah. I mean, it's the -- you keep wanting me to draw a map.
MR. CONNELL: I've been asking you to draw a map for years.
MS. MINSK: And I'm not going to draw a map. We have been through this before in depositions.
MR. CONNELL: Yeah.
MS. MINSK: Our area is defined by the monitoring well network. You can go back to that too if you want to, Lucas. Probably the next.
MR. CONNELL: That one right there. Right there. Next one.
MS. MINSK: The green dots. That one. That defines -- the monitoring well network was set up to monitor groundwater contamination. The primary contamination runs through the center where the concentrations of wells is. That's the area that

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will be focused on for remediation.
MR. CONNELL: Between the green dots?
MS. MINSK: The -- all right. I'll walk over there.
MR. CONNELL: Maybe I can get you to draw a partial map for me.
MS. MINSK: The highest concentrations are in this area, and they migrate through here to this point (pointing), so that will be the focus of the remediation.
MR. CONNELL: You had talked one time about doing some extra testing on 10th and 11th Avenue. Are you going to require AVX to do any extra testing in those areas?
MS. MINSK: Some sampling was just recently performed and we don't have that data yet.
MR. CONNELL: When will you have that?
MS. MINSK: I would anticipate, I think the sampling was just collected within the last two weeks, so with turnaround from the lab and compilation in a report, I should have that data in December, I would guess.
MR. CONNELL: And so I'm assuming that when the ERD is finished in 2012, that at that point you will be able to point to the property owners who

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DHEC is going to ask to do a deed restriction; is that right?
MS. MINSK: I -- yes, I would anticipate that there would be a list of properties that would be identified as the best locations to ask for deed restriction, yes.
MR. CONNELL: And final question and I'll sit down. Is there any indication there's any other source for the contamination other than the AVX plant in the area that you're treating or that you're looking at?
MS. MINSK: The department has not acknowledged another source at this time.
MR. CONNELL: So that means you can't -- you don't have another source at this point?
MS. MINSK: No.
MR. CONNELL: Thank you.
MS. THOMPSON: I want to ask another question. You said you had gathered some samples. How far down did you go to get those samples? Because they drew -- they did three wells side of that pond, side of my house, they went 40 feet down. That's when they found that stuff.
MS. MINSK: Yes, ma'am. The addition -- the additional samples that Mr. Connell was referring to

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would have also been collected from approximately 40 foot. That's where --

MS. THOMPSON: Now, I'm talking about the samples you say you had just got.

MS. MINSK: Right. The department did not collect those samples, okay? The consultant that works for AVX, at our request, collected those groundwater samples.

MS. THOMPSON: Okay. How far did they go down?

MS. MINSK: Forty foot.

MS. THOMPSON: Where did they get them from?

MS. MINSK: They collected the samples from locations that we requested -- go back to -- you know what map I want. Yes. They collected those samples -- yeah, where Lucas has got the map -- the arrow.

MR. BERRESFORD: If you look at the little arrow, they were collected in there.

MS. MINSK: Over in that area.

MS. THOMPSON: Now, where is over in that area at?

MR. CLEMMONS: What avenue is that?

MR. BERRESFORD: That is --

MS. MINSK: Is that 9th? No, that's not

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9th. That's 13th, that's 11th, around 10th.

MS. THOMPSON: Now let me ask you something else. This stuff that has been coming through there, has it -- does it go underground or has it been on top of the ground any, like running through the ditch?

MS. MINSK: Yes, ma'am. This is groundwater contamination we're talking about. The only location where this groundwater contamination would appear at the surface was as we discussed where you have some surface water contamination in that one limited area, right at that retention pond on 11th avenue.

MS. THOMPSON: Now, that's where I live at. But until that pond got there, that place flooded every time it come a big rain there. I mean, I got pictures of me standing on my back porch with it halfway up to my knees.

MS. MINSK: Yes, ma'am. I suppose it is possible, I can't say with any certainty, but it's possible in years past, before that pond existed, that some of the -- some of the surface water that might -- or some of the water on the surface at that location might have been a discharge of groundwater. Fortunately, those concentrations are very low at

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that point by the time they discharge from groundwater to surface water, and the dilution with other existing surface water would have made those concentrations very small.

