RECORD OF DECISION

SAN GERMAN GROUNDWATER CONTAMINATION SUPERFUND SITE
SAN GERMAN, PUERTO RICO
OU-1

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 2

December 2015

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

San German Groundwater Contamination Superfund Site
OU-1 Source Control
San German, Puerto Rico
PRN000205957

STATEMENT OF BASIS AND PURPOSE

This Record of Decision (ROD) documents the selected remedial action for the Operable Unit 1 (OU-1) at the San German Groundwater Contamination Superfund Site (Site), located at the Municipality of San German, Puerto Rico, which is chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), 42 U.S.C. § 9601-9675, as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Part 300.

The United States Environmental Protection Agency (EPA) expects to address the conditions at the Site through two separate operable units, OU-1 and OU-2, and thus two remedial actions, to address soil and groundwater contamination at the Site. OU-1 addresses soil contamination that acts as a continuing source of groundwater contamination, including soil in the vadose zone (above the water table) and soil and highly contaminated groundwater below the water table in the shallow saprolite zone (soils and highly weathered rock). The OU-1 areas also act as a source of vapors that can enter into buildings in the vicinity of the Retiro Industrial Park. By addressing these source areas first, EPA expects to begin to reduce the mass of contamination in the ground, thereby accelerating the overall groundwater cleanup. EPA intends to subsequently, in OU-2, address the Site-wide groundwater contamination as a second phase of the cleanup.

This decision document explains the factual and legal basis for selecting the remedy for OU-1 at the Site. This decision is based on the Administrative Record file for this remedy. Refer to Appendix II of Part II – Decision Summary for copy of the Administrative Record Index. The Puerto Rico Environmental Quality Board (EQB) concurs with the selected remedy. Refer to Appendix X of Part II – Decision Summary for copy of the concurrence letter.

ASSESSMENT OF SITE

EPA, in consultation with EQB, has determined that actual or threatened releases of hazardous substances from the Site, if not addressed by the selected remedy, may present a current or potential threat to human health and the environment. This determination is based on the conclusions of the Remedial Investigation (RI), Human Health Risk Assessment, and the Screening Level Ecological Risk Assessment. The media of concern at the Site are soil and groundwater. The sources of soil contamination in the southern area of the Site are on two properties, identified as “Wallace” and “CCL” in the Decision Summary, that are within the Retiro Industrial Park owned by Puerto Rico Industrial Development Company.

Based on the results of EPA’s RI, the groundwater contamination originates at the properties currently occupied by Wallace and CCL. Based on the results of the human health and ecological risk assessments conducted for the Site, a response action is necessary to protect the public health or welfare of the environment. The selected remedy complies with federal and Commonwealth levels and standards of control that are legally applicable or relevant and appropriate requirements and is cost effective.

DESCRIPTION OF THE SELECTED REMEDY

EPA, in consultation with EQB, selects a remedy that will address the soil and a portion of the groundwater contamination detected at the Site. Under the selected remedy, soil contamination will be addressed at the Wallace and CCL properties by using soil vapor extraction (SVE) and dual-phase extraction (DPE)/*in-situ* treatment. Soil contamination within the vadose zone and soil and groundwater within the shallow saprolite zone will be addressed by implementing the selected remedy to remove volatile organic compounds (VOCs), coupled with long-term monitoring. The principal components of the selected remedy include the following:

- SVE to address soil (vadose zone) source areas at the Wallace and CCL lots;
- Impermeable cover as necessary for the implementation of SVE;
- DPE in the shallow saprolite zone; and
- *In-situ* treatment, such as enhanced anaerobic biodegradation, as needed to address residual sources.

INSTITUTIONAL CONTROLS

For as long as soil and groundwater contamination is still present at the Site, institutional controls are recommended to be implemented to help control and limit exposure to hazardous substances at the Site. Examples of the types of institutional controls that can be employed for the soil and groundwater at the Site are as follows: (1) existing local laws that limit installation of drinking water wells without a permit; (2) proprietary controls (e.g., easements/covenants) on all or parts of the Wallace and CCL properties to prevent soil excavation, well installation, or disturbance of the caps or other remedial measures; (3) informational devices such as advisories published in newspapers, periodic letters sent to local government authorities informing them of the need to prevent soil excavation and well installation; and (4) inspection of local and/or Commonwealth health department records to prevent wells from being installed that could impact the groundwater plume or result in exposure to contaminated groundwater.

EPA REGION 2 CLEAN AND GREEN POLICY

The environmental benefits of the preferred remedy may be enhanced by giving consideration, during the design, to technologies and practices that are sustainable in accordance with EPA Region 2 Clean and Green Energy Policy. This will include consideration of green remediation technologies and practices. Some examples of practices that would be applicable are those that reduce emissions of air pollutants, minimize fresh water consumption, incorporate native vegetation into revegetation plans, and evaluate beneficial reuse and/or recycling of materials, among others.

DECLARATION OF STATUTORY DETERMINATIONS

STATUTORY REQUIREMENTS

The selected remedy meets the requirements for remedial actions set forth in CERCLA Section 121, 42 U.S.C. Section 9621, because it meets the following requirements: (1) it is protective of human health and the environment; (2) it meets a level of standard of control of the hazardous substances, pollutants, and contaminants that at least attains the legally applicable or relevant and appropriate requirements under the federal and State laws; (3) it is cost-effective; and (4) it utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

Statutory Preference for Treatment

The selected remedy meets the statutory preference for the use of remedies that involve treatment as a principal element.

Five-Year Review Requirements

For soils, this remedy will not result in hazardous substances, pollutants, or contaminants remaining at the Site above levels that would allow for unlimited use and unrestricted exposure; however, because it may require more than five years to implement the remedy, EPA expects to conduct five-year reviews for OU-1 until the remedial action objectives are achieved within the vadose zone soils. The OU-1 remedy addresses the most highly contaminated portion of the groundwater plume, and it is anticipated that the OU-2 remedy will address the remainder of the groundwater plume. Therefore, the need for a five-year reviews for groundwater will be reassessed in OU-2.

ROD DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary section of this ROD. Additional information can be found in the Administrative Record file located in the information repository.

- Contaminants of concern and their respective concentrations may be found in the "Site Characteristics" section.
- Potential adverse effects associated with exposure to Site contaminants may be found in the "Summary of Site Risks" section.
- A discussion of cleanup levels for chemicals of concern may be found in the "Remedial Action Objectives" section.
- A discussion of principal threat waste is contained in the "Principal Threat Waste" section.
- Current and reasonably-anticipated future land and groundwater use assumptions are discussed in the "Current and Potential Future Land and Groundwater Uses" section.
- Estimated capital, annual operation and maintenance, and total present worth costs are discussed in the "Description of Alternatives" section.
- Key factors that led to selecting the remedies (i.e., how the Selected Remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, highlighting criteria key to the decisions) may be found in the "Comparative Analysis of Alternatives" and "Statutory Determinations" sections.

AUTHORIZING SIGNATURE

Walter E. Mugdan, Director
Emergency and Remedial Response Division
EPA - Region 2

December 11, 2015
Date

DECISION SUMMARY

SAN GERMAN GROUNDWATER CONTAMINATION SUPERFUND SITE
OU-1 SOURCE CONTROL

SAN GERMAN, PUERTO RICO

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 2

DECEMBER 2015

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SITE NAME, LOCATION, AND DESCRIPTION

The San German Groundwater Contamination Superfund Site (Site) is located in San German, in southwestern Puerto Rico as shown in Figure 1 of Appendix VIII of this document. Volatile organic compounds (VOCs) were detected above federal maximum contaminant levels (MCLs) in three public water supply wells, Retiro, Lola Rodriguez de Tio I (Lola I), and Lola Rodriguez de Tio II (Lola II), located south of Guanajibo River, between Routes 139 and 360 (Figure 2 of Appendix VIII). These wells were associated with the Puerto Rico Aqueduct and Sewer Authority (PRASA) San German Urbano Water system, which includes a total of seven wells and two surface water intakes.

The Retiro, Lola I, and Lola II wells acted as an independent, interconnected supply system with approximately 800 service connections serving approximately 2,280 users in 2005. The Retiro well was located near the intersection of Route 122/Angel Castro Avenue and Guanajibo River, along the east side of a narrow, unnamed dirt road that leads to the riverbank. The Retiro well was destroyed when a new bridge was constructed across the Guanajibo River. Lola I is located near an entrance to the Lola Rodriguez de Tio public school. Lola II is located approximately 550 feet west-northwest of the Retiro well, south of Guanajibo River, on the south side of an unnamed dirt road adjacent to the river. According to PRASA, the individual mean output for each well in 2005 was approximately 398,000 gallons per day (gpd) from Retiro, 185,000 gpd from Lola I, and 170,000 gpd from Lola II.

The Site includes an industrial park owned by the Puerto Rico Industrial Development Company known as the Retiro Industrial Park, located approximately one-half mile to the southeast of the affected supply wells. Two lots within the Industrial Park have been determined to be the sources of the VOC contamination. Several of the buildings in the Industrial Park are occupied by active businesses that were investigated during the Remedial Investigation (RI).

The Site has been divided in two operable units (OUs). OU-1 addresses identified soil contamination that acts as a continuing source of groundwater contamination, including soil in the vadose zone (above the water table) and soil and highly contaminated groundwater below the water table in the shallow saprolite zone (soils and highly weathered rock). OU-2 will address the Site-wide groundwater contamination, which will be addressed in a second phase of the cleanup. This Record of Decision (ROD) addresses the selected remedy for OU-1.

SITE HISTORY AND ENFORCEMENT ACTIVITIES

From 2001 to 2005, groundwater samples collected quarterly from the Retiro, Lola I, and Lola II wells regularly exhibited detectable concentrations of tetrachloroethene (PCE) and *cis*-1,2-dichloroethene (*cis*-1,2-DCE). The maximum concentrations of PCE and *cis*-1,2-DCE detected in these wells during this period were 6.4 micrograms per liter (μg/L) and 1.2 μg/L, respectively.

The Puerto Rico Department of Health (PRDOH) ordered PRASA to close the Retiro public drinking water supply well in January 2006 because of the presence of VOC contamination in the groundwater. PCE concentrations exceeded the federal MCL of 5 μg/L. PCE was also detected in tap water samples collected from the water distribution system. PRASA responded to this order by taking the Retiro well out of service on January 19, 2006. The Lola I and Lola II wells were taken out of service in about the same time period because of exceedances in levels in those wells, too.

EPA added the Site to the National Priorities List (NPL) on March 19, 2008. The RI and Feasibility Study (FS) for the Site have been funded by EPA.

EPA POTENTIAL SOURCE AREA INVESTIGATION

In June 2006, EPA collected groundwater samples from operational wells and analyzed for target compound list (TCL) and target analyte list (TAL) contaminants, confirming the presence of PCE (1.6 µg/L), *cis*-1,2- DCE (1.5 µg/L), and trichloroethene (TCE) (0.54 µg/L). In addition, PCE was detected at an estimated concentration (below the sample quantitation limit) in the Lola II well. EPA was unable to collect a sample from the Retiro well because the pump was removed in February 2006 in response to PRDOH's shutdown order. Background groundwater samples, collected upgradient of the Retiro Industrial Park, revealed no detections for PCE, *cis*-1,2-DCE, and TCE.

In July 2006, EPA conducted reconnaissance activities at 44 industrial properties in the San German area as part of a site discovery initiative to identify hazardous waste sites that could be sources of contamination. This led to the identification of several locations in San German that were investigated further as part of the RI.

Potential source area (PSA) investigations were performed at five facilities in February and May 2012. Soil samples were collected at 0 to 2 feet, 5 to 7 feet, 10 to 12 feet, 20 to 22 feet and 30 to 32 feet (if accessible). Soil samples were analyzed for TCL VOCs, semi-volatile organic compounds, pesticides, polychlorinated biphenyls, and TAL inorganics including mercury and cyanide. A total of 41 borings were completed at five PSAs; 159 soil samples were collected.

Two out of the five facilities were identified as sources of soil contamination that reached the groundwater and formed separate and co-mingled PCE and TCE plumes. It was determined that these plumes resulted in the contamination observed in the three former supply wells. The two identified properties are currently occupied by Wallace Silversmiths de Puerto Rico, Ltd. (Wallace), and CCL Insertco de PR (CCL). These lots are referred to as the Wallace lot and the CCL lot. Wallace currently occupies two buildings. In the past, Wallace occupied a nearby building that was investigated as part of the RI. High levels of PCE were present in a majority of soil samples collected at the two buildings currently occupied by Wallace. TCE and *cis*-1,2-DCE were also frequently detected, but at lower levels. At the former Wallace building, PCE was detected in some soil samples and TCE and *cis*-1,2-DCE were detected much less frequently and at low levels.

CCL occupies a building to the east of the current Wallace facilities. Samples collected in the CCL building reflected concentrations of TCE at higher levels than PCE in soil samples. In addition, *cis*-1,2-DCE was frequently detected, generally at lower levels than TCE. PCE was rarely detected.

EPA REMEDIAL INVESTIGATION/FEASIBILITY STUDY

The nature and extent of contamination in Site media was assessed during the RI by collecting and analyzing samples and then comparing analytical results to federal, Commonwealth, and Site-specific screening criteria. Five chemicals were identified as Site-related contaminants: PCE, TCE, *cis*-1,2-DCE, 1,1-dichloroethene (1,1-DCE) and vinyl chloride. These five VOCs were detected the most frequently, and at the highest levels, in source area soil samples and other affected media including groundwater, surface water, and sediment. These chemicals include chlorinated solvents and degradation products of those solvents. The RI also investigated the Site for the presence of Site contaminants in the form of non-aqueous phase liquids (NAPLs). Site contaminants are chlorinated VOCs that are denser than water, so are also referred to as dense non-aqueous phase liquids (DNAPLs).

It should be noted that OU-2 is ongoing and will gather additional information that will allow EPA to address the groundwater contamination fully in a subsequent remedy (OU-2). Some of the data obtained during the OU-1 RI is groundwater data, and it is being presented in this document in order to show the impact to the groundwater from the contaminated soil at the identified sources.

An RI Report was prepared by EPA to document the nature and extent of the contamination at the Site. EPA also issued a Baseline Human Health Risk Assessment (HHRA) Report to document the current and future effects of Site contaminants on human health and the environment associated with the contamination found at the Site. EPA also conducted a Screening-level Ecological Risk Assessment (SLERA) to evaluate any potential for ecological risks from the presence of Site contaminants in surface water and sediment. A detailed description of the HHRA and SLERA for this Site is provided in the Summary of Risk Section of this ROD.

An FS was conducted and a FS Report was prepared to present and analyze cleanup alternatives suitable for OU-1 at the Site. The purpose of the FS Report was to identify, develop, screen, and evaluate a range of remedial alternatives that protect human health and the environment from potential risks at OU-1 and enable EPA to select a remedy for OU-1. A detailed description of the cleanup alternatives evaluated for OU-1 is provided in the Description of Alternatives Section of this ROD.

HIGHLIGHTS OF COMMUNITY PARTICIPATION

As part of the RI, a Community Involvement Plan (CIP) was developed to assess any community concerns about the Site and encourage public participation. As part of the CIP and as required by Superfund regulations, EPA prepared a Proposed Plan for the Site (Appendix I). The Proposed Plan summarizes the remedial alternatives and identifies EPA's preferred alternative and the rationale for the preferred remedy. On August 12, 2015, EPA made available to the public the Proposed Plan, the RI Report, the HHRA and SLERA Reports, and the FS Report for OU-1. All of these documents along with others are included in the Administrative Record for this remedy were made available to the public at the following locations: EPA's Docket Room in New York, New York; San German City Hall; EQB's Superfund File Room in San Juan, Puerto Rico; and EPA's Caribbean Environmental Protection Division Office in Guaynabo, Puerto Rico. A copy of the Administrative Record Index for the Site is provided in Appendix II of this ROD.

A notice of the availability of the Proposed Plan and supporting documentation was published in the "Primera Hora" newspaper on August 12, 2015 (Appendix III). In order to facilitate the communication with the community, a Fact Sheet (in Spanish) was prepared and distributed throughout the community (Appendix IV). A public comment period was held from August 12, 2015, to October 24, 2015. In addition, a public meeting was held on August 19, 2015 at the Santa Marta Basketball Court from 6:00 pm to 8:00 pm. The purpose of the public meeting was to present the Proposed Plan to the community and provide an opportunity for the public to ask questions or give comments on the proposed remedial alternatives described in the Proposed Plan and EPA's preferred alternative. At this meeting, representatives from EPA and EQB answered questions and received comments about the remedial investigation activities conducted at the Site and the proposed remedial alternative for the Site. A copy of the attendance sheet for this meeting can be found in Appendix V of this ROD. Appendix VI of this ROD contains the official transcript of the public meeting. In addition, EPA's response to written comments received during the public comment period is included in the Responsiveness Summary (Appendix VII).

SCOPE AND ROLE OF RESPONSE ACTION

EPA is addressing the cleanup of this Site in two phases, OU-1 and OU-2. This remedy is the first of two anticipated remedial actions for the Site, with OU-1 addressing contaminated soils and shallow, highly contaminated groundwater that acts as ongoing sources of groundwater contamination. The OU-1 source areas also act as a source of vapors that can enter into buildings in the vicinity of the Retiro Industrial Park. By addressing the source areas first, EPA expects to begin to reduce the mass of contamination in the ground, thereby accelerating the overall groundwater cleanup. As discussed below, further investigation of the diffuse groundwater plume (OU-2) is still needed before a remedy for OU-2 can be selected. By selecting and implementing the OU-1 remedy, EPA will be able to begin to address the Site contamination while completing the OU-2 studies.

Because of the potential for subsurface VOC vapors entering and affecting current occupants of several buildings at the Retiro Industrial Park, EPA is conducting a separate action to address vapor intrusion, using the EPA's removal action, or emergency response, authority. EPA is coordinating its remedial and removal actions so that the removal actions will not be inconsistent with EPA's final remedies selected for the Site.

SITE CHARACTERISTICS

CONCEPTUAL SITE MODEL

A Conceptual Site Model (CSM) was developed for the Site to integrate the different types of information collected during the RI, including geology, hydrogeology, background, setting, and the fate and transport of contaminants. Based on the Site-specific geology, hydrogeology, physical and chemical properties of the Site-related contaminants, and the fate and transport of the contaminants, the CSM was developed, which is summarized below and illustrated in Figure 3 and Figure 4 of Appendix VIII.

The two main sources of soil contamination were identified at the Wallace lot and the CCL lot. Contamination at the Site can be linked to previous releases and discharges to the environment from these lots. Based on the high levels of PCE at the Wallace source area and the high levels of TCE at the CCL source area, PCE and TCE are assumed to have been released to the ground as raw or waste product. The soil data indicate that significant mass of PCE and/or TCE and degradation daughter products are retained by capillary forces in the pores of soil, primarily in the unsaturated zone in the Wallace and CCL lot source areas. These contaminants have migrated downward to deeper subsurface soils and into the groundwater causing the formation of separate and co-mingled PCE and TCE plumes.

EPA has determined that both properties are the source of documented groundwater contamination at the Site, resulting in the contamination observed in the three former PRASA public water supply wells. Saprolite zone monitoring wells located at the source areas (MW-2S, MW-3S, MW-4S, and MW-5S) have consistently shown high concentrations of PCE and TCE. The predominant groundwater flow direction in the Guanajibo River alluvial valley is preferentially toward the river, as the tributary streams to the Guanajibo River likely act as aquifer drains. However, the PCE and TCE groundwater plumes are oriented southeast/northwest suggesting the pumping influence of the supply wells. Since the shutdown of the public supply wells, the groundwater flow regime may have changed, and flow may no longer be strongly drawn toward the supply wells but more northerly toward the river. Dissolved contaminants in the saprolite zone may enter the bedrock groundwater through bedding planes and fractures, although it is currently unknown whether contamination is present in the highly fractured and unstable upper bedrock, a zone identified during the RI as the "Unstable Zone," and discussed in more detail, below.

EPA conducted vapor intrusion sampling in numerous residential structures and industrial buildings. Results indicate that volatilization is an active process in the unsaturated zone throughout the Site. The PCE and TCE concentrations in the sub-slab soil gas samples were extremely high and above EPA's vapor intrusion screening levels, especially at the Wallace facility. On the other hand, PCE and TCE concentrations in indoor air samples were below their respective screening levels. The surface water results indicate that rainwater percolating through contaminated soil or contaminated groundwater is likely discharging into surface water near the CCL and Former Baytex buildings. Adjacent to the Río Guanajibo and directly north of the source areas, PCE was detected, albeit at a low level (0.77 ug/L), in one pore water sample.

SITE OVERVIEW

Topography and Drainage

San German is located in the eastern part of the Río Guanajibo floodplain. Within the municipality, the river drops from an elevation of approximately 155 feet above mean sea level in the east to approximately 115 feet in the west. The river valley is flanked to the north and south by uplands; the highest point in the area is 735 feet, at a hilltop 0.75 mile south of the public supply wells. Uplands north of the river are as high as approximately 280 feet. The three former public supply wells are located adjacent to the river on the south side, at an approximate elevation of 138 feet.

The Guanajibo River flows west through the town of San German and is the major surface water body in the area. The Guanajibo River drainage basin encompasses an area of approximately 35 square miles. A tributary to the Guanajibo River originates in the highlands southeast of the Site and flows west, then north, toward the river, discharging near the northwest corner of the Santa Marta neighborhood between Route 102 and the river.

Geology

The study area lies within the eastern part of the Guanajibo River floodplain, which is bounded to the north and south by highlands of predominantly igneous rocks and serpentinite (metamorphic). Bedrock is overlain by alluvial deposits in the river valley, and it is generally encountered at the surface in the highlands and at depths up to 100 feet below ground surface (bgs) in the river valley.

Within the monitoring well network, the shallowest deposits are the alluvial soils (Quaternary), also known as the overburden. These deposits are present in the Guanajibo River valley and along tributaries, consisting of gravel, fine sands, silty clay, clayey silt, and clay. Unsaturated and saturated deposits are generally less than 100 feet thick. The unsaturated zone varies across the Site from less than 10 feet bgs to 38 feet bgs. The relatively high percentage of low permeability soils in the unsaturated zone results in semi-confined conditions at the top of the water table, as evidenced by the observed rise in the level of the groundwater in soil borings and in cased monitoring wells.

Underlying the alluvial soils is the saprolite zone. The saprolite is composed of saturated sands, silts, clays, and highly weathered rock with an increasing percentage of rock fragments with depth. The saprolite is heterogeneous with varied content of highly weathered rock and rock fragments; drilling encountered dry conditions at different depths at different locations. The water table is generally encountered at or near the top of the saprolite zone, and the transmissivity increases with depth in the saprolite as the percentage of rock fragments increases.

The Unstable Zone is composed of highly fractured and unstable bedrock just below the saprolite zone. The high degree of fracturing means this zone was unstable during drilling, and the bedrock borehole would not remain open. During drilling of Site monitoring wells, this zone required double and triple casing in order to proceed with deeper drilling. This zone was also observed to produce a lot of water during drilling. No groundwater samples were collected during installation of monitoring wells; therefore, contaminant levels are unknown. The Unstable Zone ranges from 32 to 70 feet thick across the Site and ranges from 50 to 90 feet bgs. This zone is assumed to have a relatively high rate of groundwater flow based on the volume of water produced during drilling and on its highly fractured characteristics.

The bedrock underlying the Site is composed of highly fractured and faulted serpentinite or serpentinized peridotite of late Jurassic and early Cretaceous age or older. This zone is represented by more competent bedrock that was stable enough to maintain an open borehole after drilling. The bedrock zone is composed of fractured rocks that were evaluated with borehole geophysical methods to determine the orientation of fractures and in-flow and out-flow zones, as described in the RI Report. Joints and fractures were most commonly noted with northeast and northwest strikes and with dip toward the north. Multiport systems were installed in seven bedrock boreholes to allow for monitoring well sampling at multiple depths.

Hydrogeology

The aquifer within the study area is part of the Río Guanajibo alluvial valley. Groundwater is first encountered in the saprolite, and the depth to water ranges from river level at Río Guanajibo to about 15 to 25 feet bgs at higher elevations. The saprolite zone and bedrock are connected and form one aquifer. The Unstable Zone appears to be highly transmissive, based on the large amounts of water produced during drilling. This zone is likely composed of serpentinite similar to the underlying fractured bedrock zone; however, this layer has been too unstable to support well installation, and further investigations of this layer are required as part of the OU-2 RI/FS.

The general direction of groundwater flow from the identified contaminant source areas is to the north-northwest, and there is some indication that the aquifer is hydraulically connected to Río Guanajibo. The straight alignment of the monitoring wells (from Retiro Industrial Park to the supply wells) makes it difficult to determine the exact direct of groundwater flow. It is possible that pumping at the supply wells when they were active influenced localized groundwater flow direction toward the northwest. Observations of PCE and/or TCE contamination in private wells in the residential area (northwest of Retiro Industrial Park) and in one pore water sample from the Río Guanajibo to the north of the residential area indicate groundwater also flows in a more northerly direction and that groundwater discharges to the river. Groundwater flow occurs under both semi-confined and unconfined-conditions. Unconfined conditions predominantly occur in local areas where the alluvium is relatively thin and the thickness of the surface and subsurface clay and silt is minimal. The occurrence of semi-confining conditions within the unconsolidated deposits generally increases west of the town of San German as the depth to basement rock and the thickness of both surface and subsurface clay and silt strata increase. Vertical gradients in bedrock and saprolite zone well clusters indicate the presence of a slight upward gradient.

Cultural Resources

A Cultural Resource Survey (CRS) was performed during the RI for the Site to assess the archaeological sensitivity in the area of potential effects (APE). The APE for the Site consists of an approximately 440-acre Cultural Resource Study Area in the Municipality of San German in the Guanajibo Valley section of Puerto Rico.

A Stage 1A CRS was conducted within the APE for the Site. The primary goal of the Stage 1A cultural resources survey was to assess the archaeological sensitivity of the APE. Portions of the APE were identified to possess high and moderate sensitivity for archaeological resources as shown in Appendix H of the RI Report based on cartographic evidence and field reconnaissance. The Stage 1A CRS recommended that a Stage 1B CRS be performed in areas where subsurface disturbance for remediation is planned within zones of high or moderate archaeological sensitivity. Because the two source areas in Retiro Industrial Park are within the APE area of low sensitivity, no additional CRS activities are necessary for OU-1.

Sampling Strategy

As part of the fund lead RI, soil, groundwater, surface water, sediment, and soil vapor were sampled at numerous locations at the Site. Sampling was conducted at the following properties: Wallace, Pitusa, Former Baytex, CCL, and Acorn Dry Cleaner. In addition, soil vapor samples were collected in some residences within the area. Two rounds of sub-slab soil vapor sampling were performed. Some of the data obtained during the OU-1 RI is groundwater data, and it is being presented in this document in order to show the impact to the groundwater from the contaminated soil at the identified sources. The groundwater contamination is intended to be fully addressed in OU-2. Surface water, pore water, and sediment samples were collected from the Guanajibo River and its tributaries, as well as from catch basins adjacent to Retiro Industrial Park.

The results of these sampling events are discussed below.

Soil Sampling Results

PCE and TCE were frequently detected at elevated levels at the Wallace lot (Figure 5). PCE was detected in nearly every sample. The highest concentration was 46,000 micrograms per kilogram (µg/kg). The highest concentration of TCE was 2,300 µg/kg. *Cis*-1,2-DCE, vinyl chloride, and 1,1-DCE were detected less frequently than TCE.

PCE was frequently detected below the screening criterion at the Pitusa property (Figure 6). One concentration exceeded the criterion at 130 µg/kg. TCE, *cis*-1, 2-DCE, and 1, 1-DCE detections were below the screening criteria.

PCE was detected frequently but was generally below the screening criterion at the Former Baytex property (Figure 7). Six samples exceeded the criterion, with the highest detection at 180 µg/kg. TCE, and *cis*-1, 2-DCE did not exceed criteria.

- PCE was detected in three samples at the CCL lot (Figure 8); one detection, at 71 µg/kg, exceeded the screening criterion. In contrast to other soil results, TCE at the CCL lot was more frequently detected than PCE. TCE was in 23 of 39 samples with a maximum of 3,600 µg/kg. *Cis*-1,2-DCE was generally lower than TCE. The highest *cis*-1,2-DCE concentration was 4,400 µg/kg. Vinyl chloride was detected in five samples; the highest concentration was 520 µg/kg.
- PCE was detected at a property occupied by Acorn at very low levels (less than 1 µg/kg) in two samples and was not detected in two samples (Figure 9). TCE and *cis*-1,2-DCE results showed low level detections and no detections. Vinyl chloride and 1,1-DCE were all not detected.
- In addition to the VOCs described above, soil sampling identified metals, including chromium, cobalt, copper, lead, manganese, mercury, nickel, selenium, silver, vanadium and zinc, throughout the soil column. Metals were found at statistically similar levels across the Site, suggestive of a distribution of metals associated with the local soil (natural background) rather than attributable to a release.

<u>Summary of Soil Vapor Contamination</u>

- PCE was detected in 41 of 44 sub-slab samples collected in the first of two rounds, and exceeded the screening criterion of 94 micrograms per cubic meter ($\mu g/m^3$) in 10 samples, 7 of which were at two properties, Wallace and the former Baytex facility. PCE detections ranged from 0.04 μg/m^3 to 27,000 μg/m^3. The highest detection was at the former Baytex facility property.

- TCE was detected in 16 sub-slab samples and exceeded the screening criterion of 4.3 μg/m^3 in 10 samples, all of which were at the Baytex and CCL properties. TCE detections ranged from 0.041 μg/m^3 to 7,100 μg/m^3. The highest detection was at the CCL lot.
- In the 39 indoor air samples, PCE was detected in 23 samples, none of which exceeded the screening criterion of 9.4 μg/m^3. PCE detections ranged from 0.048 μg/m^3 to 1.7 μg/m^3.
- TCE was detected in 5 indoor air samples and exceeded the 0.43 μg/m^3 screening criterion in 1 sample at a facility within the industrial park. TCE detections ranged from 0.043 μg/m^3 to 0.88 μg/m^3.
- In the 43 sub-slab samples collected as part of the second round, PCE was detected in all samples and exceeded the screening criterion of 94 μg/m^3 in 31 samples, 28 of which were at the Baytex, CCL and Wallace properties. PCE detections ranged from 1.42 μg/m^3 to 14,200,000 μg/m^3. The highest detection was at the Wallace lot.
- TCE was detected in 42 samples in the second round and exceeded the screening criterion of 4.3 μg/m^3 in 10 samples, all of which were at the Baytex, CCL and Wallace properties.
- TCE detections ranged from 0.195 μg/m^3 to 726,000 μg/m^3. The highest detection was at the Wallace lot.
- In the 33 indoor air samples collected in the second round, PCE was detected in 23 samples, none of which exceeded the 9.4 μg/m^3 screening criterion. PCE detections in indoor air samples ranged from 7.46 μg/m^3 to 0.317 μg/m^3.
- TCE was detected in 21 samples and exceeded the 0.43 μg/m^3 screening criterion in 10 samples. TCE detections ranged from 0.167 μg/m^3 to 2.11 μg/m^3. The highest concentration was detected in a residence. Using a non-cancer TCE criterion of 2.0 μg/m^3, one sample exceeded this criterion. At this location, the indoor sample result was higher than the subslab result, indicating the probability of an indoor source for the TCE.

Summary of Groundwater Contamination

Further investigations will be required to fully delineate the groundwater plume as part of the OU-2 RI/FS, particularly with regard to the Unstable Zone. Groundwater findings discussed below are included here to support the need for a source control remedy (OU-1).

- Nine of ten soil borings at Wallace encountered groundwater (Figure 5). PCE was elevated in seven samples; the highest was 7,960 μg/L. TCE was detected in eight samples with a high of 900 μg/L. The highest detections of *cis*-1,2-DCE, vinyl chloride, and 1,1-DCE were 1,310 μg/L, 190 μg/L, and 72 μg/L, respectively.
- Nine of the ten borings at CCL encountered groundwater (Figure 8). PCE was detected in four samples; the maximum concentration was 450 μg/L. TCE and *cis*-1,2-DCE were detected in all nine samples. The maximum concentrations were 27,700 μg/L and 5,560 μg/L, respectively. Vinyl chloride and 1,1-DCE were each detected in one sample at 25.2 μg/L and 1.89 μg/L, respectively.
- Forty-three groundwater samples were collected at 37 locations along 11 transects (Figure 10) between the Retiro Industrial Park in the southeast and the closed public supply wells to the northwest. PCE was detected in most samples except transects T0 and T1, with the

highest concentration in transect T3 at 26,800 µg/L. TCE was frequently detected, including in transects T0 and T1 where PCE was not detected. The highest concentration was in transect T2 at 65,400 µg/L. Detections of *cis*-1,2-DCE were similar to TCE with the highest concentration in transect T4 at 203 µg/L. Vinyl chloride was detected in two samples, one each from transects T1 and T4; the maximum concentration was 6.41 µg/L. 1,1-DCE was frequently detected in transects T3 through T8 (except T6); the highest concentration was 126 µg/L.

- PCE was detected in groundwater samples at all nine shallow wells sampled (Figure 11); the highest concentration was in MW-2S at the Wallace source area (13,000 µg/L). PCE concentrations decrease as the plume migrates downgradient to the northwest toward the public supply wells.
- TCE concentrations were the highest in MW-3S at CCL (1,700 µg/L) with levels rapidly decreasing to the northwest in the aligned monitoring well network.
- Two *cis*-1,2-DCE concentrations exceeded the screening criterion, with the highest in MW-3S at CCL (220 µg/L) and the second exceedance in MW-5S at 100 µg/L.
- Vinyl chloride was detected in 2 monitoring wells, with a maximum concentration of 47 µg/L in MW-3S.
- 1,1-DCE was detected in seven of the nine shallow monitoring wells; the highest concentration was in MW-6S at 41 µg/L. Two detections exceeded the screening criterion.

<u>Summary of Surface Water/Sediment Contamination</u>

- In the river/tributary surface water samples (Figure 12) collected in August 2014 showed PCE detection in samples SW-10 through SW-12; the highest detection was 14 µg/L in SW-12. TCE, *cis*-1,2-DCE, and vinyl chloride were detected in SW-9 through SW-12, with the highest at 42 µg/L, 37 µg/L, and 21 µg/L, respectively. 1,1-DCE was detected at trace levels in these four samples.
- In January 2014, surface water samples were collected at locations SW-9 through SW-12. The maximum detections of PCE, TCE, *cis*-1,2-DCE, 1,1-DCE, and vinyl chloride were 32 µg/L, 98 µg/L, 36 µg/L, 0.55 µg/L and 8.7 µg/L, respectively. These four samples were collected from a small drainage channel on the northeastern side of the CCL and Former Baytex buildings in the industrial park.
- In catch basin water samples, PCE was detected in three samples; one exceeded the screening criterion at 88 µg/L at CBSW-4. All other detections were below 1 µg/L. TCE, *cis*-1,2-DCE 1,1-DCE, and vinyl chloride were detected in the same four samples, with the highest at 15 µg/L, 9.2 µg/L, 0.17 µg/L, and 1.8 µg/L, respectively. Three of the TCE detections exceeded the screening criterion and all of the vinyl chloride detections exceeded its criterion.
- In addition to the VOCs described above, soil sampling identified metals, including chromium, cobalt, copper, lead, manganese, mercury, nickel, selenium, silver, vanadium and zinc, throughout the soil column. Metals were found at statistically similar levels across the Site, suggestive of a distribution of metals associated

Sources of Contamination

Two source areas were identified during the RI. They are the Wallace lot and the CCL lot . Both source areas are in the Retiro Industrial Park and have significant soil contamination.

Wallace Source Area

The Wallace lot has been identified as a source of both soil and groundwater chlorinated VOC contamination. The Wallace soil results were dominated by detections of PCE, which was detected in 37 of 42 samples. Both surface and subsurface soil is contaminated, with PCE contamination in surface soil as high as 46,000 µg/kg (1,000 times the screening criterion) and subsurface soil, with PCE contamination exceeded its screening criterion in samples collected from 20-22 feet bgs (just above or near the water table)d. Other chlorinated VOCs, including TCE, *cis*-1,2-DCE, and vinyl chloride, were detected in soil samples.

The highest levels of soil contamination were detected in the narrow area where the two Wallace facility buildings are connected, and on the south side of the eastern-most of those two buildings. Groundwater screening samples collected at the top of the water table in soil borings indicated that the soil contamination has migrated into groundwater, forming a significant plume that flows with groundwater toward the north-northwest. Several soil borings had limited chlorinated VOC detections in the soil, but had elevated levels of PCE in groundwater (e.g., borings WS-02 and WS-07). This pattern may indicate that some of the shallow groundwater contamination originates on the southeastern part of the Wallace lot and has begun to flow with groundwater beneath the Wallace facility buildings.

CCL Source Area

The CCL lot has been identified as a source of both soil and groundwater chlorinated VOC contamination. At the CCL lot source area, soil contamination was dominated by detections of TCE rather than PCE, with TCE detected in 22 of 36 soil samples. Generally, the detections of site-related contaminants were low in shallow soil samples (less than 10 feet deep), with levels increasing with depth. The highest TCE detection was 3,600 µg/kg (100 times the screening criterion) in boring CCL-1, adjacent to groundwater screening transect location T2-2. The shallow soil samples had no TCE; the two deeper samples (10-12 feet and 20-22 feet bgs) had high levels of TCE, along with high TCE (27,700 µg/L – more than 5,500 times the screening criterion) in the grab groundwater sample.

Overall, contamination is concentrated in two areas, around soil boring CCL-1, near the woods on the east side of the CCL facility building, and around boring CCL-8, near the southeastern end of the facility building. Other soil borings on the east side of the facility building had no or very low detections of chlorinated VOCs, indicating that the soil contaminated area may be limited to a few location on the east side of the facility building.

Types of Contaminants and Migration

The primary Site-related contaminants include five chlorinated VOCs, namely TCE, PCE, *cis*-1,2-DCE, 1,1-DCE, and vinyl chloride. The fate of a chemical in the environment is a function of its physical and chemical properties and conditions at the Site. The potential for environmental transport is a function of site conditions, including the geological and hydrogeological characteristics. The primary fate and transport aspects are summarized below.

- PCE, TCE, and their degradation daughter products have migrated from the ground surface through the overburden zone and into groundwater. Some of the PCE and TCE mass is retained by capillary forces in the soil pores. The concentrations of PCE and TCE identified in the saturated zone indicate the potential for the presence of DNAPL, although DNAPL was not observed during sample collection.
- The greatest potential for the transport of the chlorinated VOCs is through continuous dissolution of contaminants in soil and vertical migration to groundwater, and then groundwater migration, and eventual volatilization.
- Dissolved contaminants move with the groundwater flow in the saprolite zone to the north-northwest toward the former supply wells and the Río Guanajibo. Dissolved contaminants in the saprolite zone may enter the bedrock groundwater through bedrock bedding planes and fractures. It is currently unknown whether contamination is present in the highly fractured and unstable upper bedrock (the Unstable Zone).
- Chlorinated VOCs in soil and groundwater have also migrated as vapor. Vapor intrusion sample results confirm the presence of vapor beneath buildings and structures in the vicinity of the groundwater plume. VOC vapors detected within the interior of buildings were below risk-based screening criteria.
- Based on an evaluation of natural attenuation, discussed below, there is limited evidence that anaerobic biodegradation of chlorinated VOCs is occurring at the Site. However, the frequent detections of *cis*-1,2-DCE and less frequent detections of trans-1,2-DCE, vinyl chloride, and 1,1-DCE are indicative of active (if incomplete) biodegradation in the aquifer.

Assessment of Natural Attenuation at the Site

Natural attenuation refers to the naturally occurring processes in soil and groundwater, including biodegradation, by subsurface microorganisms, reactions with naturally occurring minerals, and sorption on geologic media. These processes can achieve a reduction in the total mass, toxicity, mobility, volume, or concentration of contaminants. If testing indicates that conditions are favorable for natural attenuation at a site, EPA can consider relying on monitored natural attenuation (MNA) as a remedy, or as a component to a remedy.

During the RI investigation at the Site, MNA indicator parameters were collected and analyzed in the field or by an off-site laboratory in order to evaluate whether subsurface conditions are conducive to *in-situ* natural degradation of chlorinated VOCs. MNA field parameters included pH, specific conductivity, dissolved oxygen, temperature, oxygen reduction potential, and ferrous ion. MNA parameters were analyzed from multiple bedrock ports and saprolite zone monitoring wells, following EPA MNA protocols.

Based upon findings to date, there is inadequate to limited evidence that anaerobic biodegradation of chlorinated VOCs is occurring at the Site. The TCE plume displayed some reductive dechlorination in the source area near MW-3S. However, the PCE plume displayed only weak indications of reductive dechlorination. Consequently, there is inconclusive evidence that complete and sustainable reductive dechlorination of chlorinated VOCs has occurred at the Site. Given the high concentrations found in the source areas, MNA cannot be supported as a remedial component for OU-1. MNA will be further evaluated as part of the OU-2 RI/FS to determine whether it may be effective at addressing portions of the TCE and PCE plumes after the source areas have been addressed as part of OU-1.

CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

The San German municipality is comprised of 54.51 square miles with a population of 35,527 and a population density of 651.8 people per square mile (U.S. Census 2010). The primary land use in the vicinity of the San German site is agricultural with some residential, commercial, and light industrial development. The population currently served by the seven PRASA supply wells that remain open is 14,000 people. The Retiro Industrial Park, the eventual focus of the OU-1 RI/FS, is a mixture of commercial and light industrial enterprises. These land uses are not anticipated to change in the future.

SUMMARY OF SITE RISKS

As part of the RI/FS, EPA conducted a baseline risk assessment to estimate the current and future effects of contaminants on human health and the environment. A baseline risk assessment is an analysis of the potential adverse human health and ecological effects of releases of hazardous substances from a site in the absence of any actions or controls to mitigate such releases, under current and future land uses. The baseline risk assessment includes a human health risk assessment and an ecological risk assessment. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. The remedial alternative that is being chosen for the Site addresses contamination at the Site. The risks and hazards posed by the Site was presented in the baseline risk assessment are summarized in this section.

HUMAN HEALTH RISK ASSESSMENT

A four-step process is utilized for assessing site-related human health risks for a reasonable maximum exposure scenario: Hazard Identification – in which EPA uses the analytical data collected to identify the contaminants of potential concern at a site for each medium, with consideration of a number of factors explained below; Exposure Assessment - in which EPA estimates the magnitude of actual and/or potential human exposures, the frequency and duration of these exposures, and the pathways (e.g., ingesting contaminated well-water) by which humans are potentially exposed; Toxicity Assessment - in which EPA determines the types of adverse health effects associated with chemical exposures, and the relationship between magnitude of exposure (dose) and severity of adverse effects (response); and Risk Characterization - in which EPA summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of site-related risks. The risk characterization also identifies contamination with concentrations that exceed acceptable levels, as defined by the NCP and discussed below as posing either an excess lifetime cancer risk greater than the range from 1×10^{-6} to 1×10^{-4}, an excess of lifetime cancer risk greater than 1×10^{-6} (i.e., the point of departure) combined with site-specific circumstances, or a Hazard Index greater than 1. Contaminants at these concentrations are considered chemicals of concern (COCs) and are typically those that will require remediation at a site. Also included in this section is a discussion of the uncertainties associated with such risks.

HAZARD IDENTIFICATION

In this step, the chemicals of potential concern (COPCs) in each medium were identified based on such factors as toxicity, frequency of occurrence, fate and transport of the contaminants in the environment, concentrations, mobility, persistence, and bioaccumulation. The risk assessment focused on surface soil, subsurface soil, surface water, sediment, air, and groundwater contaminants related to the Site which may pose significant risk to human health and the environment. Analytical information that was collected to determine the nature and extent of contamination revealed the presence of VOCs in the soil and groundwater at concentrations of potential concern.

A comprehensive list of all COPCs can be found in the baseline human health risk assessment (BHHRA), entitled "Final Human Health Risk Assessment - San German Groundwater Contamination Site," dated July 2015. This document is available in the Administrative Record file. This ROD focuses on a site-wide evaluation, which includes the Río Guanajibo and five industrial properties, namely Wallace, CCL, Pitusa-National Lumber, the former Baytex facility, and Acorn Dry Cleaners. The contaminated media, concentrations detected, and concentrations utilized to estimate potential risks and hazards for the COCs at the Site are presented in Table 1 of Appendix IX. Soil and groundwater were the media that contained COCs.

EXPOSURE ASSESSMENT

Consistent with Superfund policy and guidance, the BHHRA is a baseline human health risk assessment and assesses conditions under the assumption that no remediation or institutional controls will be implemented to mitigate or remove hazardous substance releases. Cancer risks and noncancer hazard indices were calculated based on an estimate of the reasonable maximum exposure expected to occur under current and future conditions at the site. That exposure is defined as the highest exposure that is reasonably expected to occur at a site. For those contaminants for which the risk or hazard exceeded the acceptable levels, the central tendency estimate, or the average exposure, was also evaluated.

The industrial sites in the Retiro Industrial Park are currently zoned for industrial use, however, there are residential areas in the vicinity of the industrial facilities and overlying the groundwater plume area, and the Rio Guanajibo river may be used for recreational activities. The BHHRA evaluated potential risks to populations associated with both current and potential future land uses.

Exposure pathways were identified for each potentially exposed population and each potential exposure scenario for exposure to surface soil, subsurface soil, surface water, sediment, air, and groundwater. Exposure pathways assessed in the BHHRA are presented in Table 2 and included current exposure to industrial workers, trespassers, and recreators and future exposure to industrial workers, trespassers, residents, construction workers and recreators through incidental ingestion, dermal contact, and inhalation from contaminated media on the five subareas and Río Guanajibo. Typically, exposures are evaluated using a statistical estimate of the exposure point concentration, which is usually an upper-bound estimate of the average concentration for each contaminant, but in some cases may be the maximum detected concentration. A summary of the exposure point concentrations for the COCs in groundwater can be found in Table 2 of Appendix IX to this ROD, while a comprehensive list of the exposure point concentrations for all COPCs can be found in the BHHRA.

TOXICITY ASSESSMENT

Under current EPA guidelines, the likelihood of carcinogenic risks and noncancer hazards as a result of exposure to site chemicals are considered separately. Consistent with current EPA policy, it was assumed that the toxic effects of Site-related chemicals would be additive. Thus, cancer and noncancer risks associated with exposures to individual COPCs were summed to indicate the potential risks and hazards associated with mixtures of potential carcinogens and noncarcinogens, respectively.

Toxicity data for the human health risk assessment were provided by the Integrated Risk Information System (IRIS) database, the Provisional Peer Reviewed Toxicity Database, or another source that is identified as an appropriate reference for toxicity values consistent with EPA's directive on toxicity values. This information for the COCs is presented in Table 3 (noncancer toxicity data summary) and Table 4 of Appendix IX (cancer toxicity data summary). Additional toxicity information for all COPCs is presented in the BHHRA.

RISK CHARACTERIZATION

Noncarcinogenic risks were assessed using a hazard index (HI) approach, based on a comparison between expected contaminant intakes at the Site and benchmark comparison levels of intake (reference doses, reference concentrations). Reference doses (RfDs) and reference concentrations (RfCs) are estimates of daily exposure levels for humans (including sensitive individuals) that are thought to be safe over a lifetime of exposure. The estimated intake of chemicals identified in environmental media at the Site (e.g., the amount of a chemical ingested from contaminated drinking water) is compared to the RfD or the RfC to derive the hazard quotient (HQ) for the contaminant in the particular medium. The HI is obtained by adding the hazard quotients for all compounds within a particular medium that impacts a particular receptor population.

The HQ for oral and dermal exposures is calculated as below. The HQ for inhalation exposures is calculated using a similar model that incorporates the RfC, rather than the RfD.

HQ = Intake/RfD

Where: HQ = hazard quotient
Intake = estimated intake for a chemical (mg/kg-day)
RfD = reference dose (mg/kg-day)

The intake and the RfD will represent the same exposure period (i.e., chronic, subchronic, or acute).

As previously stated, the HI is calculated by summing the HQs for all chemicals for likely exposure scenarios for a specific population. An HI greater than 1 indicates that the potential exists for noncarcinogenic health effects to occur as a result of site-related exposures, with the potential for health effects increasing as the HI increases. When the HI calculated for all chemicals for a specific population exceeds 1, separate HI values are then calculated for those chemicals which are known to act on the same target organ. These discrete HI values are then compared to the acceptable limit of 1 to evaluate the potential for noncancer health effects on a specific target organ. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium or across media. A summary of the noncarcinogenic hazards associated with these chemicals for each exposure pathway is contained in Table 5 of Appendix IX.

It can be seen in Table 5 that the HI for noncancer effects is elevated for future residents exposed to groundwater because of concentrations of TCE, PCE, and vinyl chloride.. TCE and PCE were also identified as COCs in soil because of elevated soil gas concentrations.

For carcinogens, risks are generally expressed as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to a carcinogen, using the cancer slope factor (SF) for oral and dermal exposures and the inhalation unit risk (IUR) for inhalation exposures. Excess lifetime cancer risk for oral and dermal exposures is calculated from the following equation, while the equation for inhalation exposures uses the IUR, rather than the SF:

Risk = LADD x SF

Where: Risk = a unitless probability (1×10^{-6}) of an individual developing cancer
LADD = lifetime average daily dose averaged over 70 years (mg/kg-day)
SF = cancer slope factor, expressed as [1/(mg/kg-day)]

These risks are probabilities that are usually expressed in scientific notation (such as 1×10^{-4}). An excess lifetime cancer risk of 1×10^{-4} indicates that one additional incidence of cancer may occur in a population of 10,000 people who are exposed under the conditions identified in the assessment. Again, as stated in the NCP, the point of departure is 10^{-6} and the acceptable risk range for site-related exposure is 10^{-6} to $10^{-4.}$

A summary of the estimated cancer risks are presented in Table 6 of Appendix IX. Risks and hazards were evaluated for the potential future exposure to groundwater. The populations of interest included adult site workers, residential adults, and children at each of five properties of interest. The cancer risks exceeded EPA's acceptable ranges at two properties. The noncancer hazards at each of the properties were above the EPA acceptable value of 1. The COCs identified in the groundwater were TCE, PCE, and vinyl chloride. The groundwater remedy will be addressed in a separate operable unit and decision document. TCE and PCE were also identified as COCs in soil because of elevated soil gas concentrations.

UNCERTAINTIES

The procedures and inputs used to assess risks in this evaluation, as in all such assessments, are subject to a wide variety of uncertainties. In general, the main sources of uncertainty include:

- environmental data
- environmental parameter estimation
- toxicity values
- risk characterization

Two of the primary sources of uncertainty identified in the HHRA were associated with exposure parameters and toxicological data. Uncertainty in exposure parameters was related to many of the parameters being associated with default values because site-specific values were not available. This would provide a conservative estimate of potential risk and hazards.

Another important source of uncertainty was toxicological data. The toxicity factors used in the quantitative evaluation of potential risks and hazards were primarily selected from IRIS. For many chemicals, there is a lack of appropriate information on effects in humans (i.e., epidemiologic studies). Therefore, animal studies are generally used to develop toxicity values in human health risk assessments, which may under- or over-estimate potential risks and hazards.

More specific information concerning uncertainty in the health risks is presented in the baseline human health risk assessment report.

ECOLOGICAL RISK ASSESSMENT

A screening-level ecological risk assessment was conducted to evaluate the potential for ecological risks from the presence of contaminants in surface soil. The SLERA focused on evaluating the potential for impacts to sensitive ecological receptors to Site-related constituents of concern through exposure to surface soil on the properties and to surface water, sediment, and pore water from Rio Guanajibo. Surface soil, surface water, sediment, and pore water concentrations were compared to ecological screening values as an indicator of the potential for adverse effects to ecological receptors. A complete summary of all exposure scenarios can be found in the SLERA.

SURFACE SOIL

There is a potential for adverse effects to ecological receptors (invertebrates, reptiles, amphibians, birds, and mammals) from exposure to surface soil at the five PSA properties. The surface soil screening criteria were exceeded for metals (chromium, cobalt, copper, lead, manganese, mercury, nickel, selenium, silver, vanadium, and zinc), which resulted in HIs greater than the acceptable threshold value of 1. However, none of the metals were considered to be Site-related; therefore there were no COCs selected for surface soil at any of the properties.

SURFACE WATER

There is a potential for adverse effects to ecological receptors (invertebrates, reptiles, amphibians, birds, and mammals) from exposure to surface water in the Rio Guanajibo. The surface water screening criteria were exceeded for metals (aluminum, barium, cadmium, chromium, cobalt, copper, iron, lead, manganese, nickel, silver, vanadium, and zinc) and three volatile organic compounds (chloroform, toluene, and TCE), which resulted in HIs greater than the acceptable threshold value of 1. The metals were not considered to be Site-related and were not selected as COCs. The elevated concentration of TCE in surface water was located near a drainage area adjacent to Retiro Industrial Park, in an area with limited viable habitat. Therefore, no adverse effects on survival, growth, and/or reproduction of aquatic organisms is expected to occur, and no COCs were identified for surface water.

SEDIMENT

There is a potential for adverse effects to ecological receptors (invertebrates, reptiles, amphibians, birds, and mammals) from exposure to sediment in the Rio Guanajibo. The surface soil screening criteria were exceeded for metals (antimony, cadmium, chromium, cobalt, copper, cyanide, iron, lead, manganese, nickel, silver, and zinc), which resulted in HIs greater than the acceptable threshold value of 1. However, none of the metals were considered to be Site-related, therefore there were no COCs selected for sediment from the Rio Guanajibo.

PORE WATER

There is a potential for adverse effects to ecological receptors (invertebrates, reptiles, amphibians, birds, and mammals) from exposure to pore water in the Rio Guanajibo. The surface soil screening criteria were exceeded for metals (aluminum, barium, chromium, cobalt, copper, iron, lead, manganese, nickel, and vanadium), which resulted in HIs greater than the acceptable threshold value of 1. However, none of the metals were considered to be Site-related, therefore there were no COCs selected for pore water from the Rio Guanajibo.

Based on the results of the ecological risk assessment, no remedial action is necessary to protect the environment from actual or threatened releases of hazardous substances.

RISK ASSESSMENT SUMMARY

In summary, volatile organic compounds, specifically TCE, PCE, and vinyl chloride in groundwater at the Site contributed to unacceptable risks and hazards to future residents. TCE and PCE were also identified as COCs in soil because of elevated soil gas concentrations. Based on the results of the human health assessments, the response action selected for OU-1 in this ROD is necessary to protect the public health or welfare of the environment from actual or threatened releases of hazardous substances into the environment.

REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) are specific goals to protect human health and the environment. These objectives are based on available information and standards, such as applicable or relevant and appropriate requirements (ARARs), to-be-considered (TBC) guidance, and site-specific risk-based levels. The Site-related contaminants are chlorinated ethenes and their degradation products, including PCE, TCE, *cis*-1,2-DCE, vinyl chloride, and 1,1-DCE. The contaminated media addressed in this remedy are soils that act as a source of groundwater contamination, soil vapors, and a portion of the groundwater that is in direct contact with these contaminants in the saprolite zone.

EPA has established expectations to use treatment to address any principal threats posed by a site. Principal threat wastes are those source materials considered to be highly toxic or mobile that generally cannot be reliably contained or would otherwise present a significant risk to human health or the environment should exposure occur. At both Wallace and CCL lots, PCE and TCE concentrations were detected in groundwater samples collected from both properties, indicating contaminants have migrated from the unsaturated soil to the saturated soil and groundwater. Considering the high concentrations present in the saturated soil that underlies the source areas, data indicate that a large contaminant mass is present in the saturated soil. Therefore, PCE and TCE contamination in the vadose zone fits the definition of principal threat waste and would require remediation through treatment, where practicable.

The sources of soil contamination at the Retiro Industrial Park have been determine to be the Wallace and CCL lots. Soil on these two properties, including the shallow saprolite zone of saturated soils below the footprint of the vadose zone contamination, where the contaminants originally contacted groundwater, potentially contain residual DNAPL and likely contain the highest contaminant mass in the subsurface, which can serve as continuing sources for groundwater contamination.

Soil vapor samples show elevated soil vapor under the building slabs at both the Wallace and CCL facilities, which are currently occupied commercial buildings, and as such there is a threat of exposure to contaminants such as PCE, TCE, *cis*-1,2-DCE, 1,1-DCE, and vinyl chloride. These contaminants may pose risks to human health through inhalation, ingestion, and dermal contact. Vapor accumulation beneath the building slabs at these source areas and over the groundwater plume has been observed.

To protect human health and the environment, the following RAOs have been identified.

The RAOs for soil are:

- Prevent/minimize contaminated vadose-zone soil from serving as a source of groundwater contamination.
- Reduce contaminant mass in the saturated shallow saprolite zone soil that is serving as a source for groundwater contamination.

The RAO for soil vapor is:

- Reduce contaminant mass serving as a source for current and potential vapor intrusion.
- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion.

The soil contaminant source areas to be addressed by this response action are located above and below the water table, and they appear to extend as deep as the shallow saprolite zone.

REMEDIATION GOALS

To meet the RAOs, remediation goals were developed to aid in defining the extent of contaminated soil requiring remedial action. Remediation goals are typically chemical-specific measures for each media and/or exposure route that, if attained, are expected to be protective of human health and the environment. In this case, soil remediation goals were developed to address soils as a source of groundwater and soil vapors contamination, to satisfy the RAOs. They are derived based on comparison to ARARs, risk-based levels, and background concentrations, with consideration also given to other requirements such as analytical detection limits, guidance values, and other pertinent information.

There are no promulgated federal or Commonwealth of Puerto Rico chemical-specific ARARs for soil. To meet the RAOs for the soil as well as to address soil vapors, Site-specific soil remediation goals were developed using two parameters: the Site-specific soil-water partitioning coefficient, Kd; and a Dilution Attenuation Factor (DAF). The soil remediation goals were calculated using a Site-specific soil-partitioning coefficient and the standard DAF of 20. The DAF considers dilution and attenuation factors that reduce contaminant concentrations in soil leachate during migration through the vadose zone. Table 1, contains the remediation goals for soil based on impact to groundwater.

Table 1
Remediation Goals for Soil (all concentrations in µg/kg)

Contaminants of Concern	Soil Protective of Groundwater	Remediation Goals	Maximum Detected Concentrations
cis-1,2-dichloroethene	204	204	4,400
Tetrachloroethene	101	101	46,000
Trichloroethene	36	36	3,600
Vinyl chloride	2	2	520J
1,1-Dichloroethene	35	35	84

EPA anticipates that any remedy selected in this ROD will comprehensively address contaminated vadose-zone soil as a source of groundwater contamination and achieve the remediation goals, which are "soil" remediation goals. Below the water table, EPA expects the remedy will reduce contaminant mass in the shallow saprolite zone. However, EPA recognizes that the shallow saprolite zone includes a mixture of contaminated soil and groundwater, and, therefore, the effectiveness of the treatment technologies considered, which were primarily developed to address the soils, may be limited with respect to the groundwater.

EPA expects the implementation of this action, OU-1, to overlap with the selection and implementation of a complementary remedy to address the groundwater in OU-2. By extending the scope of the OU-1 remedial technologies to the full depth of the shallow saprolite zone below the vadose-zone source areas, EPA expects to expedite the overall remediation of the contaminant sources to groundwater. EPA expects that a final remedy for the Site, to be selected in OU-2, will reconsider the soil/groundwater in the shallow saprolite zone addressed in this OU-1 remedy, possibly augmenting or amending this OU-1 action based on new information or upon the results the OU-2 RI/FS.

DESCRIPTION OF THE ALTERNATIVES

Remedial alternatives were assembled by combining the retained remedial technologies and process options for the contaminated media in OU-1. The areas considered for remediation at OU-1 include the following:

- The soil contamination in the vadose zone that exceeds the remediation goals.
- The contaminated, saturated soil in the shallow saprolite zone below the footprint of the vadose zone contamination (as described below).

The areas where the contamination, as described above, are located are collectively referred to as the source zone. The highest contaminant mass in the source zone appears to be present in the subsurface, and it serves as a continuing source to groundwater contamination.

Five source areas (SAs), as shown in Figure 13, were identified based on a review of the RI sampling results and the past practices for storage and usage of chemicals at the Wallace and CCL facilities. Specific information for each source area is described below. High sub-slab soil vapor concentrations were detected at both facilities, and the extent of soil contamination underneath the buildings could be different from and larger than what is shown in Figure 13.

- Source Area 1 (SA-1) is located at the Wallace lot. This is the approximate area where drums were historically stored. High PCE and TCE concentrations were found in the sub-slab vapor samples in the vicinity of this area. Therefore, additional soil delineation underneath the building in this area is warranted to define the extent of contamination further.
- Source Area 2 (SA-2) is located at the Wallace lot. Soil contamination was found in this area outside the buildings as seen in Figure 11. Additional soil delineation underneath the building is warranted in this area to define the extent of the contamination further.
- Source Area 3 (SA-3) is located at the Wallace lot. This area encompasses soil where the highest PCE concentrations were detected outside a building under a paved area. The highest PCE concentrations in this area were detected in samples from the ground surface to 2 feet bgs and from 5 to 7 feet bgs in boring WS-8. The PCE concentrations decreased with depth, indicating the majority of the contaminant mass is held in the shallow unsaturated clay and silt, likely because of the presence of pavement and limited infiltration. Additional soil delineation underneath the building or along the subsurface drainage channel is warranted to define the extent of contamination further. Because of the relatively moderate groundwater contaminant concentrations at this location (WS-8 with PCE at 233 μg/L) and the fact that soil concentrations decreased with depth, the saprolite zone is not included in the source zone at this area.

- Source Area 4 (SA-4) is located at the CCL lot. Elevated TCE and *cis*-1,2-DCE soil contamination was found between 5 and 7 feet bgs. The extent of soil contamination in this area appears to be localized. Additional soil delineation is recommended to define the treatment zone.
- Source Area 5 (SA-5) is located at the CCL lot. Elevated TCE concentrations were found in the soil between 10 and 22 feet bgs. In the saturated zone, TCE was found at 27,700 µg/L from 19.5 to 23.5 feet bgs. It was also found at 65,400 µg/L from 26.5 to 30.5 feet bgs. The data indicate the possibility of residual DNAPL in the shallow saprolite zone. Additional soil and groundwater samples should be collected during the pre-design investigation (PDI) to define the treatment zone.

Common Elements

There are several common elements that are included in all the remedial alternatives. With the exception of five-year reviews, the common elements listed below do not apply to the no action alternative.

Pre-Design Work

A PDI should be conducted as part of the remedial design. The extent of soil contamination underneath the buildings would be delineated during the PDI. These activities could impact the business operations at the respective facilities, and therefore efforts will be made to minimize interruption of operations.

Institutional Controls

While the RAO for OU-1 includes addressing contaminated soils within the source areas within the Retiro Industrial Park as an initial action for the Site, contaminated groundwater (including the areas to be addressed in OU-2) poses the primary human health concern at the Site. As part of the OU-1 remedy, EPA intends to consider available institutional controls (ICs) and engineering controls that would be effective in restricting contact with contaminated groundwater. By placing ICs to restrict use of the groundwater at this time, EPA can minimize the potential for human exposure while a final remedy for the Site is considered, selected, and implemented, as necessary. ICs and engineering controls (e.g., warning signs, advisories, legally enforceable drilling restrictions, and public education) may also be employed to limit exposures to groundwater contamination.

Vapor Mitigation Systems

EPA's Removal Program is addressing vapor exposure issues separately; therefore, appropriate technologies for mitigating exposures because of vapor intrusion, such as subslab mitigation systems, are not being evaluated as part of OU-1. Systems may be installed at the facility buildings located at the Wallace and CCL lots to prevent vapor intrusion, and if so they would be expected to remain in place until the underlying soil and groundwater sources are addressed at the Site. If installed, the maintenance of these systems would be incorporated into the larger operation and maintenance (O&M) requirements for the Site remedy. Even after the remediation of vadose zone soil, potential soil vapor may continue to accumulate underneath the building slabs and require the operation of mitigation systems in order to mitigate the risk of soil vapor intrusion into the buildings until the conditions at the Site no longer necessitate their operation.

Long-term Monitoring

Periodic monitoring of Site groundwater would be implemented when contaminants remain above levels that allow for unrestricted use and unlimited exposure. The monitoring program would continue until concentrations have met remediation goals. Because the OU-1 and OU-2 remedies are anticipated to be closely aligned, the scope and extent of long-term monitoring is not considered in OU-1 but will be addressed in OU-2.

Five-Year Reviews

While not part of the remedial action, remedies resulting in contaminants remaining above levels that allow for unrestricted use and unlimited exposure require that a site be reviewed at least once every five years after the initiation of the remedy. If justified by the review, additional remedial actions may be considered to remove, treat, or contain the contamination. For remedial actions where unrestricted use and unlimited exposure is expected by the remedial action, but it may require many years to reach that objective, it is EPA policy to conduct five-year reviews until those RAOs are achieved and the use is unrestricted.

For OU-1, a remedial action objective for the vadose zone soils is unrestricted use and unlimited exposure. Because it may require more than five years to reach that objective, EPA expects to conduct five-year reviews for OU-1 until RAOs are achieved within the vadose zone soils. The OU-1 remedy addresses the most highly contaminated portion of the groundwater plume, and the OU-2 remedy will address the remainder of the groundwater plume. Therefore, the need for a five-year reviews for groundwater will be assessed during OU-2.

EPA Region 2 Clean and Green Policy

The environmental benefits of any selected remedy may be enhanced by giving consideration, during the design, to technologies and practices that are sustainable in accordance with EPA Region 2 Clean and Green Energy Policy. This will include consideration of green remediation technologies and practices. Some examples of practices that would be applicable are those that reduce emissions of air pollutants, minimize fresh water consumption, incorporate native vegetation into re-vegetation plans, and consider beneficial reuse and/or recycling of materials, among others.

Remedial Alternatives

Alternative S1 – No Action

The Superfund program requires that the “no-action” alternative be considered for comparison with the other alternatives. This serves as a baseline for comparison to active remedial alternatives. Alternative S1 costs and time frames are presented in Table 2.

Table 2
Alternative S1 Cost Summary

Capital Cost	$0
Present Worth O&M Cost	$0
Total Present Worth Cost	$0
Timeframe to meet RAOs	Will not meet RAOs

Alternative S2 – Excavation and Off-site Disposal/*In-Situ* Treatments

Because the level and distribution of contamination at each source area at the Wallace and CCL lots is different, not every component of this remedial alternative is anticipated to be applied at each source area. For cost-estimating purposes, the conceptual approach for each area is listed below:

- SA-1: Excavation and off-site disposal in the vadose zone to 13 feet bgs, followed by *in-situ* treatment in the remainder of the vadose zone from 13 feet bgs to 20 feet bgs. It is estimated that approximately 505 cubic yards will be excavated in this area. This area is underneath the Wallace facility building with limited infiltration. For cost estimating purposes, it is assumed that the treatment zone is from ground surface to 20 feet bgs.
- SA-2: Excavation and off-site disposal in the vadose zone to 13 feet bgs, followed by *in-situ* treatment for the remainder of the vadose zone and the shallow saprolite zone. It is estimated that approximately 3,827 cubic yards will be excavated in this area. This area is located at the Wallace lot.
- SA-3: Excavation and off-site disposal in the vadose zone to 13 feet bgs, followed by *in-situ* treatment for the remainder of the vadose zone to 20 feet bgs. It is estimated that approximately 2,238 cubic yards will be excavated in this area. This area is underneath the Wallace facility building and pavement with limited infiltration, contaminant concentrations are decreasing over depth, and the grab groundwater sample from WS-8 revealed PCE and TCE at 233 µg/L and 38.7 µg/L, respectively; therefore, the majority of contaminants are believed to be held in the vadose zone soil. For cost-estimating purposes, the treatment zone is assumed to be from ground surface to 20 feet bgs.
- SA-4: *In-situ* treatment in the vadose zone soil and shallow saprolite zone from 5 feet bgs to 40 feet bgs. The contaminant level was low in the shallow vadose zone; it is not cost effective to perform excavation at this area. This area is located on the CCL lot.
- SA-5: *In-situ* treatment in the vadose zone soil and the shallow saprolite zone from 5 feet bgs to 40 feet bgs. Soil contaminant concentration were moderate, and vertical distribution of contaminant concentration indicates the majority of contaminants have migrated to the shallow saprolite zone. It is not cost effective to perform excavation at this area. This area is located on the CCL lot.

For costing purposes, excavation would be performed to 13 feet bgs at SA-1, SA-2, and SA-3 areas. The exact dimensions of the area to be excavated and volume of soil to be excavated would be determined during the remedial design. The major portions of these three areas are located underneath the buildings or pavement. The concrete slab and pavement covering these areas would need to be demolished before conducting the excavation. The excavated area would be backfilled with imported clean common fill and properly compacted. The cost estimate also takes into account the reconstruction of the slab following excavation and backfilling activities.

Soil samples would also be collected from the bottom of the excavation for documentation purposes. The effectiveness of excavation would be confirmed with the post-excavation sample results from sidewalls. Two rounds of soil sampling would also be performed, each after one round of *in-situ* treatment, in the vadose zone to evaluate the effectiveness of *in-situ* treatment. Results from the first round of soil sampling would be used to design the second round of *in-situ* treatment to areas with contaminant concentrations exceeding the PRGs in the vadose zone soil.

Excavated soils would be disposed of off Site in a Resource Conservation and Recovery Act (RCRA) Subtitle D (non-hazardous) landfill. If the excavated soil is found to be hazardous as determined by toxicity characteristic leaching procedure analysis, it would be shipped to the mainland for proper treatment and disposal. The excavated area would be backfilled with imported clean common fill and properly compacted.

While methods of *in-situ* treatment discussed above are not fixed, the expected *in-situ* treatment methodology assumed in the FS was the addition of organic amendments into the subsurface to promote anaerobic biodegradation of the chlorinated VOCs. Following the excavation at SA-1 and SA-3, perforated horizontal pipes could be placed at the bottom of the excavation prior to backfill. At each area, these pipes would be combined at a header with a vertical pipe extending to ground surface and connected to a storage tank. Organic amendment solution could be added to this storage tank periodically and gravity fed into the treatment zones to promote *in-situ* anaerobic biological treatment.

At SA-2, contamination is known to have migrated into the shallow, saturated saprolite zone. Source treatment at the deep vadose zone and the shallow saprolite zone would be conducted simultaneously. Following excavation and backfill, organic amendments would be injected into boreholes from a depth of 13 feet bgs to 40 feet bgs, spaced 10 feet apart to promote anaerobic biological treatment.

The vadose zone soil contamination at SA-4 and SA-5 would be remediated together with the saturated soil using *in-situ* treatment technologies. Similar to what was described for SA-2, amendment would be distributed into the vadose zone soil and the shallow saprolite zone injection spaced 10 feet apart. Amendment distribution for the deeper treatment zone in the shallow saprolite zone would be performed with injection wells.

Monitoring wells would be installed up-gradient and downgradient of the treatment zone for the evaluation of treatment effectiveness in the shallow saprolite. MW-2S and MW-3S would be used for performance monitoring if these two wells are confirmed to be outside the treatment zone after the PDI. For cost-estimating purposes, a total of 10 monitoring wells would be installed. Groundwater and soil samples would be collected prior to treatment and post treatment to evaluate the effectiveness of *in-situ* treatment.

After the completion of this OU-1 remedial alternative, all equipment and materials would be removed from the Site. The Site would be restored to prior conditions to the extent possible. The injection and monitoring wells would be retained for use during OU-2, as appropriate. Costs associated with alternative S2 are presented in Table 3.

Table 3
Alternative S2 Cost Summary

Capital Cost	$12,883,000
Present Worth O&M Cost	$ 549,000
Total Present Worth Cost	$ 13,432,000
Construction Time Frame	12 to 18 months
Timeframe to meet RAOs	2.5 years

Alternative S3 – Soil Vapor Extraction and Dual-Phase Extraction)/*In-Situ* Treatments

Under this alternative, a pilot study would be performed as part of the PDI to collect the design parameters for the Soil Vapor Extraction (SVE) and dual-phase extraction (DPE) system. For the design of an SVE system, an air permeability test would be conducted to determine the Site-specific design parameters, such the achievable air flow rate, the required vacuum to induce the flow, the radius of influence from the applied vacuum, and the initial contaminant removal rates. For the DPE, the achievable sustained groundwater extraction rate and the drawdown would be studied.

This remedial alternative would consist of the following major components:

- Cap Installation at SA-2 and SA-3;
- SVE system installation and operation;
- Dual phase extraction system installation and operation;
- *In-situ* treatment (e.g., enhanced anaerobic biodegradation);
- Treatment performance evaluation; and
- Site restoration.

Because the level and distribution of contamination at each source area is different, not every component is anticipated to be applied at each source area. For cost-estimating purposes, the conceptual approach for each area is listed below.

- SA-1: SVE in the vadose zone.
- SA-2: SVE in the vadose zone in conjunction with DPE in the shallow saprolite zone, followed by *in-situ* treatment as described in Alternative S2.

- SA-3: SVE in the vadose zone.
- SA-4: *In-situ* treatments for both the vadose zone and the shallow saprolite as described in Alternative S2.
- SA-5: DPE in the shallow saprolite, followed by *in-situ* treatment in both the vadose zone and the shallow saprolite as described in Alternative S2.

Two existing buildings and paved driveways at the Wallace lot would act as caps for the SVE system to prevent short-circuiting from the atmosphere. Additional impermeable cover could be installed as necessary for the implementation of SVE. Any additional cover would be engineered to limit infiltration of rain water into the contaminated soils, meaning that durable, low-permeability material would be used, and rainwater would be directed away from the remediation zone. (For cost-estimating purposes, it is assumed no additional cap is needed.)

In source areas SA-1, SA-2, and SA-3, vertical SVE wells would be installed in the vadose zone to target the entire vadose zone contamination without extracting groundwater. For cost-estimating purposes, it is assumed 3, 13, and 8 SVE wells would be installed in SA-1, SA-2, and SA-3, respectively. Nested vapor monitoring wells also would be installed to monitor the progress of contaminant removal and the changes in soil vapor pressure.

Piping for transferring the extracted soil vapor to an above-ground treatment system would be routed underground, along the wall or overhead, to minimize impact to routine building operations. An above-ground treatment system would be installed in a pre-fabricated building brought on-site to treat the extracted soil vapor prior to discharge to the atmosphere.

For cost-estimating purposes, it is assumed that the SVE system would be operated continuously for the first two years and intermittently for the following eight years.

The DPE system would be installed at SA-2 and SA-5 to reduce the contaminant mass in the shallow saprolite zone prior to implementing other *in-situ* treatment methods. DPE wells would be installed based on the conclusions of the remedial design. For cost-estimating purposes, it is assumed 13 and 4 DPE wells will be installed in SA-2 and SA-5, respectively.

The extracted vapor would be treated using the same vapor treatment system described above for SVE, if possible. The water treatment system also would be installed in the same building that would house the vapor treatment system. This system is anticipated to consist of groundwater extraction pumps, piping, transfer pumps, bag filters, and an air stripper in addition to the air-water separator and vapor phase activated carbon. Treated water would be discharged to the nearby open drainage ditch and meet Puerto Rico discharge permit requirements. For cost-estimating purposes, the DPE system is anticipated to be operated for one year.

Following the DPE treatment, the remaining contamination in SA-2 and SA-5 would be remediated with an *in-situ* treatment technology similar to those described in Alternative S2. The vertical intervals for the *in-situ* treatment might be adjusted in accordance with the operation of the SVE system. *In-situ* remediation at SA-4 would be performed as described in Alternative S2.

After the completion of the remedy, equipment and materials would be removed from the Site, and the Site would be restored. The wells would be properly abandoned if necessary. DPE wells and monitoring wells screened in the shallow saprolite zone would be kept as necessary for OU-2. Costs associated with alternative S3 are presented in Table 4.

Table 4
Alternative S3 Cost Summary

Capital Cost	$ 5,448,000
Present Worth O&M Cost	$ 1,880,000
Total Present Worth Cost	$ 7,328,000
Construction Time Frame	8 months
Timeframe to meet RAOs	At least 10 years

Alternative S4 – *In-situ* Thermal Remediation and SVE/*In-Situ* Treatments

This remedial alternative would consist of the following major components:

- Cap Installation at SA-2, SA-3, and SA-5 (as necessary);
- SVE and *in-situ* thermal remediation (ISTR) system installation and operation;
- Decommissioning of ISTR;
- Treatment performance evaluation;
- *In-situ* treatment as necessary; and
- Site restoration.

Because the level and distribution of contamination at each source area is different, not every component is anticipated to be applied at each source area. For cost estimating purposes, the conceptual approach for each area is listed below.

- SA-1: ISTR and SVE in the vadose zone.
- SA-2: ISTR and SVE for both the vadose zone and the shallow saprolite, followed by *in-situ* treatments.
- SA-3: ISTR and SVE in the vadose zone.
- SA-4: *In-situ* treatment for both the vadose zone and the shallow saprolite zone.
- SA-5: ISTR and SVE for both the vadose zone and the shallow saprolite zone, followed by *in-situ* treatment.

Impermeable surface cover would be installed at SA-2, SA-3, and SA-5, as necessary. The majority of SA-2 and SA-3 areas are already under Wallace facility buildings or pavement. The building slab and pavement would be inspected and repaired as necessary. SA-5 is partially covered by parking lot. The parking lot would be inspected and repaired as necessary, and areas to be remediated with SVE and ISTR would be paved as necessary.

Combined soil vapor extraction and heating wells would be installed at the property currently occupied by Wallace (SA-1, SA-2, and SA-3) and CCL (SA-5). Electrical resistance heating (ERH) and thermal conductive heating (TCH) are the most common methods for thermal remediation of chlorinated solvent contamination. Both ERH and TCH are anticipated to be effective at the Site. For costing purposes, it is assumed ERH will be used.

As a result of space constraints at the Wallace lot, it likely would be difficult to install combined heating and vapor extraction wells in the configuration that vendors have identified as most optimal (12-inch boreholes with an 8-foot radius of influence). For cost-estimating purposes, it is assumed that 12-inch borings would be installed in outdoor areas, in both a vertical configuration and also angled under the building, and 4-inch borings would be installed indoors. Because of the lower surface area of the small-boring electrodes, the radius of influence would be less than the 12-inch boring electrodes.

At the CCL lot, SA-5 is outside and has severe space constraints. Thus, it is assumed only 12 borings would be installed at the property. At all the ISTR areas, temperature monitoring points would be installed to monitor the progress of heating in the soil along with additional dedicated soil vapor extraction wells. The existing pavement at the Site would be retained because it serves to inhibit both heat and vapor loss from the subsurface.

Heating of the soils is anticipated to take approximately 100 days, during which the SVE system would be operated to remove volatilized contaminants. Additional sampling and analysis would also be conducted in order to meet the air emission permit requirements. After heating, an approximately 100-day soil cool-down period would be needed prior to removal of the system and abandonment of the wells in SA-1 and SA-3. The SVE system would be operated during the cool-down period and possibly longer if warranted.

Toward the end of the heating period, soil samples would be collected within the treatment zones for VOC analysis to evaluate the effectiveness of the thermal treatment. For costing purposes, it is assumed that once 90 percent of the source zone mass has been removed (a typical efficiency for *in-situ* thermal remediation), then heating would be complete. *In-situ* treatment would start in SA-2 and SA-5. In SA-1 and SA-3, it is assumed for costing purposes that the SVE system would continue to target residual mass, and a cap would be maintained over the treatment area to prevent short-circuiting and surface water infiltration.

In-situ treatments would be applied in SA-4 as described in Alternative S2. At SA-1, SA-2, SA-3, and SA-5, with extended operation of the SVE system, the vadose zone soil is expected to meet the remediation goals. Therefore, no additional *in-situ* treatment is anticipated to be needed at SA-1 and SA-3. For SA-2 and SA-5, one round of *in-situ* treatment would be conducted in the shallow saprolite zone and possibly the capillary fringe using a combination of direct push technology and injection wells for amendment placement, as described in Alternative S2.

For SA-2 and SA-5, the *in-situ* treatment described above would commence soon after the ITSR phase, since the residual heat would be conducive to the growth of microbes. The effectiveness of ISTR in the vadose zone soil would be evaluated by collecting soil samples. The effectiveness of ISTR and *in-situ* treatment would be evaluated by collecting groundwater samples from monitoring wells as described in Alternative S2.

After the completion of the OU-1 remedial action, the heating wells, the soil vapor extraction wells, and soil vapor monitoring points would be properly abandoned. All the equipment and materials would be removed or demobilized. Wells that could be used for OU-2 would be kept. The Site would be restored. Costs associated with alternative S4 are presented in Table 5.

Table 5
Alternative S4 Cost Summary

Capital Cost	$ 12,741,000
Present Worth O&M Cost	$ 549,000
Total Present Worth Cost	$ 13,290,000
Construction Time Frame	1-2 years
Timeframe to meet RAOs	2.5 years

EVALUATION OF REMEDIAL ALTERNATIVES

In selecting a remedy, EPA considers the factors set out in CERCLA Section 121, 42 U.S.C. § 9621, by conducting a detailed analysis of the viable remedial alternatives in accordance with the NCP, NCP Section 300.430(e)(9)(iii) and the EPA Office of Solid Waste and Emergency Response (OSWER) Directive 9355.3-01. The detailed analysis consists of an assessment of each alternative against each of nine evaluation criteria and a comparative analysis focusing upon the relative performance of each alternative against those criteria.

The following "threshold" criteria are the most important and must be satisfied by any alternative in order to be eligible for selection:

1. *Overall protection of human health and the environment* addresses whether or not a remedy provides adequate protection and describes how risks posed through each exposure pathway (based on a reasonable maximum exposure scenario) are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.
2. *Compliance with ARARs* addresses whether or not a remedy would meet all of the applicable or relevant and appropriate requirements of other federal and state environmental statutes and regulations or provide grounds for invoking a waiver. Other federal or state advisories, criteria, or guidance are TBCs. The NCP recognizes that TBC may be used to determine what is protective of a site or how to carry out certain actions or requirements.

The following "primary balancing" criteria are used to make comparisons and to identify the major tradeoffs between alternatives:

3. *Long-term effectiveness and permanence* refers to the ability of a remedy to maintain

reliable protection of human health and the environment over time, once cleanup levels have been met. It also addresses the magnitude and effectiveness of the measures that may be required to manage the risk posed by treatment residuals and/or untreated wastes.

4. *Reduction of toxicity, mobility, or volume through treatment* is the anticipated performance of the treatment technologies, with respect to these parameters, a remedy may employ.

5. *Short-term effectiveness* addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup levels are achieved.

6. *Implementability* is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

7. *Cost* includes estimated capital, O&M, and present worth costs.

The following “modifying” criteria are used in the final evaluation of the remedial alternatives after the formal comment period, and may prompt modification of the preferred remedy that was presented in the Proposed Plan:

8. *State acceptance* indicates whether, based on its review of the RI/FS report, Human Health and Ecological Risk Assessment, and Proposed Plan, the State concurs with, opposes, or has no comments on the selected remedy.

9. *Community acceptance* refers to the public's general response to the alternatives described in the RI/FS Reports, the Human Health and Ecological Risk Assessments, and the Proposed Plan.

A comparative analysis of the alternatives considered in this ROD, based upon the evaluation criteria noted above, follows.

COMPARATIVE ANALYSIS OF ALTERNATIVES

Overall Protection of Human Health and the Environment

Alternative S1, No Action, would not meet the RAOs and would not be protective of the environment since no action would be taken. The contaminated soil would continue to be a source of groundwater and soil vapor contamination.

Alternatives S2, S3 and S4 would meet the RAOs and would be protective of human health and the environment by addressing the source areas, to the extent practicable. Treatment and excavation technologies may not be able to treat all the contamination underneath occupied buildings. If that is the case, the buildings could act as a cap to minimize infiltration of surface water and reduce contaminant migration into groundwater.

Compliance with ARARs

There are no federal or Commonwealth of Puerto Rico chemical-specific ARARs for soils. While not ARARs, the Site-specific remediation goals would be met in soils above the water table with Alternatives S2, S3, and S4, and the technologies in Alternatives S2, S3, and S4 would effectively remove contaminant mass below the water table.

Excavation and off-site disposal under Alternative S2 would need to satisfy the land disposal requirements under RCRA. All active alternatives (S2, S3, and S4) would comply with action-specific ARARs. Action-specific ARARs would not be attained under the no action alternative because no work would be implemented.

Long-Term Effectiveness and Permanence

Under the no action alternative, contamination would continue to be present in the vadose zone and migrate in the soil and continue to impact groundwater in the future. The no action alternative is not effective nor permanent.

For Alternatives S2 and S4, with either excavation (S2) or thermal remediation (S4) combined with *in-situ* treatment, a significant degree of permanent mass removal is expected, with a resulting high degree of long-term effectiveness and permanence. For Alternative S3 with DPE/SVE, technical limitations may mean that not all the contamination would be removed from the clayey soil. The radius of influence of SVE wells would be low in clayey soil. Significant diffusion of contamination into the clay is likely to have occurred. The SVE system may need to be operated for a much longer period than the time estimated for the remedial alternatives set forth in Alternatives S2 and S4 to achieve a similar level of permanent mass removal. However, the technologies employed in Alternative S3 have the best potential to treat contamination beneath building slabs, whereas the primary technologies associated with Alternatives S2 and S4 have limited effectiveness under the occupied structures.

For any contamination underneath the buildings on the Wallace and CCL lots that are not accessible for excavation or thermal treatment, the buildings would act as a cap to prevent contaminant migration into groundwater.

Reduction of Toxicity, Mobility, and Volume Through Treatment

The no action alternative would not reduce contaminant toxicity, mobility, and volume (T/M/V) because no remedial action would be conducted.

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The excavation and thermal remediation alternatives would be expected to reduce T/M/V significantly through treatment. DPE/SVE under Alternative S3 likely would reduce T/M/V through treatment to a degree, but its effectiveness in the tight soils at the Site likely would be limited, and thus, reduction of T/M/V may be limited. The extent and effectiveness of T/M/V reduction by DPE/SVE would need to be verified with monitoring. *In-situ* treatment would enhance T/M/V and is included in Alternatives S2, S3, and S4.

Short-Term Effectiveness

With respect to the no action alternative, there would be no short-term impact to the community and environment as no remedial action would occur.

There would be significant short-term impacts to the ongoing businesses on-site, the local community, and workers for the remaining alternatives because of the active remedial actions undertaken and associated construction and operation.

Operation at currently occupied facilities (e.g., at the Wallace facility) would need to be modified or temporarily shut down for Alternatives S2 and S4. Excavation would involve truck traffic and noise from heavy equipment operations. Thermal remediation under Alternative S4 would require the presence of substantial piping and treatment elements at the Site for a period on the order of one year, causing substantial short-term disruption to property use. Similarly, excavation activities under Alternative S2 would cause substantial short-term disruptions and may require temporary business closures for occupied properties in the Industrial Park. By contrast, SVE and other *in-situ* treatment infrastructure (the latter is part of all the active alternatives, and the former is part of the work to be performed for Alternative S3) would require substantially less short-term disruptions during installation, and while the systems may be present for a number of years, they would not pose any significant adverse impact property use once installed.

Alternative S3 (DPE/SVE) would have a smaller footprint in terms of short-term effectiveness as opposed to the other two active remediation options. Air monitoring, engineering controls, and appropriate worker personal protective equipment would be used to protect the community and workers during the implementation of these alternatives.

Alternatives S2 and S4 would achieve the RAOs in approximately 2.5 years while Alternative S3 is expected to achieve the RAOs in approximately 10 years.

Implementability

The no action alternative would be easiest both technically and administratively to implement as no additional work would be performed at the Site. Both Alternative S2 (with thermal remediation) and Alternative S4 (with excavation) face considerable implementation hurdles. Because excavation would be occurring directly inside and adjacent to buildings, shoring and underpinning would be necessary to support the structures during the work. Any excavated hazardous waste would have to be shipped to the continental United States for disposal because there are no permitted hazardous waste landfills on Puerto Rico.

For thermal remediation, the presence of buildings (with tenants) in the treatment zones also presents challenges regarding implementation, such as installing heating elements inside an active facility. During remedial design, it may be possible to install heating elements either at angles or horizontally into the treatment zone from outside the buildings.

For Alternative S3, the major implementability limitation would be the ability to access the treatment zone based on physical limitations. The limited effectiveness of SVE/DPE in clayey soils is also an implementability concern, but it is expected that it can be overcome by extending the period of performance out to an estimated 10 years, at which time a comparable level of mass removal can be expected, when compared to the other active alternatives.

Cost

Alternative S1 would not include any cost. Alternative S3 has substantially lower cost than Alternative S2 and S4. The cost estimates for all four alternatives are provided in Table 6.

Table 6
Alternatives Costs

Soil Source Alternative	Capital Cost	Present Worth O&M Cost	Total Present Worth Cost
S1	$ 0	$0	$0
S2	$12,883,000	$ 549,000	$13,432,000
S3	$5,448,000	$1,880,000	$7,328,000
S4	$12,741,000	$549,000	$13,290,000

State/Support Agency Acceptance

The Commonwealth of Puerto Rico concurs with the selected remedy. Copy of the concurrence letter is included in Appendix X.

Community Acceptance

All the alternatives were made available for the community to review and comment. The preferred alternative was presented to the community in the Proposed Plan. A public comment period (August 12, 2015, to October 24, 2015) was established to allow the community to review and comment on all the alternatives and the preferred alternative. In addition, a public meeting was held on August 19, 2015. EPA’s response to public comments received during the comment period is presented in the Responsiveness Summary of this ROD, included as Attachment VII.

PRINCIPAL THREAT WASTES

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a Site whenever practicable (NCP Section 300.430(a)(1)(iii)(A)). The “principal threat” concept is applied to the characterization of “source materials” at a Superfund site. Source material includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for the migration of contamination to groundwater, surface water, or air, or act as a source for direct exposure. Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained, or would present significant risk to human health or the environment should exposure occur. The principal threat concept is applied to the characterization of source materials at a Superfund site.

At both the Wallace and CCL lots, PCE and TCE concentrations have been detected in groundwater samples, indicating contaminants have migrated into the shallow saprolite zone and the deeper fractured bedrock zone below. Soil source areas found in the vadose zone, and extending below the water table into the saturated soil in the shallow saprolite zone, contain large contaminant mass. Therefore, PCE and TCE contamination in these source areas fits the definition of principal threat waste and would require remediation through treatment, where practicable. The selected soil alternative for the vadose zone and the shallow saprolite within the Wallace and CCL lots rely on treatment to address the principal threats.

SELECTED REMEDY

SUMMARY OF THE RATIONALE FOR THE SELECTED REMEDY

Based upon the requirements of CERCLA, the results of the Site investigations, the detailed analysis of the alternatives, and public comments, EPA has determined that Alternative S3 satisfies the requirements of CERCLA Section 121, 42 U.S.C. § 9621, and provides the best balance of tradeoffs among the remedial alternatives with respect to the NCP's nine evaluation criteria, set forth at 40 CFR §300.430(e)(9), as described below. The principal components of the selected remedy are described below:

<u>Alternative S3 (Soil Vapor Extraction and Dual-Phase Extraction/*In-Situ* Treatment)</u>, is the selected alternative for OU-1. The remedy includes the following components:

- SVE to address soil (vadose zone) source areas at the Wallace and CCL lots;
- Impermeable cover as necessary for the implementation of SVE;
- DPE in the shallow saprolite zone; and
- *In-situ* treatment, such as enhanced anaerobic biodegradation, as needed to address residual sources.

DETAILED DESCRIPTION OF THE SELECTED REMEDY

Under this alternative, the soil source areas will be targeted with SVE in the vadose zone in combination with DPE in the shallow saprolite zone, followed by *in-situ* treatment as necessary. For this alternative, a pilot study will be performed as part of the PDI to collect the design parameters for the SVE and DPE system. For the design of a vapor extraction system, an air permeability test would be conducted to determine the Site-specific design parameters, such the achievable air flow rate, the required vacuum to induce the flow, the radius of influence from the applied vacuum, the initial contaminant removal rates.

The two buildings and the paved driveways at the Wallace lot are expected to act as caps for the SVE system to prevent short-circuiting from the atmosphere. Additional impermeable cover may be installed, as necessary, for the implementation of SVE. Any additional cover would be engineered to limit infiltration of rainwater into the contaminated soils, meaning that durable, low-permeability material would be used, and rainwater would be directed away from the remediation zone.

For cost-estimating purposes, it is assumed 3, 13, and 8 SVE wells will be installed in the areas identified as SA-1, SA-2, and SA-3, respectively, at the Wallace lot. Nested vapor monitoring wells also will be installed to monitor the progress of contaminant removal and the changes in soil vapor pressure. Also, for cost-estimating purposes, it is assumed that the SVE system would be operated continuously for the first two years and then intermittently for the following eight years. The implementation of the SVE component of the remedy could be performed simultaneously with the operation of the DPE system, or alternatively the DPE system could be operated six months to one year after the start of the SVE system, depending on the level of initial contaminant concentrations and any other logistical considerations.

The DPE system would be installed at the areas identified as SA-2 and SA-5 to reduce the contaminant mass in the shallow saprolite zone prior to other *in-situ* treatment (that *in-situ* treatment is assumed to be the addition of organic amendments into the subsurface to promote anaerobic biodegradation). DPE wells would be installed based on the conclusions reached during the remedial design. For cost-estimating purposes, it is assumed 13 and 4 DPE wells will be installed in the areas identified as SA-2 and SA-5, respectively.

The water treatment system required for the DPE system would be installed in the same building that would house the vapor treatment system. This system is anticipated to consist of groundwater extraction pumps, piping, transfer pumps, bag filters, and an air stripper, in addition to the air-water separator and vapor phase activated carbon. Treated water would be discharged to the nearby open drainage ditch in accordance with an appropriate permit. Discharged water would meet Commonwealth of Puerto Rico discharge permit requirements. In addition, for cost-estimating purposes, the DPE system is anticipated to be operated for one year.

The remedy also calls for establishment of ICs and engineering controls to restrict contact with contaminated groundwater. By placing these controls on the groundwater at this time, EPA can minimize the potential for human exposure until the Site is available for unrestricted use. These controls (e.g., warning signs, advisories, legally enforceable drilling restrictions, and public education) would limit exposures to groundwater contamination.

EPA's Removal Program is addressing vapor exposure within the Wallace and CCL facility buildings separately. Consequently, appropriate technologies for mitigating exposures because of vapor intrusion, such as sub-slab mitigation systems, are not included in this remedy. Systems that may be installed at the buildings located at the Wallace and CCL lots to prevent vapor intrusion would be expected to remain in place until the underlying soil and groundwater sources of vapors are addressed. The maintenance of systems will be incorporated into the O&M requirements for the Site remedy.

Periodic monitoring of Site groundwater will be implemented for as long as contaminants remain above levels that allow for unrestricted use and unlimited exposure. The monitoring program would continue until concentrations have met remediation goals. Because the OU-1 and OU-2 remedies are expected to be closely aligned, the scope and extent of such long-term monitoring will be considered in OU-2.

RATIONALE FOR THE SELECTED REMEDY

EPA has determined that Alternative S3 provides the best balance of tradeoffs among the alternatives considered based on the information available to EPA at this time. EPA and Puerto Rico Environmental Quality Board, on behalf of the Commonwealth, conclude that the selected remedy will treat principal threats, be protective of human health and the environment, comply with ARARs, be cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. The selected remedy also would meet the statutory preference for the use of treatment as a principal element.

While the three active alternatives can achieve similar levels of protectiveness and Alternatives S2 and S4 appear capable of achieving the RAOs in a shorter time period (2.5 years as opposed to 10 years), the short-term occupant disruptions and implementability challenges are substantially greater than for Alternative S3. Alternative S3 also does not have the off-site disposal challenges of Alternative S2, and it is substantially less expensive.

The environmental benefits of the selected remedy may be enhanced by consideration, during the design, of technologies and practices that are sustainable in accordance with EPA Region 2's Clean and Green Energy Policy. This would include consideration of green remediation technologies and practices.

Summary of the Estimated Selected Remedy Costs

The estimated capital, O&M, and present worth costs of the components of the selected remedy is discussed in detail in the FS Report. The cost estimates, which are based on available information, are order-of-magnitude engineering cost estimates that are expected to be within +50 to -30 percent of the actual cost of the project.

The capital, O&M, and present worth costs for the selected remedy are presented in Table 7.

Expected Outcomes of Selected Remedy

The principal outcomes of the selected remedy are expected to be (1) to address soils and shallow groundwater as a source of groundwater contamination and subsurface vapors, in support of a comprehensive groundwater remedy to be evaluated in a subsequent OU-2, (2) to prevent or minimize exposure to contaminated groundwater, and (3) to allow for continued use of the Wallace an CCL facility buildings during implementation of the remedy.

STATUTORY DETERMINATIONS

CERCLA Section 121(b)(1) mandates that a remedial action must be protective to human health and the environment, be cost-effective, and utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. Section 121(b)(1) also establishes a preference for remedial actions that employ treatment to permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants, or contaminants at the Site. CERCLA 121(d) further specifies that a remedial action must attain a degree of cleanup that satisfies ARARs under federal and state laws, unless a waiver can be justified pursuant to CERCLA 121(d)(4). For the reasons discussed below, EPA has determined that the selected remedy meets the requirements of CERCLA Section 121.

Table 7
Costs for Alternative S3

Cost Estimate for Alternative S3
Soil Vapor Extraction and Dual Phase Extraction; and In Situ Treatment
San German Groundwater Contamination Site
San German, Puerto Rico

	Description	Cost
CAPITAL COSTS		
No. 1	General Conditions	$1,496,000
No. 2	SVE and DPE System Construction and Startup	$567,000
No. 3	In Situ Treatment	$796,000
No. 4	First Year Soil Vapor Extraction Operation and Maintenance	$412,000
No. 5	Year of Dual Phase Extraction Operation and Maintenance	$331,000
	Subtotal	$3,602,000
	Contingency 20%	$721,000
	Subtotal	$4,323,000
	General Contractor Bond and Insurance 5%	$217,000
	Subtotal	$4,540,000
	General Contractor Markup (profit) 10%	$908,000
	Total Remedial Action Capital Costs	**$5,448,000**
OPERATION AND MAINTENANCE COSTS		
No. 6	Annual O&M for SVE System Operating Full Year	$324,000
	Present worth of O&M Second Year Costs	$303,000
No. 7	Annual O&M for SVE System Operating Intermittently	$172,000
	Present worth of O&M Years 3-10, Intermittent Operation	$1,028,000
No. 8	Present worth of performance monitoring once per year for four years	$549,000
PRESENT WORTH		
	Total Capital Cost	$5,448,000
	Total O&M Cost	$1,880,000
	Total Present Worth	**$7,328,000**

Note: The project cost presented herein represents only feasibility study level, and is thus subject to change pending the results of the pre-design investigation, which is intended to collect sufficient data to assist in the development of remedial design and associated detailed cost estimate. Expected accuracy range of the cost estimate is -30% to +50%.

Protection of Human Health and the Environment

The selected remedy will protect human health and the environment because it will address Site's the source areas, to the extent practicable, over the long-term, address direct contact threats, and mitigate the potential for exposure through a vapor intrusion pathway until the VOC hot spots are remediated. Institutional and engineering controls will also assist in protecting human health and the environment over both the short and long-term by helping to control and limit exposure to hazardous substances.

Compliance with ARARs

There are no federal or Commonwealth chemical-specific ARARs for soils. EPA developed risk-based remediation goals and protection of groundwater values for soil at the Wallace and CCL lots. The selected remedy for soil at the Wallace and CCL lots will comply with chemical-specific and action-specific ARARs (Table 7 and 8 of Appendix IX).

The remedy will meet the RAOs and will be protective of the environment by addressing the source areas, to the extent practicable. This remedy is expected to comply with chemical, location, and action specific ARARs.

Cost Effectiveness

A cost-effective remedy is one which has costs that are proportional to its overall effectiveness (NCP Section 300.430(f)(1)(ii)(D)). Overall effectiveness is based on the evaluations of long-term effectiveness and permanence, reduction in toxicity, mobility, and volume through treatment, and short-term effectiveness. EPA evaluated the "overall effectiveness" of those alternatives that satisfied the threshold criteria (i.e., were both protective of human health and the environment and ARAR-compliant). Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility, and volume though treatment; and short-term effectiveness). Overall effectiveness was then compared to those alternatives' costs to determine cost-effectiveness.