MR. THOMPSON: I know a family that lived back there, and it got so bad, they went to the city but the city ignored it. And we just have to live with it.

MR. BERRESFORD: The flooding aspect, is that what you're -- I was just wondering --

MS. MINSK: Yeah, um-hm. Are you guys from the city?

MR. MOORE: Yes. I'm sitting here listening to all this.

MS. MINSK: Talk to them.

MS. VINCENT: And he has been waiting to ask a question.

MR. MOORE: Carol, I'm Steve Moore. I'm city storm water manager who you all are pointing your fingers at. The one thing I've had a question about is the interface between the groundwater and the discharge points into surface water. What is the highest PPB concentration you've seen?

MS. MINSK: What's the highest concentration in that area?

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MR. MOORE: Yeah.

MS. MINSK: Let me see if I have a map. It was pretty low. It was above --

MR. MOORE: Are we talking about 80 10 or we talking 20, 30, what?

MS. MINSK: I think the highest -- this was from 2007. And I want to think the highest concentration -- I got maps of everything here. I might not have it up here.

MR. MOORE: Is that the only place you've seen concentrations is that one retention pond?

MS. MINSK: Yeah. Pull that other map up, Lucas, of the surface water. Yeah. See, between the two yellow squares, between those two points was where there were concentrations that were detectable of TCE or vinyl chloride or Cis-1,2, that should be dichlorethene.

MR. MOORE: Were they below four points?

MS. MINSK: No, between the two red arrows, we actually had concentrations that exceeded drinking water standards but they were still quite low. And I can -- there's a report I can look at that's over here and I can tell you exactly how much, and there is a map I can show you exactly the highest concentration, but those concentrations,

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though above drinking water standards, were still very minimal.

There's been a risk assessment done, and even prior to that, a risk assessment being completed that went along with the feasibility study. I had a risk assessor at the department take a look at some of the numbers from the surface water and tell me, because I wanted to know before we got to that risk assessment phase, if there was a concern with children that might possibly play in that surface water, though that is not a very ideal place to play in surface water because it's fenced off and it's got riprap in it, but I had a risk assessor look at that data.

And she assumed some very conservative figures for how many days and how young the children were and the highest -- and she took the highest concentration, and her results indicated that there was not a health risk in the surface water for swimming. I told her to consider wading, and she went with swimming, which is even more conservative. So it was low concentrations but somewhat above drinking water standards.

MR. MOORE: The other question I had, when the remediation begins, how many injection wells do

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you anticipate in the plume area?

MS. MINSK: If I can remember specifically from the FS, there was an estimate of how many there would be. That isn't necessarily what will end up in the remedial design but it was a pretty good estimate. There were five rows of injections, and I want to think each row of injection was five to six wells, so let's say it was five, so five times five is 25 injection wells. And I do have the FS with me. I could show you that very specifically, if you don't want to count on my unreliable memory.

MS. VINCENT: We have a question over here.

MS. TARTE: I'm Linda Tarte again and I wanted to get back with what Mr. Clemmons said and I wanted to bring a point to public knowledge. But I'm 64, and I'm not in the plume area at all, and what you've got here is you've got people entering into retirement and maybe their plans were to sell their homes but now because of the pollution, they can't get as much money for their homes as they normally was, they would have. And that affects their nest egg.

MS. MINSK: Yeah.

MS. TARTE: And I think it's sad that because AVX did this, now they have got to suffer,

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because most people like me would be contemplating selling the home, going to something smaller, taking part of the nest egg and investing.

MS. MINSK: Right.

MS. TARTE: And I just wanted to get back to what Alan Clemmons said.

MS. MINSK: Sure, and I can empathize with what you're saying, absolutely. Anybody that owns a home can empathize with what you're saying. We would all be devastated if we saw our property values decrease because of something like this, but hopefully, because we are moving forward just as quickly as we can with remediation off site, hopefully that will help to resolve that and resolve that stigma that's attached with the homes and eventually lead to the point that that doesn't exist anymore.

MS. TARTE: Well, 64 and 15 is 79, and somebody like me won't have to get that investment back.

MS. MINSK: Yeah, but I think once you see that something is actively taking place, and there's proof that it's effective and that it's working in a very timely manner. And again, like I said, when the remediation first begins, there'll be -- there

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should be a dramatic drop in concentrations. It's those -- at any site, it's those last lingering amounts of contamination that tend to hang on for a long time. So probably after they began remediation, there'll be a massive reduction in concentrations but then there will be a time period where it takes a while to get rid of that last bit to below drinking water standards.

MS. TARTE: Just a point I wanted to raise.

MS. MINSK: And I hear you, and I wish I could do something about that but I'm not capable of changing that.

MS. VINCENT: We have a question here.

MS. CRELLIN: I was just going to recommend that the city work with the state on this remediation so that you keep informed on a regular basis and so that he's not sitting here asking you questions because this is the city that's been affected, and we've been affected already for decades, and I think it's very important that the city and the state work together in making this the best process possible.

MR. MOORE: And I think we have --

MS. MINSK: And will continue to do so.

MR. CLEMMONS: Thank you. Alan Clemmons

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again. A follow-up question on a question that was brought up just one second ago. The remediation wells, are those forecast to be placed on private property or public property? And if on private property, how is that process going to work?

MS. MINSK: Okay. A good portion of the injection wells would be placed on this Horry Land Company property. Because we don't have a complete design at this point, I can't tell you if any of the rows of injection wells would be beyond that. There was a projection of where those possible injection lines would be in that FS report, but they weren't the final design.

But certainly, if any injection points were to be put on private property, there would have to be permission to go on that property. We can't, you know, request -- we can't require a property owner to have a well on their property without permission. So I think there would be an effort to see if it were possible to design the system without interfering with anyone's property. And if not, then a request would be made to go on that property. If it were denied, then the system design would be changed to accommodate their desire to not have injection wells on their property so there wouldn't

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be a concern. No one would have any wells forced on them.

MR. CLEMMONS: So there may be a negotiation process there if that were the case.

MS. MINSK: That's possible when we get to design.

MR. CLEMMONS: Thank you.

MR. STEWART: I'd just like to add that the gaining of access, obtaining access would be performed by AVX and/or their consultant initially, and if they had trouble getting access, then at that point the state may have to step in and assist in that process, but initially it would be AVX and their consultant.

MS. CRELLIN: Last question. My understanding is AVX has only been fined $7,000 for all of this. Are you aware of there being fines for anything else by any federal, state or local agency?

MS. MINSK: Not to my knowledge.

MS. DUPRCEE: One more question. If they notified DHEC in 1993, why has it took this long for you to get the ball rolling?

MS. MINSK: Okay. It wasn't '93. Lucas, go back to -- oh, I have my history slide here. Okay. Notification was --

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MS. DUPRCEE: '95.

MS. MINSK: Yes, ma'am, in '95, and since that point, from '95 to 2006, there were a series of quite a few investigations on the AVX property itself. Numerous wells were installed. The pumping well that I discussed earlier was already in place prior to the department's knowledge of contamination. And once the department became aware of the contamination, that system was upgraded and made even more efficient, so that was part of the action that occurred under the consent order from '96. So there was a lot of activity from '96 to 2006. What happened in 2006 is we became aware of the offsite contamination.

MS. VINCENT: Any other questions? Okay. None.

MS. MINSK: If there's no more questions, and if you think of questions later, feel free to call me.

MS. VINCENT: And we thank you for coming today.

MS. MINSK: Thank you very much for attending.

(This public meeting was concluded at 7:40 p.m.)

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(**Certificate accompanies sealed original only.)

APPENDIX B

There were three comment letters received by the Department during the public comment period on the Proposed Plan. Those letters are contained within this Appendix along with the Department's official responses to the letters.

There were a number of questions during the November 1, 2011 public meeting conducted to present the Proposed Plan. Those questions were answered in full during that meeting and may be viewed in Appendix A within the transcript of the Public Meeting.