Each of the alternatives underwent a detailed cost analysis. In that analysis, capital and O&M costs were estimated and used to develop present-worth costs. In the present-worth cost analysis, O&M costs were calculated for the estimated life of each alternative. The total estimated present-worth cost for implementing the selected remedy is $7,328,000.

Based on the comparison of overall effectiveness to cost, the selected remedy meets the statutory requirement that Superfund remedies be cost-effective (NCP Section 300.430(f)(1)(ii)(D)) in that it is the least-costly alternative that comprehensively addresses contaminated vadose-zone soil as a source of groundwater contamination and achieves the remediation goals within a reasonable time frame. EPA expects that the remedial alternative selected will also reduce contaminant mass in the shallow saprolite zone. The results of the analysis support the use, for planning and estimating purposes, of an estimate of a 10-year timeframe to remediate contaminated vadose-zone soil as well as shallow saprolite zone, although remediation timeframes could exceed or be shorter in duration than this estimate.

Utilization of Permanent Solutions and Alternative Treatment (or Resource Recovery) Technologies to Maximum Extent Practicable

The selected remedy provides the best balance of tradeoffs among the alternatives with respect to the balancing criteria set forth in the NCP Section 300.430(f)(1)(i)(B), because they each represent the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the Site. The selected remedy satisfies the criteria for long-term effectiveness and permanence by removing contaminant mass with elevated levels of VOC concentrations. The combination of SVE, DPE, and *in-situ* treatments at the soil source areas permanently reduces the mass of contaminants in soil and groundwater, thereby reducing the toxicity, mobility, and volume of contamination.

Preference for Treatment as a Principal Element

By using a combination of technologies, to the maximum extent practicable, the statutory preference for remedies that employ treatment as a principal element is satisfied through the use of SVE, DPE, and other *in-situ* treatment to address the vadose zone as well as the shallow saprolite zone.

Five Year Review Requirements

For OU-1, the remedy for the vadose zone soils has unrestricted use and unlimited exposure as the remedial objective. Because it may require more than five years to reach that objective, EPA expects to conduct five-year reviews for OU-1 until RAOs are achieved within the vadose zone soils. The OU-1 remedy addresses the most highly contaminated portion of the groundwater plume, and the OU-2 remedy will evaluate the remainder of the groundwater plume. The need for a five-year reviews for groundwater will be assessed in OU-2.

DOCUMENTATION OF SIGNIFICANT CHANGES FROM PREFERRED ALTERNATIVE OF PROPOSED PLAN

The Proposed Plan for the Site was released for public comment on August 12, 2015, and the public comment period ran from that date through October 24, 2015. The Proposed Plan identified the selected remedy as the preferred alternative for the Site.

All written and verbal comments submitted during the public comment period were reviewed by EPA. See the Responsiveness Summary set forth in Attachment VII. Upon review of these comments, EPA has determined that no significant changes to the proposed remedy, as it was originally identified in the Proposed Plan, is necessary.

APPENDIX I

PROPOSED PLAN
San German Groundwater Contamination Superfund Site

OU-1

San German Groundwater Contamination Superfund Site (OU-1)

San German, Puerto Rico
August 2015

EPA Region 2

EPA ANNOUNCES PROPOSED CLEANUP PLAN

This Proposed Plan describes the remedial alternatives developed for the San German Groundwater Contamination Superfund Site (the Site) in San German, Puerto Rico, and identifies the preferred remedy for the Site with the rationale for this preference. This document was developed by the U.S. Environmental Protection Agency (EPA), the lead agency for Site activities, in consultation with the Puerto Rico Environmental Quality Board (PREQB), the support agency. EPA is issuing this Proposed Plan as part of its public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, commonly known as Superfund), 42 U.S.C. § 9617(a), and Sections 300.430(f) and 300.435(c) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

The nature and extent of the contamination at the Site and the remedial alternatives summarized in this document are described in detail in the Remedial Investigation (RI) and Feasibility Study (FS) reports. EPA is addressing the Site in two operable units (OUs). OU-1 addresses identified soil contamination that acts as a continuing source of groundwater contamination, including soil in the vadose zone (above the water table) and soil and highly contaminated groundwater below the water table in the shallow saprolite zone (soils and highly weathered rock). OU-2 will address the site-wide groundwater contaminated plume, which will be addressed in a second phase of the cleanup.

MARK YOUR CALENDAR

PUBLIC MEETING
August 19, 2015 at 6:00 pm
Santa Marta Basketball Court, San German

PUBLIC COMMENT PERIOD
August 12, 2015-September 11, 2015

INFORMATION REPOSITORY
The administrative record file, which contains copies of the Proposed Plan and supporting documentation, is available at the following locations:
San German City Hall
Hours: Monday – Friday 9:00 am to 3:00 pm

U.S. Environmental Protection Agency
City View Plaza II- Suite 7000
#48 PR-165 Km. 1.2
Guaynabo, PR 00968-8069
(787) 977-5865
Hours: Monday – Friday 9:00 am to 5:00 pm
By appointment.

Puerto Rico Environmental Quality Board
Emergency Response and Superfund Program
Edificio de Agencias Ambientales Cruz A. Matos
Urbanización San José Industrial Park
1375 Avenida Ponce de León
San Juan, PR 00926-2604
(787) 767-8181 ext 3207
Hours: Monday – Friday 9:00 am to 3:00 pm
By appointment.

U.S. EPA Records Center, Region 2
290 Broadway, 18th Floor
New York, New York 10007-1866
(212) 637-4308
Hours: Monday-Friday – 9:00 am to 5:00 pm
By appointment.

Two locations in the Retiro Industrial Park, owned by the Puerto Rico Industrial

Development Company, were identified as containing sources of contamination. These two properties are currently occupied by Wallace Silversmiths de P.R., Inc. (Wallace), and CCL Insertco de PR (CCL). These lots will be referred to as the Wallace lot and the CCL lot in this document.

EPA's preferred remedy for the Site consists of the following FS alternative to address sources contamination at the Site:

- Alternative S3 - Soil Vapor Extraction (SVE) and Dual Phase Extraction (DPE)/In Situ Treatments at the properties currently operated by Wallace and CCL.

This remedy also includes institutional controls that would restrict exposure to the soil at the properties currently occupied by the Wallace and CCL lots located at the Retiro Industrial Park.

COMMUNITY ROLE IN SELECTION PROCESS

EPA relies on public input to ensure that the concerns of the community are considered in selecting an effective remedy for each Superfund site. To this end, this Proposed Plan has been made available to the public for a 30-day public comment period, which begins with the issuance of this Proposed Plan and concludes on September 11, 2015.

EPA is providing information regarding the investigation and cleanup of the Site to the public through a public meeting and the availability of documents at public repositories, which contain the administrative record file. EPA encourages the public to gain a more comprehensive understanding of the Site and the Superfund activities that have been conducted there.

The public meeting to be held during the comment period is to provide information regarding the Site investigations, the alternatives considered and the preferred remedy, as well as to receive public comments. Comments received at the public meeting, as well as written comments, will be documented in the Responsiveness Summary Section of the Record of Decision (ROD), the document that formalizes the selection of the remedy.

Written comments on this Proposed Plan should be addressed to:

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SCOPE AND ROLE OF ACTION

EPA is addressing the cleanup of this Site in two phases, OU-1 and OU-2. This is the first planned of two remedial action for the Site, addressing contaminated soils and shallow, highly contaminated groundwater that acts as ongoing sources of groundwater contamination. The OU-1 source areas also act as a source of vapors that can enter into buildings in the vicinity of the Retiro Industrial Park. By addressing the source areas first, EPA expects to begin to reduce the mass of contamination in the ground, thereby accelerating the overall groundwater cleanup. As discussed below, further investigations of the diffuse groundwater plume (OU-2) are still needed before a remedy for that part of the Site can be selected. By selecting and implementing the OU-1 remedy, EPA will be able to begin to address the Site contamination while completing the latter, OU-2 studies.

Because of the potential for subsurface volatile organic compounds (VOC) vapors entering and affecting current occupants of several buildings at the Retiro Industrial Park, EPA is conducting a separate action to address vapor intrusion (VI), using the Agency's removal action, or emergency response, authority. EPA is coordinating its remedial and removal actions so that the removal actions will not be inconsistent with EPA's final remedies selected for the Site.

SITE BACKGROUND

Site Description

The Site is located in San German, in southwestern Puerto Rico (Figure 1). VOCs were detected above federal drinking water standards, called Maximum Contaminant Levels (MCLs), in three public water supply wells, identified as Retiro, Lola Rodriguez de Tio I (Lola I), and Lola Rodriguez de Tio II (Lola II). These wells are all located south of the Guanajibo River, between Routes 139 and 360 (Figure 2). These wells were associated with the Puerto Rico Aqueduct and Sewer Authority (PRASA) San German Urbano Water system, which includes a total of seven wells and two surface water intakes.

The Retiro, Lola I, and Lola II wells acted as an independent interconnected supply system with approximately 800 service connections serving approximately 2,280 users as of 2005. The Site includes the Retiro Industrial Park, located approximately one-half mile to the southeast of the affected supply wells. The Industrial Park has been shown to be the source of the VOCs. Several of the buildings in the industrial park are occupied by active businesses that were investigated during the RI.

Site History

From 2001 to 2005, groundwater samples collected by PRASA from the Retiro, Lola I, and Lola II wells regularly exhibited detectable concentrations of tetrachloroethene (PCE) and *cis*-1,2-dichloroethene (*cis*-1,2-DCE). The maximum concentrations of PCE and *cis*-1,2-DCE detected in these wells during this period were 6.4 micrograms per liter (μg/L) and 1.2 μg/L, respectively.

On January 17, 2006 the Puerto Rico Department of Health (PRDOH) ordered the closure of the Retiro well because of PCE concentrations exceeding the federal MCL of 5 μg/L. PCE was also detected in tap water samples collected from the water distribution system. PRASA closed the Retiro well on January 19, 2006. The Lola I and Lola II wells were taken out of service in about the same time period because of exceedances in levels in those wells, too.

EPA added the San German Groundwater Contamination Site to the National Priorities List (NPL) on March 19, 2008, because of the chlorinated solvents which were found in groundwater that supplies drinking water for local residents.

Topography and Drainage

The municipality of San German is located in the eastern part of the Guanajibo River floodplain. The three closed public supply wells are located adjacent to the river on the south side, at an approximate elevation of 138 feet above mean sea level. The Guanajibo River flows west through the municipality of San German and is the major surface water body in the area.

Geology

The study area lies within the eastern part of the Guanajibo River floodplain, which is bounded to the north and south by highlands of predominantly igneous rocks and serpentinite. Bedrock is overlain by alluvial deposits in the Guanajibo River valley and is generally encountered at the surface in the highlands, and at depths up to 100 feet below the ground surface (bgs) in the river valley.

Within the well field, the serpentinite is encountered at 30 feet bgs. The geologic units exposed or underlying the study area are described below, from youngest to oldest.

- Alluvium Soils (Quaternary) – Alluvial deposits, also known as the overburden, occur in the Guanajibo River valley and along tributaries, and are made up of sand, clay, and gravel. Deposits are generally less than 100 feet thick.
- Saprolite – This unit is composed of saturated sands, silts, clays, and highly

weathered rock with an increasing percentage of rock fragments with depth.

- Unstable Zone – A highly fractured and unstable layer, possibly composed of the underlying serpentinite, is found below the saprolite.
- Serpentinite or Serpentinized Peridotite (late Jurassic and early Cretaceous age or older) - highly fractured and faulted.

Hydrogeology

The aquifer within the study area is part of the Guanajibo River alluvial valley. Groundwater is first encountered in the saprolite (sands, silts, clays and weathered rock), and the depth to water ranges from river level at the Río Guanajibo to about 15 to 25 feet bgs. The main aquifer in the saprolite and highly fractured bedrock is under both confined and semi-confined conditions. The general direction of groundwater flow from the source areas is to the north-northwest, and there is some indication that the aquifer is hydraulically connected to the Río Guanajibo.

The Unstable Zone appears to be highly transmissive and can probably be grouped with the fractured serpentinite zone below it; however, this layer has been too unstable to support well installation, and further investigations of this layer are required as part of the OU-2 RI/FS.

Land Use

The municipality of San German is comprised of 54.51 square miles with a population of 35,527 (U.S. Census 2010). The primary land use in the vicinity of the Site is agricultural with some residential, commercial, and light industrial development.

Ecology

As the Site is comprised of residential, agricultural, commercial, and industrial developments, most undeveloped land parcels are situated along the Guanajibo River, the major surface water body in the area. The river valley is flanked to the north and south by uplands. The Guanajibo River flows from east to west through San German, and is joined by smaller unnamed tributaries within the study area. One of these tributaries originates in the highlands southeast of the Site and flows west, then north, toward the river. Little viable habitat is present within upland portions of the Site because of development. In general, the river banks are heavily vegetated and moderately to steeply sloped, depending on the reach. The majority of both the north and south banks of the river within the area of the Site have been subjected to disturbance activities associated with development. Ecological studies associated with the Site focused primarily on areas adjacent to the River. No known occurrences of listed rare, threatened, and/or endangered species or critical habitats have been identified.

EARLY SITE INVESTIGATIONS

2006 to 2008 - EPA Activities

In June 2006 EPA collected groundwater samples from operational wells and analyzed for a wide range of chemicals, including pesticides, metals, VOCs, and semivolatile organic compounds. This sampling reflected the presence of PCE (1.6 μg/L), *cis*-1,2-DCE (1.5 μg/L), and trichloroethene (TCE) (0.54 μg/L). In addition, PCE was detected at an estimated concentration (below the sample quantitation limit) in the Lola II well. EPA was unable to collect a sample from the Retiro well because the pump was removed in February 2006 as part of the response to PRDOH's closure order.

In July 2006, EPA conducted reconnaissance activities at 44 industrial sites in the San German area as part of a Site Discovery Initiative to identify hazardous waste sites that could be potential sources of contamination. This led to the identification of several locations in San German that were investigated further as part of EPA's Site studies.

NATURE AND EXTENT OF CONTAMINATION

The nature and extent of contamination in Site media was assessed during the RI by collecting and analyzing samples and then comparing analytical results to federal, Commonwealth, and Site-specific screening criteria. Five chemicals were identified as Site-related contaminants: PCE, TCE, *cis*-1,2-DCE, 1,1-dichloroethene (1,1-DCE) and vinyl chloride. These five VOCs were detected the most frequently, and at the highest levels, in source area soil samples and other affected media including groundwater, surface water, and sediment. These chemicals include chlorinated solvents and degradation products of those solvents. The RI also investigated the Site for the presence of Site contaminants in the form of nonaqueous phase liquids. Because Site contaminants are chlorinated VOCs that are denser than water, they are also referred to as dense, nonaqueous phase liquids (DNAPLs).

As part of the RI, soil, groundwater, surface water, sediment, and/or soil vapor were sampled at numerous locations at the Site. Sampling was conducted at four facilities within the Retiro Industrial Park (Wallace, Pitusa, Former Baytex, and CCL) and a fifth facility, Acorn Dry Cleaner, located to the west of the Industrial Park. In addition, soil vapor samples were collected in some residences within the area. Two rounds of sub-slab soil vapor sampling were performed.

It should be noted that OU-2 is ongoing and will gather additional information that will allow EPA to address the groundwater contamination, more thoroughly. As such, this Proposed Plan focuses on the sources of contamination, since they are the subject of the OU-1 action. Some of the data obtained during the OU-1 RI is groundwater data, and it is being presented in this document in order to show the impact of the contaminated soil at the identified sources to the groundwater.

In addition to the soil, groundwater and vapor sampling performed in developed areas of the Site, and surface water, pore water, and sediment samples were collected from the Río Guanajibo and its tributaries. Finally, samples were collected from surface water and sediment from catch basins adjacent to El Retiro Industrial Park.

The results of the sampling events are discussed below.

Summary of Soil Contamination

- PCE and TCE were frequently detected at elevated levels at the Wallace lot (Figure 3); PCE was detected in nearly every sample. The highest concentration was 46,000 micrograms per kilogram (μg/kg). The highest concentration of TCE was 2,300 J μg/kg; *cis*-1,2-DCE, vinyl chloride, and 1,1-DCE were detected less frequently than TCE.
- PCE was frequently detected below the screening criterion at the property currently occupied by Pitusa within the Retiro Industrial Park (Figure 4); one concentration exceeded the criterion at 130 μg/kg. TCE, *cis*-1, 2-DCE, and 1, 1-DCE detections were below the screening criteria.
- PCE was detected frequently but was generally below the screening criterion at the Former Baytex property in the Retiro Industrial Park (Figure 5); six samples exceeded the criterion, with the highest detection at 180 μg/kg. TCE and *cis*-1, 2-DCE did not exceed criteria.
- PCE was detected in three samples at CCL lot (Figure 6); one detection, at 71 μg/kg exceeded the screening criterion. In contrast to other soil results, TCE at the CCL lot was more frequently detected than PCE. TCE was detected in 23 of 39 samples with a maximum of 3,600 μg/kg. *cis*-1,2-DCE was generally lower than TCE. The highest *cis*-1,2-DCE concentration was 4,400 μg/kg. Vinyl chloride was detected in five samples; the highest concentration was 520 μg/kg.
- PCE was detected at the property currently occupied by Acorn, west of the

Industrial Park, at very low levels (less than 1 μg/kg) in two samples and was not detected in two samples (Figure 7). TCE and *cis*-1,2-DCE results showed low level detections and no detections, respectively. Vinyl chloride and 1,1-DCE were both non-detect.

In addition to the VOCs described above, soil sampling identified metals, including chromium, cobalt, copper, lead, manganese, mercury, nickel, selenium, silver, vanadium, and zinc, throughout the soil column. Metals were found at statistically similar levels across the Site, suggestive of a distribution of metals associated with the local soil (natural background) rather than attributable to a release.

Summary of Soil Vapor Contamination

- PCE was detected in 41 of 44 sub-slab samples collected in the first round and exceeded the screening criterion of 94 micrograms per cubic meter (μg/m$^{3)}$ in 10 samples, 7 of which were at the Former Baytex and CCL lots. PCE detections ranged from 0.04 μg/m^3 to 27,000 μg/m^3.
- TCE was detected in 16 sub-slab samples and exceeded the screening criterion of 4.3 μg/m^3 in 10 samples, 9 of which were at the Former Baytex and CCL lots. TCE detections ranged from 0.041 μg/m^3 to 7,100 μg/m^3.
- In the 39 indoor air samples, PCE was detected in 23 samples, none of which exceeded the screening criterion of 9.4 μg/m^3. PCE detections ranged from 0.048 μg/m^3 to 1.7 μg/m^3.
- TCE was detected in 5 indoor air samples and exceeded the 0.43 μg/m^3 screening criterion in 1 sample at a facility within the Retiro Industrial Park. TCE detections ranged from 0.043 μg/m^3 to 0.88 μg/m^3.
- In the 43 sub-slab samples as part of the second round, PCE was detected in all samples and exceeded the screening criterion of 94 μg/m^3 in 31 samples, 28 of which were at the Wallace, CCL, and Former Baytex lots. PCE detections ranged from 1.42 μg/m^3 to 14,200,000 μg/m^3. The highest detection was at the Wallace lot.
- TCE was detected in 42 subslab samples and exceeded the screening criterion of 4.3 μg/m^3 in 10 samples, all of which were at the Wallace, CCL and Former Baytex lots.
- TCE detections ranged from 0.195 μg/m^3 to 726,000 μg/m^3 in subslab. The highest detection was at the Wallace lot.
- In the 33 indoor air samples collected in round 2, PCE was detected in 23 samples, none of which exceeded the 9.4 μg/m^3 screening criterion. PCE detections in indoor air samples ranged from 7.46 μg/m^3 to 0.317 μg/m^3.
- TCE was detected in 21 indoor air samples and exceeded the 0.43 μg/m^3 screening criterion in 10 samples. TCE detections ranged from 0.167 μg/m^3 to 2.11 μg/m^3. The highest concentration was detected in a residence. Using a non-cancer TCE criterion of 2.0 μg/m^3, one sample exceeded the criterion. At this location, the indoor sample result was higher than the subslab result, indicating the probability of an indoor source for the TCE.

Summary of Groundwater Contamination

- Nine of 10 soil borings at the Wallace lot encountered groundwater (Figure 3). PCE was elevated in 7 samples; the highest was 7,960 μg/L. TCE was detected in 8 samples with a high of 900 μg/L. The highest detections of *cis*-1,2-DCE, vinyl chloride, and 1,1-DCE were 1,310 μg/L, 190 μg/L, and 72 μg/L, respectively.
- Nine of the 10 borings at CCL encountered groundwater (Figure 6). PCE was detected in 4 samples; the maximum concentration was 450 μg/L. TCE and *cis*-1,2-DCE were detected in all 9 samples. The maximum concentrations were 27,700 μg/L and

5,560 µg/L, respectively. Vinyl chloride and 1,1-DCE were each detected in one sample at 25.2 µg/L and 1.89 µg/L, respectively.

- Forty-three groundwater samples were collected at 37 locations along 11 transects (Figure 8) between the Retiro Industrial Park in the southeast and the closed public supply wells to the northwest. PCE was detected in most samples except transects T0 and T1, with the highest concentration in transect T3 at 26,800 µg/L. TCE was frequently detected, including in transects T0 and T1 where PCE was not detected. The highest concentration was in transect T2 at 65,400 µg/L. Detections of *cis*-1,2-DCE were similar to TCE with the highest concentration in transect T4 at 203 µg/L. Vinyl chloride was detected in two samples, one each from transects T1 and T4; the maximum concentration was 6.41 µg/L. 1,1-DCE was frequently detected in transects T3 through T8 (except T6); the highest concentration was 126 µg/L.
- PCE was detected in round one out of two groundwater samples at all 9 shallow wells sampled (Figure 9); the highest concentration was in MW-2S at the Wallace lot (13,000 µg/L). PCE concentrations decrease as the plume migrates downgradient to the northwest toward the public supply wells.
- TCE concentrations were the highest in MW-3S at CCL lot (1,700 µg/L) with levels rapidly decreasing to the northwest in the aligned monitoring well network.
- Two *cis*-1,2-DCE concentrations exceeded the screening criterion, with the highest in MW-3S at CCL (220 µg/L) and the second exceedance in MW-5S at 100 µg/L.
- Vinyl chloride was detected in 2 monitoring wells, with a maximum concentration of 47 µg/L in MW-3S.
- 1,1-DCE was detected in 7 of the 9 shallow monitoring wells; the highest concentration was in MW-6S at 41 µg/L. Two detections exceeded the screening criterion.

Summary of Surface Water/Sediment Contamination

- In the river/tributary surface water samples (Figure 10) collected in August 2014 showed PCE detection in samples SW-10 through SW-12; the highest detection was 14 µg/L in SW-12. TCE, *cis*-1,2-DCE, and vinyl chloride were detected in SW-9 through SW-12, with the highest at 42 µg/L, 37 µg/L, and 21 µg/L, respectively. 1,1-DCE was detected at trace levels in these four samples.
- In January 2014, surface water samples were collected at locations SW-9 through SW-12. The maximum detections of PCE, TCE, cis-1,2-DCE, 1,1-DCE, and vinyl chloride were 32 µg/L, 98 µg/L, 36 µg/L, 0.55 µg/L and 8.7 µg/L, respectively. These four samples were collected from a small drainage channel on the northeastern side of the CCL and Former Baytex buildings within the Retiro Industrial Park.
- In catch basin water samples, PCE was detected in three samples; one exceeded the screening criterion at 88 µg/L at CBSW-4. All other detections were below 1 µg/L. TCE, *cis*-1,2-DCE 1,1-DCE, and vinyl chloride were detected in the same four samples, with the highest at 15 µg/L, 9.2 µg/L, 0.17 µg/L, and 1.8 µg/L, respectively. Three of the TCE detections exceeded the screening criterion, and all of the vinyl chloride detections exceeded its criterion.

In addition to the VOCs described above, soil sampling identified metals, including chromium, cobalt, copper, lead, manganese, mercury, nickel, selenium, silver, vanadium, and zinc, throughout the soil column. Metals were found at statistically similar levels across the Site, suggestive of a distribution of metals associated

WHAT IS RISK AND HOW IS IT CALCULATED?

Human Health Risk Assessment:
A Superfund baseline human health risk assessment is an analysis of the potential adverse health effects caused by hazardous substance releases from a site in the absence of any actions to control or mitigate these under current- and future-land uses. A four-step process is utilized for assessing site-related human health risks for reasonable maximum exposure scenarios.

Hazard Identification: In this step, the chemicals of potential concern (COPCs) at the site in various media (*i.e.*, soil, groundwater, surface water, and air) are identified based on such factors as toxicity, frequency of occurrence, and fate and transport of the contaminants in the environment, concentrations of the contaminants in specific media, mobility, persistence, and bioaccumulation.

Exposure Assessment: In this step, the different exposure pathways through which people might be exposed to the contaminants in air, water, soil, etc. identified in the previous step are evaluated. Examples of exposure pathways include incidental ingestion of and dermal contact with contaminated soil and ingestion of and dermal contact with contaminated groundwater. Factors relating to the exposure assessment include, but are not limited to, the concentrations in specific media that people might be exposed to and the frequency and duration of that exposure. Using these factors, a “reasonable maximum exposure” scenario, which portrays the highest level of human exposure that could reasonably be expected to occur, is calculated.

Toxicity Assessment: In this step, the types of adverse health effects associated with chemical exposures, and the relationship between magnitude of exposure and severity of adverse effects are determined. Potential health effects are chemical-specific and may include the risk of developing cancer over a lifetime or other non-cancer health hazards, such as changes in the normal functions of organs within the body (*e.g.*, changes in the effectiveness of the immune system). Some chemicals are capable of causing both cancer and non-cancer health hazards.

Risk Characterization: This step summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of site risks for all COPCs. Exposures are evaluated based on the potential risk of developing cancer and the potential for non-cancer health hazards. The likelihood of an individual developing cancer is expressed as a probability. For example, a 10^{-4} cancer risk means a “one-in-ten-thousand excess cancer risk;” or one additional cancer may be seen in a population of 10,000 people as a result of exposure to site contaminants under the conditions identified in the Exposure Assessment. Current Superfund regulations for exposures identify the range for determining whether remedial action is necessary as an individual excess lifetime cancer risk of 10^{-4} to 10^{-6}, corresponding to a one-in-ten-thousand to a one-in-a-million excess cancer risk. For non-cancer health effects, a “hazard index” (HI) is calculated. The key concept for a non-cancer HI is that a Athreshold@ (measured as an HI of less than or equal to 1) exists below which non-cancer health hazards are not expected to occur. The goal of protection is 10^{-6} for cancer risk and an HI of 1 for a non-cancer health hazard. Chemicals that exceed a 10^{-4} cancer risk or an HI of 1 are typically those that will require remedial action at the site and are referred to as Chemicals of Concern or COCs in the final remedial decision or Record of Decision.

with the local soil (natural background) rather than attributable to a release.

SUMMARY OF SITE RISKS

The purpose of the risk assessment is to identify potential cancer risks and non-cancer health hazards at the Site assuming that no further remedial action is taken. A risk assessment was performed to evaluate current and future cancer risks and non-cancer health hazards based on the results of the RI. A screening-level ecological risk assessment was also conducted to assess the risk posed to ecological receptors as a result of Site-related contamination.

Human Health Risk Assessment

As part of the RI/FS, a baseline human health risk assessment was conducted to estimate the risks and hazards associated with the current and future effects of contaminants on human health and the environment. A baseline human health risk assessment is an analysis of the potential adverse human health effects caused by hazardous-substance exposure in the absence of any actions to control or mitigate these under current and future land uses.

A four-step human health risk assessment process was used for assessing site-related cancer risks and noncancer health hazards. The four-step process is comprised of: Hazard Identification of Chemicals of Potential Concern (COPCs), Exposure Assessment, Toxicity Assessment, and Risk Characterization (see adjoining box “What is Risk and How is it Calculated”).

The baseline human health risk assessment began with selecting COPCs in the various media (i.e., surface soil, subsurface soil, groundwater, sediment and surface water) that could potentially cause adverse health effects in exposed populations. The current and future land use scenarios included the following exposure pathways and populations:

- Site Worker (adult): current ingestion, dermal contact, and inhalation of soil particles and vapors for surface soil from the Wallace and CCL lots, and future ingestion, dermal contact and inhalation of soil particles and vapors for surface soil from the Wallace, CCL, Acorn Dry Cleaners, Former Baytex and Pitusa-National Lumber properties.

- Residents (child/adult): future ingestion, dermal contact and inhalation of soil particles and vapors for surface soil from the Wallace, CCL, Acorn Dry Cleaners, Former Baytex and Pitusa-National Lumber lots.
- Recreational (adolescent 12-18): current/future ingestion and dermal contact for surface water and sediment from the Rio Guanajibo.
- Trespassers (adolescent 12-18): current ingestion, dermal contact, and inhalation of soil particles and vapors for surface soil from the Wallace and CCL lots, and future ingestion, dermal contact and inhalation of soil particles and vapors for surface soil from the Wallace, CCL, Acorn Dry Cleaners, Former Baytex and Pitusa-National Lumber lots.
- Construction Workers (adult): future ingestion, dermal contact, and inhalation of soil particles and vapors for both surface and subsurface soil from the Wallace, CCL, Acorn Dry Cleaners, Former Baytex and Pitusa-National Lumber lots.

In this assessment, exposure point concentrations were estimated using either the maximum detected concentration of a contaminant or the 95% upper-confidence limit (UCL) of the average concentration. Chronic daily intakes were calculated based on the reasonable maximum exposure (RME), which is the highest exposure reasonably anticipated to occur at the Site. The RME is intended to estimate a conservative exposure scenario that is still within the range of possible exposures. Central tendency exposure (CTE) assumptions, which represent typical average exposures, were also developed. A complete summary of all exposure scenarios can be found in the baseline human health risk assessment.

Surface Soil

Risks and hazards were evaluated for current and/or future exposure to surface soil. The populations of interest included adult Site workers, child and adult residents, adolescent trespassers, and adult construction workers for the following five properties of interest. The estimated hazards and risks are presented in Table 1.

<u>Wallace</u> – The potential current hazards and risks for workers and trespassers at the Wallace lot is above the acceptable hazard index of 1. The potential current risk for these workers is above the acceptable risk range and for current trespassers it is within the acceptable risk range. The potential future hazards and risks for workers and residents exposed to surface soil at the Wallace lot exceed the acceptable hazard index of 1 and the cancer risk range. Additionally, the hazards for future trespassers exceed the acceptable hazard index of 1 and the cancer risk is within the acceptable risk range. All of the chemicals responsible for the exceedances, vanadium, chromium, and cobalt, are not Site-related, and the risks and hazards can be attributed to background. These metals are not considered to be COCs for the Wallace lot. Although there were no Site-related compounds identified for direct contact exposure, TCE and PCE are identified in surface soils. These compounds have been linked to elevated soil gas concentrations found below the building and in elevated concentrations in groundwater. Thus, only TCE and PCE have been determined to be COCs in soil.

<u>CCL</u> – The potential current hazards and risks for workers at the CCL lot is below the acceptable hazard index of 1, but above the acceptable risk range. The current hazards and risk for current trespassers is below the acceptable hazard index of 1 and within the acceptable risk range. The potential future hazards and risks for workers and residents exposed to surface soil at the CCL lot exceed the acceptable hazard index of 1 and the cancer risk range. Additionally, the hazards for future trespassers exceed the acceptable hazard

index of 1 and the cancer risk is within the acceptable risk range. All of the chemicals responsible for the exceedances, vanadium, chromium, and cobalt, are not Site-related, and the risks and hazards can be attributed to background. These metals are not considered to be COCs for the CCL lot. Although there were no Site-related compounds identified for direct contact exposure, TCE and PCE were identified in surface soils. These compounds have been linked to elevated soil gas concentrations found below the building and to elevated concentrations in groundwater. Thus, only TCE and PCE have been determined to be COCs in soil.

<u>Acorn Dry Cleaners</u> – The potential future hazards and risks for workers and residents exposed to surface soil at the Acorn Dry Cleaners property exceed the acceptable hazard index of 1, and for residents it also exceeded the cancer risk range. Additionally, the hazards for future trespassers at the Acorn Dry Cleaners property exceed the acceptable hazard index of 1 and the cancer risk for workers and trespassers are within the acceptable risk range. All of the chemicals responsible for the exceedances, vanadium, chromium, and cobalt, are not Site-related, and the risks and hazards can be attributed to background. Therefore, no COCs were identified for the Acorn Dry Cleaners property.

<u>Former Baytex</u> – The potential future hazards and risks for workers and residents exposed to surface soil at the Former Baytex property exceed the acceptable hazard index of 1 and the cancer risk range. Additionally, the hazards for future trespassers at the Former Baytex property exceed the acceptable hazard index of 1, and the cancer risk is within the acceptable risk range. All of the chemicals responsible for the exceedances, vanadium, chromium, and cobalt, are not Site-related, and the risks and hazards can be attributed to background. Therefore, no COCs were identified for the Former Baytex property.

<u>Pitusa-National Lumber</u> – The potential future hazards and risks for workers and residents exposed to surface soil at the Pitusa-National Lumber property exceed the acceptable hazard index of 1 and the cancer risk range. Additionally, the hazards for future trespassers at the Pitusa-National Lumber property exceed the acceptable hazard index of 1 and the cancer risk is within the acceptable risk range. All of the chemicals responsible for the exceedances, vanadium, chromium, cobalt and silver, are not Site-related, and the risks and hazards can be attributed to background. Therefore, no COCs were identified for the Pitusa-National Lumber property.

The potential for lead in surface soils was evaluated separately for each of the five above-mentioned lots in surface soil and there were no concentrations detected above EPA protective screening values. Therefore, lead is not a COC at any of the lots.

Table 1. Summary of hazards and risks associated with surface soil.

Receptor	Hazard Index	Cancer Risk
Wallace Property		
Site Worker – current	**3.61**	**$2.7x10^{-4}$**
Site Worker – future	**3.93**	**$2.3x10^{-4}$**
Resident adult – future	**5.96**	**$1.1x10^{-3}$**
Resident child – future	**56.9**	
Trespasser – current	**3.38**	$6.0x10^{-5}$
Trespasser – future	**3.64**	$5.3x10^{-5}$
CCL Label Property		
Site Worker – current	0.66	**$2.0x10^{-4}$**
Site Worker – future	**3.08**	**$2.7x10^{-4}$**
Resident – future	**4.53**	**$1.3x10^{-3}$**
Resident child – future	**45.5**	
Trespasser – current	0.60	$4.4x10^{-5}$
Trespasser – future	**2.88**	$6.1x10^{-5}$

Receptor	Hazard Index	Cancer Risk
Acorn Dry Cleaners Property		
Site worker – future	**3.18**	9.9x10^{-5}
Resident adult – future	**4.47**	**4.7x10^{-4}**
Resident child – future	**47.3**	
Trespasser – future	**2.99**	2.2x10^{-5}
Former Baytex Property		
Site worker – future	**2.6**	**1.7x10^{-4}**
Resident adult – future	**3.69**	**8.2x10^{-4}**
Resident child – future	**38.5**	
Trespasser – future	**2.43**	3.9x10^{-5}
Pitusa-National Lumber		
Site worker – future	**2.64**	**1.5x10^{-4}**
Resident adult– future	**3.8**	**7.2x10^{-4}**
Resident child – future	**39**	
Trespasser – future	**2.47**	3.5x10^{-5}
There were no COCs identified in the surface soil at the Acorn Dry Cleaner, Former Baytex or Pitusa-National Lumber properties. TCE and PCE were identified as COCs for the Wallace and CCL lots due to their connection to elevated subslab soil gas and contaminated groundwater.		

Combined Surface/Subsurface Soil

Risks and hazards were evaluated for the potential future exposure to surface and subsurface soil. The population of interest included adult construction workers at each of the five properties of interest. The cancer risks were below or within the EPA acceptable ranges. The non-cancer hazards at each of the properties were above the EPA acceptable value of 1. The COC identified in the surface/subsurface soil was vanadium (Table 2). Vanadium was not considered to be a Site-related contaminant, and the risks and hazards can be attributed to background. As with the surface soils discussion above, TCE and PCE were identified in subsurface soils, and these compounds have been linked to elevated soil gas concentrations found below buildings and to elevated concentrations in groundwater. Thus, TCE and PCE have been determined to be COCs in soil.

Table 2. Summary of hazards and risks associated with surface/subsurface soil.

Receptor	Hazard Index	Cancer Risk
Wallace Property		
Construction Worker – future	**5.03**	1.3x10^{-5}
CCL Label Property		
Construction Worker - future	**2.19**	1.4x10^{-5}
Acorn Dry Cleaner Property		
Construction Worker – future	**3.99**	3.8x10^{-6}
Former Baytex Property		
Construction Worker – future	**3.26**	8.5x10^{-6}
Pitusa-National Lumber Property		
Construction Worker – future	**3.5**	6.1x10^{-6}
There were no COCs identified in the surface/subsurface soil for construction workers.		

Groundwater

Risks and hazards were evaluated for the potential future exposure to groundwater. The populations of interest included adult site workers and residential adults and children at each of the five properties of interest. The cancer risks were above the EPA acceptable ranges. The non-cancer hazards at each of the properties were above the EPA acceptable value of 1. The COCs identified in the groundwater were TCE, PCE, and vinyl chloride. The groundwater remedy will be addressed in a separate decision document.

Table 3. Summary of hazards and risks associated with groundwater.

Receptor	Hazard Index	Cancer Risk
Wallace Property		
Site Worker – future	**16.8**	**2.7x10^{-4}**
Resident adult – future	**128**	**2.0x10^{-3}**
Resident child - future	**124**	
CCL Label Property		
Site Worker – future	**16.8**	**2.7x10^{-4}**
Resident adult – future	**128**	**2.0x10^{-3}**
Resident child - future	**124**	
Acorn Dry Cleaners Property		
Site worker – future	**16.8**	**2.7x10^{-4}**
Resident adult – future	**128**	**2.0x10^{-3}**
Resident child - future	**124**	
Former Baytex Property		
Site worker – future	**16.8**	**2.7x10^{-4}**
Resident adult – future	**128**	**2.0x10^{-3}**
Resident child - future	**124**	
Pitusa-National Lumber		
Site worker – future	**16.8**	**2.7x10^{-4}**
Resident adult – future	**128**	**2.0x10^{-3}**
Resident child - future	**124**	
The COCs identified in the groundwater were PCE, TCE, and vinyl chloride. Arsenic and vanadium were not considered to be site-related.		

Surface Water and Sediment

Risks and hazards were evaluated for the potential future exposure to surface water and sediment in the Rio Guanajibo. The population of interest included adolescent recreators. The cancer risks were below or within the EPA acceptable ranges. The non-cancer hazards were below or slightly above the EPA acceptable value of 1. The sum of the hazard quotients slightly exceed 1 for the sediment pathway, however, no individual chemical or chemicals that act on the same target organ were above a value of 1. Therefore, there were no COCs identified in the surface water or sediment.

Table 4. Summary of hazards and risks associated with surface water and sediment.

Receptor	Hazard Index	Cancer Risk
Rio Guanajibo		
Recreator surface water – current/future	0.26	4.3x10^{-6}
Recreator sediment – current/future	**1.2**	2.3x10^{-5}
There were no COCs identified in the surface water or sediment.		

Vapor Intrusion

The potential for vapors to volatilize from contaminated groundwater into buildings that are over the groundwater plume was evaluated. Elevated soil gas concentrations of TCE and PCE were detected under several buildings (three commercial buildings and two residential properties). One of the residential properties also had a slight exceedance of the indoor air screening value for TCE. The vapor intrusion pathway will continue to be evaluated and appropriate remedial actions will be taken based on the sampling results.

Ecological Risk Assessment

A screening-level ecological risk assessment (SLERA) was conducted to evaluate the potential for ecological risks from the presence of contaminants in surface soil. The SLERA focused on evaluating the potential for impacts to sensitive ecological receptors to Site-related constituents of concern through exposure to surface soil on the properties and surface water, sediment, and pore water from Rio Guanajibo. Surface soil, surface water, sediment and pore water concentrations were compared to ecological screening values as an indicator of the potential for adverse effects to ecological receptors. A complete summary of all exposure scenarios can be found in the SLERA.

Surface Soil: There is a potential for adverse effects to ecological receptors (invertebrates, reptiles, amphibians, birds, and mammals) from exposure to surface soil at the five properties. The surface soil screening criteria were exceeded for metals (chromium, cobalt, copper, lead, manganese, mercury, nickel, selenium, silver, vanadium and zinc), which resulted in HIs greater than the acceptable value of 1. However, none of the metals were considered to be Site-related, therefore there were no COCs selected for surface soil from any of the properties.

Surface Water: There is a potential for adverse effects to ecological receptors (invertebrates, reptiles, amphibians, birds, and mammals) from exposure to surface water in the Rio Guanajibo. The surface water screening criteria were exceeded for metals (aluminum, barium, cadmium, chromium, cobalt, copper, iron, lead, manganese, nickel, silver, vanadium and zinc) and three volatile organic compounds (chloroform, toluene and TCE), which resulted in HIs greater than the acceptable value of 1. The metals were not considered to be site-related and were not selected as COCs. The elevated concentration of TCE in surface water was located near a drainage area adjacent to Retiro Industrial Park, in an area with limited viable habitat. Therefore, no adverse effects on survival, growth and/or reproduction of aquatic organisms are expected to occur, and no COCs were identified for surface water.

Sediment: There is a potential for adverse effects to ecological receptors (invertebrates, reptiles, amphibians, birds, and mammals) from exposure to sediment in the Rio Guanajibo. The surface soil screening criteria were exceeded for metals (antimony, cadmium, chromium, cobalt, copper, cyanide, iron, lead, manganese, nickel, silver and zinc), which resulted in HIs greater than the acceptable value of 1. However, none of the metals were considered to be site-related, therefore, there were no COCs selected for sediment from the Rio Guanajibo.

Pore Water: There is a potential for adverse effects to ecological receptors (invertebrates, reptiles, amphibians, birds, and mammals) from exposure to pore water in the Rio Guanajibo. The surface water screening criteria were exceeded for metals (aluminum, barium, chromium, cobalt, copper, iron, lead, manganese, nickel and vanadium), which resulted in HIs greater than the acceptable value of 1. However, none of the metals were considered to be site-related, therefore there were no COCs selected for pore water from the Rio Guanajibo.

Based on the results of the ecological risk assessment, no remedial action is necessary to protect the environment from actual or threatened releases of hazardous substances.

Risk Assessment Summary

Based on the results of the human health risk assessment, a remedial action is necessary to protect public health, welfare, and the environment from actual or threatened releases of hazardous substances to groundwater and, as an ongoing source of VOC contamination to the groundwater, in soils at the Wallace and CCL lots. Furthermore, soil and groundwater in the vicinity of these lots are a source of subsurface vapors that may result in unacceptable human exposures through the vapor intrusion pathway.

Based upon the results of the human health and ecological risk assessments, a remedial action is not necessary for the surface water or sediment.

REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) are specific goals to protect human health and the environment. These objectives are based on available information and standards, such as applicable or relevant and appropriate requirements (ARARs), to-be-considered (TBC) guidance, and site-specific risk-based levels. The Site-related contaminants are chlorinated ethenes and their degradation products, including PCE, TCE, *cis*-1,2-DCE, vinyl chloride, and 1,1-DCE. The contaminated media addressed in this Proposed Plan are soil that act as a source of groundwater contamination and soil vapors.

EPA has a statutory preference to use treatment to address any principal threats posed by a site. Principal threat wastes are those source materials considered to be highly toxic or mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur.

At both the Wallace and CCL lots, PCE and TCE concentrations were detected in groundwater samples, indicating contaminants have migrated from the unsaturated soil to the saturated soil and groundwater. Considering the high concentrations present in the saturated soil that underlies the source areas at these lots, data indicate that a large contaminant mass is present in the saturated soil. Therefore, PCE and TCE contamination in the vadose zone fits the definition of principal threat waste and would require remediation through treatment, where practicable.

The sources of soil contamination identified at Retiro Industrial Park are located on the Wallace and CCL lots. Soil on these two properties, including the shallow saprolite zone of saturated soils below the footprint of the vadose zone contamination, where the contaminants originally contacted groundwater, potentially contains residual DNAPL and likely contains the highest contaminant mass in the subsurface that can serve as continuing sources for groundwater contamination.

Soil vapor samples show elevated soil vapor under the building slabs at both the Wallace and CCL lots, currently occupied buildings, and as such there is a threat of exposure to contaminants such as PCE, TCE, *cis*-1,2-DCE, 1,1-DCE, and vinyl chloride. These contaminants may pose risks to human health through inhalation, ingestion, and dermal contact. Vapor accumulation beneath the building slabs at the source area and over the groundwater plume has been observed. EPA anticipates that the vapor exposure issues will be addressed separately; therefore, appropriate technologies for mitigating exposures as a result of vapor intrusion, such as subslab mitigation systems, are not included in this proposed action. Should the anticipated vapor response not occur as expected, it can be revisited and addressed during the OU-2 response activities.

To protect human health and the environment, the following RAOs have been identified.

The RAOs for soil are:

- Prevent/minimize contaminated vadose-zone soil from serving as a source of groundwater contamination.
- Reduce contaminant mass in the saturated shallow saprolite zone soil serving as a source for groundwater contamination.

The RAOs for soil vapor are:

- Reduce contaminant mass serving as a source for current and potential vapor intrusion.
- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion.

The soil source areas to be addressed by this action are located above and below the water table, and appear to be as deep as the shallow saprolite zone. RAOs have been developed separately for unsaturated and saturated soil, as discussed in more detail below.

REMEDIATION GOALS

To meet the RAOs, remediation goals were developed to aid in defining the extent of contaminated soil requiring remedial action. Remediation goals are typically chemical-specific measures for each media and/or exposure route that, if attained, are expected to be protective of human health and the environment. In this case, soil remediation goals were developed to address soils as a source of groundwater and soil vapor contamination, to satisfy the RAOs. They are derived based on comparison to ARARs, risk-based levels, and background concentrations, with consideration also given to other requirements such as analytical detection limits, guidance values, and other pertinent information.

There are no promulgated federal or Commonwealth chemical-specific ARARs for soil. To meet the RAOs for the soil as well as to address soil vapors, soil remediation goals were developed using two parameters: the Site-specific soil-water partitioning coefficient, Kd; and a Dilution Attenuation Factor (DAF). The soil remediation goals were calculated using a Site-specific soil-partitioning coefficient and the standard DAF of 20. The DAF considers dilution and attenuation factors that reduce contaminant concentrations in soil leachate during migration through the vadose zone. Table 5, at the end of this Proposed Plan, contains the remediation goals for soil based on impact to groundwater.

EPA expects the remedial alternatives considered in this Proposed Plan to address contaminated vadose-zone soil as a source of groundwater contamination comprehensively, and achieve the remediation goals, which are "soil" remediation goals.

Below the water table, EPA expects the remedial alternatives considered to reduce contaminant mass in the shallow saprolite zone; however, the shallow saprolite zone includes a mixture of contaminated soil and groundwater, and the effectiveness of the treatment technologies considered, which were primarily developed to address the soils, may be limited. EPA expects the implementation of this action, OU-1, to overlap with the selection and implementation of a complementary remedy to address the groundwater in OU-2. By extending the scope of the OU-1 remedial technologies to the full depth of the shallow saprolite zone below the vadose-zone source areas, EPA expects to expedite the overall remediation of the sources to groundwater. EPA expects that a final remedy for the Site, to be selected in OU-2, will reconsider the soil/groundwater in the shallow saprolite zone addressed in OU-1, possibly augmenting or amending the OU-1 action based new information or upon the results the OU-2 RI/FS.

SUMMARY OF REMEDIAL ALTERNATIVES

Section 121(b)(1) of CERCLA, 42 U.S.C. § 9621(b)(1), mandates that remedial actions must be protective of human health and the environment, be cost-effective, and utilize permanent solutions and alternative treatment technologies and resource recovery alternatives to the maximum extent practicable. Section 121(b)(1) also establishes a preference for remedial actions, which employ, as a principal element, treatment to permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants and contaminants at a site. Section 121(d) of CERCLA, 42 U.S.C. § 9621(d), further specifies that a remedial action must attain a level or standard of control of the hazardous substances, pollutants, and contaminants that at least attains ARARs under federal and state laws, unless a waiver can be justified pursuant to Section 121(d)(4) of CERCLA, 42 U.S.C. § 9621(d)(4).

The time frames presented below for each alternative reflect only the time required to construct and/or implement the remedy and do not include the time required to design the remedy, negotiate the performance of the remedy with any potentially responsible parties, or procure contracts for design and construction.

The cost estimates, which are based on available information, are order-of-magnitude engineering cost estimates that are expected to be within +50 to -30 percent of the actual cost of the project.

Common Elements

There are several common elements that are included in all active remedial alternatives. With the exception of five-year reviews, the common elements listed below do not apply to the No Action alternatives.

Pre-Design Work

A pre-design investigation (PDI) would be conducted as part of the remedial design. The extent of soil contamination underneath the buildings would be delineated during the PDI. These activities could impact the business operations at the respective facilities, and therefore efforts will be made to minimize interruption of operations.

Vapor Mitigation Systems

As discussed earlier, EPA anticipates that vapor mitigation systems will be installed at the buildings currently occupied by Wallace and CCL to prevent vapor intrusion. Even after the remediation of vadose zone soil, potential soil vapor may continue to accumulate underneath the building slabs and require the operation of the mitigation systems in order to mitigate the risk of soil vapor intrusion into the buildings until the conditions at the Site are fully remediated.

Institutional Controls

While the OU-1 remedy proposed in this document is addressing contaminated soils within the source areas at Retiro Industrial Park as a first action for the Site, contaminated groundwater (including the areas to be addressed in OU-2), is the primary human health concern at the Site. As part of the OU-1 remedy, EPA proposes to establish institutional controls (ICs) that would restrict contact with contaminated groundwater throughout the area of the plume. By placing ICs on the groundwater at this time, EPA can minimize the potential for human exposure while the final remedy for the Site is selected and implemented.