Summary of Letters:

1. Thompson & Henry, P.A.(J. Jackson Thomas) to Carol C. Minsk dated November 2, 2011
2. R. Crellin to Carol Minsk dated November 27, 2011
3. ARCADIS (Mark Hanish) to Carol C. Minsk dated December 1, 2011

51602

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November 2, 2011

Carol C. Minsk, Project Manager
Division of Hydrology
Bureau of Land and Waste Management
Dept. Of Health and Environmental Control
2600 Bull Street
Columbia, SC 29201

RE: John H. Nance, et al. vs. AVX Corporation
Civil Action No: 2008-CP-26-0436

Dear Ms. Minsk:

Saunders Bridges and I represent Plaintiffs in the above-entitled action. In connection with that representation I attended the November 1st public meeting held at the Lakewood Elementary School in Horry County. I have a question regarding the institutional controls (deed notifications/restrictions) called for under alternatives OGW-3A and OGW-3B. I'm interested to know the substance of the restrictions and what activity the proposed restrictions would restrict. I presume the restrictions would limit subsurface activity such as irrigation wells but I'm not clear whether there may be limitations on other subsurface activities such as the driving of pilings or excavations of any nature (such as for swimming pools).

Can you provide me either with a rough idea of what the restrictions would entail. I presume there have been other instances in which this approach was used and perhaps a copy of those previously used restrictions would provide information we are looking for.

Thank you for your assistance.

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Very Truly Yours,

THOMPSON & HENRY, P.A.

J. JACKSON THOMAS

JJT/tmm

cc: Saunders M. Bridges, Jr., Esquire
Charles B. Jordan, Jr., Esquire
Kevin A. Dunlap, Esquire
Max E. Justice, Esquire

51602

D H E C
PROMOTE PROTECT PROSPER

C. Earl Hunter, Commissioner

Promoting and protecting the health of the public and the environment.

January 25, 2012

Mr. J. Jackson Thomas, Esquire
Thompson & Henry, P.A.
Post Office Box 1290
Myrtle Beach, South Carolina 29578

Re: Letter dated November 2, 2011 regarding AVX Corporation (Myrtle Beach)

Dear Mr. Thomas:

This letter is a response to your November 2, 2011 letter to the Department. Your letter requested a clarification of the institutional controls (deed notifications/restrictions) component, of the groundwater alternatives, as presented in the Department's Proposed Plan (Plan) for Site Remediation of the AVX Myrtle Beach Site/Operable Unit 2 dated October 2011. Institutional controls were proposed for inclusion in three of the four groundwater alternatives presented in the Plan (OGW-2, OGW-3a and OGW-3b).

It is important to note that the alternatives as presented in the Proposed Plan are not final at this time. The Department will consider input from the community regarding the Proposed Plan before the choice of a final remedy is selected. Therefore, it is possible that institutional controls could be eliminated from the alternatives before the final Record of Decision (ROD) is written.

However, to answer your question, should the final remedy retain the implementation of institutional controls, only AVX would be required to place deed notifications and restrictions on land that was owned by the corporation within Operable Unit 2. Residents, in locations deemed to be located above the plume of contaminated groundwater, might be requested to also place a notification on their property deed but they would not be required to do so. The deed notification/restriction would state that the property has been determined to be located above groundwater known to be contaminated with volatile organic chemicals (VOCs) exceeding drinking water standards. Therefore, no wells should be installed on that property and the groundwater should not be consumed for drinking purposes.

If you have any questions feel free to contact me at (803) 896-4032.

Sincerely,

Carol C. Minsk

Carol C. Minsk
State Remediation Section
Division of Site Assessment, Remediation and Revitalization
Bureau of Land and Waste Management

cc: Lucas Berresford, BLWM
Gary Stewart, BLWM
File # 51602

51602

Carol Minsk, Project Manager
DHEC-L&WM
2600 Bull St.
Columbia, SC 29201

November 27, 2011

Dear Ms. Minsk,

These comments are in response to your Proposed Plan cleanup of groundwater and surface water contaminated with toxic chemicals in areas surrounding AVX Corporation in Myrtle Beach, SC. In addition to the record provided by the South Carolina Department of Health and Environment (SCDHEC) in this proceeding, relevant information about the timing and type of contamination in this area from AVX can be found in the federal court case AVX Corp. v. Horry Land Company. This contamination that has existed for decades has resulted in a trichloroethylene (TCE) groundwater plume that has also entered the surface water, soil, and potentially through vapor intrusion, buildings in the area. This presents a tragedy for the residents of the City of Myrtle Beach.