The types of institutional controls which would be employed for the soil and groundwater at the Site include local laws that limit installation of drinking water wells without a permit, deed restrictions that would limit the use of the Wallace and CCL lots to prevent any soil excavation or well installation. In addition, informational devices such as advisories published in newspapers and periodic letters sent to local government authorities can be used to informing them of the need to prevent soil excavation and well installation in the area within the contaminated plume.

Long-term Monitoring

Periodic monitoring of Site groundwater would be implemented when contaminants remain above levels that allow for unrestricted use and unlimited exposure. The monitoring program would continue until concentrations have met remediation goals. Because the OU-1 and OU-2 remedies are expected to be closely aligned, the scope and extent of long-term monitoring is not considered in OU-1 but will be addressed in OU-2.

Five-Year Reviews

Alternatives resulting in contaminants remaining above levels that allow for unrestricted use and unlimited exposure require that the Site be reviewed at least once every five years. If justified by the review, additional remedial actions may be considered to remove, treat, or contain the contamination. For remedial actions where unrestricted use and unlimited exposure is the remedial objective, it may require many years to reach that objective. It is EPA policy to conduct five-year reviews until remediation goals are achieved.

EPA expects that this Site will require more than five-year reviews; however, because the OU-1 and OU-2 remedies are expected to be closely aligned, the need for five-year reviews will be addressed in OU-2. For OU-1, a remedial action for the vadose zone soils has unrestricted use and unlimited exposure as the remedial objective, and because it may require more than five years to reach that objective, EPA anticipates it will conduct five-year reviews for OU-1 until RAOs are achieved within the vadose zone soils.

EPA Region 2 Clean and Green Policy

The environmental benefits of the preferred remedy may be enhanced by giving consideration, during the design, to technologies and practices that are sustainable in accordance with EPA Region 2's Clean and Green Energy Policy.[1] This will include consideration of green remediation technologies and practices. Some examples of practices that would be applicable are those that reduce emissions of air pollutants, minimize fresh water consumption, incorporate native vegetation into revegetation plans, and consider beneficial reuse and/or recycling of materials, among others.

Remedial Alternatives

Remedial alternatives were assembled by combining the retained remedial technologies and process options for each contaminated media. The areas for remediation at the Site include:

- The vadose zone with soil contamination exceeding the remediation goals.
- The soil in the saturated soils of the shallow saprolite zone below the footprint of the vadose zone contamination (as described below).

The two areas are collectively referred to as the source zone, which appears to contain the highest contaminant mass in the subsurface and serves as a continuing source of groundwater contamination.

Five source areas (SA), as shown in Figure 11, were identified based on a review of the RI sampling results and the past practice for storage and usage of chemicals at the Wallace and CCL lots. Specific information for each source area is described below. High sub-slab soil vapor concentrations were detected at the Wallace and CCL lots, and the extent of soil contamination underneath the buildings could be different from and larger than what is shown in Figure 11.

- Source Area 1 (SA-1) located at the Wallace lot: this is the approximate area where drums were historically stored. High PCE and TCE concentrations were found in the sub-slab vapor samples in the vicinity of this area. Therefore, additional soil delineation underneath the building in this area is warranted to further define the extent of contamination.
- Source Area 2 (SA-2) located at the Wallace lot: soil contamination was found in this area outside the buildings as seen in Figure 11. Additional soil delineation underneath the building is warranted in this area to define the extent of the contamination further.
- Source Area 3 (SA-3) located at the Wallace lot: this area encompasses soil where the highest PCE concentrations were detected outside a building under a paved area. The highest PCE concentrations in this source area were detected in samples from the ground surface to 2 feet bgs and from 5 to 7 feet bgs in boring WS-8. The PCE concentrations decreased with depth, indicating the majority of the contaminant mass is held in the shallow unsaturated clay and silt, likely because of the presence of pavement and limited infiltration. Additional soil delineation underneath the building or along the

[1]See http://epa.gov/region2/superfund/green_remediation.

subsurface drainage channel is warranted to define the extent of contamination further. Because of the relatively moderate groundwater contaminant concentrations at this location (WS-8 with PCE at 233 μg/L) and the fact that soil concentrations decreased with depth, the saprolite zone is not included in the source zone at this area.

- Source Area 4 (SA-4) located at the CCL lot: elevated TCE and *cis*-1,2-DCE soil contamination was found between 5 and 7 feet bgs. The extent of soil contamination in this area appears to be localized. Additional soil delineation is recommended to define the treatment zone further.
- Source Area 5 (SA-5) located at the CCL lot: elevated TCE concentrations were found in the soil between 10 and 22 feet bgs. In the saturated zone, TCE was found at 27,700 μg/L from 19.5 to 23.5 feet bgs and at 65,400 μg/L from 26.5 to 30.5 feet bgs. The data indicate the possibility of residual DNAPL in the shallow saprolite zone. Additional soil and groundwater samples would be collected during the PDI to define the treatment zone.

Alternative S1 – No Action

Capital Cost	$0
Present Worth O&M Cost	$0
Total Present Worth Cost	$0
Timeframe to meet RAOs	Will not meet RAOs

The No Action alternative is required by the NCP to be carried through the screening process. The No Action alternative would include no action being taken and serves as a baseline for comparison of remedial alternatives.

Alternative S2 – Excavation and Offsite Disposal/*In-Situ* Treatments

Capital Cost	$12,883,000
Present Worth O&M Cost	$ 549,000
Total Present Worth Cost	$ 13,432,000
Construction Time Frame	12 to 18 months
Timeframe to meet RAOs	2.5 years

Because the level and distribution of contamination at each source area is different, not every component of this remedial alternative is anticipated to be applied at each source area. For cost-estimating purposes, the conceptual approach for each area is listed below:

- SA-1: Excavation and off-site disposal in the vadose zone to 13 feet bgs, followed by *in-situ* treatment in the remainder of the vadose zone from 13 feet bgs to 20 feet bgs. It is estimated that approximately 505 yd^3 will be excavated in this area. This area is underneath the building with limited infiltration. For cost estimating purposes, it is assumed the treatment zone is from ground surface to 20 feet bgs.
- SA-2: Excavation and offsite disposal in the vadose zone to 13 feet bgs, followed by in-situ treatment for the remainder of the vadose zone and the shallow saprolite zone. It is estimated that approximately 3,827 yd^3 will be excavated in this area.
- SA-3: Excavation and off-site disposal in the vadose zone to 13 feet bgs, followed by *in-situ* treatment for the remainder of the vadose zone to 20 feet bgs. It is estimated that approximately 2,238 yd^3 will be excavated in this area. This area is underneath the building and pavement with limited infiltration, contaminant concentrations are decreasing over depth, and the grab groundwater sample from WS-8 revealed PCE and TCE at 233 μg/L and 38.7 μg/L, respectively; therefore, the majority of contaminants are believed to be held in the vadose zone soil. For cost-

estimating purposes, the treatment zone is assumed to be from ground surface to 20 feet bgs.

- SA-4: *In-situ* treatment in the vadose zone soil and shallow saprolite zone from 5 feet bgs to 40 feet bgs. The contaminant level was low in the shallow vadose zone; it is not cost effective to perform excavation at this area.
- SA-5: *In-situ* treatment in the vadose zone soil and the shallow saprolite zone from 5 feet bgs to 40 feet bgs. Soil contaminant concentrations were moderate, and vertical distribution of contaminant concentrations indicate the majority of contaminants have migrated to the shallow saprolite zone. It is not cost effective to perform excavation at this area.

For costing purposes, excavation would be performed to 13 feet bgs at SA-1, SA-2, and SA-3 areas. The exact dimensions of the area to be excavated and volume of soil to be excavated would be determined during the remedial design. The major portions of these three areas are located underneath the buildings or pavement. The concrete slab and pavement covering these areas would need to be demolished before conducting the excavation. The excavated area would be backfilled with imported, clean common fill and properly compacted. The cost estimate also takes into account the reconstruction of the slab following excavation and backfilling activities.

Soil samples would also be collected from the bottom of the excavation for documentation purposes. The effectiveness of excavation would be confirmed with the post-excavation sample results from sidewalls. Two rounds of soil sampling would also be performed, each after one round of in-situ treatment in the vadose zone to evaluate the effectiveness of in-situ treatment. Results from the first round of soil sampling would be used to design the second round of in-situ treatment to areas with contaminant concentrations exceeding the PRGs in the vadose zone soil.

Excavated soils would be disposed of offsite in a Resource Conservation and Recovery Act (RCRA) Subtitle D (non-hazardous) landfill. If the excavated soil is found to be hazardous as determined by toxicity characteristic leaching procedure analysis, it would be shipped to the mainland and properly treated and disposed of. The excavated area would be backfilled with imported clean common fill and properly compacted.

Following the excavation at SA-1 and SA-3, perforated horizontal pipes could be placed at the bottom of the excavation prior to backfill. At each area, these pipes would be combined at a header with a vertical pipe extending to ground surface and connected to a storage tank. Organic amendment solution could be added to this storage tank periodically and gravity fed into the treatment zones to promote *in-situ* anaerobic biological treatments.

At SA-2, contamination is known to have passed to the shallow saturated saprolite zone. Source treatment at the deep vadose zone and the shallow saprolite zone would be conducted simultaneously. Following excavation and backfill, amendment would be injected into boreholes from a depth of 13 feet bgs to 40 feet bgs, spaced 10 feet apart.

The vadose zone soil contamination at SA-4 and SA-5 would be remediated together with the saturated soil using in situ treatment technologies. Similar to what was described for SA-2, amendment would be distributed into the vadose zone soil and the shallow saprolite zone injection spaced 10 feet apart. Amendment distribution for the deeper treatment zone in the shallow saprolite zone would be performed with injection wells.

Monitoring wells would be installed upgradient and downgradient of the treatment zone for the evaluation of treatment effectiveness in the shallow saprolite. MW-2S and MW-3S would be used for performance monitoring if these two wells are confirmed to be outside the treatment zone after the PDI. For cost-estimating purposes, a total of 10 monitoring wells would be installed. Groundwater and soil samples would be collected prior to treatment and post treatment to evaluate the effectiveness of *in-situ* treatment.

After the completion of this OU1 remedial alternative, all equipment and materials would be removed from the Site. The Site would be restored to prior conditions to the extent possible. The injection and monitoring wells would be retained to be used under OU2 as appropriate.

Alternative S3 – Soil Vapor Extraction and Dual-Phase Extraction /*In-Situ* Treatments

Capital Cost	$ 5,448,000
Present Worth O&M Cost	$ 1,880,000
Total Present Worth Cost	$ 7,328,000
Construction Time Frame	8 months
Timeframe to meet RAOs	At least 10 years

Under this alternative, a pilot study would be performed as part of the PDI to collect the design parameters for the SVE and dual-phase extraction (DPE) system. For the design of a SVE system, an air permeability test would be conducted to determine the Site-specific design parameters, such the achievable air flow rate, the required vacuum to induce the flow, the radius of influence from the applied vacuum, and the initial contaminant removal rates. For the DPE, the achievable sustained groundwater extraction rate and the drawdown would be studied.

This remedial alternative would consist of the following major components:

- Cap Installation at SA-2 and SA-3;
- SVE system installation and operation;
- Dual phase extraction system installation and operation;
- *In-situ* treatments;
- Treatment performance evaluation; and
- Site restoration

Because the level and distribution of contamination at each source area is different, not every component is anticipated to be applied at each source area. For cost-estimating purposes, the conceptual approach for each area is listed below:

- SA-1: SVE in the vadose zone.
- SA-2: SVE in the vadose zone in conjunction with DPE in the shallow saprolite zone, followed by *in-situ* treatment as described in Alternative S2.
- SA-3: SVE in the vadose zone.
- SA-4: *In-situ* treatments for both the vadose zone and the shallow saprolite as described in Alternative S2.
- SA-5: DPE in the shallow saprolite, followed by *in-situ* treatment in both the vadose zone and the shallow saprolite as described in Alternative S2.

Two existing buildings and paved driveways at the Wallace lot would act as caps for the SVE system to prevent short-circuiting from the atmosphere. Additional impermeable cover could be installed as necessary for the implementation of SVE. Any additional cover would be engineered to limit infiltration of rainwater into the contaminated soils, meaning that durable, low-permeability material would be used, and rainwater would be directed away from the remediation zone. (For cost-estimating purposes, it is assumed no additional cap is needed.)

In source areas SA-1, SA-2, and SA-3, vertical SVE wells would be installed in the vadose zone to target the entire vadose zone contamination without extracting groundwater. For cost-estimating purposes, it is assumed 3, 13, and 8 SVE wells would be installed in SA-1, SA-2, and SA-3, respectively. Nested vapor monitoring wells also would be installed to monitor the progress of contaminant removal and the changes in soil vapor pressure.

Piping for transferring the extracted soil vapor to an above-ground treatment system would be routed underground, along the wall, or overhead to minimize impact to routine building operations. An above-ground treatment system would be installed in a pre-fabricated building brought on-site to treat the extracted soil vapor prior to discharge to the atmosphere.

For cost-estimating purposes, it is assumed that the SVE system would be operated continuously for the first two years and intermittently for the following eight years.

The DPE system would be installed at SA-2 and SA-5 to reduce the contaminant mass in the shallow saprolite zone prior to implementing other *in-situ* treatment methods. DPE wells would be installed based on the conclusions of the remedial design. For cost-estimating purposes, it is assumed 13 and 4 DPE wells will be installed in SA-2 and SA-5, respectively.

The extracted vapor would be treated using the same vapor treatment system described above for SVE, if possible. The water treatment system also would be installed in the same building that would house the vapor treatment system. This system is anticipated to consist of groundwater extraction pumps, piping, transfer pumps, bag filters, and an air stripper in addition to the air-water separator and vapor phase activated carbon. Treated water would be discharged to the nearby open drainage ditch with an appropriate permit. Discharged water would meet Puerto Rico discharge permit requirements. For cost-estimating purposes, the DPE system is anticipated to be operated for one year.

Following the DPE treatment, the remaining contamination in SA-2 and SA-5 would be remediated with an *in-situ* treatment technology similar to those described in Alternative S2. The vertical intervals for the *in-situ* treatment might be adjusted in accordance with the operation of the SVE system.

In-situ remediation at SA-4 would be performed as described in Alternative S2.

After the completion of each phase of this alternative, equipment and materials would be removed from the Site, and the Site would be restored. The wells would be properly abandoned if necessary. DPE wells and monitoring wells screened in the shallow saprolite zone would be kept as necessary for OU2.

Alternative S4 – *In-situ* Thermal Remediation and SVE/*In-Situ* Treatments

Capital Cost	$ 12,741,000
Present Worth O&M Cost	$ 549,000
Total Present Worth Cost	$ 13,290,000
Construction Time Frame	1-2 years
Timeframe to meet RAOs	2.5 years

This remedial alternative would consist of the following major components:

- Cap Installation at SA-2, SA-3, and SA-5 (as necessary);
- SVE and in-situ thermal remediation (ISTR) system installations and operation;
- Decommissioning of ISTR;
- Treatment performance evaluation;
- *In-situ* treatments; and
- Site restoration.

Because the level and distribution of contamination at each source area is different, not every component is anticipated to be applied at each source area. For cost estimating purposes, the conceptual approach for each area is listed below:

- SA-1: ISTR and SVE in the vadose zone.
- SA-2: ISTR and SVE for both the vadose zone and the shallow saprolite, followed by *in-situ* treatments.
- SA-3: ISTR and SVE in the vadose zone.
- SA-4: *In-situ* treatments for both the vadose zone and the shallow saprolite zone.
- SA-5: ISTR and SVE for both the vadose zone and the shallow saprolite zone, followed by *in-situ* treatments.

Impermeable surface cover would be installed at SA-2, SA-3, and SA-5 areas as necessary. The majority of SA-2 and SA-3 areas are already under buildings or pavement. The building slab and pavement would be inspected and repaired as necessary. SA-5 is partially covered by a parking lot. The parking lot would be inspected and repaired as necessary, and areas to be remediated with SVE and ISTR would be paved as necessary.

Combined soil vapor extraction and heating wells would be installed at the Wallace lot (SA-1, SA-2, and SA-3) and the CCL lot (SA-5). Electrical Resistance Heating (ERH) and Thermal Conductive Heating (TCH) are the most common methods for thermal remediation of chlorinated solvent contamination. Both ERH and TCH are anticipated to be effective at the Site. For costing purposes, it is assumed ERH will be used.

As a result of space constraints at the Wallace lot, it likely would be difficult to install combined heating and vapor extraction wells in the configuration that vendors have identified as most optimal (12- inch boreholes with an 8-foot radius of influence). For cost-estimating purposes, it is assumed that 12-inch borings would be installed in outdoor areas, in both a vertical configuration and also angled under the building, and 4-inch borings would be installed indoors. Because of the lower surface area of the small-boring electrodes, the radius of influence would be less than the 12-inch boring electrodes.

At the CCL lot, the treatment zone (SA-5) is outside and has minimal space constraints. Thus, it is assumed only 12 borings would be installed at the property. At all the ISTR areas, temperature monitoring points would be installed to monitor the progress of heating in the soil along with additional dedicated soil vapor extraction wells. The existing pavement at the Site would be retained because it serves to inhibit both heat and vapor loss from the subsurface.

Heating of the soils is anticipated to take approximately 100 days, during which the SVE system would be operated to remove volatilized contaminants. Additional sampling and analysis would also be conducted in order to meet the air emission permit requirements. After heating, an approximately 100-day soil cool-down period would be needed prior to removal of the system and abandonment of the wells in SA-1 and SA-3. The SVE system would be operated during the cool-down period and possibly longer if warranted.

Toward the end of the heating period, soil samples would be collected within the treatment zones for VOC analysis to evaluate the effectiveness of the thermal treatment. For costing purposes, it is assumed that once 90 percent of the source zone mass has been removed (a typical efficiency for *in-situ* thermal remediation), then heating would be complete. *In-situ* treatment would start in SA-2 and SA-5. In SA-1 and SA-3, it is assumed for costing purposes that the SVE system would continue to target residual mass, and a cap would be maintained over the treatment area to prevent short-circuiting and surface water infiltration.

In-situ treatments would be applied in SA-4 as described in Alternative S2. At SA-1, SA-2, SA-3, and SA-5, with extended operation of the SVE system, the vadose zone soil is expected to meet the remediation goals. Therefore, no additional *in-situ* treatment is anticipated to be needed at SA-1 and SA-3. For SA-2 and SA-5, one round of *in-situ* treatment would be conducted in the shallow saprolite zone and possibly the capillary fringe using a combination of direct push technology and injection wells for amendment placement, as described in Alternative S2.

For SA-2 and SA-5, *in-situ* treatment would be conducted in the shallow saprolite zone, starting soon after the ITSR phase, since the residual heat would be conducive to the growth of microbes.

The effectiveness of ISTR in the vadose zone soil would be evaluated by collecting soil samples. The effectiveness of ISTR and *in-situ* treatment would be evaluated by collecting groundwater samples from monitoring wells as described in Alternative S2.

After the completion of the OU-1 remedial action, the heating wells, the soil vapor extraction wells, and soil vapor monitoring points would be properly abandoned. All the equipment and materials would be removed or demobilized.

Wells that could be used for OU-2 would be kept. The Site would be restored.

EVALUATION OF REMEDIAL ALTERNATIVES

Nine criteria are used 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 nine criteria, noting how it compares to the other options under consideration. The nine evaluation criteria are discussed below. A detailed analysis of alternatives can be found in the FS.

A comparative analysis of these alternatives based upon the evaluation criteria noted above is presented below. Comparative Analysis of Alternatives

Overall Protection of Human Health and the Environment

Alternative S1, No Action, would not meet the RAOs and would not be protective of the environment since no action would be taken. The contaminated soil would continue to be a source of groundwater contamination and soil vapors.

Alternatives S2, S3 and S4 would meet the RAOs and would be protective of human health and the environment by addressing the source areas, to the extent practicable. Treatment and excavation technologies may not be able to treat all the contamination underneath occupied buildings. If that is the case, the buildings could act as a cap to minimize infiltration of surface water and reduce contaminant migration into groundwater.

Compliance with ARARs

There are no Federal or Puerto Rico chemical-specific ARARs for soil. While not ARARs, the Site-specific remediation goals would be met above the water table by Alternatives S2, S3 and S4, and these technologies would effectively remove contaminant mass below the water table.

Excavation and off-site disposal under Alternative S2 would need to satisfy the land disposal requirements under RCRA. All active alternatives would comply with action-specific ARARs. Action-specific ARARs would not be attained under the No action alternative because no work would be implemented.

NINE EVALUATION CRITERIA FOR SUPERFUND REMEDIAL ALTERNATIVES
Overall protection of human health and the environment determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.
Compliance with ARARs evaluates whether the alternative would meet all of the applicable or relevant and appropriate requirements of federal and state environmental statutes and other requirements that pertain to the site, or provide grounds for invoking a waiver.
Long-term effectiveness and permanence considers the ability of an alternative to maintain protection of human health and the environment over time.
Reduction of toxicity, mobility, or volume through treatment is the anticipated performance of the treatment technologies an alternative may employ.
Short-term effectiveness considers the period of time needed to implement an alternative and the risks the alternative may pose to workers, residents, and the environment during implementation.
Implementability is the technical and administrative feasibility of implementing the alternative, including the availability of materials and services.
Cost includes estimated capital and annual operation and maintenance costs, as well as present-worth costs. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.
Commonwealth acceptance considers whether the Commonwealth (the support agency) concurs with, opposes, or has no comments on the preferred remedy.
Community acceptance will be assessed in the ROD and refers to the public's general response to the alternatives described in the Proposed Plan and the RI/FS reports. Comments received on the Proposed Plan are an important indicator of community acceptance.

Long-Term Effectiveness and Permanence

Under the No Action alternative, contamination would continue to be present in the vadose zone and migrate in the soil and potentially impact groundwater at some point in the future. The No Action alternative is not effective or permanent.

For Alternatives S2 and S4, with excavation and thermal remediation plus *in-situ* treatment, a significant degree of permanent mass removal is expected, with a resulting high degree of long-term effectiveness and permanence. For Alternative S3 with DPE/SVE, technical limitations may mean that not all the contamination would be removed from the clayey soil. The radius of influence of SVE wells would be low in clayey soil. Significant diffusion of contamination into the clay is likely to have occurred. The SVE system may need to be operated for a much longer period than estimated in Alternatives S2 and S4 to achieve a similar level of permanent mass removal.

For any contamination underneath a building that is not accessible for excavation or thermal treatment, the buildings would act as a cap to prevent contaminant migration into groundwater.

Reduction of Toxicity, Mobility, or Volume (T/M/V) Through Treatment

The No Action alternative would not reduce contaminant T/M/V because no remedial action would be conducted.

The excavation and thermal remediation alternatives would be expected to significantly reduce T/M/V through treatment. DPE/SVE under Alternative S3 likely would reduce T/M/V through treatment to a degree, but its effectiveness in the tight soils at the Site likely would be limited, and thus, reduction of T/M/V may be limited. The extent and effectiveness of T/M/V reduction by DPE/SVE would need to be verified with monitoring. *In-situ* treatment would enhance T/M/V and is included in Alternatives S2, S3, and S4.

Short-Term Effectiveness

With respect to the No Action alternative, there would be no short-term impact to the community and environment as no remedial action would occur.

There would be significant short-term impacts to the ongoing business on-site, local community, and workers for the remaining alternatives because of the active remedial actions undertaken and associated construction and operation.

Operation at facilities (i.e., Wallace) would need to be modified or temporarily shut down. Excavation would involve truck traffic and noise from heavy equipment operations. Thermal remediation under Alternative S4 would require the presence of substantial piping and treatment elements at the Site for a time period on the order of one year, causing substantial short-term disruption to property use. Similarly, excavation activities under Alternative S2 would cause substantial short-term disruptions and may require temporary business closures for occupied properties in the Industrial Park. By contrast, SVE and other *in-situ* treatment infrastructure (part of all the active alternatives but the bulk of the work to be performed for Alternative S3) would require substantially less short-term disruptions during installation, and while the systems may be present for a number of years, they would not pose significant hardships on property use.

Alternative S3 (DPE/SVE) would have a smaller footprint in terms of short-term effectiveness as opposed to the other two active remediation options. Air monitoring, engineering controls and appropriate worker personal protective equipment would be used to protect the community and workers during the implementation of these alternatives.

Alternatives S2 and S4 would achieve the RAOs in approximately 2.5 years while Alternative S3 is expected to achieve the RAOs in approximately 10 years.

Implementability

The No Action alternative would be easiest both technically and administratively to implement as no additional work would be performed at the Site.

Both Alternative S2 (with thermal remediation) and Alternative S4 (with excavation) face considerable implementation hurdles. Because excavation would be occurring directly inside and adjacent to buildings, shoring and underpinning would be necessary to support the structures during the work. Excavated hazardous waste would have to be shipped to the continental United States because there are no hazardous waste landfills on Puerto Rico.

For thermal remediation, the presence of buildings (with tenants) in the treatment zones also presents challenges regarding implementation, such as installing heating elements inside an active facility. During remedial design, it may be possible to install heating elements either at angles or horizontally into the treatment zone from outside the buildings.

For Alternative S3, the major implementability limitation would be the ability to access the treatment zone based on physical limitations. The limited effectiveness of SVE/DPE in clayey soils is also an implementability concern; however, it is expected that it can be overcome by extending the period of performance out to an estimated 10 years, at which time a comparable level of mass removal can be expected, when compared to the other active alternatives.

Cost

The cost estimates for all alternatives are provided.

Soil Source Alternative	Capital Cost	Present Worth O&M Cost	Total Present Worth Cost
S1	$ 0	$0	$0
S2	$12,883,000	$ 549,000	$13,432,000
S3	$5,448,000	$1,880,000	$7,328,000
S4	$12,741,000	$549,000	$13,290,000

Commonwealth/Support Agency Acceptance

The PREQB agrees with the preferred remedy in this Proposed Plan.

Community Acceptance

Community acceptance of the preferred remedy will be evaluated after the public comment period ends, and it will be described in the Responsiveness Summary section of the ROD for this Site. The ROD is the document that formalizes the selection of the remedy for a site.

PREFERRED REMEDY

Alternative S3 (Soil Vapor Extraction/Dual Phase Extraction/*In-Situ* Treatment) is the preferred alternative for the soil source areas. Under this alternative, the soil source areas would be targeted with soil vapor extraction in the vadose zone in combination with DPE in the shallow saprolite zone, followed by *in-situ* treatment. For this alternative, a pilot study would be performed as part of the PDI to collect the design parameters for the SVE and DPE system. For the design of a vapor extraction system, an air permeability test would be conducted to determine the site-specific design parameters, such the achievable air flow rate, the required vacuum to induce the flow, the radius of influence from the applied vacuum, and the initial contaminant removal rates.

The two buildings and the paved driveways at the Wallace lot would act as caps for the SVE system to prevent short-circuiting from the atmosphere. Additional impermeable cover may be installed as necessary for the implementation of SVE. Any additional cover would be engineered to limit infiltration of rainwater into the contaminated soils, meaning that durable, low-permeability material would be used, and rainwater would be directed away from the remediation zone. (For cost-estimating purposes, it is assumed no additional cap is needed.)

For cost-estimating purposes, it is assumed that 3, 13, and 8 SVE wells would be installed in SA-1, SA-2, and SA-3, respectively. Nested vapor monitoring wells also would be installed to monitor the progress of contaminant removal and the changes in soil vapor pressure. Also, for cost-estimating purposes, it is assumed that the SVE system would be operated continuously for the first two years and intermittently for the following eight years. The implementation of SVE remedy could be performed simultaneously with the DPE, or the DPE could be operated six months to one year after the start of the SVE system, depending on the level of initial contaminant concentrations and any other logistical considerations.

The DPE system would be installed at SA-2 and SA-5 to reduce the contaminant mass in the shallow saprolite zone prior to other *in-situ* treatment. DPE wells would be installed based on the conclusions of the remedial design. For cost-estimating purposes, it is assumed 13 and 4 DPE wells will be installed in SA-2 and SA-5, respectively.

The water treatment system would be installed in the same building that would house the vapor treatment system. This system is anticipated to consist of groundwater extraction pumps, piping, transfer pumps, bag filters, and an air stripper in addition to the air-water separator and vapor phase activated carbon. Treated water would be discharged to the nearby open drainage ditch with an appropriate permit. Discharged water would meet Puerto Rico discharge permit requirements. In addition, for cost-estimating purposes, the DPE system is anticipated to be operated for one year.

BASIS FOR REMEDY PREFERENCE

The Preferred Alternative is believed to provide the best balance of tradeoffs among the alternatives based on the information available to EPA at this time. EPA and PREQB believe that the preferred remedy would treat principal threats, be protective of human health and the environment, comply with ARARs, be cost-effective and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. The preferred remedy also would meet the statutory preference for the use of treatment as a principal element. The preferred alternative can change in response to public comment or new information.

While the three active alternatives can achieve similar levels of protectiveness and Alternatives S2 and S4 appear capable of achieving the RAOs in a shorter time period (2.5 years as opposed to 10 years), the short-term occupant disruptions and implementability challenges are substantially greater than for Alternative S3. Alternative S3 also does not have the off-site disposal challenges of Alternative S2, and is substantially less expensive.

The environmental benefits of the preferred remedy may be enhanced by consideration, during the design, of technologies and practices that are sustainable in accordance with EPA Region 2's Clean and Green Energy Policy. This would include consideration of green remediation technologies and practices.

Table 5
Preliminary Remediation Goals for Soil (all concentrations in µg/kg)

Contaminants of Concern	CAS Number	Soil Protective of Groundwater	PRGs	Maximum Detected Concentrations
cis-1,2-Dichloroethene	156-59-2	204	204	4,400
Tetrachloroethene	27-18-4	101	101	46,000
Trichloroethene	79-01-6	36	36	3,600
Vinyl chloride	75-01-4	2	2	520J
1,1-Dichloroethene	75-35-4	35	35	84

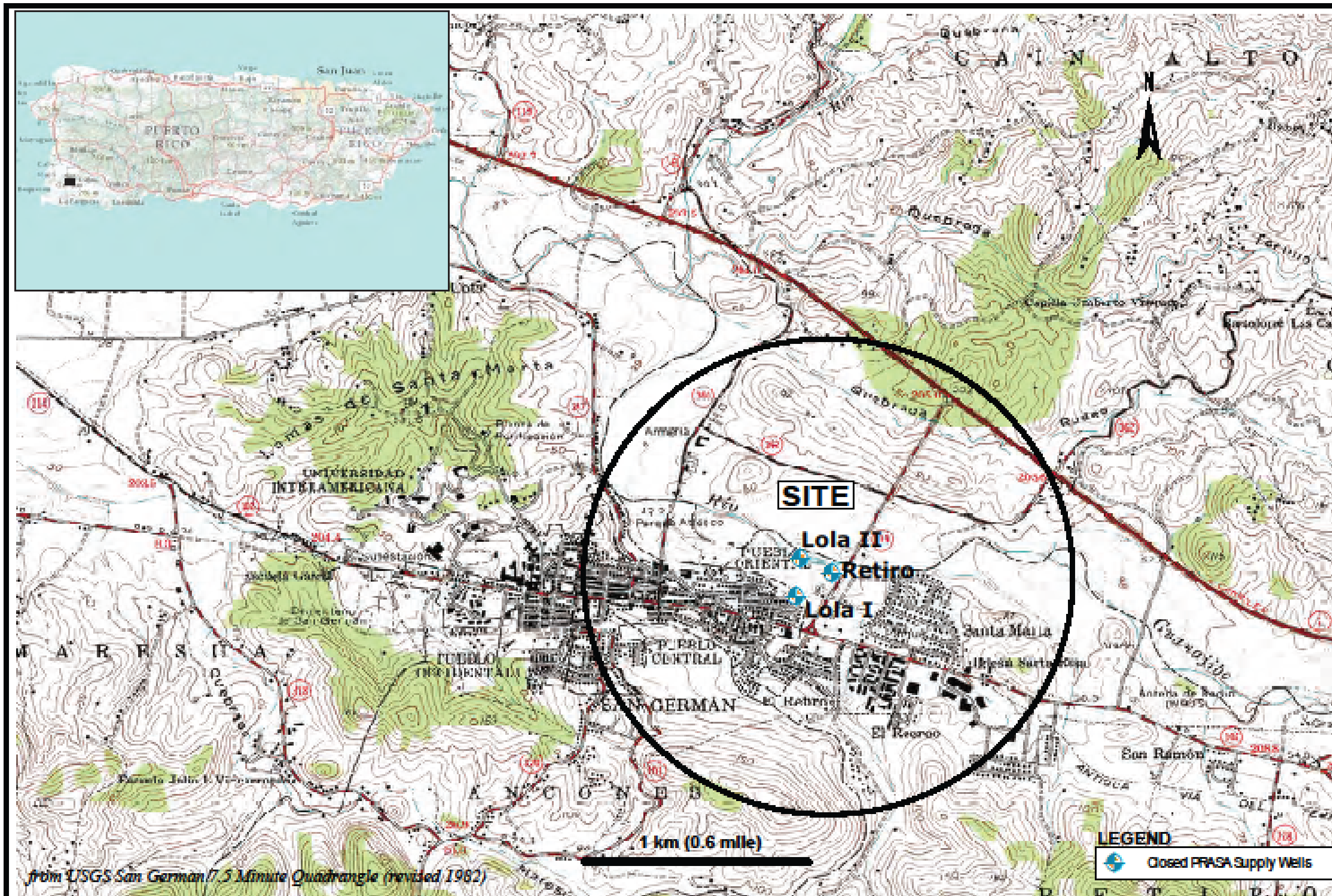


Figure 1
Site Location Map
San German Groundwater Contamination Site
San German, Puerto Rico

CDM Smith

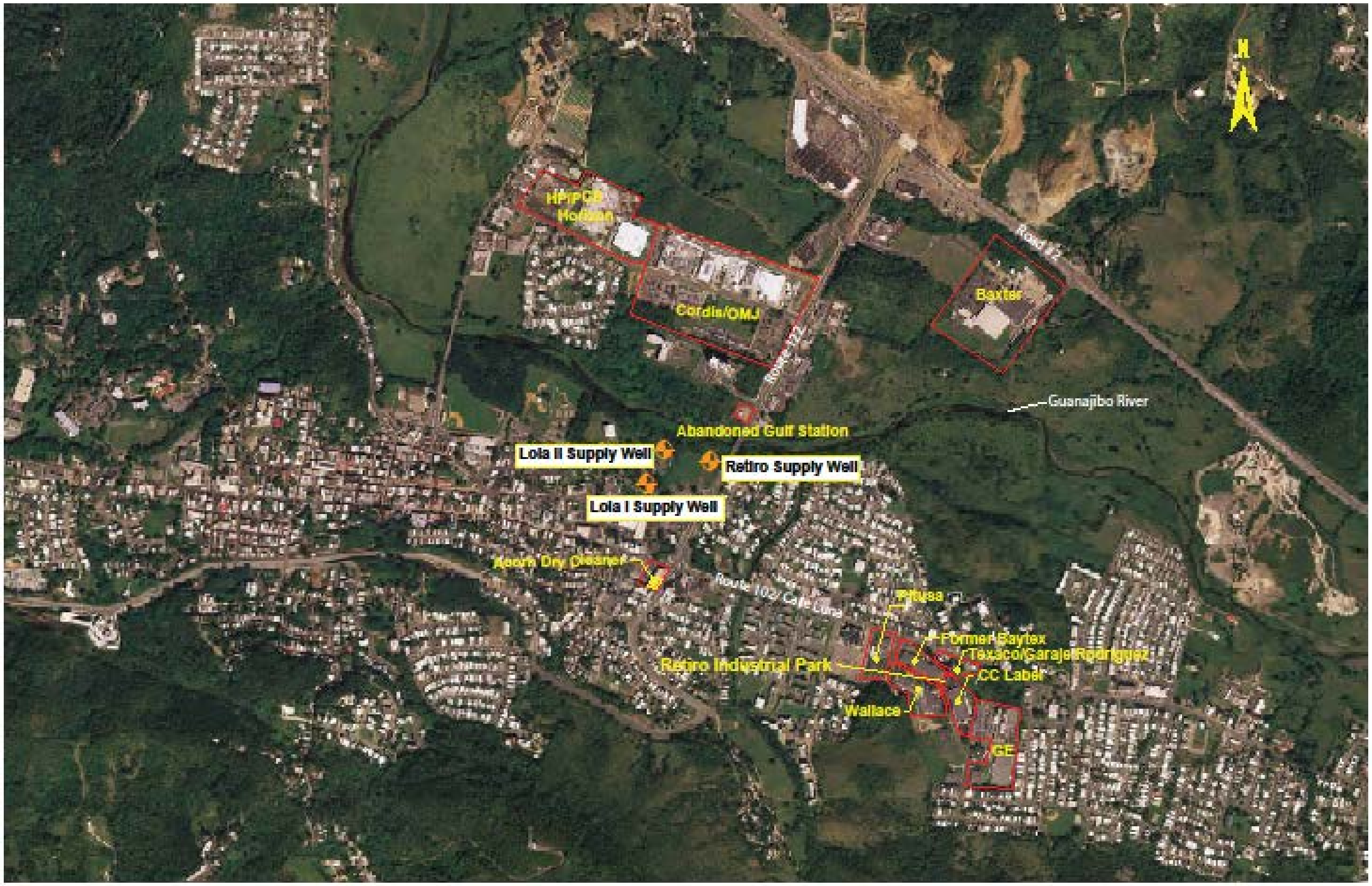


Figure 2
Site Map
San German Groundwater Contamination Site
San German, Puerto Rico

CDM Smith

WS-01

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	5.2 J	7 U	7 U	7 U	7 U
	5-7	0.93 J	6.3 U	6.2 J	6.3 U	6.3 U
	10-12	190	25	25	6.1 U	6.1 U
	20-22	62	0.64 J	6.2 U	6.2 U	6.2 U

WS-02

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	4.2 J	6.4 UJ	6.4 U	6.4 U	6.4 U
	5-7	2.5 J	6.3 UJ	6.3 U	6.3 U	6.3 U
	10-12	5 J	0.99 J	6.8 U	6.8 U	6.8 U
	20-22	13	4.1 U	4.1 U	4.1 U	4.1 U
Gw (µg/L)	19-23	270 D	5 U	5 U	5 U	5 U

WS-03

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	5.7 J	7.1 UJ	7.1 U	7.1 U	7.1 U
	5-7	260 J	5.8 J	13	8.4 U	8.4 U
	10-12	850 J	12 J	2.1 J	1.5 J	3.4 U
	20-22	1,200 J	210 J	380	56 J	360 U
Gw (µg/L)	21-25	7,960 D	900 D	1,310 D	72	190

WS-04

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	5.7	0.33 J	1.9 J	2.8 U	2.8 U
	0-2(Dup)	6.3 J	6.2 UJ	2.5 J	6.2 U	6.2 U
	5-7	17,000 J	660 U	77 J	660 U	660 U
	10-12	3,800 J	1.6 J	1.1 J	6 U	6 U
	20-22	1,500 J	160 J	120 J	330 UJ	330 UJ
	30-32	7.2 J	5.4 UJ	5.4 U	5.4 UJ	5.4 UJ
Gw (µg/L)	30-34	5,360 D	31 J	47 J	250 U	250 U

WS-05

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	2.4 UJ	0.42 J	4.6 J	2.4 U	2.4 U
	5-7	8,000 J	420 J	700 J	9.6	5.2 J
	10-12	220 J	400 U	58 J	400 U	400 U
	20-22	6.3 U	6.3 U	6.3 U	6.3 UJ	6.3 U
Gw (µg/L)	19-23	7,620 D	53.5 J	87 J	250 U	250 U

WS-06

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	4,900	1,100	160 J	380 U	380 U
	5-7	4,000 J	2,300 J	280 J	2.5 J	49
	10-12	4,200	560	340 U	340 U	340 U
	20-22	44 J	0.37 J	0.61 J	2.4 U	2.4 UJ
Gw (µg/L)	23-27	9,420 D	278 D	114 J	250 U	250 U

WS-07

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	12 J	2.4 J	4.8 J	3.4 UJ	3.4 UJ
	5-7	8.3 J	6.3 J	14 J	0.54 J	2.7 UJ
	10-12	2.1 UJ	2.1 UJ	2.1 UJ	2.1 U	2.1 UJ
	20-22	1.6 J	R	R	R	R
Gw (µg/L)	21-25	244	12.4	7.71	4.22 J	5 U

WS-08

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	46,000	6,000 U	6,000 U	6,000 UJ	6,000 U
	5-7	34,000 J	1,600	980	71 J	310 U
	10-12	2,900	420	180 J	52 J	250 U
	20-22	31 J	7.8 J	2.1 J	3.3 U	3.3 U
Gw (µg/L)	21-25	233	38.7	5.92	5 U	5 U

WS-09

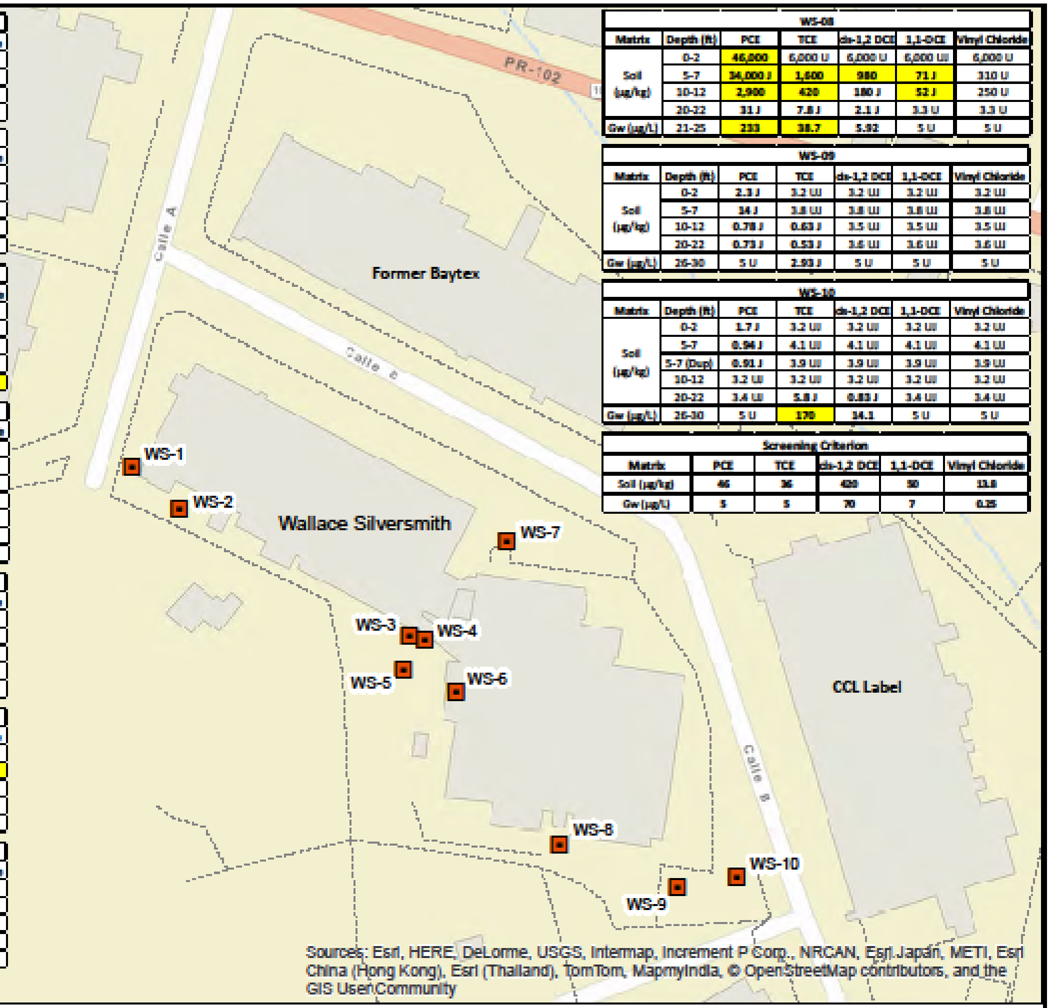
Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	2.3 J	3.2 UJ	3.2 UJ	3.2 UJ	3.2 UJ
	5-7	14 J	3.8 UJ	3.8 UJ	3.8 UJ	3.8 UJ
	10-12	0.78 J	0.63 J	3.5 UJ	3.5 UJ	3.5 UJ
	20-22	0.73 J	0.53 J	3.6 UJ	3.6 UJ	3.6 UJ
Gw (µg/L)	26-30	5 U	2.93 J	5 U	5 U	5 U

WS-10

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	1.7 J	3.2 UJ	3.2 UJ	3.2 UJ	3.2 UJ
	5-7	0.94 J	4.1 UJ	4.1 UJ	4.1 UJ	4.1 UJ
	5-7 (Dup)	0.91 J	3.9 UJ	3.9 UJ	3.9 UJ	3.9 UJ
	10-12	3.2 UJ	3.2 UJ	3.2 UJ	3.2 UJ	3.2 UJ
	20-22	3.4 UJ	5.8 J	0.83 J	3.4 UJ	3.4 UJ
Gw (µg/L)	26-30	5 U	170	14.1	5 U	5 U

Screening Criterion

Matrix	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	46	36	420	50	13.8
Gw (µg/L)	5	5	70	7	0.25



LEGEND

Soil/Groundwater Screening Location

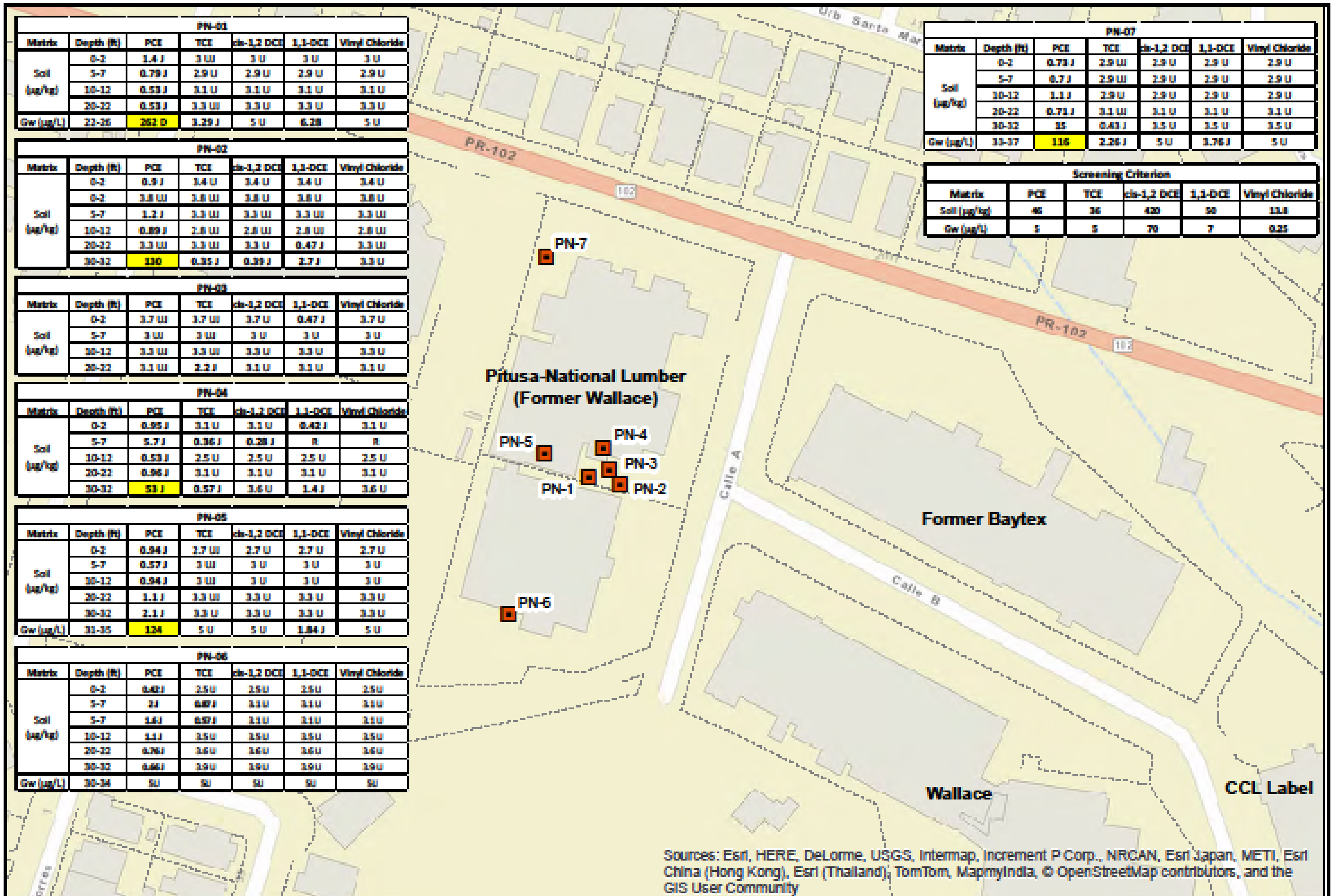
Notes:
PCE- tetrachloroethene
TCE- trichloroethene
DCE - dichloroethene
Gw - groundwater
µg/kg - micrograms per kilogram
µg/L - micrograms per liter

D - diluted
J - estimated
U - not detected
ft - feet

Feet 0 50 100 200

Figure 3
Wallace Soil and Groundwater Screening Sampling Results
San German Groundwater Contamination Site
San German, Puerto Rico

CDM Smith



PN-01						
Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	1.4 J	3 UJ	3 U	3 U	3 U
	5-7	0.79 J	2.9 U	2.9 U	2.9 U	2.9 U
	10-12	0.53 J	3.1 U	3.1 U	3.1 U	3.1 U
	20-22	0.53 J	3.3 UJ	3.3 U	3.3 U	3.3 U
Gw (µg/L)	22-26	262 D	1.29 J	5 U	6.28	5 U

PN-02						
Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	0.9 J	3.4 U	3.4 U	3.4 U	3.4 U
	0-2	3.8 UJ	3.8 UJ	3.8 U	3.8 U	3.8 U
	5-7	1.2 J	3.3 UJ	3.3 UJ	3.3 UJ	3.3 UJ
	10-12	0.89 J	2.8 UJ	2.8 UJ	2.8 UJ	2.8 UJ
	20-22	3.3 UJ	3.3 UJ	3.3 U	0.47 J	3.3 UJ
	30-32	130	0.35 J	0.39 J	2.7 J	3.3 U