According to federal court records and Sun News articles, during the past several decades at times AVX has discharged TCE and other toxic chemicals into the stream that runs through the adjacent community and into the soil and groundwater under and adjacent to its facility. The extent of the TCE plume has not been delineated and the boundaries of the contamination are unclear. The community surrounding AVX has essentially served as an externality or collateral damage to AVX's manufacturing and business activities. There has been no clean up, no compensation, no assistance from AVX to the surrounding community residents. Neither has any government agency provided any assistance. Losses sustained by residents have been their own to bear.

Initially, a supplement to SCDHEC's Proposed Plan that was not evaluated by AVX and SCDHEC is proposed here. It is recommended that given the enormity of the clean up required to eliminate the toxic elements in the groundwater, surface water, soil, and air in this community in Myrtle Beach, and the 15 year time frame proposed for clean up, AVX should offer to purchase homes affected by the contamination (within 1000 feet of a high reading – 4 times normal standards). Offers for purchase should be based on current appraised value and appraised value existing at the time the contamination was disclosed, that is 2006. Those residents desiring to accept AVX's offer of purchase should be paid by AVX the appraised value of their residence in 2006. Those choosing to remain in their homes despite clean up activities should be paid by AVX an amount equal to the difference between the 2006 appraised value and the current appraised value of their homes. Given the hundreds of millions of dollars AVX has earned during the decades its activities have resulted in contamination of the surrounding Myrtle Beach area, this proposal seems fair and reasonable. AVX could proceed with subsequent clean up work as proposed by SCDHEC with fewer residents to be affected.

If this supplement recommended above is not accepted, then the SCDHEC's "Planned Proposal for AVX Site Remediation – Operable Unit 2" clean up proposal will at least

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begin the clean up process that should have begun decades ago. Of greatest importance is that SCDHEC very closely monitor the clean up work and that residents be protected from any adverse results. For example, since thousands of gallons of water will be pumped into the groundwater near the community, care should be taken to ensure that there is no flooding in the area, particularly in the stormwater pond. Assessment should be made of the soil in the streams and the stormwater pond to ensure that TCE and other toxic chemicals have not settled into the sediment. The flow of any water from the clean up to the ocean should be monitored to deter any danger to ocean life and wetlands.

Moreover, since TCE degrades to vinyl chloride and methane, care should be taken not to affect residents particularly children and elderly residents. AVX is proposing to demolish some of its old buildings and build new ones on its site; care should be taken regarding further movement of the TCE plume and other toxins currently on its site. The adverse effects of ground-level ozone in the area surrounding AVX and within the surrounding community should be closely monitored given the presence of toxic volatile organic compounds and their reaction with sunshine. Any areas that can be a danger to residents in the community should be clearly announced and delineated for residents.

Finally, taking no action to remove the contamination from the community surrounding AVX would be substantially detrimental to the residents and the Myrtle Beach community and compound the damage done to date.

R. Crellin
717 11th Ave. South
Myrtle Beach, SC 29577

51602

D H E C

PROMOTE PROTECT PROSPER

C. Earl Hunter, Commissioner

Promoting and protecting the health of the public and the environment.

February 15, 2012

Ms. R. Crellin
717 11th Ave. South
Myrtle Beach, SC 29577

Ms. Crellin,

This letter is in response to your letter submitted to the Department dated November 27, 2011 regarding the Department's Proposed Plan (Plan) for clean up of the AVX/Myrtle Beach Site. The Department appreciates your taking the time to review the Plan and provide your input.

In an effort to best respond to your review of the Plan, each of your points of concern was extracted from your letter and addressed separately. If any issues were not addressed, please feel free to contact the Department for further elaboration.

1. *(Paragraph #2) The extent of the TCE plume has not been delineated and the boundaries of the contamination are unclear.*

The Department does believe that the extent of groundwater contamination migrating from the AVX facility has been well delineated. Based on the data from greater than seventy-five (75) temporary groundwater sample locations and a monitoring well network consisting of fifteen (15) permanent wells, a good understanding of the extent of the off-property TCE groundwater plume has been established. The existing well network will continue to be sampled on a routine basis and new observation wells will be installed during the process of remediation.

2. *(Paragraph #2) AVX, nor any government agency, has provided residents with a clean up or provided assistance/compensation for losses sustained by residents from groundwater or surface water contamination.*

The Department, with the cooperation of AVX, is working toward a final clean up plan for the groundwater and surface water contamination migrating into the neighborhood near the AVX facility. Providing compensation, or requiring AVX to provide

compensation, to residents for any perceived reduction in property values is beyond the scope of the Department's authority.