PN-03						
Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	3.7 UJ	3.7 UJ	3.7 U	0.47 J	3.7 U
	5-7	3 UJ	3 UJ	3 U	3 U	3 U
	10-12	3.3 UJ	3.3 UJ	3.3 U	3.3 U	3.3 U
	20-22	3.1 UJ	2.2 J	3.1 U	3.1 U	3.1 U

PN-04						
Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	0.95 J	3.1 U	3.1 U	0.42 J	3.1 U
	5-7	5.7 J	0.36 J	0.28 J	R	R
	10-12	0.53 J	2.5 U	2.5 U	2.5 U	2.5 U
	20-22	0.96 J	3.1 U	3.1 U	3.1 U	3.1 U
	30-32	53 J	0.57 J	3.6 U	1.4 J	3.6 U

PN-05						
Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	0.94 J	2.7 UJ	2.7 U	2.7 U	2.7 U
	5-7	0.57 J	3 UJ	3 U	3 U	3 U
	10-12	0.94 J	3 UJ	3 U	3 U	3 U
	20-22	1.1 J	3.3 UJ	3.3 U	3.3 U	3.3 U
	30-32	2.1 J	3.3 U	3.3 U	3.3 U	3.3 U
Gw (µg/L)	31-35	124	5 U	5 U	1.84 J	5 U

PN-06						
Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	0.42J	2.5U	2.5U	2.5U	2.5U
	5-7	2J	0.87J	3.1U	3.1U	3.1U
	5-7	1.6J	0.57J	3.1U	3.1U	3.1U
	10-12	1.1J	3.5U	3.5U	3.5U	3.5U
	20-22	0.76J	3.6U	3.6U	3.6U	3.6U
	30-32	0.66J	3.9U	3.9U	3.9U	3.9U
Gw (µg/L)	30-34	5U	5U	5U	5U	5U

PN-07						
Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	0.73 J	2.9 UJ	2.9 U	2.9 U	2.9 U
	5-7	0.7 J	2.9 UJ	2.9 U	2.9 U	2.9 U
	10-12	1.1 J	2.9 U	2.9 U	2.9 U	2.9 U
	20-22	0.71 J	3.1 UJ	3.1 U	3.1 U	3.1 U
	30-32	15	0.43 J	3.5 U	3.5 U	3.5 U
Gw (µg/L)	33-37	116	2.26 J	5 U	3.76 J	5 U

Screening Criterion					
Matrix	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	46	36	420	50	13.8
Gw (µg/L)	5	5	70	7	0.25

LEGEND

Soil/Groundwater Screening Location

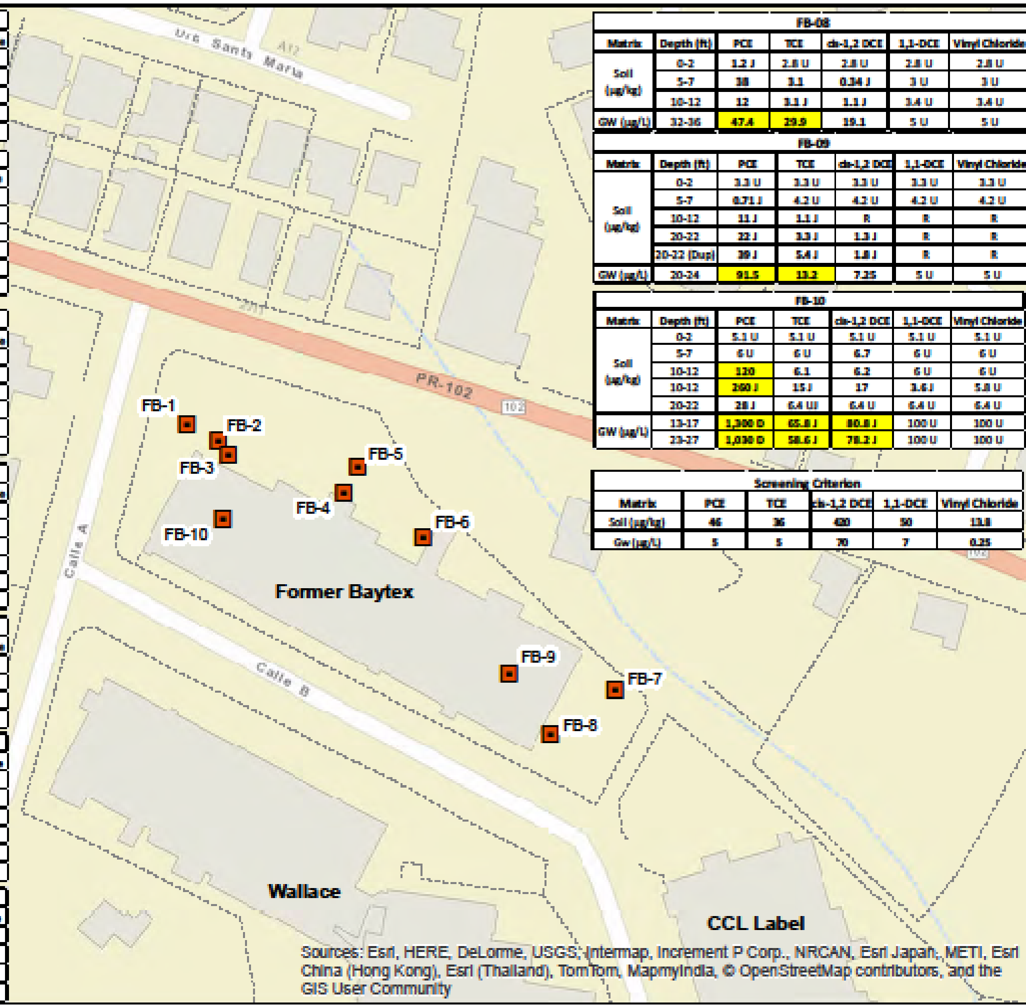
Notes:
PCE- tetrachloroethene
TCE- trichloroethene
DCE - dichloroethene
Gw - groundwater
µg/kg - micrograms per kilogram
µg/L - micrograms per liter

D - diluted
J - estimated
U - not detected
ft - feet

Feet

Figure 4
Pitusa Soil and Groundwater Screening Sampling Results
San German Groundwater Contamination Site
San German, Puerto Rico

CDM Smith



FB-01

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	0.98 J	3.2 UJ	3.2 U	3.2 U	3.2 U
	5-7	0.88 J	3.1 UJ	3.1 U	3.1 U	3.1 U
	10-12	0.87 J	2.9 UJ	2.9 U	2.9 U	2.9 U
	20-22	97 J	3.3 UJ	3.3 U	2.6 J	3.3 U
GW (µg/L)	20-24	832	3.45 J	7.52	13.9	5 U

FB-02

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	0.69 J	3.5 UJ	3.5 U	3.5 U	3.5 U
	5-7	0.58 J	2.9 U	2.9 U	2.9 U	2.9 U
	10-12	0.82 J	2.7 U	2.7 U	2.7 U	2.7 U
	20-22	93 J	1.2 J	0.75 J	3.5 UJ	3.5 U
	30-32	33	3.2 U	3.2 U	3.2 UJ	3.2 U
GW (µg/L)	32-36	906 D	7.28	8.04	14.6	5 U

FB-03

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	0.91 J	3.2 UJ	3.2 U	3.2 UJ	3.2 U
	5-7	0.84 J	3.3 U	2.6 J	3.3 U	3.3 U
	10-12	6.1	0.52 J	0.58 J	4.2 UJ	4.2 U
	10-12 (dup	0.71 J	2.3 U	2.3 U	0.29 J	2.3 U
	20-22	53	0.36 J	0.4 J	0.65 J	2.9 U
GW (µg/L)	24-28	1,500 D	10.6	9.41	20.1	5 U

FB-04

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	1.4 J	2.9 U	2.9 U	2.9 U	2.9 U
	5-7	1.1 J	3.6 U	3.6 U	3.6 U	3.6 U
	10-12	150	8.6	9.6	5.7 UJ	5.7 U
	20-22	3.1	3 U	3 U	3 U	3 U
	30-32	3.7	2.8 U	2.8 U	2.8 U	2.8 U
GW (µg/L)	32-36	134	12	13.7	5 U	5 U

FB-05

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	0.83 J	3.1 U	3.1 U	3.1 U	3.1 U
	5-7	1.5 J	0.36 J	3.6	3.5 U	1.2 J
	10-12	180 J	5.4	6.3	3 U	3 U
GW (µg/L)	20-24	2,690 D	122 D	158 D	50 U	50 U

FB-06

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	0.55 J	3.5 U	3.5 U	3.5 U	3.5 U
	5-7	0.93 J	3.2 U	2.5 J	3.2 U	3.2 U
	10-12	5.3 J	2.5 J	1.6 J	R	R
	20-22	32	2 J	2.1 J	2.7 U	2.7 U
	30-32	20 J	0.94 J	0.68 J	2.9 U	2.9 U
GW (µg/L)	32-36	246	24.1	89.3	5 U	5 U

FB-07

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	1.1 J	0.49 J	R	R	R
	5-7	1.8 J	0.86 J	1.2 J	3.4 U	3.4 U
	10-12	3.1 J	4.3	4.7	3.4 U	3.4 U
GW (µg/L)	32-36	5 U	16.1	5 U	5 U	5 U

FB-08

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	1.2 J	2.8 U	2.8 U	2.8 U	2.8 U
	5-7	38	3.1	0.34 J	3 U	3 U
	10-12	12	3.1 J	1.1 J	3.4 U	3.4 U
GW (µg/L)	32-36	47.4	29.9	19.1	5 U	5 U

FB-09

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U
	5-7	0.71 J	4.2 U	4.2 U	4.2 U	4.2 U
	10-12	11 J	1.1 J	R	R	R
	20-22	22 J	3.3 J	1.3 J	R	R
	20-22 (Dup)	39 J	5.4 J	1.8 J	R	R
GW (µg/L)	20-24	91.5	13.2	7.25	5 U	5 U

FB-10

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U
	5-7	6 U	6 U	6.7	6 U	6 U
	10-12	120	6.1	6.2	6 U	6 U
	10-12	260 J	15 J	17	3.6 J	5.8 U
	20-22	28 J	6.4 UJ	6.4 U	6.4 U	6.4 U
GW (µg/L)	13-17	1,300 D	65.8 J	80.8 J	100 U	100 U
	23-27	1,030 D	58.6 J	78.2 J	100 U	100 U

Screening Criterion

Matrix	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	46	36	420	50	13.8
Gw (µg/L)	5	5	70	7	0.25

LEGEND

Soil/Groundwater Screening Location

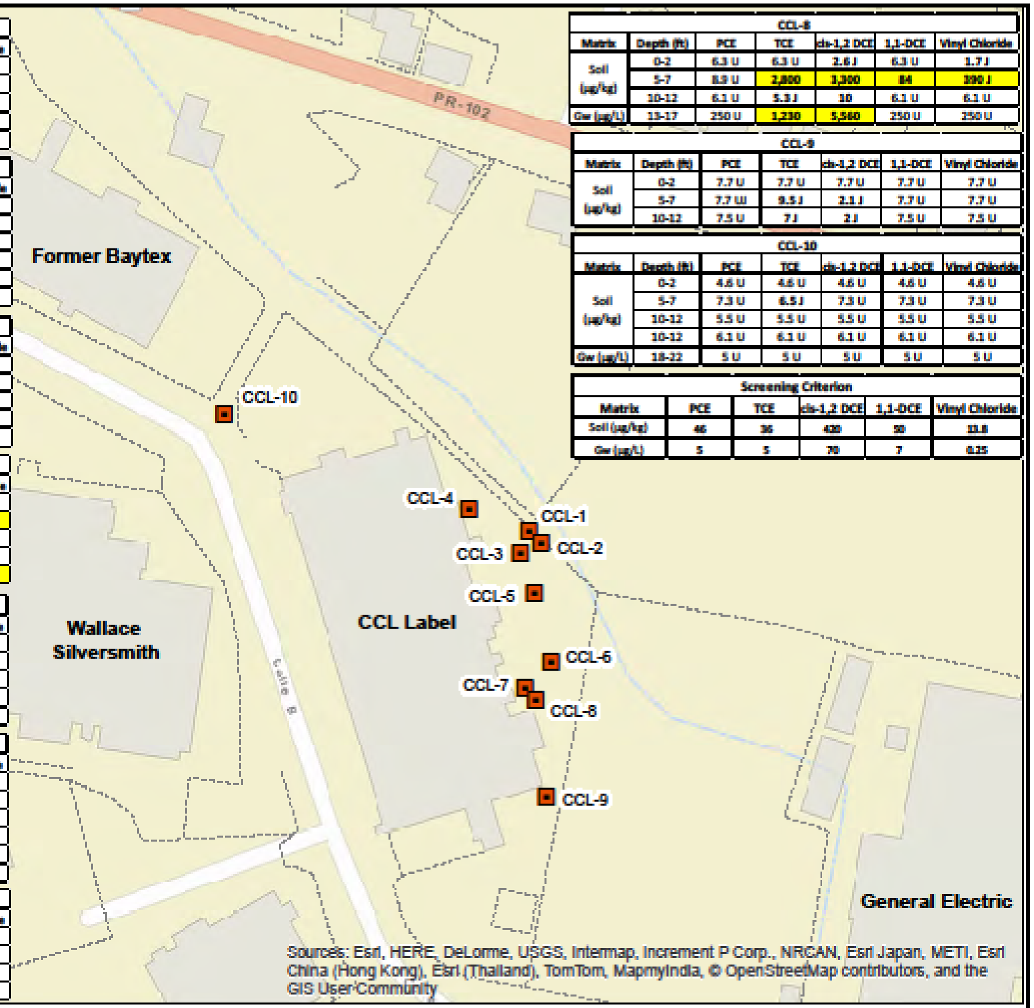
Notes:
PCE- tetrachloroethene
TCE- trichloroethene
DCE - dichloroethene
Gw - groundwater
µg/kg - micrograms per kilogram
µg/L - micrograms per liter

D - diluted
J - estimated
U - not detected
ft - feet

0 50 100 200 Feet

Figure 5
Former Baytex Soil and Groundwater Screening Sampling Results
San German Groundwater Contamination Site
San German, Puerto Rico

CDM Smith



CCL-1						
Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	5.6 U	5.6 U	5.6 U	5.6 U	5.6 U
	5-7	9.8 U	9.8 U	9.8 U	9.8 U	9.8 U
	10-12	71	2,500	90	7.4 U	7.4 U
	20-22	24	3,600	10	5.3 U	5.3 U
Gw (µg/L)	19.5-23.5	450	27,700	52 J	100 U	100 U

CCL-2						
Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	5.2 U	5.2 U	5.2 U	5.2 U	5.2 U
	5-7	10 U	10 U	65	10 U	3.2 J
	10-12	6.8 U	69	3.9 J	6.8 U	6.8 U
	20-22	5.1 U	110	2.5 J	5.1 U	5.1 U
	20-22 (Dup)	5.4 U	30	1.2 J	5.4 U	5.4 U
Gw (µg/L)	26-30	5 U	775	11	5 U	5 U

CCL-3						
Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	4.8 U	4.8 U	2.8 J	4.8 U	4.8 U
	5-7	7.2 U	7.2 U	7.2 U	7.2 U	7.2 U
	10-12	6.8 U	40	51	6.8 U	6.8 U
	20-22	5.2 U	1.1 J	2.4 J	5.2 U	5.2 U
Gw (µg/L)	20-24	5 U	26.1	39.6	5 U	5 U

CCL-4						
Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	11 U	3.7 J	11 U	11 U	11 U
	5-7	640 U	230 J	4,400	9.1 U	520 J
	10-12	6.5 U	12	22	6.5 U	6.5 U
	20-22	2.7 J	25	2.3 J	4.8 U	4.8 U
Gw (µg/L)	20-24	18.7	127	505	1.89 J	25.2

CCL-5						
Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	5.5 U	5.5 U	5.5 U	5.5 U	5.5 U
	5-7	12 U	23	11 J	12 U	12 U
	10-12	7.2 U	7.2 U	7.2 U	7.2 U	7.2 U
	20-22	4.4 U	8.9	2.1 J	4.4 U	4.4 U
Gw (µg/L)	17-21	5 U	13.4	17.4	5 U	5 U

CCL-6						
Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	6.4 U	6.4 U	6.4 U	6.4 U	6.4 U
	0-2 (Dup)	5.5 U	5.5 U	5.5 U	5.5 U	5.5 U
	5-7	7.1 U	3.7 J	2.9 J	7.1 U	7.1 U
	10-12	7 U	7.5	6 J	7 U	7 U
	20-22	4.6 U	7.2	8.4	4.6 U	4.6 U
Gw (µg/L)	18-22	0.66 J	46.5	40.4	5 U	5 U

CCL-7						
Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	8.9 U	8.9 U	8.9 U	8.9 U	8.9 U
	5-7	6.1 U	4.8 J	130	6.1 U	3.4 J
	10-12	7 U	5.8 J	2.9 J	7 U	7 U
Gw (µg/L)	13-17	0.72 J	18.3	76.6	5 U	5 U

CCL-8						
Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	6.3 U	6.3 U	2.6 J	6.3 U	1.7 J
	5-7	8.9 U	2,800	3,300	84	390 J
	10-12	6.1 U	5.3 J	10	6.1 U	6.1 U
Gw (µg/L)	13-17	250 U	1,230	5,560	250 U	250 U

CCL-9						
Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	7.7 U	7.7 U	7.7 U	7.7 U	7.7 U
	5-7	7.7 UJ	9.5 J	2.1 J	7.7 U	7.7 U
	10-12	7.5 U	7 J	2 J	7.5 U	7.5 U

CCL-10						
Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	4.6 U	4.6 U	4.6 U	4.6 U	4.6 U
	5-7	7.3 U	6.5 J	7.3 U	7.3 U	7.3 U
	10-12	5.5 U	5.5 U	5.5 U	5.5 U	5.5 U
	10-12	6.1 U	6.1 U	6.1 U	6.1 U	6.1 U
Gw (µg/L)	18-22	5 U	5 U	5 U	5 U	5 U

Screening Criterion					
Matrix	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	46	36	420	50	13.8
Gw (µg/L)	5	5	70	7	0.25

LEGEND

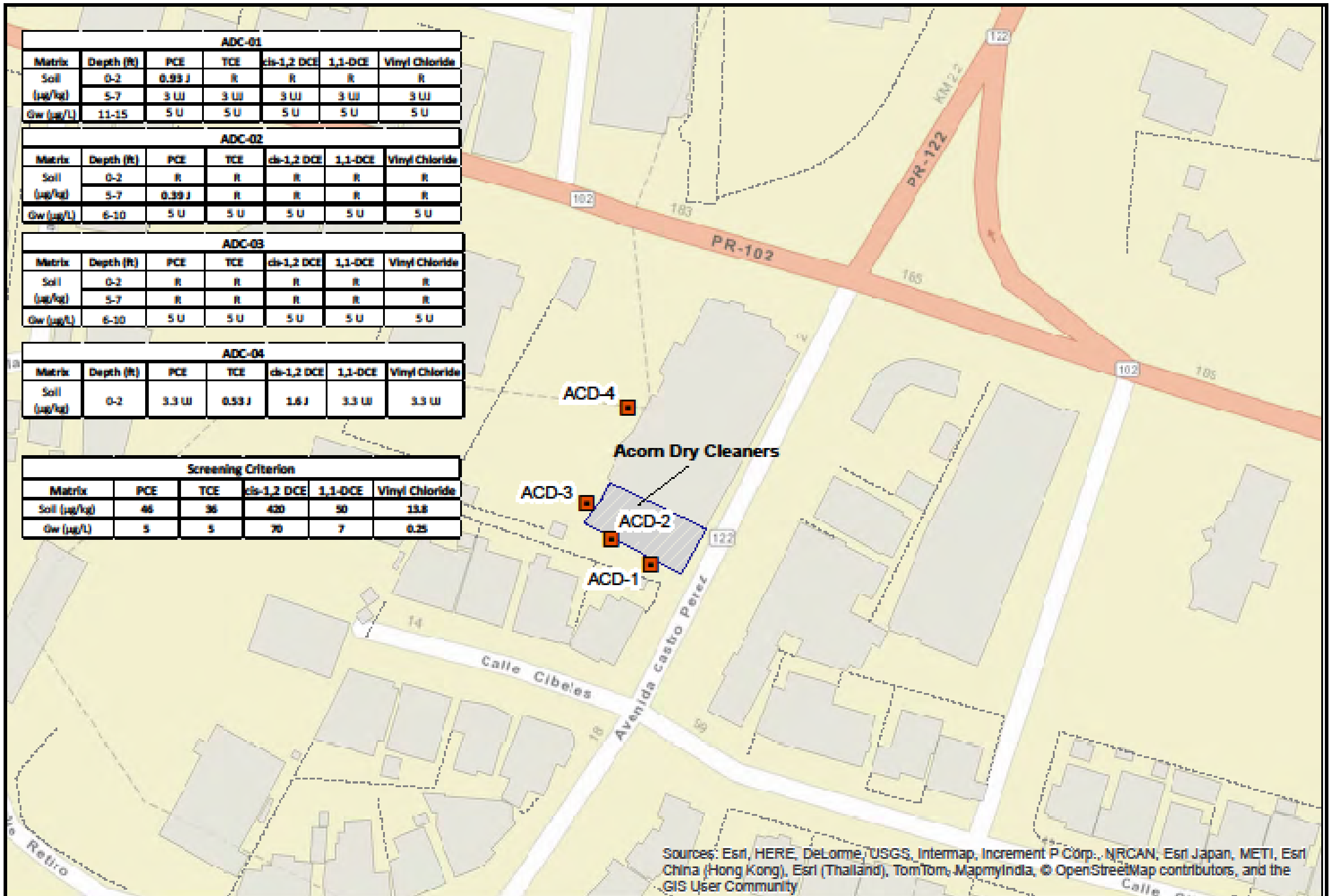
Soil/Groundwater Screening Location

Notes:
PCE- tetrachloroethene
TCE- trichloroethene
DCE - dichloroethene
Gw - groundwater
µg/kg - micrograms per kilogram
µg/L - micrograms per liter

D - diluted
J - estimated
U - not detected
ft - feet

Figure 6
CCL Label Soil and Groundwater Screening Sampling Results
San German Groundwater Contamination Site
San German, Puerto Rico

CDM Smith



ADC-01

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	0.93 J	R	R	R	R
	5-7	3 UJ	3 UJ	3 UJ	3 UJ	3 UJ
Gw (µg/L)	11-15	5 U	5 U	5 U	5 U	5 U

ADC-02

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	R	R	R	R	R
	5-7	0.39 J	R	R	R	R
Gw (µg/L)	6-10	5 U	5 U	5 U	5 U	5 U

ADC-03

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	R	R	R	R	R
	5-7	R	R	R	R	R
Gw (µg/L)	6-10	5 U	5 U	5 U	5 U	5 U

ADC-04

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	3.3 UJ	0.53 J	1.6 J	3.3 UJ	3.3 UJ

Screening Criterion

Matrix	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	46	36	420	50	13.8
Gw (µg/L)	5	5	70	7	0.25

LEGEND

Soil/Groundwater Screening Location

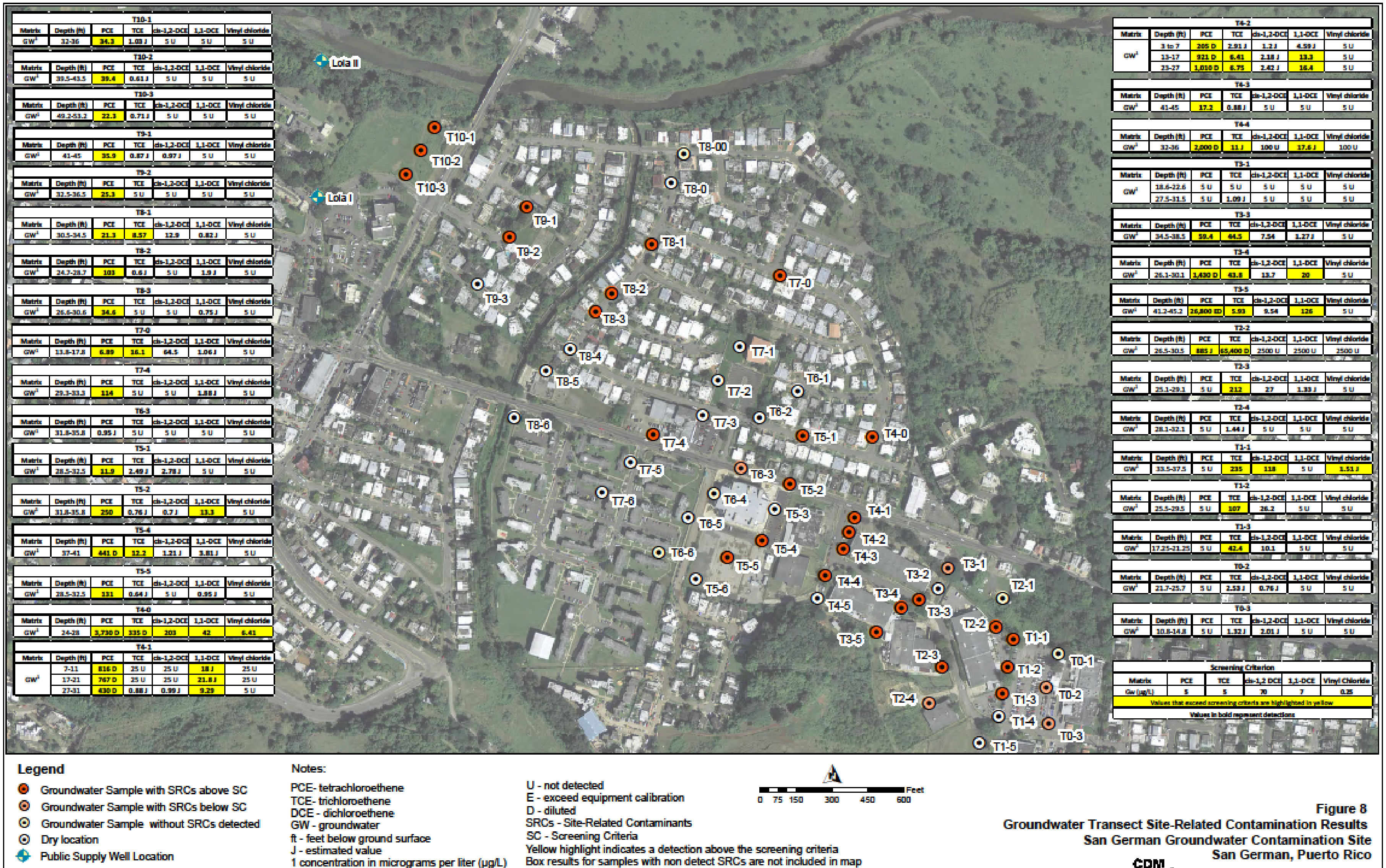
Notes:
PCE- tetrachloroethene
TCE- trichloroethene
DCE - dichloroethene
Gw - groundwater
µg/kg - micrograms per kilogram
µg/L - micrograms per liter

D - diluted
J - estimated
U - not detected
ft - feet

Feet
0 40 80 160

Figure 7
Acorn Dry Cleaners Soil and Groundwater Screening Sampling Results
San German Groundwater Contamination Site
San German, Puerto Rico

CDM Smith



Location	Matrix	Depth (ft)	PCE	TCE	cis-1,2-DCE	1,1-DCE	Vinyl chloride
T10-1	GW[1]	32-36	34.3	1.03 J	5 U	5 U	5 U
T10-2	GW[1]	39.5-43.5	39.4	0.61 J	5 U	5 U	5 U
T10-3	GW[1]	49.2-53.2	22.3	0.71 J	5 U	5 U	5 U
T9-1	GW[1]	41-45	35.9	0.87 J	0.97 J	5 U	5 U
T9-2	GW[1]	32.5-36.5	25.3	5 U	5 U	5 U	5 U
T8-1	GW[1]	30.5-34.5	21.3	8.57	12.9	0.82 J	5 U
T8-2	GW[1]	24.7-28.7	103	0.6 J	5 U	1.9 J	5 U
T8-3	GW[1]	26.6-30.6	34.6	5 U	5 U	0.75 J	5 U
T7-0	GW[1]	13.8-17.8	6.89	16.1	64.5	1.06 J	5 U
T7-4	GW[1]	29.3-33.3	114	5 U	5 U	1.88 J	5 U
T6-3	GW[1]	31.8-35.8	0.95 J	5 U	5 U	5 U	5 U
T5-1	GW[1]	28.5-32.5	11.9	2.49 J	2.78 J	5 U	5 U
T5-2	GW[1]	31.8-35.8	250	0.76 J	0.7 J	13.3	5 U
T5-4	GW[1]	37-41	441 D	12.2	1.21 J	3.81 J	5 U
T5-5	GW[1]	28.5-32.5	131	0.64 J	5 U	0.95 J	5 U
T4-0	GW[1]	24-28	3,730 D	335 D	203	42	6.41
T4-1	GW[1]	7-11	816 D	25 U	25 U	18 J	25 U
		17-21	767 D	25 U	25 U	21.8 J	25 U
		27-31	430 D	0.88 J	0.99 J	9.29	5 U
T4-2	GW[1]	3 to 7	205 D	2.91 J	1.2 J	4.59 J	5 U
		13-17	921 D	6.41	2.18 J	13.3	5 U
		23-27	1,010 D	6.75	2.42 J	16.4	5 U
T4-3	GW[1]	41-45	17.2	0.88 J	5 U	5 U	5 U
T4-4	GW[1]	32-36	2,000 D	11 J	100 U	17.6 J	100 U
T3-1	GW[1]	18.6-22.6	5 U	5 U	5 U	5 U	5 U
		27.5-31.5	5 U	1.09 J	5 U	5 U	5 U
T3-3	GW[1]	34.5-38.5	59.4	44.5	7.54	1.27 J	5 U
T3-4	GW[1]	26.1-30.1	1,430 D	43.8	13.7	20	5 U
T3-5	GW[1]	41.2-45.2	26,800 ED	5.93	9.54	126	5 U
T2-2	GW[1]	26.5-30.5	885 J	65,400 D	2500 U	2500 U	2500 U
T2-3	GW[1]	25.1-29.1	5 U	212	27	1.33 J	5 U
T2-4	GW[1]	28.1-32.1	5 U	1.44 J	5 U	5 U	5 U
T1-1	GW[1]	33.5-37.5	5 U	235	118	5 U	1.51 J
T1-2	GW[1]	25.5-29.5	5 U	107	26.2	5 U	5 U
T1-3	GW[1]	17.25-21.25	5 U	42.4	10.1	5 U	5 U
T0-2	GW[1]	21.7-25.7	5 U	2.53 J	0.76 J	5 U	5 U
T0-3	GW[1]	10.8-14.8	5 U	1.32 J	2.01 J	5 U	5 U

Screening Criterion					
Matrix	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Gw (µg/L)	5	5	70	7	0.25
Values that exceed screening criteria are highlighted in yellow					
Values in bold represent detections					

Figure 8
Groundwater Transect Site-Related Contamination Results
San German Groundwater Contamination Site
San German, Puerto Rico

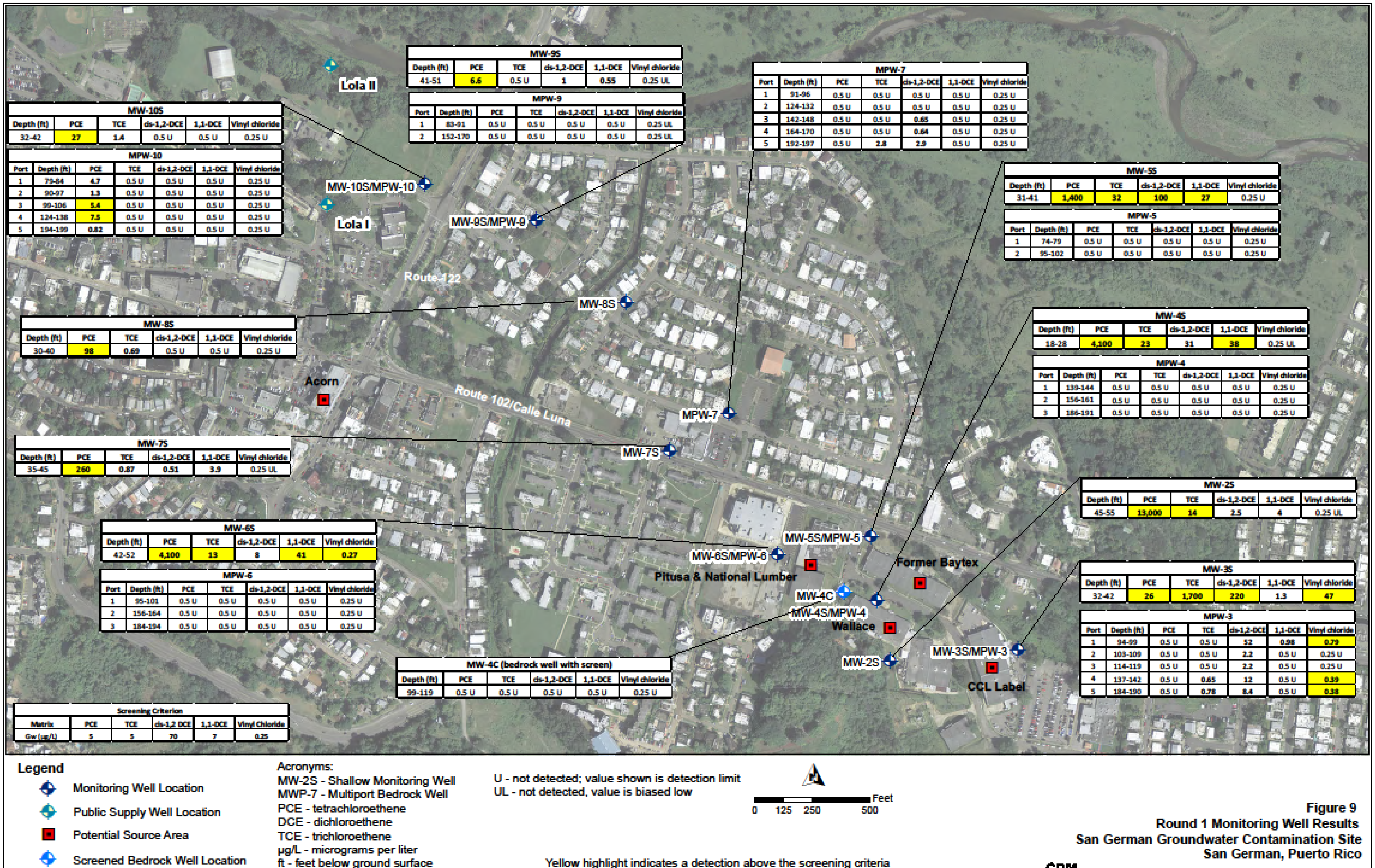
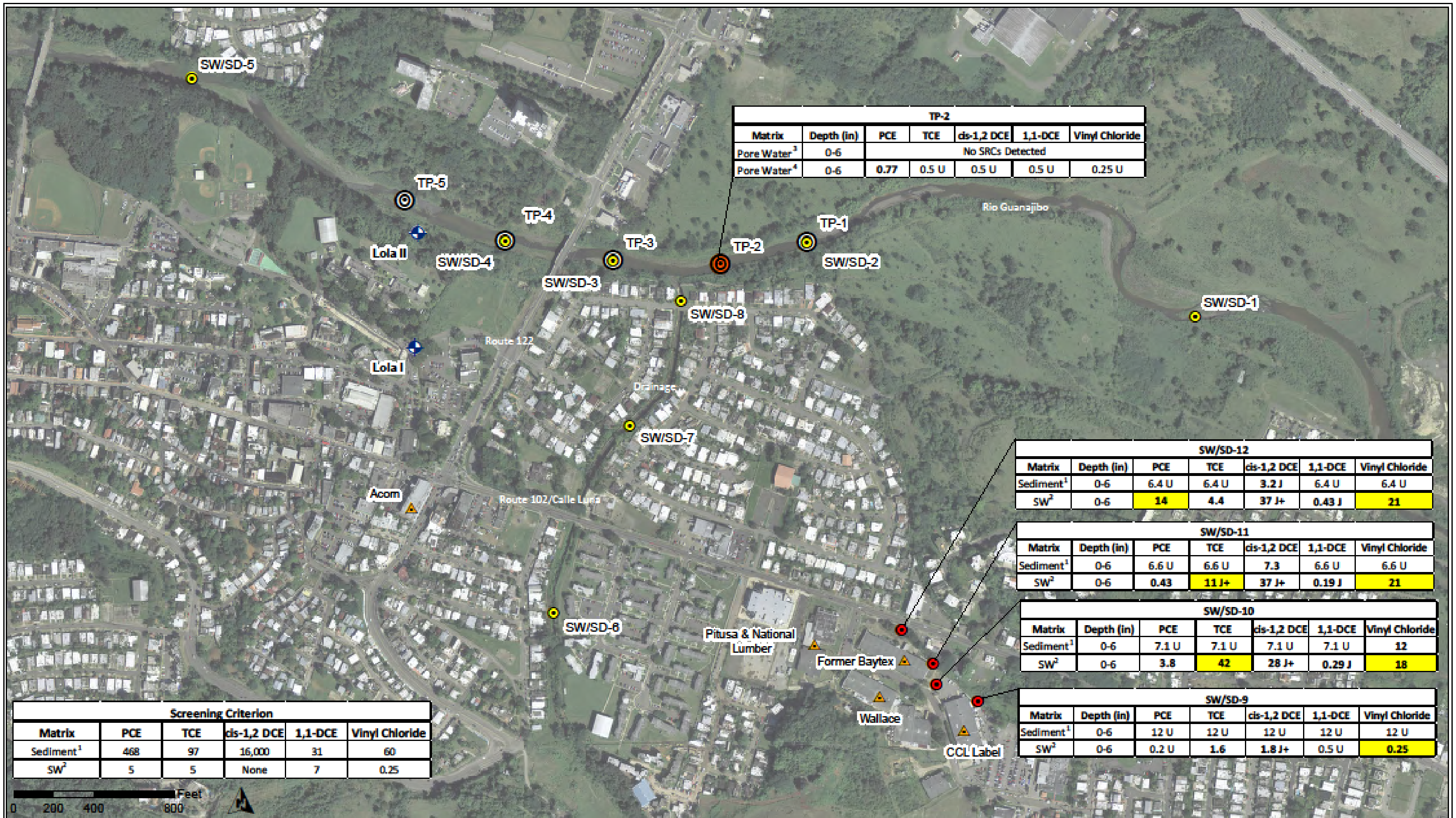


Figure 9
Round 1 Monitoring Well Results
San German Groundwater Contamination Site
San German, Puerto Rico



TP-2						
Matrix	Depth (in)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Pore Water[3]	0-6	No SRCs Detected				
Pore Water[4]	0-6	0.77	0.5 U	0.5 U	0.5 U	0.25 U

SW/SD-12						
Matrix	Depth (in)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Sediment[1]	0-6	6.4 U	6.4 U	3.2 J	6.4 U	6.4 U
SW[2]	0-6	14	4.4	37 J+	0.43 J	21

SW/SD-11						
Matrix	Depth (in)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Sediment[1]	0-6	6.6 U	6.6 U	7.3	6.6 U	6.6 U
SW[2]	0-6	0.43	11 J+	37 J+	0.19 J	21

SW/SD-10						
Matrix	Depth (in)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Sediment[1]	0-6	7.1 U	7.1 U	7.1 U	7.1 U	12
SW[2]	0-6	3.8	42	28 J+	0.29 J	18

SW/SD-9						
Matrix	Depth (in)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Sediment[1]	0-6	12 U	12 U	12 U	12 U	12 U
SW[2]	0-6	0.2 U	1.6	1.8 J+	0.5 U	0.25

Screening Criterion					
Matrix	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Sediment[1]	468	97	16,000	31	60
SW[2]	5	5	None	7	0.25

Legend

- Surface Water and Sediment Sampling Location without SRCs
- Surface Water and/or Sediment Sampling Location with SRCs
- Pore Water/Temporary Piezometer Sampling Location without SRCs
- Pore Water/Temporary Piezometer Sampling Location with SRCs
- Public Supply Well Location
- Potential Source Area Location

Notes:
PCE- tetrachloroethene
TCE- trichloroethene
DCE - dichloroethene
1 - concentration in micrograms per kilogram (µg/kg)
2 - concentration in micrograms per liter (µg/L)
3 - difussion bag sample
4 - grab sample

SRCs - Site-Related Contaminants
In - inches below surface
D - diluted
U - not detected
SW - surface water
J - estimated
J+ - value is estimated high

Figure 10
Surface Water, Sediment and Pore Water Sampling Results
San German Groundwater Contamination Site
San German, Puerto Rico

CDM Smith

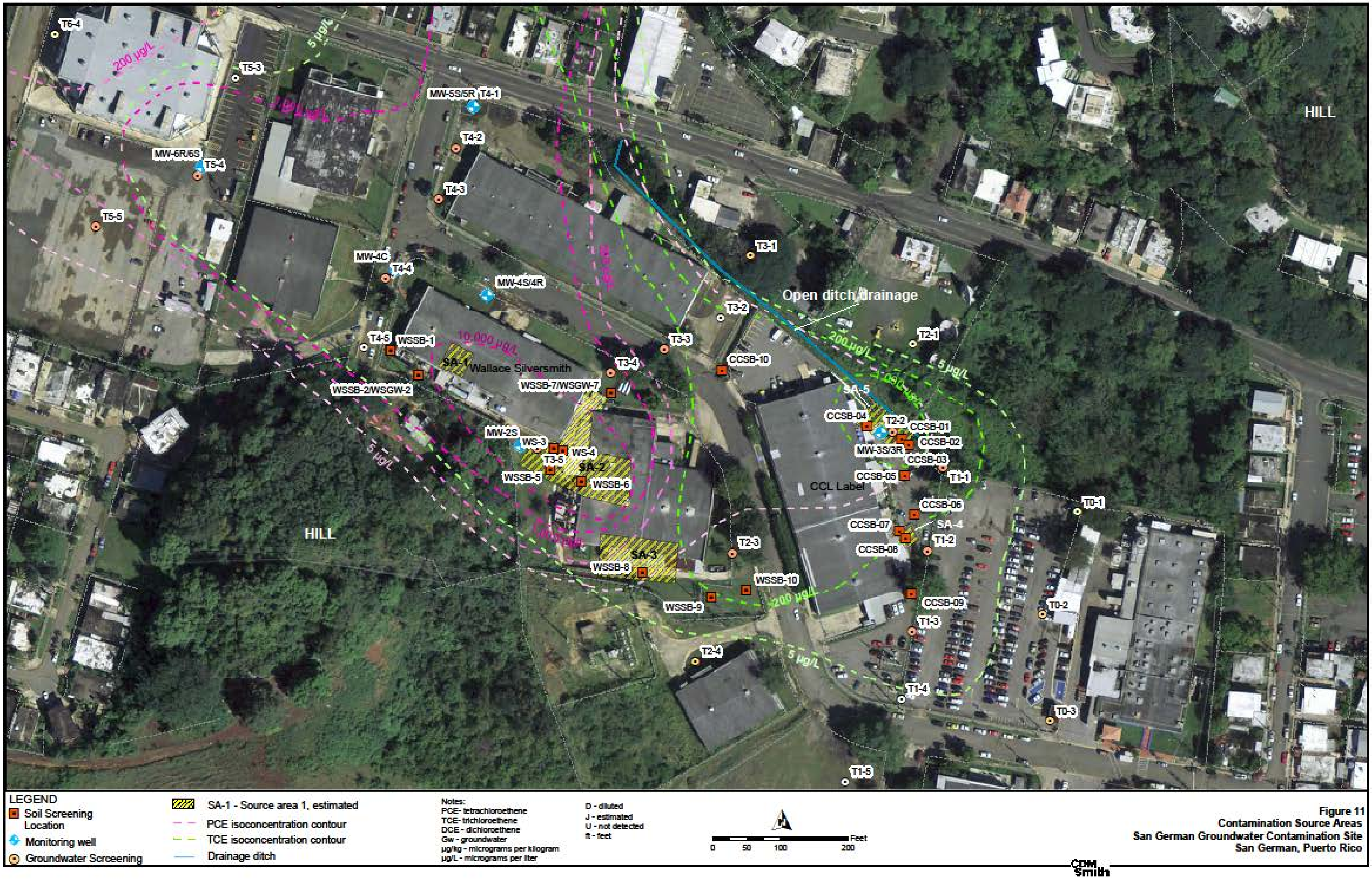


Figure 11
Contamination Source Areas
San German Groundwater Contamination Site
San German, Puerto Rico

APPENDIX II
ADMINISTRATIVE RECORD INDEX
San German Groundwater Contamination Superfund Site
OU-1

ADMINISTRATIVE RECORD INDEX OF DOCUMENTS

FINAL

08/13/2015

REGION ID: 02

Site Name: SAN GERMAN GROUND WATER CONTAMINATION
CERCLIS ID: PRN000205957
OUID: 01
SSID: 02YP
Action:

DocID:	Doc Date:	Title:	Image Count:	Doc Type:	Addressee Name:	Addressee Organization:	Author Name:	Author Organization:
319527	08/13/2015	ADMINISTRATIVE RECORD INDEX OU1 FOR THE SAN GERMAN GROUND WATER CONTAMINATION SITE	3	[INDEX]				[US ENVIRONMENTAL PROTECTION AGENCY]
241415	07/27/2006	RCRA INSPECTION REPORT: WALLACE SILVERSMITHS, PARENT COMPANY SYRATECH CORPORATION FOR THE SAN GERMAN GROUND WATER CONTAMINATION SITE	20	[REPORT]	[]	[]	[,]	[US ENVIRONMENTAL PROTECTION AGENCY]
202861	10/01/2006	HAZARD RANKING SYSTEM DOCUMENTATION PACKAGE FOR THE SAN GERMAN GROUNDWATER CONTAMINATION SITE VOLUME 1 OF 2	988	[REPORT]	[,]	[US ENVIRONMENTAL PROTECTION AGENCY]	[,]	[WESTON SOLUTIONS]
202862	10/01/2006	HAZARD RANKING SYSTEM DOCUMENTATION PACKAGE FOR THE SAN GERMAN GROUNDWATER CONTAMINATION SITE VOLUME 2 OF 2	472	[REPORT]	[,]	[US ENVIRONMENTAL PROTECTION AGENCY]	[,]	[WESTON SOLUTIONS, INCORPORATED]
241414	04/12/2007	NOTICES OF VIOLATION RCRA 3007 INFORMATION REQUEST FOR THE SAN GERMAN GROUND WATER CONTAMINATION SITE	20	[LETTER]	[SANTIAGO, LUIS]	[WALLACE SILVERSMITHS]	[MEYER, GEORGE C]	[US ENVIRONMENTAL PROTECTION AGENCY]
306947	05/29/2008	US EPA GENERAL NOTICE OF POTENTIAL LIABILITY AND REQUEST FOR INFORMATION FOR THE SAN GERMAN GROUND WATER CONTAMINATION SITE	10	[LETTER]	[FITZGERALD , DAVID , SANTIAGO, LUIS , SIEGEL , JEFFREY]	[LIFETIME BRANDS INCORPORATED, SYRATECH CORPORATION, WALLACE SILVERSMITHS]	[BASSO, RAYMOND]	[US ENVIRONMENTAL PROTECTION AGENCY]
306948	06/18/2008	LIFETIME BRANDS' RESPONSE TO THE US EPA GENERAL NOTICE OF POTENTIAL LIABILITY AND REQUEST FOR INFORMATION FOR THE SAN GERMAN GROUND WATER CONTAMINATION SITE	16	[LETTER]	[KOLENBERG, BEVERLY , O'NEIL, CARLOS]	[US ENVIRONMENTAL PROTECTION AGENCY]	[SHINDEL , SARA]	[LIFETIME BRANDS INCORPORATED]

ADMINISTRATIVE RECORD INDEX OF DOCUMENTS

FINAL

08/13/2015

REGION ID: 02

Site Name: SAN GERMAN GROUND WATER CONTAMINATION
CERCLIS ID: PRN000205957
OUID: 01
SSID: 02YP
Action:

DocID:	Doc Date:	Title:	Image Count:	Doc Type:	Addressee Name:	Addressee Organization:	Author Name:	Author Organization:
241412	03/09/2009	CORRESPONDENCE REGARDING COMPLIANCE REPORT DOCKET NO. RCRA-02-2008-7109 IN THE MATTER OF WALLACE SILVERSMITHS DE PUERTO RICO, LIMITED (WITH ENCLOSURES) FOR THE SAN GERMAN GROUND WATER CONTAMINATION SITE	623	[LETTER]	[PLOSSL, CARL]	[US ENVIRONMENTAL PROTECTION AGENCY]	[FITZGERALD, DAVID]	[LIFETIME BRANDS INCORPORATED]
241408	05/19/2010	FINAL WORK PLAN VOLUME 1 FOR THE REMEDIAL INVESTIGATION / FEASIBILITY STUDY FOR THE SAN GERMAN GROUND WATER CONTAMINATION SITE	174	[PLAN]	[,]	[US ENVIRONMENTAL PROTECTION AGENCY]	[,]	[CDM FEDERAL PROGRAMS CORPORATION]
319515	08/23/2011	FINAL QUALITY ASSURANCE PROJECT PLAN FOR THE SAN GERMAN GROUND WATER CONTAMINATION SITE	376	[REPORT]	[,]	[US ENVIRONMENTAL PROTECTION AGENCY]	[,]	[CDM FEDERAL PROGRAMS CORP]
308899	08/03/2012	PUBLIC HEALTH ASSESSMENT FOR EXPOSURE TO CHLORINATED VOCS IN MUNICIPAL DRINKING WATER SYSTEM FOR THE SAN GERMAN GROUND WATER CONTAMINATION SITE	29	[REPORT]	[]	[]	[,]	[US DEPARTMENT OF HEALTH AND HUMAN SERVICES]
318397	05/19/2015	US EPA 104E REQUEST FOR INFORMATION SENT TO PUERTO RICO INDUSTRIAL DEVELOPMENT COMPANY FOR THE SAN GERMAN GROUND WATER CONTAMINATION SITE	12	[LETTER]	[MEDINA COMAS, ANTONIO L]	[PUERTO RICO INDUSTRIAL DEVELOPMENT COMPANY]	[DIFORTE, NICOLETTA]	[US ENVIRONMENTAL PROTECTION AGENCY]
319524	05/22/2015	PUERTO RICO INDUSTRIAL DEVELOPMENT COMPANY'S RESPONSE TO US EPA 104E RESPONSE FOR INFORMATION FOR THE SAN GERMAN WATER CONTAMINATION SITE	17	[LETTER]	[GUZMAN, HENRY]	[US ENVIRONMENTAL PROTECTION AGENCY]	[BALSA , ANA]	[PUERTO RICO INDUSTRIAL DEVELOPMENT COMPANY]
319525	06/03/2015	WALLACE SILVERSMITHS DE PUERTO RICO, LIMITED RESPONSE TO PUERTO RICO INDUSTRIAL DEVELOPMENT COMPANY LETTER DATED 05/13/2015 FOR THE SAN GERMAN GROUND WATER CONTAMINATION SITE	4	[LETTER]	[BALSA , ANA]	[PUERTO RICO INDUSTRIAL DEVELOPMENT COMPANY]	[NIEVES-MIRANDA , PEDRO]	[WALLACE SILVERSMITHS DE PUERTO RICO, LIMITED]

ADMINISTRATIVE RECORD INDEX OF DOCUMENTS

FINAL

08/13/2015

REGION ID: 02

Site Name: SAN GERMAN GROUND WATER CONTAMINATION
CERCLIS ID: PRN000205957
OUID: 01
SSID: 02YP
Action:

DocID:	Doc Date:	Title:	Image Count:	Doc Type:	Addressee Name:	Addressee Organization:	Author Name:	Author Organization:
319523	06/19/2015	CORRESPONDENCE REGARDING WALLACE SILVERSMITHS DE PUERTO RICO, LIMITED VOLUNTARILY STEP FORWARD TO COORDINATE AND WORK WITH US EPA FOR THE SAN GERMAN GROUND WATER CONTAMINATION SITE	2	[LETTER]	[SPIESMAN, THOMAS]	[PORZIO BROMBERG & NEWMAN]	[GUZMAN, HENRY]	[US ENVIRONMENTAL PROTECTION AGENCY]
350338	07/14/2015	PROPOSED PLAN CONCURRENCE LETTER FOR THE SAN GERMAN GROUND WATER CONTAMINATION SITE	1	[LETTER]	[BOSQUE, ADALBERTO]	[US ENVIRONMENTAL PROTECTION AGENCY]	[, , PEEBLES, JUAN]	[OFFICE OF THE GOVERNOR OF PUERTO RICO, PUERTO RICO ENVIRONMENTAL QUALITY BOARD]
350378	07/22/2015	REVISED FINAL SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT REPORT FOR OU1 FOR THE SAN GERMAN GROUND WATER CONTAMINATION SITE	80	[REPORT]	[]	[]	[,]	[CDM SMITH]
350380	07/22/2015	FINAL FEASIBILITY STUDY REPORT FOR OU1 FOR THE SAN GERMAN GROUND WATER CONTAMINATION SITE	193	[REPORT]	[]	[]	[,]	[CDM SMITH]
350388	07/23/2015	FINAL HUMAN HEALTH RISK ASSESSMENT FOR OU1 FOR THE SAN GERMAN GROUND WATER CONTAMINATION SITE	775	[REPORT]	[]	[]	[,]	[CDM SMITH]
350390	07/24/2015	FINAL REMEDIAL INVESTIGATION REPORT FOR OU1 FOR THE SAN GERMAN GROUND WATER CONTAMINATION SITE	1288	[REPORT]	[]	[]	[,]	[CDM SMITH]
319528	08/11/2015	PROPOSED PLAN FOR OU1 FOR THE SAN GERMAN GROUND WATER CONTAMINATION SITE	39	[PLAN]	[]	[]	[,]	[US ENVIRONMENTAL PROTECTION AGENCY]

APPENDIX III
PUBLIC NOTICE

San German Groundwater Contamination Superfund Site
OU-1

La Agencia Federal de Protección Ambiental Anuncia el Plan Propuesto y Periodo de Comentarios Para el Lugar de Superfondo Contaminación de Agua Subterránea de San Germán San Germán, Puerto Rico

La Agencia Federal de Protección Ambiental (EPA por sus siglas en inglés) en colaboración con la Junta de Calidad Ambiental, anuncia el comienzo de un período de treinta (30) días de comentario público sobre el Plan Propuesto para la remediación del lugar conocido como Contaminación de Agua Subterránea de San Germán, localizado en el municipio de San Germán, Puerto Rico. El Plan Propuesto describe las alternativas recomendadas y las razones para estas recomendaciones. Antes de seleccionar un remedio final, la EPA va a considerar los comentarios escritos y verbales recibidos durante este periodo de comentario público. Todos los comentarios (verbales y/o escritos) deberán ser recibidos en o antes del 11 de Septiembre de 2015 La EPA proveerá un resumen de todos los comentarios y sus respuestas en el Récord de Decisión para este lugar.

La EPA llevará a cabo una reunión pública el miércoles 19 de agosto de 2015, de 6:00 pm a 8:00 pm en la Cancha de la Urbanización Santa Marta, San Germán, Puerto Rico. El propósito de esta reunión es informarle a la comunidad sobre los hallazgos, conclusiones y recomendaciones de la investigación remedial realizada en el lugar. Además, se discutirá la alternativa de remediación recomendada. Durante esta reunión pública, la EPA contestará preguntas o comentarios que los participantes tengan con relación a la investigación realizada y sobre la alternativa de limpieza recomendada.

Copias del Plan Propuesto y otros documentos relacionados al lugar están disponibles en los siguientes repositorios de información:

Nueva Alcaldía de San Germán
Calle Luna
San Germán, Puerto Rico 00683
(787) 892-3500
Horario: Lunes – Viernes 8:00am a 4:00 pm

Junta de Calidad Ambiental de Puerto Rico
Programa de Respuestas de Emergencias y Superfondo
Edificio de Agencias Ambientales Cruz A. Matos
Urbanización San José Industrial Park
1375 Avenida Ponce de León
San Juan, PR 00926-2604
(787)767-8181 ext 3207
Horario: Lunes – Viernes 9:00am a 3:00 pm
Por cita

Agencia Federal de Protección Ambiental, Región 2
División de Protección Ambiental del Caribe
City View Plaza II- Suite 7000
48 RD, 165 Km. 1.2
Guaynabo, PR 00968-8069
Fax: (787) 289-7104 (787) 977-5869
Horario: Lunes.- Viernes, 9:00 a.m. a 4:30 p.m.
Por cita

U.S. Environmental Protection Agency, Region 2
290 Broadway, 18th floor
New York, New York 10007-1866
(212) 637-4308
Horario: Lunes.-Viernes, 9:00 a.m. a 3:30 p.m.
Por cita

Para más información, favor llamar a Adalberto Bosque PhD, MBA al (787) 977-5825. Comentarios escritos al Plan Propuesto deben ser enviados a:

Adalberto Bosque PhD, MBA
Gerente de Proyectos
Agencia Federal de Protección Ambiental, Región 2
División de Protección Ambiental del Caribe
City View Plaza II- Suite 7000
48 RD, 165 Km. 1.2
Guaynabo, PR 00968-8069
Fax: (787) 289-7104
Internet: bosque.adalberto@epa.gov

AVISO PÚBLICO

LA AGENCIA FEDERAL DE PROTECION AMIENTAL ANUNCIA EL PLAN PROPUESTO Y PERIODO DE COMENTARIOS PARA EL LUGAR DE SUPERFONDO ALMACEN DE PESTICIDAS III DE MANATI MANATI, PUERTO RICO

La Agencia Federal de Protección Ambiental (EPA por sus siglas en inglés) en colaboración con la Junta de Calidad Ambiental, anuncia el comienzo de un período de treinta (30) días de comentario público sobre el Plan Propuesto para la remediación del lugar conocido como Almacén de Pesticidas III, localizado en el sector Palo Alto en el municipio de Manatí, Puerto Rico. El Plan Propuesto describe las alternativas recomendadas y las razones para estas recomendaciones. Antes de seleccionar un remedio final, la EPA va a considerar los comentarios escritos y verbales recibidos durante este periodo de comentario público. Todos los comentarios (verbales y/o escritos) deberán ser recibidos en o antes del 11 de Septiembre de 2015. La EPA proveerá un resumen de todos los comentarios y sus respuestas en el Récord de Decisión para este lugar.

La EPA llevará a cabo una reunión pública el martes 18 de agosto del 2015, de 6:00 pm a 9:00 pm en el salón de conferencias de la Alcaldía de Manatí, Puerto Rico. El propósito de esta reunión es informarle a la comunidad sobre los hallazgos, conclusiones y recomendaciones de la investigación remedial realizada en el lugar. Además, se discutirá la alternativa de remediación recomendada. Durante esta reunión pública, la EPA contestará preguntas o comentarios que los participantes tengan con relación a la investigación realizada y sobre la alternativa de limpieza recomendada.

Copias del Plan Propuesto y otros documentos relacionados al lugar están disponibles en los siguientes repositorios de información:

Biblioteca Municipal
Paseo de las Atenas y Calle Mackinley
Manatí, Puerto Rico 00739
(787) 884-5494
Horario: Lunes – Viernes 7:00am a 11:00 pm

Junta de Calidad Ambiental de Puerto Rico
Programa de Respuestas de Emergencias y Superfondo
Edificio de Agencias Ambientales Cruz A. Matos
Urbanización San José Industrial Park
1375 Avenida Ponce de León
San Juan, PR 00926-2604
(787)767-8181 ext 3207
Horario: Lunes – Viernes 9:00am a 3:00 pm
Por cita

Agencia Federal de Protección Ambiental, Región 2
División de Protección Ambiental del Caribe
City View Plaza II- Suite 7000
48 RD, 165 Km. 1.2
Guaynabo, PR 00968-8069
Fax: (787) 289-7104 (787) 977-5869
Horario: Lunes.- Viernes, 9:00 a.m. a 4:30 p.m.
Por cita

U.S. Environmental Protection Agency, Region 2
290 Broadway, 18th floor
New York, New York 10007-1866
(212) 637-4308
Horario: Lunes.-Viernes, 9:00 a.m. a 3:30 p.m.
Por cita

Para más información, favor llamar al señor Luis E. Santos al (787) 977-5865. Comentarios escritos al Plan Propuesto deben ser enviados a:

Luis E. Santos
Gerente de Proyectos
Agencia Federal de Protección Ambiental, Región 2
División de Protección Ambiental del Caribe
City View Plaza II- Suite 7000
48 RD, 165 Km. 1.2
Guaynabo, PR 00968-8069
Fax: (787) 289-7104
Email: santos.luis@epa.gov

APPENDIX IV
FACT SHEET (IN SPANISH
San German Groundwater Contamination Superfund Site
OU-1

San German Superfund Site

San German, Puerto Rico
Agosto del 2015

EPA Region 2

PARA OBTENER MÁS INFORMACIÓN

Participación de la Comunidad
La participación del público es esencial para el éxito del Programa de Superfondo de la EPA. Si usted tiene alguna pregunta acerca de las actividades sobre el Lugar de Superfondo de San Germán puede llamar a:

Dr. Adalberto Bosque Gerente de Proyecto Remediación de EPA al (787) 977-5825, bosque.adalberto@EPA.gov , o con la Sra. Brenda Reyes, Coordinadora de Participación de la Comunidad de la EPA al (787) 977-5869, reyes.brenda@epa.gov .

Superfondo
Para obtener información sobre el proceso de Superfondo, visite el sitio web de la EPA en www.epa.gov/superfund.

Repositorio de información
El repositorio de información contiene documentos relacionados con el Lugar, disponibles para la revisión del público en las siguientes ubicaciones:

Nueva Alcaldía de San Germán
Calle Luna
San Germán, Puerto Rico 00683
(787) 892-3500
Horario: Lunes – Viernes 8:00am a 4:00 pm

USEPA Región II
Centro de Expedientes del Superfondo
290 Broadway, piso 18
Nueva York, NY 10007-1866
Lunes a viernes de 9:00 AM a 5:00 PM
(212) 637-4308

Agencia Federal de Protección Ambiental, Región 2
División de Protección Ambiental del Caribe
City View Plaza II, Suite 7000
#48 PR-165 km 1.2
Guaynabo, Puerto Rico 00968-8069
Lunes a viernes de 9:00 AM a 4:30 PM
Brenda Reyes, (787) 977-5869

Reunión Pública
Cancha de la Urbanización Santa Marta
San Germán, Puerto Rico 00683
Fecha: 19 de agosto de 2015
Hora: 6:00 PM

CONTAMINACIÓN DEL AGUA SUBTERRANEA DE SAN GERMAN UNIDAD OPERACIONAL 1

San Germán, Puerto Rico
Agosto del 2015

LA EPA PROPONE REMEDIO PARA LA UNIDAD OPERACIONAL 1 DEL LUGAR DE CONTAMINACION DE AGUA SUBTERRANEA DE SAN GERMÁN

HISTORIA Y ANTECEDENTES DEL LUGAR

El Lugar de Contaminación de Agua Subterránea de San Germán (el Lugar) está ubicado en San Germán, Puerto Rico. Muestras tomadas de pozos de abastecimiento público detectaron la presencia de compuestos orgánicos volátiles (VOC, por sus siglas en inglés) en tres pozos de agua de abastecimiento público localizados en San Germán.Estos pozos eran y operaban para la Autoridad de Acueductos y Alcantarillados de Puerto Rico (AAA). Estos fueron los pozos Retiro, Lola Rodriguez de Tío (Lola I) y Lola Rodriguez de Tío II (Lola II), ubicados al sur del Río Guanajibo, entre las carreteras 139 y 360. Estos pozos eran parte del sistema de agua de AAA conocido como San Germán Urbano. Los tres pozos fueron puestos fuera de servicio en el 2006.

Entre el 2001 y el 2005, las muestras de agua subterránea tomadas trimestralmente en los pozos Retiro, Lola I y II Lola resultaron con concentraciones detectables de tetracloroeteno (PCE, por sus siglas en inglés) y cis-1, 2-dicloroeteno (cis-1, 2-DCE). Las concentraciones máximas de PCE y cis-1, 2-DCE fueron de 6.4 microgramos por litro (µg/L) y 1.2 µg/L, respectivamente.

En junio del 2006, la EPA recopiló y analizó muestras de agua subterránea en pozos activos en el área para una variedad de contaminantes. Los resultados confirmaron la presencia del PCE (1.6 µg/L), cis-1, 2-DCE (1.5 µg/L) y tricloroetileno (TCE) (0.54 µg/L). En julio del 2006 y enero del 2007, la EPA realizó actividades de reconocimiento en varios lugares industriales en el área de San Germán para identificar fuentes potenciales de la contaminación del agua subterránea en los pozos de suministro.

La EPA añadió el Lugar de Contaminación de Agua Subterránea de San Germán a la Lista de Prioridades Nacionales (NPL, por sus siglas inglés) el 19 de marzo del 2008 por la presencia de disolventes clorados en el agua subterránea que abastece el agua potable para los residentes del área. En el año 2015, la EPA divide el Lugar en dos unidades operacionales (OUs). El OU-1 incluye suelos contaminados en áreas identificadas como fuente y el OU-2 incluye la investigación de agua subterránea. Esta hoja informativa tiene pertinencia a la fase OU-1.

INVESTIGACIÓN DE REMEDIACIÓN

La EPA ha llevado a cabo una investigación de remediación en el Lugar para evaluar el suelo y el agua subterránea. Para identificar las fuentes de la contaminación observada en los pozos de suministro, para esto se tomaron muestras de suelo en cinco áreas identificadas como fuentes potenciales. Se realizaron un total de 41 perforaciones y se tomaron 159 muestras de suelo. Se han identificado dos propiedades como fuentes de contaminación en el Parque Industrial el Retiro. Las dos propiedades están actualmente ocupadas por Wallace Silversmiths de Puerto Rico, Ltd. (Wallace), and CCL Insertco de PR (CCL). En estas dos propiedades se detectaron los mismos contaminantes encontrados en el agua subterránea.

La EPA también llevó a cabo una investigación del agua subterránea para determinar la magnitud y alcance de la contaminación, incluyendo un muestreo inicial del agua subterránea entre las áreas de la fuente en el parque industrial y los pozos de suministro impactados. Los resultados iniciales del muestreo de proporcionaron inicialmente la delineación de la extensión de la contaminación en el agua subterránea. Posteriormente, la EPA instaló 17 pozos de muestreo dentro de esta zona para evaluar la contaminación del agua subterránea.

La EPA recogió dos rondas de muestras de agua subterránea de los pozos de muestreo, incluyendo varios pozos residenciales privados en la zona (Ronda 2).

Muestras de agua superficial y sedimento fueron tomadas de alcantarillas pluviales en el Parque Industrial el Retiro y en el Río Guanajibo para determinar si habían sido impactada por la contaminación del agua subterránea. En marzo del 2013 y enero del 2014, la EPA tomo dos rondas de muestras de vapor de suelo en los edificios del Parque Industrial del Retiro y en un número de propiedades residenciales ubicadas al noroeste del Parque Industrial el Retiro. El propósito de este muestreo de vapor de suelo fue determinar si la intrusión del vapor de los contaminantes en el aire interior sería una preocupación para el área.

RESULTADOS DE LA INVESTIGACIÓN DE REMEDIACIÓN

Los resultados de la investigación del suelo indican que dos propiedades en el Parque Industrial el Retiro tienen concentraciones altas de contaminación en el suelo con los mismos productos químicos que han sido identificados en el agua subterránea. Estas áreas de contaminación de suelo causaron la contaminación del agua subterránea y comprenden el OU-1 del Lugar.

Los mismos productos químicos también fueron detectados en muestras de agua superficial en el Parque Industrial. VOCs relacionados al Lugar no fueron detectados en muestras de agua superficial en el río Guanajibo. Contaminantes relacionados al Lugar fueron detectados en muestras de sedimentos en el drenaje del Parque Industrial pero no en el río Guanajibo.

La investigación de remediación indica la presencia de la contaminación del agua subterránea entre el Parque Industrial el Retiro y los pozos de suministro cerrados de AAA. Las concentraciones de los contaminantes en sobrepasaron el nivel máximo del contaminante (MCL, por sus siglas en inglés), el nivel máximo de contaminantes permitidos para fines de agua potable. La contaminación del agua subterránea se evaluará más adelante bajo el OU-2.

Los resultados de vapor de suelo demostraron que VOCs se han acumulado bajo los cimientos de algunos edificios en el Parque Industrial del Retiro, aunque las concentraciones de VOCs dentro de esos edificios no excedieron los límites de acción establecidos por la EPA. Los resultados de vapor de suelo en las residencias muestreadas presentaron concentraciones de VOCs por debajo de los límites de acción.

RESULTADOS DE LA EVALUACIÓN DE RIESGO

Evaluación Base de Riesgos a Salud Humana

Se realizó una evaluación base de riesgos a la salud humana para estimar los riesgos y peligros asociados con los efectos presentes y futuros de los contaminantes en la salud humana en ausencia de cualquier acción para controlar o mitigar la contaminación bajo los usos del suelo presentes y futuros.

La evaluación de riesgos a la salud humana comenzó con la selección de los productos químicos de interés potencial (COPCs, por sus siglas en inglés) en los diferentes medios (es decir, suelo, agua subterránea, agua superficial y sedimento) que potencialmente pueden causar efectos adversos a la salud en poblaciones expuestas. Los escenarios de uso presente y futuro del terreno incluyen las siguientes vías de exposición y las poblaciones de:

- Trabajador en el Lugar (adulto): ingestión al presente, contacto cutáneo y la inhalación de las partículas del suelo y los vapores de la superficie del suelo en las propiedades de Wallace y CCL y futura ingestión, contacto cutáneo y la inhalación de las partículas del suelo y los vapores de la superficie del suelo en las propiedades de Wallace, CCL, Acorn Dry Cleaners, Former Baytex y Pitusa-Ferretería Nacional.
- Residentes (niño/adulto): futura ingestión, contacto cutáneo y la inhalación de las partículas del suelo y los vapores de la superficie del suelo en las propiedades de Wallace, CCL, Acorn Dry Cleaners, Former Baytex y Pitusa-Ferretería Nacional.
- Recreacional (adolescentes 12-18): ingestión presente y futura, y contacto dérmico con las aguas superficiales y sedimentos en el río Guanajibo.
- Intrusos (adolescentes 12-18): ingestión al presente, contacto cutáneo y la inhalación de partículas de suelo y vapores para superficie suelo de Wallace, y propiedades CCL e ingestión futura, contacto cutáneo, inhalación de partículas y vapores de superficie de suelo en las propiedades de Wallace, CCL, Acorn Dry Cleaners, Former Baytex y Pitusa-Ferretería Nacional.
- Trabajadores de la construcción (adulto): futura ingestión, contacto cutáneo y la inhalación de vapores del suelo superficial y del subsuelo en Wallace, CCL, Acorn Dry Cleaners, Former Baytex y Pitusa-Ferretería Nacional.

Suelo: Los riesgos y peligros fueron evaluados para la exposición potencial futura de suelo superficial y subsuelo. La población de interés incluía obreros adultos en cada una de las cinco propiedades de interés. Los riesgos de cáncer estaban por debajo o dentro de los rangos aceptables de la EPA. Los riesgos no-cancerígenos en cada una de las propiedades estaban por encima del valor aceptable de 1 de la EPA. El COPC identificado para el suelo superficial/subsuelo fue vanadio. Vanadio no era considerado como un contaminante relacionado con el Lugar, y los riesgos y peligros pueden atribuirse al trasfondo. TCE y PCE fueron identificados en el subsuelo, y estos compuestos se han vinculado a las concentraciones elevadas en los vapores de suelos encontrados debajo de edificios y a concentraciones elevadas en el agua subterránea. Por lo tanto, TCE y PCE se han escogido como químicos de preocupación (COC, por sus siglas en inglés) en el suelo.

Agua subterránea: Los riesgos y peligros fueron evaluados para la exposición potencial futura al agua subterránea. Las poblaciones de interés incluyen trabajadores adultos del Lugar y residentes adultos y niños en cada una de las cinco propiedades de interés. Los riesgos para cáncer estaban por encima de los rangos aceptables de la EPA. Los riesgos no-cancerígenos para cada una de las propiedades estaban por encima del valor aceptable de 1 de la EPA. Los COC identificados en el agua subterránea eran TCE, PCE y cloruro de vinilo. El recurso de agua subterránea se abordará en un documento de decisión independiente bajo el OU-2.

Agua superficial y sedimento: los riesgos y peligros fueron evaluados para la exposición potencial futura de las aguas superficiales y sedimentos en el Río Guanajibo. La población de interés incluyo adolescentes en actividades recreacionales. Los riesgos de cáncer estaban por debajo o dentro de los rangos aceptables de la EPA. Los riesgos no-cancerígenos estaban por debajo o ligeramente por encima del valor aceptable de 1 de la EPA. La suma de los cocientes levemente excede el valor de 1 para sedimentos; sin embargo, no hay químicos individuales o productos químicos que actúan sobre el mismo órgano por encima de un valor de 1. Por lo tanto, no existe COCs identificados para el agua superficial o sedimentos.

Vapor de Suelo: Se evaluó el potencial que vapores del agua subterránea contaminada se volatilizaran y penetraran dentro de edificios que se encuentran sobre el agua subterránea contaminada. Las concentraciones elevadas de vapores de suelos de TCE y PCE fueron detectadas en varios edificios (tres edificios comerciales y dos viviendas). Una de las propiedades residenciales también tenía una leve superación del aire interior al valor de detección para TCE. La vía de la intrusión de vapor de suelo continuará a ser evaluada y acciones correctivas apropiadas se tomarán basándose en los resultados de las muestras.

Evaluación de riesgo ecológico

Se realizó una evaluación de riesgo ecológico por detección (SLERA, por sus siglas en ingles) para evaluar el potencial de riesgo ecológico por la presencia de contaminantes en la superficie del suelo. El SLERA se centró en evaluar el potencial de impactos a los receptores ecológicos sensibles a los COC relacionados con el Lugar a través de la exposición a la superficie del suelo en las propiedades, agua superficial, sedimentos y agua de poro del Río Guanajibo.

Superficie del suelo: Existe el potencial para efectos adversos a los receptores ecológicos a la exposición a la superficie del suelo de metales (cromo, cobalto, cobre, plomo, manganeso, mercurio, níquel, selenio, plata, vanadio y zinc). Sin embargo, ninguno de los metales se consideran relacionados al Lugar; por lo tanto, ningún COC fue seleccionado para la superficie del suelo en cualquiera de las propiedades.

Agua superficial: Existe el potencial para efectos adversos a los receptores ecológicos por exposición a metales (aluminio, bario, cadmio, cromo, cobalto, cobre, hierro, plomo, manganeso, níquel, plata, vanadio y zinc) y tres compuestos orgánicos volátiles (cloroformo, tolueno y TCE). Los metales no se consideraron relacionados con el Lugar y no fueron seleccionados como COC. La elevada concentración de TCE fue situada en una zona de drenaje con limitado hábitat viable adyacente al Parque Industrial el Retiro. No se espera ningún efecto ecológico adverso y los COC no fueron identificados para aguas superficiales.

Sedimento: Existe potencial para efectos adversos a los receptores ecológicos por exposición a metales (antimonio, cadmio, cromo, cobalto, cobre, cianuro, hierro, plomo, manganeso, níquel, plata y zinc). Sin embargo, ninguno de los metales se consideran relacionados con el Lugar; por lo tanto, ningún COC fue seleccionado para el sedimento en el Río Guanajibo.

Agua de poro: Existe potencial para efectos adversos a los receptores ecológicos por exposición a metales (aluminio, bario, cromo, cobalto, cobre, hierro, plomo, manganeso, níquel y vanadio) en el agua de poro. Sin embargo, ninguno de los metales se consideran relacionados con el Lugar; por lo tanto, ningún COC fue seleccionado para el agua de poro del Río Guanajibo.

Basado en los resultados de la evaluación del riesgo ecológico medidas correctivas no son necesarias para proteger el medio ambiente por derrames en el pasado o posibles derrames de sustancias peligrosas en el futuro.

Resumen de las evaluaciones de riesgos

Basado en los resultados de la evaluación de riesgos a la salud humana, una acción correctiva es necesaria para proteger la salud pública, bienestar y el medio ambiente de posibles derrames de sustancias peligrosas en el futuro a las aguas subterráneas y, como una fuente continúa de contaminación de compuestos orgánicos volátiles a las aguas subterráneas, en los suelos en las propiedades Wallace y CCL. Además, suelo y agua subterránea en las proximidades de estas propiedades son una fuente de vapores sub-superficiales que puede dar lugar a exposición inaceptable a humanos a través de la vía de la intrusión de vapor. Basándose en los resultados a la salud humana y las evaluaciones de riesgo ecológico, una acción correctiva no es necesaria para aguas superficiales o sedimentos.

OBJETIVOS DE LA ACCIÓN CORRECTIVA

Los objetivos de acción remedial (RAOs, por sus siglas en inglés) son objetivos específicos para proteger la salud humana y el medio ambiente. Los contaminantes relacionados al lugar incluyen TCE, PCE, cis-1,2-DCE, cloruro de vinilo y 1,1-DCE. El medio contaminado abordado en el Plan Propuesto y en esta hoja informativa es el suelo que actúa como una fuente de contaminación al agua subterránea y vapores del suelo.

Tanto en Wallace como en CCL, las concentraciones de PCE y TCE fueron detectadas en muestras de agua subterránea tomadas en ambas propiedades, indicando que los contaminantes han migrado desde el suelo no saturado al suelo saturado y al agua subterránea. Teniendo en cuenta las altas concentraciones presentes en el suelo saturado que subyace a las zonas de origen, los datos indican que una gran masa de contaminantes pueda estar presente en el suelo saturado. Por lo tanto, residuos de contaminación con PCE y TCE en la zona vadosa es una principal amenaza y requiere remediación a través de tratamiento, siempre que sea posible.

Las fuentes de contaminación en el suelo del Parque Industrial el Retiro están en las propiedades ocupadas actualmente por Wallace y CCL. El suelo en estas dos propiedades, incluyendo la zona de saprolita superficial de los suelos saturados por debajo de la huella de la contaminación de la zona vadosa, donde los contaminantes originalmente en contacto con el agua subterránea, potencialmente contiene líquidos de fase no acuosa densa residual (DNAPL, por sus siglas en inglés) y probablemente la mayor masa del contaminante en el subsuelo que puede servir como fuente de contaminación del agua subterránea continua.

Muestras de vapor de suelo muestran concentraciones de vapores elevadas bajo el piso del edificio de Wallace y CCL, edificios ocupados en la actualidad, y como tal hay una amenaza de exposición a contaminantes tales como PCE, TCE, cis-1, 2-DCE, 1, 1-DCE y cloruro de vinilo. Estos contaminantes pueden representar riesgos para la salud humana por inhalación, ingestión y contacto dérmico. La EPA anticipa que los asuntos relacionados a la exposición a vapor serán atendidos por separado; por lo tanto, las tecnologías apropiadas para mitigar las exposiciones debido a la intrusión de vapor, como los sistemas de mitigación por debajo del piso, no están incluidas en la propuesta de acción para el Lugar.

Para proteger la salud humana y el medio ambiente, se han identificado los siguientes RAOs.

Los RAOs de suelo son:

- Prevenir/minimizar los suelos contaminados de la zona vadosa que sirven como una fuente de contaminación al agua subterránea.
- Reducir la masa del contaminante en el suelo de la zona saprolita superficial saturada que sirve como una fuente de contaminación del agua subterránea.

El RAO de vapores del suelo es:

- Mitigar los impactos a la salud pública resultantes de la exposición existente o potencial a la intrusión de vapor del suelo.

Las áreas de la fuente de suelo que debe abordar la acción descrita en esta hoja de datos y en el Plan Propuesto se encuentran por encima y por debajo del nivel freático y parece ser tan profunda como la zona superficial de la saprolita.

RESUMEN DE ALTERNATIVAS CORRECTIVAS

En todas las alternativas correctivas activas se incluyen varios elementos comunes. Los elementos comunes que se enumeran a continuación no se aplican a las alternativas de No Acción.

Elementos comunes

Trabajo pre-diseño: una investigación pre-diseño (PDI, por sus siglas en inglés) se llevaría a cabo como parte del diseño del remedio. La extensión de la contaminación del suelo por debajo de los edificios sería delineado. Puesto que estas actividades podrían tener impacto a las operaciones comerciales en las instalaciones, se harán arreglos para minimizar la interrupción de las operaciones.

Sistemas de mitigación de Vapor: La EPA anticipa que sistemas para mitigación de vapor serán instalados en los edificios ocupados actualmente por Wallace y CCL para prevenir la intrusión de vapores. Incluso después de la remediación de suelos de la zona vadosa, el vapor de suelo todavía puede acumularse debajo de las losas del edificio y requerir la operación de los sistemas de mitigación para atenuar la intrusión de vapor del suelo hasta que el sitio este totalmente remediado.

Controles Institucionales: Mientras que el remedio del OU-1 discutido en este folleto y en el Plan Propuesto es tratar suelos contaminados en las áreas de la fuente en el Parque Industrial el Retiro, el agua subterránea contaminada incluyendo el área a ser atendida en OU-2 es la preocupación primaria a la salud humana en el Lugar. Como parte de la solución de OU-1, la EPA propone establecer controles institucionales (ICs, por sus siglas en ingles) que sería restringir el contacto con las aguas subterráneas contaminadas a lo largo del área impactada. Colocando los ICs en las aguas subterráneas en este momento, la EPA puede reducir al mínimo el potencial de exposición humana mientras que el remedio de OU-2 está siendo seleccionado e implementado. Los ICs incluyen restricciones en el agua subterránea para la perforación en el área del agua subterránea contaminada, anuncios, avisos y educación pública.

Política Limpia y Verde de la EPA, Región 2

Los beneficios ambientales del remedio preferido pueden mejorarse tomando en consideración, durante el diseño, las tecnologías y prácticas que sean sostenibles de acuerdo con la Política Energética de la EPA de la Región 2.

Alternativas de remediación

Las alternativas de remediación se elaboraron por la combinación de tecnologías de remediación aplicables y opciones de proceso para cada medio contaminado. Las áreas a remediar en el Lugar incluyen:

- La zona vadosa con suelos contaminados sobre los objetivos de remediación.
- El suelo en la zona saturada y en la zona de saprolita superficial por debajo de la huella de la contaminación en la zona vadosa (como se describe a continuación).

Las dos zonas se denominan conjuntamente la zona de la fuente, que parece contener la mayor masa de contaminante en el subsuelo y sirve como una fuente continua de contaminación al agua subterránea.

Cinco zonas de fuente (SA), como se muestra en la figura 1 se identificaron en las propiedades ocupadas actualmente por Wallace y CCL. A continuación se describe con información específica cada fuente. Concentraciones de vapor de suelo altas se detectaron por debajo de la losa de piso, y el grado de contaminación del suelo debajo del edificio podría ser distinto y más grande que lo que se muestra en la figura 1.

- Área de Fuente 1 (SA-1) en la propiedad actualmente ocupada por Wallace: es el área aproximada donde históricamente se almacenaban drones. Se encontraron concentraciones altas de PCE y TCE en las muestras de vapor de suelo por debajo de la losa de piso. Por lo tanto, es necesario una investigación adicional del suelo debajo del edificio en esta zona para poder definir la extensión de la contaminación.
- Área de Fuente 2 (SA-2) en la propiedad actualmente ocupada por Wallace: la contaminación del suelo se encuentra en esta zona fuera de los edificios como se ve en la figura 1. Es necesaria una investigación adicional del suelo debajo del edificio en esta zona para poder definir la extensión de la contaminación.
- Área de Fuente 3 (SA-3) en la propiedad actualmente ocupada por Wallace: esta área abarca el suelo donde se detectaron las mayores concentraciones de PCE fuera de un edificio en una zona pavimentada en muestras tomadas de la superficie del suelo hasta 2 pies y de 5 a 7 pies en el barreno WS-8. Las concentraciones de PCE disminuyeron con profundidad, indicando que la mayoría del contaminante es superficial en la zona no saturada de arcilla y limo, probablemente debido a la presencia de pavimento y la infiltración limitada de agua. Es necesaria una investigación adicional del suelo debajo del pavimento en esta zona o en el canal de drenaje sub-superficial para poder definir la extensión de la contaminación. Debido a que las concentraciones de contaminantes en el agua subterránea es relativamente moderada en este lugar (WS-8 con PCE en 233 µg/L) y el hecho de que las concentraciones disminuyen con la profundidad, la zona de saprolita de suelo no está incluida en esta zona.
- Área de Fuente 4 (SA-4) en la propiedad actualmente ocupada por CCL: contaminación de TCE y cis-1, 2-DCE en el suelo fue encontrado en concentraciones altas entre 5 y 7 pies pero parece ser localizado. Investigación de suelo adicional se recomienda es esta área para delinear más la zona de tratamiento.
- Área de Fuente 5 (SA-5) en la propiedad actualmente ocupada por CCL: contaminación de TCE en el suelo fue encontrado en concentraciones altas entre 10 y 22 pies. En la zona saturada, el TCE fue encontrado a una concentración de 27,700 µg/L de 19.5 a 23.5 pies; y en 65,400 µg/L de 26.5 a 30.5 pies. Muestreo de suelos y de agua subterránea adicionales se colectarían para el PDI para definir la zona de tratamiento.

Cuatro alternativas correctivas fueron evaluadas las cuales se describen brevemente a continuación. Detalles adicionales están disponibles en el Plan Propuesto del Lugar.

Alternativa S1 – No Acción

Costo Capital $0
Costo de Operación y Mantenimiento $0
Total del Valor Presente $0
Tiempo Estimado para lograr los RAOs
No logra los RAOs

La alternativa de No Acción no incluiría ninguna acción de remediación y sirve como base para la comparación.

Alternativa S2 – Excavación y Disposición Fuera del Lugar / Tratamiento In-situ

Costo Capital $12, 883,000
Costo de Operación y Mantenimiento
$ 49,000
Total del Valor Presente $ 13,432,000
Plazo de construcción 12 a 18 meses
Plazo para lograr los RAOs 2.5 años

Puesto que el nivel y la distribución de la contaminación en cada área de la fuente es diferente, no todos los componentes de esta alternativa remedial se prevé que para se pueden aplicar a cada área de la fuente, como se resume a continuación.

- SA-1: excavación y disposición fuera del Lugar en la zona vadosa hasta 13 pies, seguido por el tratamiento in situ en el resto de la zona vadosa de 13 a 20 pies. Se excavaran aproximadamente 505 yardas cúbicas (yd^3). Esta área está por debajo del edificio que tiene infiltración limitada. La zona de tratamiento se supone que sea desde la superficie del suelo hasta 20 pies.
- SA-2: excavación y disposición fuera del Lugar en la zona vadosa hasta 13 pies, seguido por el tratamiento in situ para el resto de la zona vadosa y la zona llana de la saprolita. Se estima que aproximadamente 3,827 yd^3 de material será excavado en esta zona.
- SA-3: excavación y disposición fuera del Lugar en la zona vadosa hasta 13 pies, seguido por el tratamiento in situ para el resto de la zona vadosa hasta 20 pies. En esta área se excavará aproximadamente 2,238 yd^3. Esta área está por debajo del edificio y la acera que tiene infiltración limitada, las concentraciones de contaminantes disminuyen con la profundidad. La zona de tratamiento se supone que sea desde la superficie del suelo hasta 20 pies.
- SA-4: tratamiento in-situ en el suelo de la zona vadosa y la zona llana de la saprolita de 5 a 40 pies.
- SA-5: tratamiento in-situ en el suelo de la zona vadosa y la zona llana de la saprolita de 5 a 40 pies. Las concentraciones de contaminantes del suelo eran moderadas, y la distribución vertical de los contaminantes indica que la mayoría ha emigrado a la zona llana de la saprolita.

Siguiendo la excavación de SA-1 y SA-3, se podría perforar e instalar tubos horizontales en la parte inferior de la excavación antes de rellenar. En cada área, estos tubos se conectaran con un tubo vertical que se extienda hasta la superficie y conectado a un tanque de almacenamiento. Aditivos orgánicos podría añadirse a este tanque de almacenamiento y por gravedad inyectados a las zonas de tratamiento para promover tratamiento in-situ biológicos anaeróbicos.

Alternativa S3 – Extracción de Vapor de Suelo (SVE) y Fase de Extracción Doble (DPE) / Tratamiento In-Situ

Costo Capital $5,448,000
Costo de Operación y Mantenimiento
$1,880,000
Total del Valor Presente $7,328,000
Plazo de construcción 8 meses
Plazo de construcción Por lo menos 10 años

Esta alternativa remedial constaría de los siguientes componentes principales:

- Instalación de la cubierta en SA-2 y SA-3;
- Instalación del sistema SVE y operación;
- Sistema de extracción de fase dual;
- Tratamientos en el lugar (in-situ);
- Evaluación del desempeño del tratamiento; y
- Restauración del Lugar

Puesto que el nivel y la distribución de la contaminación en cada área de la fuente es diferente, no se anticipa que todos los componentes se puedan aplicar a cada área de la fuente como se resume a continuación.

- SA-1: SVE en la zona vadosa.
- SA-2: SVE en la zona vadosa con DPE en la zona llana de la saprolita, seguido por el tratamiento in-situ descrito en la alternativa S2.

- SA-3: SVE en la zona vadosa.
- SA-4: Tratamiento in situ de la zona vadosa y la saprolita llana descrita en la alternativa S2.
- SA-5: DPE en la zona llana de la saprolita, seguida de tratamiento in-situ en la zona vadosa y la zona llana de la saprolita descrita en la alternativa S2.

En SA-1, SA-2 y SA-3, pozos verticales de SVE se instalarán en la zona no saturada para atender la contaminación de toda la zona vadosa sin extraer agua subterránea. Para propósito de establecer el costo se asume que se instalarán 3, 13 y 8, pozos de SVE respectivamente. El sistema anterior de tratamiento de suelo que se instalará será en una estructura pre-fabricada traída al Lugar para tratar el vapor de suelo extraído antes de liberarlo a la atmósfera. Se asume que el sistema SVE estará funcionado continuamente durante los primeros dos años e intermitentemente durante los siguientes ocho años.

El sistema de la DPE se instalaría en SA-2 y SA-5 para reducir la masa de contaminante en la zona llana de la saprolita antes de aplicar otros métodos de tratamiento in situ. La localización del DPE se basaría en el diseño del remedio. Se supone se instalarán 13 y 4 pozos, respectivamente para el DPE.

Tras el tratamiento del sistema DPE, la contaminación restante en los SA-2 y SA-5 será remediada con una tecnología de tratamiento in-situ.

Alternativa S4 – Remediación Termal In-Situ (ISTR) y SVE / Tratamientos In-Situ

Costo Capital	$ 12,741,000
Costo de Operación y Mantenimiento	$ 549,000
Total del Valor Presente	$ 13,290,000
Plazo de construcción	1-2 años
Plazo de construcción	2.5 años

Esta alternativa remedial constaría de los siguientes componentes principales.

- Instalación de Cubierta SA-2, SA-3 y SA-5 (según sea necesario);
- Instalación y operación de SVE e ISTR;
- Clausura de ISTR;
- Evaluación del desempeño del tratamiento;
- Tratamiento in situ; y
- Restauración del Lugar.

Puesto que el nivel y la distribución de la contaminación en cada área de la fuente es diferente, no se prevé que todos los componentes se puedan aplicar a cada área de la fuente como se resume a continuación.

- SA-1: ISTR y SVE en la zona vadosa.
- SA-2: ISTR y SVE para ambos la zona vadosa y la zona llana de saprolita, seguido de tratamientos in situ.
- SA-3: ISTR y SVE en la zona vadosa.
- SA-4: Tratamientos In situ de la zona vadosa y la zona llana de la saprolita.
- SA-5: ISTR y SVE para ambos la zona vadosa y la zona llana de la saprolita, seguido por tratamiento in situ.

Pozos de SVE y de calentar se instalarían en la propiedad ocupada por Wallace (SA-1, SA-2 y SA-3) y CCL (SA-5). El sistema de calefacción de resistencia eléctrica (ERH) y calefacción conductor térmico (TCH) son los métodos más comunes para la recuperación térmica de contaminación para solvente clorinados. Se supone que se utilizará ERH.

El calentamiento de los suelos se anticipa que durará aproximadamente 100 días, durante el cual el sistema SVE operará para eliminar los contaminantes volatilizados. Análisis y muestreo adicional sería también necesario para cumplir con los requisitos de autorización de emisión de aire. Después de calentar, se necesitaría un período de enfriamiento de la tierra de aproximadamente 100 días antes de retirar el sistema y el abandono de los pozos de SA-1 y SA-3. El sistema SVE sería operado durante el período de enfriamiento y posiblemente más si se justifica.

Para los áreas SA-2 y SA-5, tratamiento in situ se llevaría a cabo en la zona llana de la saprolita, comenzando poco después de la fase ITSR, puesto que el calor residual sería propicio para el crecimiento de microbios.

EVALUACIÓN DE ALTERNATIVAS DE REMEDIACIÓN

Protección General a la Salud Humana y al Medio Ambiente

La Alternativa S1, No Acción, no satisface los RAOs y no sería protectora del medio ambiente ya que no habría una acción de remediación. El suelo contaminado seguirá siendo una fuente de contaminación al agua subterránea y vapores del suelo.

Las Alternativas S2, S3 y S4 satisfacen los RAOs y serían protectoras del medio ambiente abordando las áreas de la fuente, en la medida posible. Tecnologías de tratamiento y excavación no serían capaces de tratar toda la contaminación por debajo de los edificios ocupados. De ser el caso, los edificios podrían actuar como un tapón para minimizar la infiltración del agua superficial y reducir la migración de contaminantes en las aguas subterráneas.

Cumplimiento de ARARs

No existen ARARs químico-específicos para el suelo Federales o para Puerto Rico. Sin embargo, los objetivos de remediación específicos del Lugar se cumplirían con las alternativas S2, S3 y S4 para los contaminantes sobre el nivel freático, y las tecnologías efectivamente eliminarían la masa del contaminante por debajo del nivel freático.

La excavación y eliminación fuera del Lugar bajo la alternativa S2 necesitaría satisfacer los requisitos de disposición de tierras bajo la Ley de Recuperación y Conservación de Recursos (RCRA, por sus siglas en ingles). Todas las alternativas activas cumplirían con los ARARs de acción-específica. Los ARARs de acción-específica no cumplirán en la NO Acción ya que ningún trabajo se llevaría a cabo.

Permanencia y efectividad a largo plazo

Bajo la alternativa de No Acción, la contaminación seguirá presente en la zona vadosa y migrará al suelo y potencialmente impactará en el futuro al agua subterránea. La alternativa de No Acción no es efectiva o permanente.

Para las alternativas S2 y S4, con excavación y remediación térmica además de tratamiento in situ, se espera un grado significativo de eliminación masiva permanente, con un alto grado de efectividad y permanencia a largo plazo. Para la alternativa S3 con DPE/SVE, limitaciones técnicas podrían significar que no toda la contaminación se eliminaría del suelo arcilloso. El radio de influencia de los pozos SVE sería bajo en suelo arcilloso. Es posible que significante difusión de la contaminación en la arcilla se haya producido. El sistema SVE puede necesitar ser operado durante un periodo de tiempo mucho más largo que las alternativas S2 y S4 para alcanzar un nivel similar de eliminación masiva permanente.

Para cualquier tipo de contaminación por debajo del edificio que no es accesible para la excavación o tratamiento térmico, los edificios actuarían como una tapa para evitar la migración de contaminantes al agua subterránea.

Reducción de la Toxicidad, Movilidad o Volumen (M/T/V) a través del Tratamiento

La alternativa de No Acción no reduciría contaminantes T/M/V puesto que no llevaría a cabo ninguna acción correctiva.

Las alternativas de excavación y remediación térmica se espera puedan reducir significativamente M/T/V a través del tratamiento. DPE/SVE bajo la alternativa S3 probablemente reduciría T/M/V mediante tratamiento a un grado, pero su eficacia en los suelos apretados probablemente estaría limitado y por lo tanto, la reducción de T/M/V puede ser limitada. El alcance y efectividad de la reducción de la T/M/V por DPE/SVE tendría que monitorearse. El tratamiento in situ mejoraría T/M/V y se incluye en las alternativas S2, S3 y S4.

Efectividad a Corto Plazo

La alternativa de No Acción no tendría ningún impacto a corto plazo a la comunidad y al medio ambiente por no ocurrir ninguna acción correctiva.

Las restantes alternativas tendría efectos importantes a corto plazo en las empresas activas, comunidad local y los trabajadores de debido a las acciones correctivas activas y actividades de construcción y operación asociadas.

Operación en las instalaciones (es decir, Wallace) tendría que ser modificado o cerrado temporalmente. La excavación implica tráfico de camiones y el ruido de las operaciones de equipo pesado. La remediación térmica bajo la alternativa S4 requeriría la presencia de tuberías y elementos de tratamiento por un periodo de aproximadamente un año, causando la interrupción substancial a corto plazo en la propiedad. Asimismo, las actividades de excavación bajo la alternativa S2 podrían causar importantes perturbaciones a corto plazo y requieran cierre temporero de empresas el parque industrial. Por el contrario, SVE y otras infraestructuras de tratamiento in situ (parte de todas las alternativas activas pero la mayor parte de los trabajos que se realicen para la alternativa S3) requerirían sustancialmente menos trastornos a corto plazo durante la instalación, y mientras que los sistemas pueden estar presentes por un periodo de años, no plantearía dificultades significativas en el uso de la propiedad.

La Alternativa S3 (DPE/SVE) tendría huella menor en términos de eficacia a corto plazo que las otras dos alternativas activas. Monitoreo de aire, controles de ingeniería y protección apropiada para los trabajadores apropiado (Equipo de Protección Personal, PPE) será utilizado para proteger a la comunidad y los trabajadores para estas alternativas.

Alternativas S2 y S4 alcanzarían los RAOs en aproximadamente 2.5 años mientras que la alternativa S3 se espera que alcance los RAOs en aproximadamente 10 años.

Aplicabilidad

La alternativa de No Acción sería más fácil técnicamente y administrativamente a implementar por no se requerir trabajo adicional en el Lugar.

Tanto la alternativa S2 (remediación térmica) y la alternativa S4 (excavación) para su implantación enfrentarían considerables obstáculos. Puesto que la excavación se produciría directamente dentro y adyacentes a los edificios, soporte y refuerzo de zapatas sería necesario para apoyar las estructuras durante el trabajo. Residuos peligrosos excavados tendrían que ser transportados a los Estados Unidos continentales ya que hay no existen vertederos de residuos peligrosos en Puerto Rico.

Para la remediación térmica, la presencia de edificios (con inquilinos) en las zonas de tratamiento presenta desafíos en cuanto a ejecución, como la instalación de elementos de calefacción dentro de un centro activo. Es posible instalar resistencias en ángulos u horizontalmente en la zona de tratamiento desde afuera de los edificios.

Para la Alternativa S3, la mayor limitación en aplicabilidad sería el acceso de los equipos de perforación en la zona de tratamiento. La limitada eficacia del SVE/DPE en suelos arcillosos es también una preocupación de aplicabilidad; sin embargo, se prevé que puede ser superado por extender el plazo de ejecución a un estimado de 10 años, momento en el que se puede esperar un nivel comparable de eliminación masiva, en comparación con las otras alternativas activas.

Costo

A continuación se proporcionan los estimados de costos para todas las alternativas.

Alterna-tiva	Costo Capital	Costo de Operación y Manteni-miento	Total del Valor Presente
S1	$ 0	$ 0	$ 0
S2	$12,883,000	$ 549,000	$ 13,432,000
S3	$5,448,000	$1,880,000	$7,328,000
S4	$12,741,000	$549,000	$13,290,000

Comunidad/apoyo Agencia aceptación

La JCA está de acuerdo con la alternativa preferida recomendada en el Plan Propuesto.

Aceptación de la Comunidad

Aceptación de la comunidad al remedio preferido será evaluada después de la culminación del periodo de comentario público y será descrito en la sección de Resumen de Respuestas el cual será incluido en el ROD del Lugar. El ROD es el documento que formaliza la selección del remedio para un lugar.