3. *(Paragraph #3) Proposal of a supplement to the Plan that would require AVX to purchase homes affected by contamination that has migrated from the AVX facility.*

The Department does not have the regulatory authority to require AVX to purchase residents property. Fortunately, information and data collected during the Remedial Investigation have shown that residents are not exposed to contaminated media from the AVX facility. The possible pathways for exposure to residents from contamination that were examined included groundwater, surface water and vapor intrusion of volatile organic compounds from the groundwater plume. Remediation of contaminated groundwater and surface water from the AVX facility will be conducted, however, residents are not exposed to contaminated groundwater and surface and therefore are not at risk by remaining in their homes.

4. *(Paragraph #4) SCDHEC should very closely monitor the clean up work and residents should be protected from any adverse results.*

The Department's top priority will be to protect residents from any adverse results from the remediation process. All proposed and completed activities related to the investigation and/or clean up of contamination associated with the AVX/Myrtle Beach site will be reviewed by the Department. Additionally, the Department will make efforts to keep the public updated on progress of the remediation and always be available to answer questions and concerns regarding the clean-up activities.

5. *(Paragraph #4) Assessment should be made of the sediment in the streams and storm water pond for the presence of TCE. Additionally, surface water should be monitored.*

Multiple rounds of surface water samples have been collected from the surface water bodies that flow down gradient of the AVX facility. The only portion of the surface water sampled that had any detections of site-related contamination were at the end of the groundwater plume. The presence of site-related contamination in surface water at the end of the groundwater plume is due to the discharge of groundwater to surface water at this location. There is no valid reason to believe that TCE exists in sediment in the stream or storm water pond. Additionally, as you suggest, surface water will be routinely monitored as part of the remedial alternative selected.

6. *(Paragraph #5) Since TCE degrades to vinyl chloride and methane, care should be taken not to affect residents (particularly children and elderly).*

The Department's preferred remedial alternative for groundwater does include routine methane gas monitoring and routine groundwater sampling. The groundwater sampling would include a complete list of VOC's

7. *(Paragraph #5) AVX is proposing to demolish some of its old buildings and build new ones on its site; care should be taken regarding further movement of the TCE plume and other toxins currently on its site.*

AVX has already removed two buildings, and has plans to remove more of the buildings, from the Myrtle Beach facility location. It is the Department's understanding that there are no plans to construct new buildings on this site. The only new construction, on property owned by AVX in this location, is the building constructed to house the equipment used in the pilot testing of the enhanced reductive dechlorination system. This same building will ultimately be used to house the equipment needed for the full groundwater remediation system.

As buildings are removed from the AVX site work plans have been, and will continue to be, submitted to the Department for approval. The work plans detail the process that will be followed in screening and sampling soils beneath the buildings upon removal. The Department receives reports of all data collected and actively stays involved determining if additional source areas are found once soils beneath the buildings become accessible.

8. *(Paragraph #5) The adverse effects of ground-level ozone in the area surrounding AVX and within the surrounding community should be closely monitored given the presence of toxic volatile organic compounds and their reaction with sunshine.*

The Department does not expect that ground level ozone (smog) will be a concern associated with this site. However, methane is the most likely volatile gas to be present at the ground surface in association with this remedial process and there is already an inclusion in the proposed remedy to monitor methane production. Ground level ozone is created by a chemical reaction between volatile organic compounds, oxides of nitrogen (NOx) and sunlight. The proposed remedial alternative of enhanced reductive dechlorination will not create a NOx source and the levels of methane gas generated should be minimal.

9. *(Paragraph #6) Taking no action to remove the contamination from the community surrounding AVX would be substantially detrimental to the residents and the Myrtle Beach community.*

The Department agrees. Active remedies are proposed for groundwater and surface water.

If you have any questions please feel free to contact me. My office number is (803) 896-4032 or you can email me at Minskcc@dhec.sc.gov.