REMEDIO RECOMENDADO:

La Alternativa S3 (Extracción de Vapor de Suelo/Extracción Doble fase/Tratamiento In-Situ) es la alternativa preferida para las áreas de fuente en el suelo. Bajo esta alternativa, las zonas de la fuente en el suelo se atenderán con extracción de vapor del suelo en la zona vadosa en combinación con DPE en la zona llana de la saprolita, seguida por tratamiento in situ. Para esta alternativa, se realizara un estudio piloto como parte del PDI para recoger los parámetros de diseño para el sistema SVE y DPE. Para el diseño de un sistema de extracción de vapor, se llevaría a cabo una prueba de permeabilidad de aire para determinar los parámetros de diseño específicos como el flujo de aire posible, el vacío necesario para inducir el flujo, el radio de influencia del vacío aplicado y las tasas de remoción del contaminante inicial.

Los dos edificios y las entradas pavimentadas en la propiedad actualmente ocupada por Wallace actuarían como cubiertas para el sistema SVE para evitar cortocircuitos con la atmósfera. Una cubierta impermeable adicional puede ser instalada para la implementación del SVE. Cualquier cubierta adicional sería diseñada para limitar la infiltración del agua de lluvia en los suelos contaminados, lo que significa que materiales duraderos de baja permeabilidad serían utilizados, y el agua de lluvia sería dirigido lejos de la zona de remediación. Para efecto de estimación de costos, se supone que una cubierta adicional no será necesaria.

Para efectos de estimación de costos, se supone se instalaría pozos SVE 3, 13 y 8 en las zonas SA-1SA-2 y SA-3, respectivamente. Una red de pozos de monitoreo serán instalados para monitorear el progreso de la eliminación de contaminantes y los cambios en la presión de vapor del suelo. Para efectos de estimados de costos, se supone que el sistema SVE vay a funcionar continuamente durante los primeros dos años e intermitentemente durante los siguientes ocho años. La implementación de la solución SVE podría realizarse de forma simultánea con el DPE, o DPE podría ser operado seis meses a un año después del comienzo del sistema SVE, dependiendo del nivel de las concentraciones de contaminantes inicial y cualquier otra consideración de logística.

El sistema de la DPE se instalaría en la SA-2 y SA-5 para reducir la masa de contaminante en la zona llana de la saprolita antes de otro tratamiento in situ. Se instalarían pozos DPE basado en el diseño del remedio. Para efectos de estimados de costos, se supone que se instalarán 13 y 4 pozos DPE en las zonas SA-2 y SA-5, respectivamente.

El sistema de tratamiento de agua se instalará en el mismo edificio que albergaría el sistema de tratamiento de vapor. Se asume que este sistema tenga bombas de extracción de agua subterránea, tuberías, bombas de transferencia, filtros de bolsa y un extractor de aire además del separador de agua y aire y carbón activado de vapor. El agua tratada sería descargada en la zanja de drenaje cerca del lugar con un permiso apropiado. El agua descargada reuniría los requisitos de permiso de descarga de Puerto Rico. Además, efectos de estimados de costos, el sistema DPE está previsto para funcionar por un año.

BASE PARA EL REMEDIO DE PREFERENCIA

Se cree que la alternativa preferida podrá proporcionar el mejor balance entre las alternativas basado en la información disponible a la EPA en este momento. La EPA y la JCA entienden que el remedio recomendado: tratara las principales amenazas, protege la salud humana y el medio ambiente, cumple con ARARs, es costo efectivo y utiliza soluciones permanentes y tecnologías de tratamiento alternativas o tecnologías de recuperación de recursos en la medida máxima posible. El remedio recomendado: también cumplirá la preferencia legal por el uso de tratamiento como un elemento principal. La alternativa preferida puede cambiar en respuesta a comentarios públicos o nueva información.

Mientras que las tres alternativas activas pueden alcanzar niveles de protección similares y las alternativas S2 y S4 parecen capaces de alcanzar los RAOs en un período de tiempo más corto (2.5 años frente a 10 años), las interrupciones a corto plazo de los ocupantes y los desafíos de aplicabilidad son substancialmente mayores que el de la alternativa S3. La alternativa S3 también no presenta problemas de disposición fuera del Lugar como la alternativa S2 y es considerablemente menos costoso.

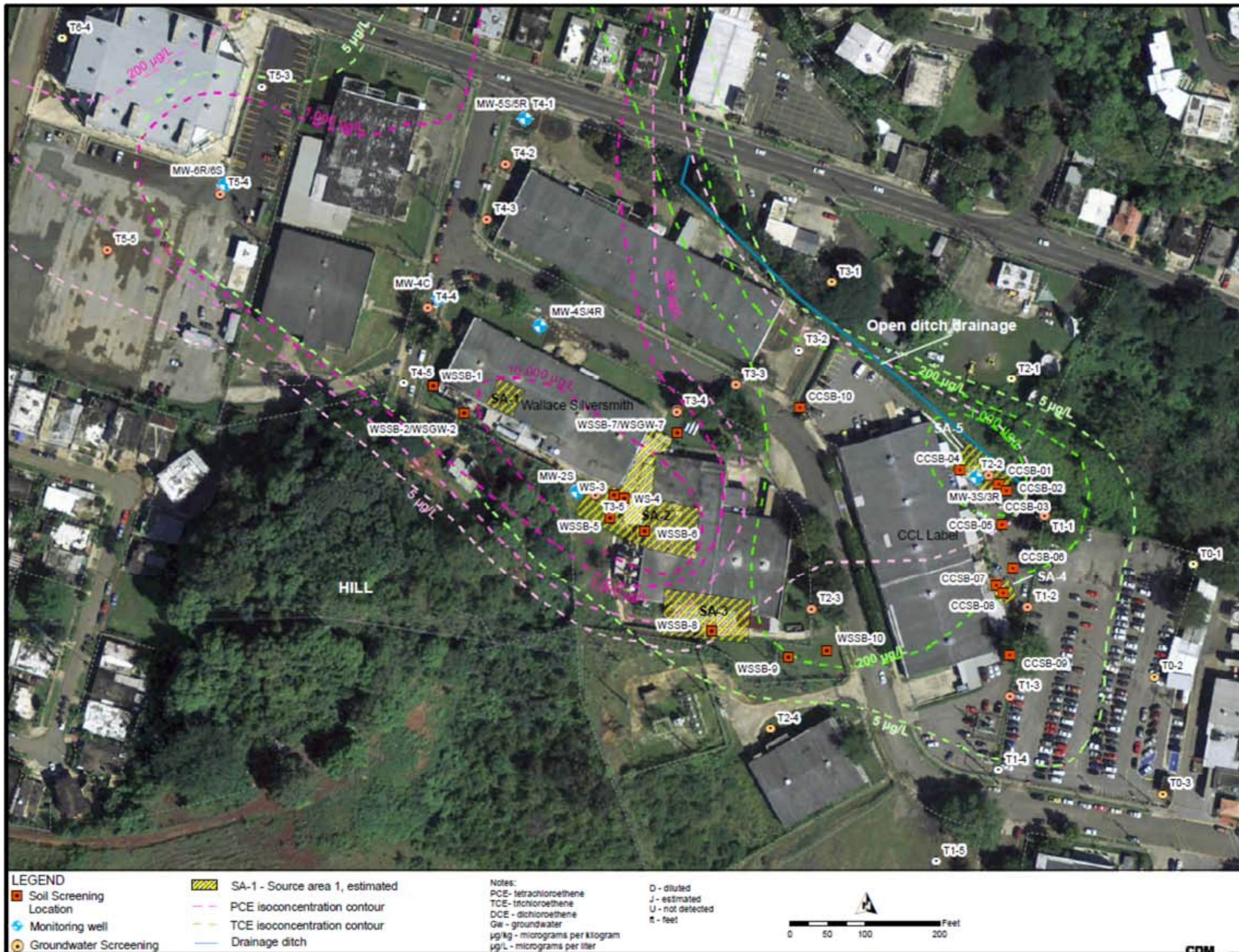


Figure 1
Contamination Source Areas
San German Groundwater Contamination Site
San German, Puerto Rico

CDM Smith

APPENDIX V
ATTENDANCE SHEET

San German Groundwater Contamination Superfund Site
OU-1

San German Groundwater Contamination Site

Public Meeting – August 19, 2015 6 to 8 p.m.

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San German Groundwater Contamination Site
Public Meeting – August 19, 2015 6 to 8 p.m.

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APPENDIX VI

TRANSCRIPT OF THE PUBLIC MEETING
San German Groundwater Contamination Superfund Site
OU-1

REUNIÓN PÚBLICA SAN GERMÁN
CONTAMINACIÓN DEL AGUA SUBTERRÁNEA
PROGRAMA DE SUPERFONDO
SAN GERMÁN, PUERTO RICO

Fecha: 19 de agosto de 2015
Hora: 6:00pm
Lugar: Cancha de la Urbanización Santa Marta

Brenda Reyes: Buenas noches, le voy a agradecer que tomen asiento y pasen aquí para dar inicio. Buenas noches, muchísimas gracias por estar aquí con nosotros en la tarde de hoy, y bienvenidos todos. Esto es una reunión informativa, una reunión pública informativa sobre el caso de Superfondo, mejor conocido como caso de Superfondo de San German, pozos de San Germán. En la tarde de hoy me acompañan compañeros de la Junta de Calidad Ambiental de Puerto Rico, CDM, contratistas para el lugar y el Dr. Adalberto Bosque de la EPA, gerente de proyecto. Si no me presenté mi nombre es Brenda Reyes, oficial de prensa y asuntos públicos. En la tarde de hoy el Dr. Bosque nos va a estar ofreciendo una presentación. El formato como vamos a hacer es que el va a ofrecer la presentación, al final ustedes hacen sus preguntas. Les voy a pedir que cuando vayan a hacer las preguntas utilicen este micrófono y digan su nombre, apellido, si son contratista, residente o a quién representa. Es bien importante porque tenemos hoy transcripción y ella tiene que poner eso. Si alguien tiene algún comentario que ya lo tenga por escrito o algo que quiera decir pues también le agradecemos si puede pasar por aquí y ofrecerlo. Adalberto, sí ya estamos. Importante, darle gracias al señor alcalde Isidro Negrón que está aquí con nosotros, gracias por ayudarnos a gestionar las facilidades. Esto ha sido un trabajo que venimos haciendo ya hace algunos añitos con el municipio. Siempre nos ofrecen su ayuda y su cooperación, así que Sr. Alcalde muchas gracias. Dr. Adalberto Bosque se le busca. Dr., se le solicita.

Adalberto Bosque: Gracias Brenda, buenas tardes. Buenas tardes, ¿no? Hace bastante calor, ya prendieron el abanico, esperamos que refresque un poco. Vamos a estar compartiendo con ustedes en esta tarde. Esperamos que no sea mucho tiempo pero que el tiempo que podamos compartir con ustedes le podamos dar un resumen. Le podamos dar un resumen de la investigación que ha estado realizando la Agencia de Protección Ambiental Federal aquí en el pueblo de San Germán. Ha sido un trabajo en equipo. Muchas personas envueltas, principalmente los ciudadanos de la Urbanización Santa Marta, Porta Coeli y Riverside. El Sr. Alcalde y su personal. Así también con las empresas, las compañías que nos han estado proveyendo acceso y ayudando en la logística para poder llevar a cabo este estudio que estaremos hablando en esta tarde. Sumamente importante cuando hablamos de este estudio, este estudio realizado aquí en el pueblo de San Germán, específicamente por la contaminación de tres pozos utilizados por la Autoridad de Acueductos y Alcantarillados, que fueron cerrados debido a la detección de unas substancias orgánicas llamadas tetracloroetileno y tricloroetileno, que le estaremos presentando la información durante la presentación. Cuando la Agencia de Protección Ambiental Federal hace este estudio, este estudio está dividido en dos partes. La parte que estaremos hablando en esta noche o en esta tarde, es la parte que tiene que ver específicamente con la fuente de contaminación. Se hizo la investigación, se determinó de donde se originaban los compuestos orgánicos volátiles que impactaron los pozos de Acueductos y Alcantarillados, entiéndase el Pozo Retiro, Lola 1 y Lola 2, que fueron cerrados para el año 2006. La segunda parte de la investigación que será, esperamos Dios mediante, que para el próximo año, continúa llevándose a cabo, que tiene que ver con el agua subterránea contaminada desde el Parque Industrial El Retiro en dirección noroeste hacia los pozos que fueron cerrados de la Autoridad de Acueductos y Alcantarillados. Brenda les indicó que las preguntas que puedan tener las dejamos para el final si nos hacen el favor. Todo lo que ustedes digan eventualmente va a estar, aquí se está tomando nota de todo lo que se diga y todas las preguntas. Todas las preguntas que se hagan en esta noche, así también como las preguntas que hagan por escrito van a ser contestadas e incluidas en el documento que se llama "Récord de decisión", que estará firmando o espera firmar la Agencia de Protección Ambiental Federal para el día 30 de septiembre de este año. Pregunta tras pregunta, todas las preguntas van a ser debidamente contestadas en ese record administrativo, en ese documento de respuestas. Bien, cuando se lleva a cabo una investigación como la que estamos llevando, hay diferentes pasos.

Hay varios objetivos que tiene la Agencia de Protección Ambiental Federal cuando lleva a cabo una investigación de este tipo *(ver diapositiva número 2 de la presentación: enfoque del estudio).* El primer objetivo que tiene la Agencia cuando lleva a cabo una investigación de esta naturaleza, cuando hay un lugar que está contaminado, bien sea el agua subterránea contaminada, el agua superficial contaminada, suelo contaminado, independientemente el medio que esté contaminado hay varios objetivos. Estos objetivos fueron contestados y completados durante esta investigación. El primer objetivo fue definir la magnitud y la extensión de la contaminación. En el caso aquí de San Germán para los años 2001 al 2005 aproximadamente estos tres pozos utilizados por la Autoridad de Acueductos y Alcantarillados fueron impactados o se detectó la presencia de compuestos orgánicos volátiles. En aquel momento la concentración máxima que se detectó de tetracloroetileno fue 6.4 partes por billón, el estándar de agua potable, de agua para consumo, son 5 partes por billón, y en el año 2006 se cerró ese pozo. Quiere decir que eventualmente la Agencia Protección Ambiental Federal en un caso como el de aquí de San Germán el agua subterránea contaminada, la Agencia investiga, lleva a cabo una investigación para determinar la cantidad de área que ha sido impactada, el medio que ha sido impactado. En este caso, para poder definir de una forma vertical y una forma horizontal la Agencia sigue tomando muestras, hincando pozos de muestreo, tomando muestras de suelo, agua superficial, agua subterránea, muestra de sedimento. El Río Guanajibo se tomó muestra, para ver si había habido un impacto. Los sedimentos se muestrearon e inclusive se toman muestras de los vapores que puedan estar debajo de algunas estructuras, y eso también se hizo en esta investigación y se determinó la extensión y la magnitud de la contaminación y estaremos hablando. Una vez la Agencia tiene la información con relación al tipo de contaminante, las concentraciones presentes, dónde se origina ese contaminante, hasta donde llega ese contaminante, los medios afectados, se lleva a cabo lo que se conoce como un avalúo de riesgo a la salud humana y al ecosistema. Donde en base a la información obtenida durante la investigación, los posibles receptores, las vías de exposición, el contaminante cómo se mueve desde la fuente de contaminación hasta el receptor, el individuo, la población que pueda recibir esa contaminación, así también como las personas, la población que pudiera estar impactada independientemente la vía o la ruta de exposición a la cual la persona se puede estar exponiendo. Hay cuatro rutas de exposición: ruta de inhalación, el contaminante si es volátil se puede estar inhalando, usted cuando respira lo inhala, pudiera estar ingiriéndolo si toma agua contaminada con un contaminante, pudiera ser a través del contacto dermal, o pudiera ser a través de inyección. En este caso pudiera ser a través de inhalación, contacto dermal o inhalación. Eventualmente en este estudio que es parte del record administrativo se determina si el riesgo que representan los contaminantes a la población expuesta o con el potencial de ser expuesta, hay un riesgo aceptado o un riesgo no aceptado. Cuando digo riesgo aceptado o no aceptado, siempre que hablamos de riesgo tenemos que decir o el riesgo es aceptado o es no aceptado. Siempre hay riesgo, aún para uno levantarse hay riesgo de uno caerse de la cama o tropezar uno y caerse. Quiere decir que se determina si hay un riesgo no aceptable para la población que pudiera exponerse. Eventualmente se prepara un documento que se llama el estudio de viabilidad, en ese estudio de viabilidad, en ese documento, una vez que se identifica que hay la necesidad de tomar una acción se evalúan diferentes alternativas desde la alternativa de no acción. La ley que provee la autoridad a la Agencia de Protección Ambiental Federal para llevar a cabo este tipo de investigación y establecer las responsabilidades en las partes que pueden haber sido de una forma u otra responsable de la contaminación establece que una de las alternativas que tiene que ser evaluada es la de no acción. Quiere decir no acción y de ahí en adelante se evalúan otras alternativas para ser consideradas. En este caso se evaluaron cuatro alternativas incluyendo la no acción. Por último, en este proceso que estamos llevando a cabo en el día de hoy, la Agencia de Protección Ambiental Federal en agosto 12 liberó al público, hizo disponible al público lo que nosotros conocemos como el plan propuesto, ustedes tienen copia del plan propuesto. Los documentos que son la base para la toma de decisión de la Agencia de Protección Ambiental Federal, se pusieron en los diferentes lugares. En el caso de San Germán están en la alcaldía, en las oficinas de la Agencia de Protección Ambiental Federal en Guaynabo, en las oficinas de la Junta de Calidad Ambiental y así también en la oficina de la EPA en la ciudad de Nueva York, Manhattan. Bien. Hay un proceso que se tiene que llevar a cabo cuando se descubre que hay un lugar contaminado, este es un proceso desde el descubrimiento del lugar, independientemente. En este caso, 2001 a 2005 se detectó la presencia de compuestos orgánicos volátiles impactando los pozos Retiro, Lola 1, Lola 2. La Agencia de Protección Ambiental Federal interviene en el proceso, para los años 2006 aproximadamente la Agencia de Protección Ambiental Federal una vez interviene, lleva a cabo unos estudios e identifica aproximadamente cuarenta y cuatro… cuarenta y cuatro facilidades o actividades que de una forma u otra había la duda o había la preocupación o la interrogante de si podían ser o no los causantes de esta contaminación en estos pozos. Eventualmente, la Agencia de Protección Ambiental Federal hace un estudio preliminar… hace un estudio preliminar. Esa cantidad de posibles fuentes de cuarenta y cuatro, eventualmente toma muestras en los pozos de Autoridad de Acueductos y Alcantarillados y eventualmente determina que se quedaran aproximadamente cinco facilidades como posibles fuentes de contaminación. Entiéndase, aquí en el pueblo de San Germán está el Parque Industrial del Norte, el Parque Industrial en el norte al norte del Río Guanajibo y está el Parque Industrial El Retiro. El Norte está donde estaba anteriormente Cordis. Ahí estaba Digital anteriormente, PCB Horizon. Al norte del Río Guamaní la Agencia de

Protección Ambiental Federal investiga y descarta el Parque Industrial del Norte, el Río Guanajibo como posible fuente de la contaminación de los tres pozos que fueron impactando, y quedando en la investigación 5 facilidades que estaremos mencionando. Cinco, digo propiedades, cuando hablamos de facilidades recuérdense hay unas compañías que actualmente están ubicadas en estos lotes. Digo lotes o propiedades donde se investigaron, no necesariamente estamos diciendo que estas compañías fueron las responsables de haber causado la contaminación. Lo que sí estamos indicando es que se llevó a cabo una investigación, y la investigación determinó que en ese lote, donde actualmente existen unas compañías que cuando pasamos por allí tienen nombre y apellido, se identificaron como fuente de contaminación. Actualmente, la agencia y sus abogados siguen investigando y eventualmente estarán en contacto o han estado en contacto con diferentes compañías. Se llevó a cabo esta investigación eventualmente en marzo 19 del año 2008. Se incluyó el lugar en la Lista Nacional de Prioridad *(ver diapositiva número 3 de la presentación: Proceso Superfondo).* La Lista Nacional de Prioridad es una lista que crea la Agencia de Protección Ambiental Federal, la creó desde sus orígenes en el año 1980, donde se establece un procedimiento de puntuación y eventualmente aquellos lugares que ameritan ser investigados, porque ameritan o representan un riesgo no aceptado… pudieran representar un riesgo no aceptado es sumamente importante llevar a cabo la investigación. Le da la autoridad a la EPA para que pueda investigar, incurrir en el costeo, pagar por la investigación que se lleve en el lugar. Marzo 2008 se incluye en la Lista Nacional de Prioridad y posteriormente aproximadamente en el año 2010, 2015 hasta el día de hoy la Agencia llevó a cabo la investigación que estaremos hablando en esta tarde. Estamos en esta etapa, un periodo de comentario de treinta días que finaliza en septiembre 11, comenzó agosto 12 y finaliza en septiembre 11. Posteriormente, la Agencia una vez recibidos los comentarios tanto en esta tarde como los comentarios escritos, la Agencia finalmente con la anuencia del Gobierno de Puerto Rico, a través de la Junta de Calidad Ambiental firma lo que se conoce como el Record de Decisión, que es el documento formal donde la Agencia de Protección Ambiental Federal estará decidiendo la acción que se va a tomar en el caso de San Germán. Al momento es simplemente una propuesta que está haciendo la Agencia de Protección Ambiental Federal con la anuencia o con el respaldo del Gobierno de Puerto Rico, a través de la Junta de Calidad Ambiental. Se firma el Record de Decisión, eventualmente la Agencia de Protección Ambiental Federal entra en conversaciones. Ya ha entrado en conversaciones con… si están identificadas compañías, facilidades que pudieran ser responsables, la Agencia de Protección Ambiental Federal entra en unos diálogos con estas compañías, de estar presentes, haberse identificado y finalmente se firma lo que se conoce como un acuerdo... un “agreement”, un acuerdo por consentimiento, donde las compañías si se han identificado aceptan, acuerdan llevar a cabo el trabajo de diseño y eventualmente de implementación de la acción en el lugar y finalmente se opera el sistema hasta tanto y en cuanto cumpla con los límites establecidos de limpieza, bien.

¿Dónde estamos ubicados?, pues no hay que mencionar mucho donde estamos ubicado, aquí son, ustedes son de San Germán. Los que no, pues sabemos prácticamente donde estamos, hablamos de la historia… hablamos de la historia, bien. Tenemos aquí esta figura *(ver diapositiva número 4 de la presentación: Mapa de*

Localización), aquí vemos el Río Guanajibo, aquí podemos ver los tres pozos, los tres pozos que fueron impactados, aquí podemos ver el Parque Industrial del Retiro, aquí está el Parque Industrial en el norte del Río Guanajibo. Entiéndase, aquí hay una facilidad donde la Agencia de Protección Ambiental Federal, el programa que tiene que ver con desperdicios peligros ha estado supervisando unos trabajos de limpieza. Aquí es donde estaba Digital anteriormente, que posteriormente estuvo PCB Horizon y la Junta de Calidad Ambiental ha estado llevando a cabo un estudio *(ver diapositiva número 5 de la presentación)*. En este estudio pues se tomó muestras, tomó muestras en dirección hacia el Río, ¿no? En dirección hacia el Río para saber hasta dónde llegaba la contaminación que se estaba remediando en esta facilidad y se determinó que este Parque Industrial no fue la fuente del impacto en estos tres pozos. No así el Parque Industria o algunos lotes, algunas operaciones en el Parque Industrial El Retiro que sí se determinó que habían sido la fuente. La fuente del impacto de estos tres pozos propiedad de Autoridad de Acueductos y Alcantarillados. El lugar de la investigación pues definitivamente mencioné incluye el Parque Industrial El Retiro, incluye los tres pozos cerrados y áreas aledañas en dirección noroeste, digo en dirección noroeste recuérdense del parque industrial yendo en dirección hacia los tres pozos que fueron cerrados *(ver diapositiva número 6 de la presentación: Descripción del Lugar)*. En esa dirección pues tenemos varias urbanizaciones que han sido parte del estudio: la Urbanización Santa Marta, la Urbanización Porta Coeli, la Urbanización Riverside. Esas tres urbanizaciones fueron parte de la investigación que nosotros llevamos a cabo.

Este trasfondo histórico *(ver diapositiva número 7 de la presentación: Trasfondo Histórico)* prácticamente ya se los mencioné, bien. Este es el mapa que ustedes vieron anteriormente *(ver diapositiva número 8 de la presentación: Investigación Remediativa, Muestras de Suelo),* es sumamente importante que las cinco, las cinco, cinco lotes. Recuérdense que inicialmente yo les mencioné que la EPA había identificado cuarenta y cuatro facilidades o actividades como posibles lugares para ser investigado. Eventualmente la Agencia, en base a su investigación, fue eliminando de la lista aquellos que no iban a ser o que no eran fuente de contaminación, o fuentes para ser investigados y llegó a esta lista. Tenemos por aquí en el Parque Industrial El Retiro, tenemos los lotes donde actualmente se encuentra la compañía Wallace Silversmiths de Puerto Rico Ltd., ¿no? Para propósitos del documento nosotros pues decimos que de ahí en adelante se conoce como… le vamos a decir Wallace, pero el nombre es Wallace Silversmiths de Puerto Rico. Tenemos el lote donde actualmente está ubicada la compañía CCL Insertco de Puerto Rico, tenemos el lote donde actualmente la compañía Pitusa, donde está Pitusa actualmente, donde está actualmente un lote que está vacante, no hay nadie ocupándolo. Un edificio, un edificio donde estaba anteriormente la compañía Baytex, actualmente de hace un tiempo hacia acá el lote está desocupado. Tenemos, tirando hacia el pueblo tenemos el lote donde está ubicado un “dry cleaners”, que se llama Acorn Dry Cleaners, que también se tomaron muestras del suelo en esas cinco facilidades. De estas 5 facilidades, pues la EPA tomó muestras y eventualmente se descartaron tres, permaneciendo dos lotes en la investigación y posteriormente identificado como fuente de contaminación, donde está actualmente el lote, donde está actualmente la compañía Wallace Silversmiths y el lote donde se encuentra actualmente CCL Insertco o CCL, bien. Ese es en el Parque Industrial El Retiro. Durante la investigación del suelo y entiéndase se hacen unos barrenos para determinar la extensión de la contaminación, si hay contaminación en el lote, en el área, en los predios donde está ubicada la facilidad. Donde opera actualmente, el lote donde opera actualmente la compañía Wallace. Recuérdense el nombre que yo les mencioné, Wallace Silversmiths, se encontró contaminación en suelo de aproximadamente 46,000 *(ver diapositiva número 9 de la presentación: Investigación Remediativa, Resultados de Estudio de Suelo)*, la concentración más alta en suelo fue de 46,000 partes por billón, 46,000 partes por billón. El contaminante principal fue, este que se abrevia PCE, por sus siglas en inglés, que es tetracloroetileno. Esos son solventes, solvente. La concentración mayor de tricloroetileno, otro solvente y entiéndase hay otros contaminantes que pudieran ser producto de biodegradación, pudieron ser producto de biodegradación del primero. Está el papá y viene el hijo, y puede venir el nieto. No necesariamente el nieto tiene que ser menos peligroso que el papá, pudiera ser que el nieto, como el caso de "vinyl chloride", cloruro de vinilo, que es más perjudicial a la salud que el primero. No estamos diciendo que el nieto, digo que se produjo como consecuencia del primero, hay mayor concentración, la concentración mayor en el lote de Wallace es de tetracloroetileno. Posteriormente viene tricloroetileno, entiéndase cuando se realiza la investigación del agua, del agua, el contaminante mayor encontrado en este lote, en este lote es de tetracloroetileno, que concuerda con las concentraciones encontradas en el suelo. Estamos hasta ahí.

Aquí tenemos la facilidad el lote donde se encuentra actualmente la compañía Wallace Silversmiths *(ver diapositiva número 10 de la presentación)* y los cuadritos que están en amarillo representan los puntos donde se encontraron unas concentraciones por encima de los niveles que la Agencia de Protección Ambiental Federal entiende que son importantes, que levanta la banderita ¿no?, indicando que hay que investigar. En este lote y posteriormente lo estaremos viendo, hay 3 áreas que son áreas de preocupación o áreas donde cuando nosotros presentemos la alternativa de remediación se entiende que hay que llevar a cabo una remediación. Entiéndase esta porción en esta esquinita, esta área aquí y esta área aquí y esta área en esta otra esquinita. Quiere decir que en este lote de Wallace, donde está Wallace Silversmiths actualmente hay tres áreas. Área 1, área 2 y área 3, para propósitos de la remediación, de la acción de remediación van a haber cinco zonas que hay que remediar actualmente. Tres en este lote y las otras tres, las otras dos estarán en el lote que actualmente ocupa CCL, bien. Concentración máxima de tricloroetileno, el contaminante que se detectó con mayor concentración en el caso de CCL fue este que se llama tricloroetileno *(ver diapositiva número 11 de la presentación: Investigación Remediativa Resultados del Estudio de Suelo)*, ese fue el de concentración mayor, con una concentración de 3,600 partes por billón. Entiéndase, tanto la concentración en el lote de Wallace, con concentración de tetracloroetileno (PCE) en suelo de 46,000 ppb mg/kg concuerda, ustedes lo van a ver, con la concentración mayor de contaminación en agua subterránea porque cuando vamos a agua subterránea, usted va a ver que en el lote donde está ubicado Wallace se encuentra alta concentración en suelo de tetracloroetileno y en el agua subterránea. Entiéndase, esta acción es fuente. En esta acción estamos tratando, la remediación propuesta, la alternativa, y la que estamos recomendando estará lidiando con el suelo, recuérdense que cuando nosotros estamos aquí hay suelo que no hay agua en la zona que nosotros llamamos el "vadose zone", y eventualmente comienza a haber un poco de agua, comienza el agua. Se encontraron concentraciones altas en suelo y cuando llegamos a la porción donde está el agua, dónde está el agua, también se encontraron altas concentraciones de tetracloroetileno, en el caso de Wallace, en el lote estoy hablando del lote. El lote donde está la compañía, con concentraciones de tetracloroetileno en aguas subterráneas de hasta 26,000 partes por billón. El estándar es 5 de agua potable, bien. En el lote de CCL, aquí podemos ver en el lote donde se encuentra CCL, aquí podemos ver el lote donde está Wallace, el lote donde está CCL, el lote donde está la Former Baytex anteriormente, un lote que está vacío *(ver diapositiva número 12 de la presentación).* Aquí se encontraron concentraciones, mencioné anteriormente de 3,600, el contaminante principal fue tricloroetileno. La concentración mayor fue 3,600 y la concentración mayor en agua subterránea, estamos hablando posiblemente de 28, 30, 31 "shallow", llanita se encontraron concentraciones en este lote de hasta 65,000 partes por billón de tricloroetileno. Quiere decir que concuerda con los hallazgos tanto del suelo y el agua subterránea en las dos compañías. Quiere decir que estamos viendo en este lote una concentración principal, también hay contaminante, hay tetracloroetileno. Aquí podemos ver, esto es tetracloroetileno. Tenemos las concentraciones, ¿no? Esta tablita presenta en las primeras… la última línea representa concentraciones en aguas subterráneas. Se estaba haciendo el barreno aquí tenemos ejemplo 0-2 pies, 5-7 pies, 10-12 pies, así sucesivamente. Aquí podemos tener yo creo que de 15-17 pies si mi vista no me falla, posiblemente 30-42 aguas subterráneas. Ya se entró en aguas subterráneas y se pudo detectar la presencia de unos compuestos, recuérdense en suelo y eventualmente en agua subterránea. Lo mismo sucedió aquí en la facilidad, en el lote donde se encuentra actualmente Wallace, que podemos ver contaminantes específicamente tetracloroetileno. Se recuerdan que yo les mencioné que la concentración mayor de tetracloroetileno era de 46,000 ppb en suelo y aquí lo podemos ver de 0-2 pies hay contaminación, 5-7 hay contaminación, 10-12 pies hay contaminación, etcétera, etcétera. El agua subterránea eventualmente pues podemos ver el impacto en el agua subterránea, eso fue suelo y podemos ver también cuando se entró a la interface con el agua subterránea.

Entre los estudios que se realizaron aquí, como parte de esta investigación se llevó a cabo también una investigación para determinar si había la presencia o no de vapores estando siendo acumulados los vapores. Recuérdense que los vapores tienden a salir de si están en el agua o en el terreno, pues definitivamente traten a qué, pues tratan de subir. En los lugares donde hay problemas, digo problemas, una situación donde hay suelo contaminado con compuestos orgánicos volátiles, agua subterránea contaminada con compuestos orgánicos volátiles definitivamente la Agencia de Protección Ambiental Federal tiene que llevar a cabo una investigación para determinar si debajo de los edificios, estructuras, los vapores están saliendo del suelo contaminado o del agua subterránea y eventualmente están subiendo y se están acumulando dónde, debajo de las lozas, debajo del piso y también la Agencia de Protección Ambiental Federal toma muestras del aire del interior de estas estructuras para determinar si ha habido la posibilidad de que ese contaminante que se haya estado acumulando, recuérdense cuando nosotros salimos al patio pues si hay contaminantes pues sale, el aire se lo llevo, pero si hay una estructura, qué hace ese contaminante, pues sube. Queda un poco atrapado, si fuera esta cancha aquí abajo pudieran haber contaminantes, si pasa al agua subterránea estos compuestos siguen subiendo se salen del agua siguen subiendo cuando llegan aquí, está cubierta este piso, quiere decir que se van acumulando. Si la estructura tiene grietas, tiene alguna apertura por la cual puede entrar ese contaminante, ese contaminante pudiera estar entrando a esa estructura. Para eso la agencia realiza este estudio. Este estudio de vapores del suelo se realizó en dos etapas, la primera etapa se tomaron muestras de dos estructuras, de dos estructuras, tres, dos estructuras ubicadas en el Parque Industrial El Retiro, específicamente donde estaba lo que conocemos y le estamos mencionando en el documento como el Former Baytex, el edificio que anteriormente estaba ubicada la compañía Baytex, donde se encontraron contaminantes concentración de vapores debajo de la loza de hasta 27,000 mg/m3, 27,000 mg/m3, entiendo que el nivel que levanta la banderita son como 94 *(ver diapositiva número 13 de la presentación: Investigación Remediativa: Resultado de Estudio de Vapores en el Suelo).* Por encima de los niveles que se levantaba la preocupación para llevar a cabo la investigación. En el lote o debajo del edificio donde está la compañía actualmente la compañía CCL se encontraron concentraciones de aproximadamente 7,100mg/m3, este 3 tenía que estar un poquito más arriba, se quedó abajo *(se refiere a un error en la presentación)*. 7,100mg/m3, vamos bien, no. En Baytex, Former Baytex se encontró concentraciones hasta 27,000 mg/m3. La investigación, y hago un paréntesis aquí, la investigación que se realizó la información que revela es que la propiedad donde está ubicada o donde estuvo ubicada lo que conocemos como el edificio de Former Baytex es un edificio, cuando se tomó muestra de suelo fueron por debajo de los límites que necesitaba algún tipo de acción y entendemos que los vapores que se encuentran debajo de la estructura son vapores que surgen del agua subterránea, que salen de la fuente, digo cuando digo fuente el suelo que está impactado, tanto en el área de CCL, el lote donde está CCL, donde está tricloroetileno, contaminante principal, como el lote donde está actualmente Wallace Silversmiths, donde el contaminante principal es tetracloroetileno. Cuando el agua subterránea sigue moviéndose pasa debajo del edificio pues suben estos vapores, bien.

Entonces, se muestrearon además aproximadamente treinta y una residencias, se pidió el acceso, ¿no? Tuvimos la cooperación de aproximadamente treinta y una residencia, dueños de residencias y pudimos hacer el estudio para determinar si se estaban acumulando vapores debajo del piso y si había concentraciones de estos vapores dentro de las casa por encima de unos niveles que ameritaban algún tipo de acción, ¿ok? La investigación reveló que todas las estructuras, todas las estructuras que se llevó a cabo muestreo dentro, las muestras tomadas dentro de la estructura, estoy hablando las dos en el Parque El Retiro y las treinta y una aproximadamente residencias que se tomaron muestras que estaban por debajo de los límites, que merecía algún tipo de… que levantara alguna banderita, que levantara algún tipo de banderita. No así en las dos propiedades que se llevó a cabo el muestreo, entiéndase Former Baytex y CCL, ya que en Former Baytex había 27,000 mg/m3 levantaba una banderita, levantaba una banderita. Recuérdense, independientemente de que haya actualmente la presencia de estos vapores dentro de la estructura, el mero hecho de que haya unas concentraciones sumamente elevadas debajo de la estructura eso levanta una bandera, y máximo si la propiedad está ocupada quiere decir que hay que darle seguimiento. No quiere decir que la gente se está afectando, porque el aire dentro de la estructura hay unos parámetro establecidos donde se entiende que no debe haber un riesgo no aceptable, bien. Eso fue el primer "round" de muestreo. El segundo "round" de muestreo para "soil vapor extraction", para los vapores en el suelo, los vapores debajo de la estructura se incluyó, en el Parque Industrial se incluyó el lote o la estructura donde está operando actualmente la compañía Wallace, se incluyó Former Baytex se incluyó de nuevo, CCL se incluyó de nuevo y se incluyeron aproximadamente siete residencias, siete residencias. De todas las demás se repitieron dos, dos residencias y se incluyeron aproximadamente 5 a ser residencias. Anteriormente, en el primer "round" de muestreo habían habido dos residencias que debajo del piso tenían unas concentraciones que demostraba que se estaba acumulando un poco de vapor, se estaba acumulando un poco de vapor, pero entiéndase el aire en el interior de todas estas residencias, de todas las residencias estuvieron por debajo de los límites que pueda causar algún tipo de riesgo no aceptable. Quiere decir que estaba dentro de lo permitido. Con relación al lote, a los lotes muestreados en el Parque Industrial pues definitivamente en el Former Baytex se detectó prácticamente la misma concentración *(ver diapositiva número 13 de la presentación: Investigación Remediativa, Resultados de estudio de Vapores en el Suelo).* Anteriormente eran como 27,000, después fue aproximadamente 23,000 mg/m3, en CCL anteriormente habían sido como 7,000 se detectó como 8,000 prácticamente en el mismo, en el mismo rango. En la estructura donde está actualmente la compañía Wallace, que fue muestreada por primera ocasión, entiéndase eso se toman muchos puntos, muchos puntos de investigación. Se encontraron concentraciones, la concentración mayor fue de aproximadamente de 726,000 o 732,000 mg/m3. Actualmente la Agencia de Protección Ambiental Federal está en conversaciones, está en trámites para tomar algún tipo de posible acción para tratar de mitigar, tratar de mitigar el potencial o la probabilidad o reducir cualquier probabilidad, bien, estamos, seguimos.

El agua subterránea, el agua subterránea, esta transparencia prácticamente la habíamos mencionado anteriormente *(ver diapositiva número 14 de la presentación: Investigación Remediativa, Resultados de Estudio de la Contaminación del Agua Subterranea).* Cuando se hicieron los barrenos se recuerdan que en las facilidades donde está Wallace actualmente, el lote donde está Wallace se había detectado hasta 46,000 partes por billón en suelo, pero cuando se hacen los barrenos, se estaban haciendo los barrenos cuando se tocó el agua se llegó al agua, se tomó muestra y se detectó 7,960 mg por litro de tetracloroetileno. Lo que significaba que seguía reforzando los hallazgos de que en el lote de Wallace el contaminante principal es tetracloroetileno, y el contaminante principal en el lote de CCL es tricloroetileno. Como parte de la investigación del agua subterránea, se hicieron aproximadamente, esto se conoce como unos transeptos, entiendo yo como diez u once aproximadamente. Aproximadamente como diez u once transeptos, transeptos son barrenos que se hacen prácticamente en línea desde la posible fuente. Ustedes ven estos puntitos por aquí son barrenos que se hicieron para tomar muestras *(ver diapositiva número 16 de la* *presentación: Investigación Remediativa, Agua Subterránea),* unas muestras del agua subterránea y aquí se pudo ver, se pudo comprobar las concentraciones. Los cuadritos en amarillo significan que exceden los 5 partes por billón. Se pudo definir claramente y ver un movimiento, un movimiento desde el Parque Industrial El Retiro, específicamente estos dos lotes que mencionamos anteriormente, en dirección a dónde. En dirección a los pozos que fueron impactados. Con concentraciones mayor en el caso del lote de CCL. Aquí está el lote de CCL a la parte de atrás, concentración de 65,000 partes por billón. En el lote donde está ubicado actualmente Wallace se encontró la concentración máxima de tetracloroetileno con una concentración de 26,000, aproximadamente 26,000 partes por billón, y de ahí en adelante pues se pudo ver un patrón, un patrón de movimiento del contaminante, ¿no?, del contaminante hacia en esta dirección *(ver diapositiva número 17 de la presentación: Investigación Remediativa, Agua Subterránea).* Sumamente importante, la porción del agua subterránea, específicamente la acción relacionada a esta parte del agua, a esta parte del agua subterránea contaminada va a ser parte, o va a ser la acción que esperamos nosotros para septiembre del próximo año, del próximo año estar atendiendo. Estamos atendiendo en este momento la fuente de contaminación para tratar de evitar que el contaminante, que el contaminante que está en el suelo, en el suelo saturado o suelo no saturado, que ese contaminante siga saliendo, porque aquí están las concentraciones mayores, 65,000 de tricloroetileno, 26,000 de tetracloroetileno y queremos atender para tratar de evitar que ese contaminante se siga moviendo y atender la fuente de la forma más rápida posible, para que se siga remediando, se siga remediando estos lotes. Tenemos por aquí como parte de la investigación de agua subterránea, se hincaron diez pozos de monitoreo, para tomar muestras del agua subterránea. Esto pues aquí está la información y revelan prácticamente lo mismo. Un movimiento, una tendencia del agua subterránea moviéndose en esta dirección. Sumamente importante, en este momento el agua subterránea estaba, mostraba tendencia en esta dirección. Entendemos que cuando estaban en operación los pozos El Retiro, Lola I y Lola II, pues definitivamente estaban halando el agua, creaban un cono, un cono de influencia y halaban el agua hacia ellos. Aquí tenemos al norte, al norte tenemos el Río Guamanino, Guanajibo, el Río Guanajibo, me confundí allá, estoy con Guayama. El Río Guanajibo tenemos el Río Guanajibo, entendemos que eventualmente el agua cuando no hay acción moviéndolo hacia en una dirección noroeste pues eventualmente el agua pudiera tratar de tender o tender moverse hacia dónde. Quiere decir que nuestra investigación, que continuamos haciendo la investigación pues estaremos obteniendo una información que nos hace falta para poder eventualmente tomar y establecer cuál sería la acción para remediar el agua subterránea. Definitivamente el agua subterránea tiene altas concentraciones y entendemos que definitivamente cuando se haga el avalúo de riesgo, pues debiera estar indicando que hay que tomar una acción para el agua subterránea, pero eso es el objeto de otra acción que estaremos tomando el año próximo.

Aparte de la investigación del agua subterránea, el suelo, los vapores, la Agencia de Protección Ambiental Federal también tomó muestras del agua superficial, así también como de sedimento *(ver diapositiva número 18 de la presentación: Resultados de Estudio de la Contaminación del Agua Superficial).* Aquí tenemos el Río Guanajibo. Se tomaron muestras a aguas de superficie, sedimento del Río Guanajibo. Estamos bien allí, o sea aquí no vemos contaminantes. Recuérdense que en la tablita los cuadritos amarillos es donde hay contaminación. No así, uno drenajes que está entre el edificio donde está actualmente la compañía CCL y la compañía donde estaba anteriormente Former Baytex, aquí hay como un canal. Un canal que pasa hacia allá, se mueve hacia allá en dirección norte y ahí se encontraron contaminantes que entendemos pues son. Aquí tenemos tricloroetileno, el contaminante principal tricloroetileno. Entendemos que las altas concentraciones que están en esa zona pues son las causantes de que haya habido un impacto en el agua superficial de esos drenajes *(ver diapositiva número 19 de la presentación).* Aquí podemos ver específicamente donde se encuentra actualmente Wallace, donde está CCL y Former Baytex. Aquí podemos ver, yo les mencioné anteriormente que había cinco áreas donde se detectó la presencia mayor de contaminantes que hace falta tomar una acción remediativa. Aquí tenemos el área, vamos a decir en la zona 1, zona 2, zona 3, donde está ubicado actualmente la compañía Wallace, el lote donde está actualmente la compañía Wallace, entiéndase estas propiedades, lotes. En este caso estos tres lotes están actualmente estas compañías pero estos lotes son propiedad del Gobierno de Puerto Rico, de Fomento Industrial, la compañía de Fomento Industrial. Actualmente pues están estas compañías, en el pasado hubo otras compañías que estuvieron operando en esos lotes y la Agencia de Protección Ambiental Federal pues ha estado recopilando información en relación al tipo de operación que llevaron a cabo estas compañías y están en conversaciones con las compañías que actualmente están allí. Quiere decir que eventualmente la Agencia pues se reunirá con todas estas compañías y se dialogará acerca de las acciones que tienen que llevarse a cabo y cómo se estarán llevando a cabo este tipo de acción. En el lote donde está CCL, pues podemos ver dos áreas, 1 y 2. Siendo el área 2 y el área 5. Esta es la 2. 1, 2, 3, 4 y 5; el área 2 y el área 5 las áreas donde se encontró la mayor concentración en aguas subterráneas, bien.

Se llevó a cabo un avalúo de riesgo *(ver diapositiva número 20 de la presentación: Resumen de Riesgo en el Lugar),* en ese avalúo de riesgo pues se evaluaron diferentes escenarios. Escenarios de qué sucedería, los trabajadores que estén actualmente que están en la facilidad, residentes, uso recreacional, personas que puedan ingresas, trabajadores de construcción en el futuro pudieran estar llevando a cabo algún tipo de actividades. Luego de haberse llevado a cabo el estudio entiéndase que cuando se llevó a cabo este estudio se detectaron unos metales, se detectaron unos metales pero el estudio indica que las concentraciones presentes de estos metales son concentraciones naturales que existen en el área. Es que los contaminantes de preocupación o sí de preocupación en este caso que estamos atendiendo la fuente es tetracloroetileno y tricloroetileno, son las contaminantes principales con sus otros productos que surgen como consecuencia de estos productos principales.

El resumen del avalúo del riesgo que se llevó a cabo indicó que es necesaria una acción remediativa para proteger la salud pública, el bienestar y el medio ambiente de la amenaza impacto actual al agua subterránea *(ver diapositiva número 20 de la presentación: San Germán Groundwater Contamination Site)*. Recuérdense actualmente hay suelo contaminado o ha habido suelo contaminado que ha estado impactando el agua subterránea. Por eso fue que se impactó los pozos Retiro. Quiere decir que la Agencia de Protección Ambiental Federal con de acuerdo con la Junta de

Calidad Ambiental, en acuerdo con la Junta de Calidad Ambiental entienden que es sumamente necesario tomar una acción para tratar de evitar que esos contaminantes sigan pasando del suelo al agua subterránea y así también minimizar el potencial o el riesgo de que estos contaminantes pasen del suelo o la zona llana donde está el agua, donde comienza a haber el agua pase a vapores, y eventualmente haya ese potencial o esa preocupación de que pueda estar impactando a las estructuras o a las personas que habitan o trabajan en estas estructuras, bien. Objetivos de la acción remediativa *(ver diapositiva número 22 de la presentación: San Germán Groundwater Contamination Site)* que se estará llevando a cabo, hay dos áreas. Uno el suelo, prevenir o reducir que los suelos contaminados actúen como fuente de contaminación del agua subterránea, por eso hay que tomar acción, hay que tomar acción. Dos, reducir que la masa de contaminantes en la zona saturada de suelo, lo que se conoce la saprolita actúe como fuente de contaminación del agua subterránea, por eso estamos atendiendo la fuente, entiéndase zona de suelo no saturada y done comienza ya a haber el acuífero. Estamos hablando aproximadamente hasta treinta y cinco pies yo creo, treinta y cinco, quizás cuarenta, las zonas llanas que es la zona mayormente afectada. Entendemos que al tratar el suelo remover estos compuestos orgánicos volátiles por la alternativa que estamos recomendando pues evitará o reducirá el potencial de que estos contaminantes pasen al agua subterránea. Así también reducirá el potencial de que esos contaminantes sirvan como fuente de esa generación de vapores que eventualmente se acumulan en el edificio y pudiera haber el potencial o la probabilidad de que eventualmente pudieran acceder al interior de estos edificios. Entiéndase, se está tomando, actualmente hay unas conversaciones para tomar unas acciones dirigidas a estos vapores que están debajo en estas dos lotes principales que estamos mencionando, estructuras. Hay unas conversaciones para tomar algún tipo de acción lo antes posible, ¿no?, para tratar de atender esos vapores, bien. Eventualmente, la Agencia de Protección Ambiental Federal en su investigación que continúa pues estará siguiendo atendiendo, atendiendo y la acción que se esté tomando ahora va a hacer, lo que se haga con relación a la mitigación de los vapores que hay debajo de estos pisos, de estos edificios. Cuando digo edificios, los dos que mencionamos anteriormente. La acción que la Agencia tome en estos momentos va a ser cónsona. Ambas acciones van a ser cónsonas con la acción, con la remediación de estos vapores, suelos y vapores que están en estos dos lotes, bien.