Sincerely,

Carol C. Minsk, Project Manager
State Remediation Section
Division of Site Assessment, Remediation and Revitalization
Bureau of Land and Waste Management

cc: Lucas Berresford, BLWM
Gary Stewart, BLWM
Larry Ragsdale, Region 6 EQC
File: # 51602

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South Carolina Department of Health and Environmental Control
2600 Bull Street
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Date:
December 1, 2011

Contact:
Mark B. Hanish

Phone:
724.742.9180 ext 518

Email:
mark.hanish@
arcadis-us.com

Our ref:
B0007394.0000

Subject:
Comments to SCHEC's October 2011 Proposed Plan for Site Remediation
AVX – Myrtle Beach Site/Operable Unit 2
AVX Corporation, Myrtle Beach Facility
801 17th Avenue South
Horry County, Myrtle Beach, South Carolina
SCD 062 690 557

Dear Ms. Minsk:

On behalf of AVX Corporation (AVX), ARCADIS respectfully submits the following comments to the South Carolina Department of Health and Environmental Control's (SCDHEC) October 2011 *Proposed Plan for Site Remediation, AVX – Myrtle Beach Site/Operable Unit 2* (Proposed Plan). Overall, we agree with the Proposed Plan but believe it is also important to provide a few clarifications for the Administrative Record. Our comments are numbered below.

1. **Sources: Page 2,** Second Column – AVX agrees with the SCDHEC that, to date, no sources of volatile organic compounds (VOCs) have been identified in Operable Unit-2 (OU-2), which is depicted on the attached figure in the Proposed Plan. It should be noted that there are also other documented upgradient sources of VOCs, located west of 17th Avenue South, which could impact downgradient properties. In addition, other suspected sources of VOCs in groundwater are also present that are unrelated to AVX activities and are outside of OU-2 which is depicted in the Proposed Plan. One of those suspected sources is the former dry cleaner on the corner of 8th Avenue South and Kings Highway.

2. **Summary of Site Risks:** Page 3, First Column, First Paragraph – As outlined in the February 2011 *Human Health Risk Assessment for Operable Unit 2* (HHRA), approved by the SCDHEC on July 19, 2011, the VOCs in groundwater do not pose an unacceptable risk because there is no known potable use of groundwater in the area. In addition, we understand that local ordinances have been enacted to disallow the discharge of groundwater into the sanitary sewer system.

3. **Remedial Action Objectives: Page 3, First Column, First Bullet** – A stated remedial action objective in the Proposed Plan is "Restore groundwater aquifer by reducing the concentrations of constituents of concern (COCs) in groundwater to below the Federal Maximum Contaminant Levels (MCLs) for drinking water". It is our understanding that achieving the MCLs will meet the SCDHEC's regulatory requirements.

4. **Remedial Action Objectives: Page 3, First Column, Second Bullet** – A stated remedial action objective presented in the Proposed Plan is "Mitigate the concentrations of COCs in surface water to below the SCDHEC Water Standards for Surface Water and/or the United States Environmental Protection Agency (USEPA) Regional Screening Level (RSL) for tap water." It is our understanding that the USEPA RSL for tap water only applies if the SCDHEC does not have a surface water quality standard for a particular COC.

5. **Active Remediation – Enhanced Anaerobic Bioremediation Alternative OGW-3b:** Page 8, First Column, Second Paragraph – The SCDHEC states that "access to contaminated groundwater would be limited through deed notifications/restrictions and irrigation well abandonment". It should be noted that AVX will implement restrictions on the HLC property but that restrictions on other properties outside of AVX's direct control will be sought by AVX although the restrictions on these properties are strictly voluntary.

6. **Active Remediation – Enhanced Anaerobic Bioremediation Alternative OGW-3b:** Page 8, First Column, Fourth Paragraph - The remediation process proposed will not put the properties or residents at risk. Monitoring of the process, including degradation of the VOCs over time and assessment of methane generation will be integral to the remedial action program. Due to the rapid decay of the injected carbohydrate substrate (molasses) and the subsequent rapid dissipation of methane generated following termination of

injections, it is unlikely that methane monitoring will be necessary for longer than a year following the final injection event.

It should be noted that no unacceptable risks to current owners or residents are indicated in the SCDHEC-approved HHRA.

7. **Active Remediation – Enhanced Anaerobic Bioremediation Alternative OGW-3b:** Page 8, First Column, Fifth Paragraph - The SCDHEC states that "this alternative provides the most protection of human health and the environment, and reduces the concentrations of COCs in groundwater in a timely manner." Remediation to MCLs is planned for any affected properties within OU-2 (i.e., those properties within the OU-2 area, depicted in figure attached to the Proposed Plan, for which groundwater may have VOC concentrations above the MCLs) and will be performed in the timeframe outlined in the Proposed Plan. It should be noted that groundwater beneath some properties will be remediated faster than beneath other properties based on the proximity of those properties to the location of the injection wells. In addition, areas with initially lower concentrations of VOCs, along the perimeter of impact, will also tend to be remediated in a shorter time than areas closer to the center of VOC impact. It should also be noted that should the proposed remedy lag with respect to the expected speed of cleanup, then refinements to the remedial system could be implemented that could further accelerate the remediation effect. In addition, although MCLs are the stated objective, given sufficient time, concentrations of VOCs are expected to continue to decrease to below detection limits.

Thank you for your consideration of our clarifications. If you have any questions, please do not hesitate to call me at 724.742.9180, ext. 518.

Sincerely,

ARCADIS

Mark B. Hanish
Project Manager

Copies:
Mr. Larry Ragsdale, South Carolina Department of Health and Environmental Control
Mr. Larry Blue, AVX Corporation
Mr. Evan Slavitt, AVX Corporation
Mr. John Sarvis, AVX Corporation
Mr. Max E. Justice, Parker Poe
Mr. Brad DeVore, Womble Carlyle Sandridge & Rice
Mr. William B. Popham, ARCADIS
Mr. Jeff Beckner, ARCADIS

D H E C
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Catherine B. Templeton, Director
Promoting and protecting the health of the public and the environment

May 30, 2012

Mr. Mark B. Hanish, Project Manager
ARCADIS U.S. Inc.
One Adams Place
310 Seven Fields Blvd., Suite 210
Seven Fields, PA 16046

Re: Comments to SCDHEC's October 2011 Proposed Plan for Site Remediation AVX – Myrtle Beach Site/Operable Unit 2
AVX Corporation
SCD 062 690 557
Horry County

Dear Mr. Hanish:

The referenced document has been reviewed. A response to each comment provided to the Department regarding the Proposed Plan is provided below.

Comment #1- Regarding Sources Areas for Groundwater Contamination within OU-2: The addition of a discussion of possible source areas outside of OU-2, for which there is no direct evidence that these areas have contributed to the groundwater contamination within OU-2, does not seem relevant to the Proposed Plan.

Comment # 2- Summary of Site Risks: The Proposed Plan does state that the affected aquifer within OU-2 is a potential underground drinking water source. That reference is made due to the fact that the State of South Carolina Water Classifications and Standards (R.61-68) does consider all ground waters of the State to be Class GB (underground sources of drinking water) unless classified otherwise. The Proposed Plan also states that a public water system is available in the area and that residents do seem to use that system as a drinking water source. The Department agrees that there is currently no known potable use of groundwater in the area and therefore no unacceptable risk due to ingestion of groundwater. However, because the aquifer beneath OU-2 is considered to be a potential source of drinking water, the possible future use of the aquifer must be considered.

Comment # 3 and #4- Remedial Action Objectives: The Proposed Plan's statement of the remedial action objectives (RAOs) is consistent with the RAOs as defined in the Feasibility Study Operable Unit 2 report dated February 2011 (page 18).

Comment # 5- Active Remediation – Enhanced Anaerobic Bioremediation Alternative OGW-3b: The Department agrees with this comment.

Comment # 6-Active Remediation - Enhanced Anaerobic Bioremediation Alternative OGW-3b: A clarification on the estimated length of time that methane monitoring will be necessary with the implementation of groundwater alternative OGW-3b is appreciated.

Comment # 7-Active Remediation – Enhanced Anaerobic Bioremediation Alternative OGW-3b: This clarification is noted.

If you have any questions feel free to contact me at (803) 896-4032.

Sincerely,

Carol C. Minsk
State Remediation Section
Division of Site Assessment, Remediation and Revitalization
Bureau of Land and Waste Management

cc: Larry Blue, AVX
Gary Stewart, BLWM
File # 51602
Larry Ragsdale, Director, EQC Region 6