Se evaluaron cuatro alternativas. Aquí podemos ver cuatro alternativas *(ver diapositiva 23 de la presentación: Alternativas Remediativas IDC)* La alternativa número 1, incluida en el record, en el documento que se conoce Estudio de Viabilidad, es la alternativa de no acción *(ver diapositiva 24 de la presentación: Alternativa S1 No Acción)*. Recuérdense, independientemente que nosotros sepamos que hay que tomar una acción, por ley tenemos que considerar qué sucedería si no se toma acción, y definitivamente si no se toma pues sigue la contaminación, la contaminación se sigue expandiendo. El contaminante del suelo sigue llegando al agua subterránea y estas altas concentraciones que están en un área localizada pues definitivamente mientras más se expanda pues más difícil va a ser eventualmente qué, el remediarlas, bien. La segunda alternativa que se consideró fue la excavación y disposición fuera del lugar y tratamiento en el lugar. Cuando hablamos de excavación, todas estas alternativas con excepción de la primera, hago la salvedad, la dos, la tres y la cuatro incluyen como parte de sus componentes, uno que se establezcan unos controles institucionales. Lo que se conoce como "dig restriction", una restricción, unos gravámenes en el título de propiedad donde diga "mira no me excaves el terreno porque aquí este terreno está contaminado", para evitar que se excave el terreno, para evitar que se hinque un pozo y extraiga agua de esa área que está impactada. Quiere decir que Agencia de Protección Ambiental Federal a través del Gobierno de Puerto Rico, la Junta de Calidad Ambiental y agencias del Gobierno de Puerto Rico pues estarán estableciendo unos mecanismos para tratar de evitar que las áreas afectadas sean impactadas. Estamos claros con eso. Aparte de eso, la dos, la tres y la cuatro también requieren como se permanece un contaminante por equis periodo de tiempo en lo que se remedia, de que cada cinco años luego de que comience la acción de remediación se lleva a cabo una evaluación para determinar si la acción que se está llevando a cabo, independientemente cual sea, la dos, la tres, la cuatro, se esté llevando correctamente, bien. Regresando a la número dos, número dos es excavación y disposición fuera del lugar, tratamiento en el lugar *(ver diapositiva 25 de la presentación: Alternativa S2 Excavación y Disposición fuera del lugar/Tratamiento en el Lugar)*. Les mencioné anteriormente que había cuántas áreas, cinco áreas, ¿se recuerdan? Tres en el lote donde se encuentra Wallace, dos en el lote donde se encuentra CCL. Todas estas alternativas, la dos, tres y la cuatro hay diferentes componentes. En el caso de excavación, pide que la excavación sea, aquí tenemos la figura, ¿no?, que la excavación sea hasta aproximadamente, hasta aproximadamente trece pies, hasta aproximadamente trece pies, en el uno, en el dos y en el tres. Les estoy mencionando las alternativas y luego les diré la que la Agencia está recomendando. Excavación, tú sabes, hasta trece pies recuérdense para excavar posiblemente hay que estar trabajando en esta porción dentro del edifico, ¿no? y la Agencia pues considera eso. En su documento reconoce el impacto que esto puede causar, que esto puede causar. Hay nueve criterios que la Agencia compara, estas alternativas. Le estoy diciendo lo que conlleva, lo que conllevaría. Pues, recuérdense cuando estamos hablando de las áreas que están aquí en amarillito, diagonales amarillo, aquí. Luego que se firme el record de decisión, se entra en comunicación, se firma un acuerdo por consentimiento para llevar a cabo los trabajos de remediación. Se tiene que llevar a cabo el diseño de cualquier tipo de acción. Durante la parte de diseño se va a tener que hacer qué, se va a tener que llevar a cabo un muestreo para poder definir claramente hasta donde llega el área que habría que estar trabajando. Quiere decir, conlleva excavación. Posteriormente se retornaría, se echa terreno limpio, se echa terreno limpio, se compacta, se compacta, también incluye si hay terrenos que exceda los límites establecidos, que indique que el terreno tiene unas características de peligrosidad habría que disponerlo en Estados Unidos. Posteriormente tratamiento en el lugar. Tratamiento en el lugar lo que significa es que se le añaden unos aditivos orgánicos en el terreno a diferentes profundidades, esto es para incentivar la actividad de las bacterias porque las bacterias allá siguen trabajando con ese contaminante y lo van eliminando, para que se pueda biodegradar. Tratamiento en sitio, esa es la alternativa número dos.

La alternativa número tres, que es la alternativa que la Agencia de Protección Ambiental Federal con la Junta de Calidad Ambiental están recomendando es la alternativa que conlleva extracción de vapores del suelo *(ver diapositiva 26 de la* *presentación: Alternativa S3 Extracción de Vapores del Suelo y Extracción en interfaces / Tratamiento en el lugar)*. Recuérdense se hincan una serie de pozos, una serie, como una serie de pozos, ¿no?, eso es para extraer, un sistema para extraer los vapores que se están generando, extraen los vapores, esos vapores se sacan a la superficie. Se capturan en un sistema, un sistema de carbón activado, se capturan y también incluye una extracción en interface. Lo que se conoce como "dual phase". Recuérdense estábamos hablando que hay una porción de terreno, posiblemente no sé dieciocho, veinte pies aproximadamente de terreno que no tiene agua. Aquí estarían los pozos de "soil vapor", hay una porción que ya comienza el agua, que ya comienza el agua, ahí sería extracción de agua, extracción de agua, el agua se saca de la superficie, se trataría en un sistema de tratamiento, un sistema de tratamiento. Eventualmente, pues se descargaría el agua tratada cumpliendo con los parámetros establecidos, recuérdense estas acciones tienen que cumplir con todas las leyes que aplican. Eso estamos claro con ello, y posteriormente incluye el tratamiento en el lugar. El tratamiento en el lugar, el tratamiento en el lugar, bien. Cuando hablamos de sistema de extracción de vapores estamos hablando de estos tres. Uno dos, tres, extracción de sistema de vapor, extracción de vapores de vapor, en la dos incluye "dual phase", "dual phase" es que el agua, aquí se va a tratar agua, agua. Aquí en el área de CCL, aquí incluye "in situ treatment", pero aquí en el área número cinco, que fue el área donde se encontró la alta concentración de 65,000 partes por billón, ahí incluye el "dual phase" también. "Dual phase" y después "in situ treatment". Cuando hablamos de este sistema de remediación, la alternativa número tres, y luego lo van a estar viendo en una tablita incluye que el sistema de extracción de vapor va a estar aproximadamente, se entiende que dos años continuos, el “soil vapor”. Dos años, e intermitente por los próximos ocho años, para un total de 10 años, aproximadamente. Durante la fase de diseño se tiene que refinar, se tiene que refinar este sistema. La alternativa número cuatro es tratamiento termal, y extracción de vapor y tratamiento en el lugar. Tratamiento termal significa que hay unos sistemas que calienta, ¿no?, que calientan, que calientan esa área donde están esos compuestos, y ahí genera calor y esos compuestos orgánicos volátiles qué hacen, pues se van a vapor, ¿no? Los que están en agua o están en suelo se liberan y salen y el sistema de vapor los atrapa. Es mucho más difícil de implementar, es mucho más difícil, más complicado. Requiere un espacio mayor para ser implantado. Estos son los costos asociados, están en su documento *(ver diapositivas 23 a la 26 de la presentación: San Germán Groundwater Contamination Site).* No acción pues no conlleva costo. La alternativa número dos es una alternativa que el costo, ves, aquí tenemos aproximadamente cuando se redondea la operación y el mantenimiento con el costo capital son aproximadamente $13.4 millones, tiempo de construcción de doce a dieciocho meses, tiempo de implementación 2.5, pero el costo es $13.4 millones. La alternativa número tres tiene un costo, cuando añadimos costo de operación y mantenimiento, costo capital de aproximadamente $7.3 millones. $7.3 millones y dice tiempo de operación aproximadamente diez años, les mencioné anteriormente que la operación del sistema de extracción de vapores se entiende que son dos años continúa, y de una forma intermitente aproximadamente ocho años más, para un total de aproximadamente 10 años. Tiene un costo de $7.3 millones. La alternativa número cuatro pues tiene un costo de aproximadamente $13.3 millones *(ver diapositiva 27 de la presentación:*

Alternativa S4 Tratamiento Termal en el Lugar y SVE / Tratamiento en el Lugar). Cuando se evalúa esta alternativa y eventualmente ustedes van a ver que aquí tenemos los nueve criterios por los cuales la Agencia de Protección Ambiental Federal, la Junta de Calidad Ambiental comparan todas estas alternativas. Están en el documento que ustedes tienen *(ver diapositiva número 28 de la presentación: Criterios para la selección de la acción remediativa bajo CERCLA).* Recuérdense, no necesariamente una alternativa por costar más quiere decir que va a ser la más efectiva, o la más costo efectiva. Costo efectiva significa que lo que yo alcanzo por la inversión de dinero que yo estoy haciendo, si yo con $7 millones alcanzo mi objetivo de llegar a los niveles de limpieza que yo estoy obteniendo en vez de $13 millones, ustedes dicen pues esta es más costo efectiva. Este no es el único criterio, aquí no es dinero el criterio, aquí es uno de los criterios, porque hay otros criterios, como por ejemplo es la implantación. ¿Cuán factible? El efecto que tiene a corto plazo, el efecto que tiene a la operación de las facilidades que están ubicadas allí o sus alrededores. Todo esto la Agencia de Protección Ambiental Federal lo toma en consideración, toma en consideración estas alternativas pueden lograr con los objetivos de limpieza, los estándares establecidos y así sucesivamente. Reducción de la toxicidad, de la movilidad, del volumen, efectividad a corto plazo, el efecto que puede tener a corto plazo, la implantación, la interrupción que pueda tener, todos los efectos que puedan tener. Uno de los elementos que es el elemento número ocho, que es la aceptación de la agencia estatales, la Agencia de Protección Ambiental Federal antes de someter este documento a comentario público en agosto 12, recibe, tiene que recibir una carta del Gobierno de Puerto Rico, a través de la Junta de Calidad Ambiental. En este caso recibió una carta donde la Junta de Calidad Ambiental, el Gobierno de Puerto Rico a través de la Junta de Calidad Ambiental endosa la alternativa propuesta por la Agencia de Protección Ambiental Federal, que es la alternativa número tres. Estamos en este momento en un periodo de comentario público de treinta días, termina en septiembre 11 donde eventualmente, aquí está, se está cumpliendo el criterio qué, el criterio número nueve. La alternativa que está proponiendo, la que mencioné anteriormente, la alternativa número tres *(ver diapositiva número 29 de la presentación: Plan Propuesto).* Entiéndase los trabajos de investigación no terminan con la toma de esta decisión. La Agencia de Protección Ambiental Federal, la Junta de Calidad Ambiental continuamos investigando y tomando las acciones necesarias, las acciones necesarias para salvaguardar y proteger nuestro medio ambiente, y sobre todo la salud de quién, la salud de las personas, que eso es lo más importante. Recuérdense cuando hablamos de salud, le digo doy clase en la Escuela de Medicina de Ponce, Universidad de Ciencias de la Salud. El problema de la salud pública, cuando hablamos de salud no es simplemente ausencia de enfermedades, conlleva un espectro muchísimo mayor. Eso es lo que estamos buscando. El periodo de comentarios lo mencionamos anteriormente *(ver diapositiva número 30 de la presentación: Periodo de Comentarios),* aquí tienen la información mía, estamos a sus órdenes en la Agencia de Protección Ambiental Federal. Tenemos por aquí los lugares donde se encuentran los documentos, la alcaldía, la oficina de la alcaldía, la Agencia de Protección Ambiental Federal en Guaynabo, la Junta de Calidad Ambiental, la oficina en Nueva York *(ver diapositiva número 31 y 32 de la presentación: Repositorios).* Queremos agradecer al equipo completo de trabajo, cuando hablamos del municipio de San Germán, hablamos completo, lo principal aquí son los residentes. Sin los residentes, el aporte de los residentes, no hubiese sido posible esta investigación. Miren, aquí yo me tomé cafecito, juguito, arroz con dulce, galletitas, etcétera, etcétera, porque uno va allí y vienen los residentes de aquí son buenísimos. Al Sr. Alcalde, a todo su personal, queremos agradecer. Queremos agradecer también a la Junta de Calidad Ambiental. A todo el personal de la Agencia de Protección Ambiental Federal por toda la ayuda, que hicieron posible la realización. Las compañías que nos ayudaron en la realización de esta investigación. ¿Preguntas?

Brenda Reyes: Les pido que para preguntas digan su nombre para el record, ya que tenemos aquí a la transcripción, así que si hay alguna pregunta pues este es el momento. Sí.

Cándido Rodríguez: Sí, buenas noches.

Brenda Reyes: Buenas noches.

Cándido Rodríguez: Mi nombre es Cándido Rodríguez. Fui residente de esta Urbanización unos años, luego me fui para la zona metropolitana y actualmente estoy cuidando a mi mamá en esta misma calle. Voy a decir que soy ingeniero industrial, porque por ahí va a partir mi pregunta. Cuando yo empecé la industria hace unos treinta años en el norte de la isla, trabajé con una compañía que se utilizaba este tipo de solvente para limpiar piezas electrónicas. Específicamente en el área de Vega Alta, esas piezas que se limpiaban con este solvente era para volverlas a utilizar y lamentablemente en esa época y en esa zona ese solvente una vez ya no se podía utilizar porque era reusable hasta que se llenaba de grasa y ya no podía utilizarse, se disponía de la siguiente manera. Los “drones” se sacaban al terreno, se tiraban a la tierra y la tierra se encargaba de disponer de ella. En el área de Vega Alta lamentablemente para esa época, había cerca de nueve pozos que se utilizaban por Acueductos para extraer agua y procesarla y utilizarla en el pueblo. Lamentablemente se identificó con el tiempo que cinco de esos pozos tuvieron que ser cerrados porque estaban contaminados. Con los años la investigación determinó que tres de las compañías incluyendo la que yo trabajaba pues fue "liable", responsable por esta situación. Se hicieron estudios de suelo y se determinó cuáles fueron y se pusieron unas multas increíbles a las tres compañías, que solamente una de ellas está allí. El área de Vega Alta se identificó como con una alta incidencia de cáncer en las personas. Obviamente no sé si se ha dicho, porque llegué un poquito tarde, que estos solventes son carcinógenos. Una de las preguntas es: ¿se ha hecho algún estudio en el área de San Germán si la incidencia de cáncer ha aumentado en el período en que ocurrió esta situación? porque yo entiendo que esos tres pozos que están actualmente fuera de operación en algún momento se utilizó el agua por Acueducto. No sé si se trató o no se trató el agua, y si esa agua llegó hasta, hasta los seres humanos y fue consumida. Si ese estudio ustedes lo tienen contemplado mirar o si se miró y cuáles son los resultados, porque por lo que yo he podido ver la problemática va mucho más allá de lo que se está exponiendo aquí y no los estoy acusando de nada pero pienso que es un problema real, es un problema que va a afectar el futuro y está afectando el presente de esta urbanización, porque ustedes identificaron unos pozos que posiblemente las personas los han estado utilizando por años y podría haber estado causando a ellos o a sus vecinos, que algunos casos se sirvieron de esa agua, mayores problemas como cáncer o enfermedades mayores.

Adalberto Bosque: Bien. Gracias por su pregunta. La pregunta suya queda anotada en el documento y eventualmente se puede elaborar un poco más en la contestación. Nosotros en este momento no tenemos información con relación a prevalencia. Por lo menos yo no tengo, tendría que verificar eventualmente en la oficina de Nueva York, ¿no? Si hay información con relación a prevalencia de cáncer, lo que sí podemos decir es que cuando existen pozos que son utilizados para abastos de agua potable, independientemente que sea un pozo, que sea manejado por la Autoridad de Acueductos y Alcantarillados o sea un pozo de un sistema que se conoce como non-PRASA. El Departamento de Salud, que es utilizado para abastos de aguas potables, el Departamento de Salud interviene. Cuando digo interviene, el Departamento de Salud requiere por ley que se lleve a cabo cierto análisis, cierto muestreo de ese pozo. En este caso de los pozos que nosotros estamos mencionando, y estoy mencionando los pozos de Acueductos, bien. En el caso de Acueductos, los pozos Lola 1y Lola 2 y El Retiro, pues definitivamente tenían que cumplir y cumplían con el requisito del Departamento de Salud y se muestreaban, periódicamente se le toman muestras. Por eso la información cuando la Agencia de Protección Federal incluye un lugar en la Lista Nacional de Prioridad hay varias etapas. La primera etapa, la primera etapa es, es la etapa donde la Agencia de Sustancias Tóxicas y Registro de Enfermedades conocida como ATSDR. ATSDR lleva a cabo un estudio, como si fuera un avalúo de riesgo. Es cualitativo, no es cuantitativo, que dice pues mira cuál es la información, cuáles son las concentraciones. La información que nosotros recopilamos y obtuvimos a través de todas las agencias, todas las investigaciones que se realizaron, llevaron a cabo, indicaban que en ese momento la concentración mayor, entiéndase del 2001 al 2005 aproximadamente, un periodo de tiempo. Se había detectado la presencia de compuestos, se estaba detectando, ¿no? No fue hasta que llegó un momento que excedió ese límite donde el Departamento de Salud le indicó. Los resultados son enviados al Departamento de Salud y el Departamento de Salud qué le dice: "cierra el pozo". Los pozos de Acueductos, la información que tengo y está en el documento que eran, creo que son aproximadamente, no sé si eran 8,000 o 16,000 personas, provee la cantidad de personas que eran servidas, que eran servidas, se descontinuó la operación de esos pozos. Estamos claros, estamos bien hasta el momento. Importante, hizo una pregunta, hizo una pregunta porque en este caso algo que nosotros hemos tratado de pasar la voz y seguimos en colaboración con el Municipio y con el Departamento de Salud y con el Departamento de Recursos Naturales, es que la información que nosotros tenemos. La información, por lo menos aquí tuvimos una reunión de disponibilidad con la ciudadanía, hemos tenido una o dos reuniones aquí en este lugar y hemos repartido información y hemos visitado algunas casas, de que para los años setenta, para los años setenta, setenta y pico hubo una situación que hubo una necesidad de agua, no sé si era con un huracán o una inundación… setenta y cinco, la tormenta Eloísa. Sucedió ese evento que hubo la necesidad de una necesidad de agua. Cuando digo necesidad de agua que Acueducto, el agua de Acueducto no venía, aparentemente se descontinuó, pasó algo que no había. Según la información que nosotros tenemos, un grupo de residentes no sé si fue que se unieron o algo así. Ellos hincaron unos pozos, hincaron unos pozos. Nosotros como parte de la investigación hemos tratado de determinar y de identificar pozos que existan en el área. Nosotros identificamos siete pozos, en las reuniones que nosotros hemos tenido aquí, hemos identificado… bueno y tuvimos acceso. Tuvimos acceso a siete, a ocho pozos. El primer pozo que muestreamos, en un pozo de los que muestreamos que lo cerraron, que lo cerraron, se detectó contaminantes por encima de los 5 partes por billón. De los otros siete pozos que muestreamos, si mi mente no me falla, dos pozos detectaron por encima de los 5 partes por billón. Cuando dialogamos con las personas, las personas nos dicen, “yo no utilizo el pozo, el pozo para lo único que lo utilizo es para regar las matas, etcétera, etcétera”. Como quiera que sea a las casas donde nosotros muestreamos los pozos le llevamos unas cartas, fuimos allá a las casas y les llevamos unas cartas donde le decíamos “estos son los resultados, su pozo excede este valor, por lo tanto le recomendamos que no lo utilice”, y aunque no excediera le estamos diciendo “recomendamos que no lo utilice, que no lo utilice”. Entiéndase también y con esto hago el otro punto, viene una parte y es bien importante que nosotros tenemos que seguir trabajando con el Municipio y con el Departamento de Recursos Naturales. No sabemos cuántos pozos hay. Hay veces que uno va a la casa, que uno va a la casa, y aquí hay personas de la compañía CDM que la compañía que le hace el trabajo de campo a la EPA, y van a las casas. Se va a la casa y le dice “mira yo vengo aquí a ver si tú tienes algún pozo privado, porque me gustaría si lo tienes te lo muestreo de una forma gratuita y te doy los resultados, o sea yo no te estoy penalizando porque ese no es el trabajo de la EPA”. La EPA no le va a decir “cierra el pozo”, no, la EPA lo que quiere decir es “te tomo muestra del pozo de una forma gratuita y te doy los resultados para que tú sepas la calidad”. Hay personas que le dicen a uno “no, yo no tengo pozo”. No estoy diciendo que tengan o no tengan, entendemos nosotros que hay más, posiblemente más de siete pozos. Nosotros estamos en conversaciones, o nos hemos reunidos, nos reunimos ya con el Departamento de Salud, específicamente el Director del Programa de Agua Potable, el Ingeniero Javier Torres, ya nos reunimos con él y estamos haciendo otras reuniones. Yo creo que se lo había mencionado al Sr. Alcalde que tenemos que hacer ese tipo de reunión y con el Sr. Nelson Velázquez, subsecretario de Recursos Naturales de Permiso y Franquicia porque tenemos que ver de qué forma u otra se chequean. Hay personas que le dicen a uno "no tengo pozo" cuando en la realidad tienen. En la parte de aguas subterráneas se va a hacer el avalúo del riesgo, y eventualmente se dice si el riesgo excede el riesgo de cáncer es por encima de lo aceptado. Es de 1 en 10,000 a 1 en 1,000,000, lo aceptado, si se excede la probabilidad de exceso de cáncer, así se llama. Si se excede a la probabilidad de exceso de cáncer, si existe o no la prevalencia de cáncer eso entiendo yo que lo pudiéramos, yo entiendo que se puede conseguir porque yo entiendo que a través del Departamento de Salud, ellos tienen las estadísticas. Es buen punto, lo pudiéramos tratar de conseguir. Se le agradece su comentario, un comentario válido. Bien, ¿alguna otra pregunta?

Recuérdense como mencioné anteriormente la información de nosotros está en el documento. Cualquier información. Nosotros trajimos unas cartas que son unos sobrecitos amarillos que tienen los resultados de las casas donde tomamos el muestreo de los vapores. Para los que estuvieron aquí, si no mañana yo voy a venir aquí y los voy a entregar, y si no, pues coordinamos con el municipio de qué forma le podemos hacer llegar esas cartas y eventualmente pues seguiremos nosotros tratando de hacerles llegar este mensaje a la ciudadanía, que nosotros estamos aquí para ayudar. Entiéndase, para ayudar, para tratar de determinar si existe algún, no quiere decir que porque haya un contaminante quiere decir que va a haber problemas. Puede haber una concentración no necesariamente va a haber un exceso de cáncer por encima de los límites. ¿Alguna otra pregunta? Sí, y después usted.

Cándido Rodríguez: ¿Quién va a asumir el costo de….?

Adalberto Bosque: El nombre, si me hace el favor.

Cándido Rodríguez: Cándido Rodríguez, nuevamente. ¿Quién va a asumir el costo? y si se le va a asignar alguna responsabilidad a estas compañías que algunas están todavía operando y otras no están operando, pero me imagino que se pueden contactar y si son responsables se les debe, deben asumir responsabilidad.

Adalberto Bosque: Bien, buena pregunta. El procedimiento que sigue la Agencia de Protección Ambiental Federal que está avalado por la ley, que le da la autoridad a la Agencia de Protección Ambiental Federal cuando tiene conocimiento de un lugar contaminado la Agencia trata de identificar partes responsables. Digo, partes responsables, pudiera ser la compañía que causó la contaminación, el que está operando, el dueño del lugar y entra en unas conversaciones, entra en unas conversaciones. No le estoy diciendo que todo eventualmente van a pagar, van a haber unas conversaciones y si se identifica antes de comenzar la investigación pues la Agencia va donde ella y le dice: "quiero que pagues". O un acuerdo por consentimiento a una orden unilateral, o pudiera ser que la Agencia diga "en esta etapa del proceso yo quiero recopilar un poco más de información para determinar exactamente hacia donde yo voy dirigida", y la Agencia eventualmente identifica, o sea la Agencia costea. Estos son trabajos que valen millones de dólares, son trabajos que valen millones de dólares. La Agencia lleva a cabo la investigación, recopila la información y después dice "vénganse para aquí todas las compañías". Recuérdense, cuando estamos hablando, en este caso mencionamos unas compañías, pero hicimos la salvedad de que aparte de estas compañías anteriormente había otras compañías. Quiere decir que la Agencia, su abogado o su personal está investigando y va a traer en un momento, notifica a todas, les envía cartas, recopila información suficiente para eventualmente sentarse a la mesa de negociación y decirle "aquí está el trabajo, yo he invertido equis cantidad de millones", la limpieza de una parte, recuérdense que esto es solamente en la fuente, la fuente son siete, la remediación no la investigación. La remediación $7.3 millones. "Vamos a sentarnos, tengo suficiente información, vamos a firmar". Las compañías tienen dos opciones, por consentimiento o que la Agencia eventualmente vaya contra ella. La Agencia tiene la autoridad para cobrarle hasta tres veces la cantidad que la Agencia ha invertido. Tiene la autoridad, quiere decir que la Agencia cuando hay compañías. La Agencia va, va a buscar el que le pague lo invertido. Digo lo invertido, no dije lo gastado porque esto es inversión, porque es beneficio a la salud y eventualmente el dinero de la remediación, ¿qué estamos hablando? $7.3 más lo invertido en la investigación, más el costo de la remediación que va a ser el agua subterránea, que yo asumiría que pudiera ser mucho mayor de que la remediación del agua, de la fuente de remediación.

Brenda Reyes: Yo voy a poner… Voy a intervenir aquí para contestar su pregunta. Recientemente terminamos trabajo en un lugar de Superfondo en el pueblo de Vega Baja, donde las compañías lo que se hizo fue un grupo donde estaban las partes potencialmente responsables que fueron identificadas luego de un largo proceso, eso incluyó agencias de gobierno, o sea no solamente son empresas. Hay agencias de gobierno que pueden estar involucradas como partes potencialmente responsables. No vamos a adjudicar esto solamente a verdad, a un ente privado. En este caso el Departamento de la Vivienda, en ese caso específico en Vega Baja, el Departamento de la Vivienda y el Municipio porque era un antiguo vertedero. Se unieron juntos a empresas como fueron Motorola, Pfizer que ya no operaban y echaban los desperdicios en el lugar, pero pues nada, espero poder haber contestado su pregunta, porque mientras él hablaba recordé este caso que es tan reciente, que hace como un mes que cerramos operaciones allí. Incluyó unidad operable uno que era agua subterránea y unidad operable dos que era remoción de suelo. Nosotros recientemente culminamos con unidad operable de un proyecto, yo trabajé casi trece años en ese proyecto.

Adalberto Bosque: Como dijo Brenda, sabes, la Agencia tiene la autoridad para ir contra el que sea. Sea el gobierno o sea una industria privada, o contra todos, eso es bien importante. Si no hubiera partes responsables que tenga el dinero, o la capacidad financiera pues la Agencia pudiera estar costeándolo. Recuérdense estamos en un periodo de tiempo ahora que los chavos son un poco escasos, para el gobierno, estamos para el gobierno estatal y gobierno federal también. Si en un caso que la Agencia de Protección Ambiental Federal tuviera que pagar, la Agencia va por un 10% contra el gobierno, pudiera hasta un 50%, si es una facilidad que pertenece al gobierno pudiera ir hasta un 50%. Si no, hasta un 10%, pero en este caso nosotros entendemos que estamos en diálogo, estamos en diálogo y en evaluación para irnos hacia la implementación de la acción. Bien. Sr. Alcalde.

Isidro A. Negrón, Alcalde: Buenas noches a todos. Isidro Negrón el alcalde de San Germán. Primero que nada agradecer a la EPA por la intervención en este asunto y haber tenido siempre la deferencia desde el momento en que se aprobó en el Superfondo el que este estudio se hiciera me lo notificaran antes de que saliera a la prensa y nos dieron los datos para si la prensa preguntaba uno poder responder. Igual antes de traer esta información a la comunidad, pues también tuvieron la deferencia de reunirse conmigo, presentarme el informe y yo poderlo analizar antes de que se presentara aquí. Así que agradezco esa deferencia. A los residentes de esta comunidad que siempre estuvieron dispuestos a colaborar cuando se le pidió la colaboración de entrar a sus hogares, hacer monitoreo dentro de sus hogares, no todo el mundo está dispuesto a permitir que entren a sus casas, ¿verdad? Entienden que es un recinto sagrado. La pregunta que voy a hacer la voy a hacer para beneficio de los residentes que están aquí presentes. Yo conozco la respuesta pero como no se ha dicho y puede estar en la mente de ellos, la quiero hacer. Aquí no se ha adjudicado todavía quien es el responsable, podrían ser los que estuvieron antes, podrían ser los que están ahora, o podrían haber sido ambos. Si asumimos que los que fueron antes son los responsables y los que están ahora no lo son, pues ciertamente se adjudicará y ellos se harán responsables de la limpieza, pero si se encuentra que los responsables son los que están ahora se inicia un proceso de limpieza conforme aquí se ha establecido, ¿cuál es el mecanismo que se va a establecer para asegurarse que una vez se limpió los que han provocado la contaminación no lo van a volver a hacer?

Adalberto Bosque: Buena pregunta. La Agencia tiene, la Agencia de Protección Ambiental Federal tiene diferentes mecanismos, diferentes leyes. Cuando digo leyes, diferentes programas que trabajan con aire, con desperdicios peligrosos, con descargas a un cuerpo de agua y así sucesivamente, y se le da seguimiento. Se le da seguimiento a las operaciones de las compañías, independientemente el tipo de reglamente para el cual tuvieran que estar cumpliendo. En el caso de aquí en San Germán, como en todos los demás sitios, la Agencia definitivamente de Protección Ambiental Federal le ha dado seguimiento, le ha dado seguimiento a estos lotes, ¿no?, a las compañías que están aquí envueltas, que están envueltos. Los abogados de la Agencia de Protección Ambiental Federal han estado en intercambio de información, pedido de información, intercambio de información y los inspectores de la Agencia de Protección Ambiental Federal han estado dándole seguimiento al cumplimiento de las normas establecidas por estas compañías. Cuando hay caso como este definitivamente la Agencia pues interviene, busca información y hace una investigación para determinar que no esté ocurriendo un derrame, digo un tipo de actividad que siga causando ese tipo de problema de contaminación. Entiéndase los accidentes pueden ocurrir, los accidentes pueden ocurrir, independientemente sean naturales o humanos, pero la Agencia de Protección Ambiental Federal, la Junta de Calidad Ambiental le dan seguimiento a estas compañías para tratar de evitar de que esto ocurra en el futuro, y las compañías definitivamente. Una compañía que tiene una situación como esta con más razón tiene que darle un seguimiento más de cerca para estar seguro de que esta situación no ocurra. Así también del dueño de, en este caso, el Gobierno de Puerto Rico, la compañía de Fomento Industrial es dueña de este y otros parques industriales, alrededor de toda la isla. Entiendo yo que cuando saben de que tienen un problema de contaminación, pues ellos tienen un personal en área de ambiental, área de propiedades donde tienen que darle un seguimiento más de cerca para estar seguro de que esto no vuelva a ocurrir o minimizar de que pueda seguir ocurriendo, ¿bien? De que puede ocurrir, pues definitivamente un accidente pudiera estar ocurriendo. Bien. ¿Alguna otra pregunta?

Brenda, estamos entonces, ¿no? Bien pues entonces… Pregunta por allá. Licenciado.

Pedro Nieves: Muy buenas noches, Pedro Nieves de Fiddler, González y Rodríguez, en representación de Wallace quería hacer la aclaración que en la versión del documento que se les entregó hoy, y eso lo habíamos hablado, el nombre de la compañía está identificado incorrectamente. La compañía que opera actualmente es Wallace Silversmiths Puerto Rico, Ltd. Eso es todo. Buenas noches.

Adalberto Bosque: Gracias por la aclaración. Bien. Ese es el nombre y ese nombre va a estar debidamente corregido. Se piden las excusas, ¿no? Va a estar debidamente corregido. Bien. Si no hay ninguna otra pregunta les pedimos que por favor aquellas personas que no hayan firmado el registro de asistencia, así lo puedan hacer. Cualquier pregunta que puedan tener saben dónde pueden conseguirnos. Algún residente de aquí de San Germán si necesita que vengamos aquí en persona, nos reunamos aquí en su hogar, pues estamos en la mejor disposición de contestarle cualquier pregunta. Muchas gracias y buenas noches.

CERTIFICADO DE TRANSCRIPTORA

Yo, Aledawi Figueroa Martínez, transcriptora de Smile Again Learning Center, Corp. CERTIFICO:

Que la que antecede constituye la transcripción fiel y exacta de la grabación realizada durante la reunión celebrada en el sitio y la fecha que se indican en la página uno de esta transcripción.

Certifico además que no tengo interés en el resultado de ese asunto y que no tengo parentesco en ningún grado de consanguinidad con las partes involucradas en el mismo.

En Isabela, Puerto Rico, a 27 de agosto de 2015.

Aledawi Figueroa Martínez
Smile Again Learning Center, Corp.

APPENDIX VII
RESPONSIVENESS SUMMARY

San German Groundwater Contamination Superfund Site
OU-1

PUBLIC COMMENTS PREPARED IN SUPPORT OF THE RESPONSIVENESS SUMMARY FOR THE RECORD OF DECISION SAN GERMAN GROUNDWATER CONTAMINATION SITE – OU1 SOIL SAN GERMAN, PUERTO RICO

On August 12, 2015, the U.S. Environmental Protection Agency (EPA) released for public comment the Proposed Plan for the San German Groundwater Contamination Site (Site) – Operable Unit 1 Soil. During the public comment period, EPA held a public meeting on August 19, 2015, to discuss and accept comments regarding the Proposed Plan. EPA received verbal comments at the public meeting as well as written comments during the public comment period, which lasted from August 12, 2015 through October 24, 2015. EPA's initial thirty (30) days comment period was extended in response to a request for an extension. This document summarizes comments from the public at the public meeting on August 19, 2015, and those submitted via mail. EPA's responses are provided following each comment.

The comments are grouped generally in the following categories:

- Background
- Remedial Investigation
- Risk Assessments
- Feasibility Study
- Preferred Alternative - Alternative S3
- Vapor
- Miscellaneous

Background

Comment 1: A representative of the current tenant of the CCL property (CCL Label) summarized the company's position with regard to the TCE source area found there. The representative indicated that the company did not arrive at the property until August 1995, and that previous tenants were likely users of TCE. Furthermore, the representative indicated studies at the time of occupancy showed that TCE was already present in soils, and that the company did not use TCE in its processes. Finally, the representative indicated that the CCL property does not contain septic systems (and did not in 1995), and instead uses the Puerto Rico Aqueduct and Sewer Authority (PRASA) sewer system.

Because of these conclusions, CCL asked EPA to delete references to the "CCL lot," "CCL label source area," "CCL Label," or similar terms, and that EPA identify the property by another term without making reference to the name CCL.

Response 1: The name designations "Wallace" and "CCL" for the source areas is made solely for the ease of reference and is not intended to infer a determination of liability on the part of the companies that currently occupy the property. While referring to the property, EPA cites it as the property currently occupied by CCL, and that the lot is owned by the Puerto Rico Industrial Development Company (PRIDCO). As such, the Site reports will not be revised.

Comment 2: CCL further stated that EPA has failed to perform a full and complete search for potentially responsible parties (PRPs) at the Site. Other tenants of the Retiro Industrial Park, including former occupants of the CCL and Wallace lots, and the owners of additional area facilities may also be PRPs for the identified well field contamination. CCL alleges that EPA did not fully research the universe of PRPs and facts associated with 44 area facilities and only recently acknowledged potential contributions of other parties to the releases or threats of releases of hazardous substances affecting the Site by issuing notice letters and/or requests for information to six companies on September 16, 2015.

Response 2: The administrative record was developed to support EPA's findings about releases found at the Site and is not meant to be an exhaustive evaluation about potential enforcement actions that EPA may consider in response to those releases.

Remedial Investigation

Comment 3: Section 1.3.2.2 of the RI Report (CCL Label Section) **-** This section indicates that presently the CCL property does not have septic tanks, a conclusion that is consistent with PRIDCO's original drawings of the CCL building. In some documents found in the review of PRIDCO's files found references to a septic tank in the premises associated with earlier tenants.

Response 3: EPA notes the information provided in the comment.

Comment 4: Section 1.3.2.2 of the RI Report (Wallace Section, 5th paragraph) PRIDCO suggested that the following sentence, "Manufacturing operations at this facility indicate that prior tenants may have generated spent solvents including PCE, TCE, and 1,1,1 trichloroethane (1,1,1 TCA)" be modified as follows: "Manufacturing operations at this facility indicate that site tenants may have generated spent solvents including PCE, TCE, and 1,1,1 trichloroethane (1,1,1 TCA)."

PRIDCO indicated that, in the 4th paragraph of this section, the existing Wallace silverware casting process is described as washing silverware in TCE to remove oil and other surface contaminants. In addition, EPA documents state that in 2006, EPA and the Puerto Rico Environmental Quality Board (PREQB) found drums of waste TCE and oil.

Response 4: EPA notes the information provided in the comment. The final documents for the Site will not be modified, as the change would not change the environmental findings made by the RI Report.

Comment 5: Section 4.2.2.2 of the RI Report (Wallace Section, 1st paragraph) - This paragraph references sampling point WS-02 showing the highest concentrations of PCE (7,960 µg/L) and TCE (900 µg/L). However, Figure 4-1 indicates that the highest concentrations of PCE and TCE were recorded at WS-03, not at WS-02.

Response 5: The commenter is correct: the RI report references WS-02 with the highest groundwater grab sample result, whereas the correct boring reference is WS-03. If results are referenced in any future Site documents, the correction will be made.

Comment 6: Section 5.2 of the RI Report (Soil Saturation Limit)) - The PCE soil saturation limit is described in this paragraph as 166 mg/kg. However, RI Table 5-1 shows the soil saturation limit for PCE to be 145 mg/kg.

Response 6: The commenter is correct. If soil saturation is discussed in any future documents for the Site, the correct soil saturation limit of 145 mg/kg will be used.

Comment 7: The RI Report states that the groundwater flow is to the north-northwest. However, the Report also indicates that the straight alignment of the monitoring wells from the industrial park to the public supply wells makes it difficult to determine the exact flow direction. The north-northwest flow may have been also influenced by the PRASA pumping rate. The RI Report appears to suggest also that there might be a flow more northerly - towards the Guanajibo River - than reported. A representative for CCL further indicated that tributary streams to the river likely act as aquifer drains, and that there is a small creek or stream on the north-northeast side of the CCL property which may have a local influence in groundwater flow direction in a more northerly direction than EPA states.

Furthermore, the USGS Topographic Map from 1966 corresponding to the San German Quadrangle shows the small creek on the north-northeast side of the CCL property. This creek might have been relocated during construction of the industrial park. It is possible that the current creek or any previous water body in the area that might have been affected during construction of the industrial park could influence the groundwater in the area to a more northerly or northeast direction than EPA states.

Response 7: The RI Report supports the conclusion that when the three PRASA wells were pumping, these wells likely influenced the direction of groundwater flow. The RI Report further acknowledges that the direction of groundwater flow is probably shifting back to a more natural flow direction (toward the river), now that the three wells are no longer in service. Additional monitoring wells will be installed to more precisely define the current direction of groundwater flow and the impact of groundwater flow on the distribution of contamination as part of Operable Unit 2 for the Site.

Comment 8: A representative for CCL stated that EPA cannot conclude that the CCL property is a source of TCE without discarding the potential scenario that the TCE found at CCL originates from degradation of PCE that had migrated from the property currently occupied by Wallace. The RI Report indicates that PCE degrades into TCE, DCE, and Vinyl Chloride. Furthermore, according to the RI Report, except for PCE (where the highest concentrations in groundwater and soil were found at Wallace), most of the highest concentrations of TCE, *cis*-1,2-DCE, vinyl chloride and 1,1-DCE in soil and groundwater where found at the CCL. This might indicate that PCE is migrating from Wallace and degrading into the substances found at CCL, as the groundwater flows in a more northerly direction towards the small creek and other storm water channels that may be acting as aquifer drains. This potential scenario is consistent with some of these contaminants of concern (COCs) being found in the surface water samples at the small creek and at the storm water channel adjacent to CCL. The RI Report also states that these COCs would rapidly volatilize based on half-lives of several hours to several days. Therefore, unless a discharge of these COCs into the small creek or storm water channel had occurred hours or several days before the sampling - keeping in mind that CCL does not use these COC- the presence of these substances in the creek could be an additional indication of degradation and migration through groundwater flow into these bodies of water acting as aquifer drains.

EPA states in the RI Report that separate plumes of PCE and TCE originate at Wallace and at CCL, respectively. It also mentions that PCE predominates at Wallace and TCE predominates at CCL. However, there is no documented evidence in the administrative record showing that the COCs were used or spilled at CCL by any of its tenants. Furthermore, higher TCE vapor concentrations at Wallace do not support EPA's theory of two separate plumes.

Response 8: TCE can be a degradation product of PCE under certain environmental conditions, though it is a common chemical for degreasing and cleaning purposes in many industrial operations. Based on the pattern of contamination observed at the two source areas, EPA believes that the TCE in both soil and groundwater in the vicinity of the building currently occupied by CCL does not originate at Wallace. TCE is observed at much higher levels than PCE in both soil and groundwater near the building currently occupied by CCL, whereas PCE is observed at much higher levels than TCE in both soil and groundwater in the vicinity of the other source area. In addition, TCE observed in soil samples above the water table in the vicinity of the building currently occupied by CCL cannot have plausibly originated at Wallace. The hydrological conditions and sampling results support that there are two separate source areas.

As stated in the response to comment number 7, additional groundwater investigations will be conducted at the Site for OU-2 to resolve the uncertainty in the groundwater flow direction.

Soil gas samples at Wallace and at other lots were not collected for the purpose of delineating the extent of the soil or groundwater source areas, and were not used in the RI for that purpose. Soil gas concentrations are influenced by a variety of factors, and it is not possible to use the RI soil gas data as a delineation tool to predict soil or groundwater transportation pathways, or to attribute the TCE contamination to one source or two, as the commenter suggests.

Comment 9: No subsurface soil and/or groundwater samples were collected in "Street 8" (Calle B) of the industrial park between CCL and Wallace. Samples in this area might have provided better technical data to determine potential sources and groundwater flow direction in the area.

Response 9: The commenter is correct that no soil or groundwater samples were collected in Calle B during the RI. As stated previously, additional monitoring wells will be installed for OU- 2 to resolve the uncertainty in the direction of groundwater flow and to fill other data gaps.

Comment 10: Surface water and sediment samples were collected in the storm water channel between the Property and the PRIDCO lot formerly leased by Baytex, and at the small creek north/northeast of CCL. Samples, however, appear to have been collected downstream of other storm water discharge points from the remaining properties of the industrial park into the creek and into the channels that run adjacent to CCL. There are also storm water pipes or collection systems from other areas of the industrial park that discharge into the Property through its southwest and southeast sides and crossing CCL towards the small creek. Therefore, it is also possible that samples taken downstream of the storm water discharges point might be reflecting potential discharges of these COCs from other facilities in the industrial park. Also, the Administrative Record does not provide any information or documentation regarding depth and structural integrity of the storm water system of the industrial park, specifically, the segments of that system that crosses through CCL to the discharge point at the small creek.

Response 10: Surface water and sediment samples were collected at locations near the industrial buildings in Retiro Industrial Park that were identified during a Site reconnaissance visit to the area. Samples were collected both in catch basins and in channelized streams. Only a limited number of sample results exceeded the screening criteria used for the RI Report and the FS determined that remediation of surface water and sediment was not needed since the soil remedy is expected to reduce contaminants in these media in the future. Therefore, EPA concluded that the TCE and PCE source areas were the likely source of these surface water/sediment detections; no other source areas were identified in the RI.

Comment 11: CCL stated that EPA's theory is that waste solvents and or waste waters were likely discharged to the ground surface resulting in contamination of surface and subsurface soil at the two source areas. This theory, however, may be in conflict with soil sampling results at the CCL property, noting that, with few exceptions, were not found in surface soils, but at greater depths. Also, EPA provides no explanation as to why contaminants were found only at certain depths but not consistently at all depths. CCL suggests that this inconsistent pattern of contaminant distribution could indicate potential cross-contamination or “false positive” results.

Response 11: Data used in the RI was validated using the quality control/quality assurance plans included in the administrative record, following standard EPA protocols. Only data that passed EPA’s validation protocols were used in the RI, and the results are considered valid and appropriate for use in the RI report, the risk assessments, and the FS report. Given that the releases may have occurred many years prior to the RI sampling, minimal detections of VOCs in shallow soils is not surprising, as the contaminants readily volatilize when exposed to air. The “intermittent” results in the subsurface could be related to the type of soil present, and the porosity and/or permeability of the soil in the unsaturated zone, or the sample frequency. None of these supposed anomalies disagree with EPA’s assessment of the source area.

Comment 12: There is not enough information in the studies to discard the possibility that changes in groundwater levels during dry and wet seasons might have also contributed to the presence of the contaminants in soils at different depth levels, and at multiple locations within the industrial park. CCL understands that there might be a possibility that soil contamination may be related to changes in groundwater levels during dry or wet seasons.

Response 12: The selected remedy for OU-1 will address contamination above and below the water table, including contamination within the zone of water level fluctuation due to wet and dry season changes in the water table.

Comment 13: According to section 4.2.2.3 of the RI Report, EPA took 43 groundwater samples at 37 locations along 11 transects at the Site. Samples from transects T0-2 and T0-3 showed detections of TCE (2.53J, 1.32J) respectively, and cis-1,2-DCE (0.76J, 2.01J) respectively, below the EPA's screening criteria of 5 µg/L for TCE and 70 for *cis*-1,2-DCE. These transects are up-gradient of the CCL property and were installed at the PRIDCO lot immediately adjacent to the eastern boundary of the CCL property. CCL identified parties that are currently occupying upgradient lots (GE Industrial of PR, LLC, and Pace Analytical del Caribe Inc.). Furthermore, CCL indicated that there had been violations of the Resource Conservation and Recovery Act by both these companies, and that at least GE Industrial handled solvents similar to the ones found at CCL, suggesting that there was an upgradient source.

Response 13: Very low levels of TCE and *cis*-1,2-DCE were detected in groundwater screening samples from transect T0 as described in the comment. The detections in transects T1 and T2, located adjacent to the building occupied by CCL, were orders of magnitude higher than in transect T0. Since the screening samples from these transects were collected from the very top of the water table, contaminant migration from another source to transects T1 and T2 is unlikely, especially when the soil and groundwater "grab" sample results are also considered. Utilizing all of the data collected during the RI, it is clear that significant soil and groundwater contamination is present on the east side of the building currently occupied by CCL.

Comment 14: A representative for CCL noted that catch basins on the CCL property receive drainage from upgradient properties in the industrial park, and indicated that these upgradient properties could be sources of the contamination found on the CCL property. Furthermore, the CCL representative noted that catch basins on upgradient properties were not sampled, suggesting that further investigations are needed into these properties.

Response 14: Data from multiple media collected during the RI were evaluated to determine the sources of contamination in the soil, and the connection between the soil contamination and the groundwater plumes that were identified. In the vicinity of the building occupied by CCL, elevated concentrations of TCE and other chlorinated compounds were observed in the soil and in the groundwater at the top of the water table, linking the two media. It is highly unlikely that the contamination identified in the unsaturated soil could be transported from some upgradient location, and the clear link between the soil and groundwater contaminants indicates the groundwater plume was also unlikely to originate at a separate location.

As part of the supplemental groundwater investigations for OU-2, additional monitoring wells will be installed to confirm contaminant concentrations and to enhance the understanding of the groundwater flow direction.

Risk Assessments

Comment 15: The risk assessments prepared to evaluate the significance of contaminant exposures are misleading and exaggerate Site risks. The risks identified in the screening-level ecological risk assessment (SLERA) report are primarily based upon theoretical exposures to naturally occurring metals associated with the igneous geology of the area. After documenting excessive ecological risk through several exposure mechanisms, it was concluded in the SLERA that Site-related contaminants pose no risk to ecological receptors. The HHRA also identified various risks to human health due to the presence of naturally-occurring metals including vanadium and chromium (also, all chromium was assumed to have been present in its most toxic valence state, which is virtually never the case). Future risks attributable to the presence of chlorinated VOCs in groundwater were largely based upon the assumption that the Retiro Industrial Park would become a future residential development, which is to be specifically prohibited under institutional land use controls described in the Proposed Plan.

Response 15: The risk assessments performed for the Site fully complied with EPA protocols and procedures for conducting both human health and ecological risk assessments at Superfund sites.

Feasibility Study

Comment 16: Section 1.5.4 of the FS Report indicates that the hydraulic conductivity for the saprolite zone was estimated to be between 5 to 15 feet per day. It indicates that, with a hydraulic gradient of 0.022, the estimated groundwater flow velocity would be between 40 to 120 feet per year. Using the effective porosity included in Table 5-1 of the RI report (0.43), a representative for CCL computed groundwater flow velocities that are twice as much as the values shown in the FS Report. Also, it is not clear how the groundwater flow velocity in the saprolite will increase if the hydraulic gradient is reduced to 0.011. Since the reviewer did not find in the report the raw data used in the calculations presented in this section, it was not possible to assess whether or not they are accurate, but recommended that the groundwater flow velocity estimated values included in the FS be checked for accuracy.

Response 16: The groundwater flow conditions will be evaluated further as part of the additional work for OU-2. The OU-1 FS did not rely on these calculated values in preparing or assessing remedial alternatives.

Comment 17: Section 2.2.2 of the FS Report - Site Related ARARs and TBCs (1st paragraph) - This paragraph makes reference to Table 2-1 and Table 2-2. However, these tables make reference to the Cidra Ground Water Contamination Site.

Response 17: The commenter is correct; the Site name on the two tables referenced is incorrect. The information in the tables, however, is correct and applicable to the San German Groundwater Contamination Site.

Comment 18: Section 2.6.2.3 Groundwater Use Restrictions - This section indicates that groundwater use restrictions or well drilling restrictions are generally administrated by the

PREQB. However, it is our understanding that these restrictions in Puerto Rico are administrated by the Department of Natural and Environmental Resources and not by the PREQB.

Response 18: The commenter is correct, groundwater use restrictions or well drilling restrictions would be administered by the Department of Natural and Environmental Resources.

Comment 19: Currently, the only identified source materials for potential groundwater contamination at the Wallace location consist of chlorinated VOC-impacted soils within the vadose zone, predominantly at one discrete area of the property. The purpose of the proposed remedy for OU-1 of the Site is to address soil contamination that acts as a continuing source of groundwater contamination, referred to in CERCLA practice as "source material" or "principal threats". Data from the RI demonstrate that elevated concentrations of chlorinated VOCs in the upper seven feet of soil within two primary source areas (SAs) of the Wallace lot (SA-2 and SA-3) rapidly decrease with depth to undetectable or relatively low "estimated" concentrations just above the shallow water table. Due to restriction of rainfall infiltration as a result of surface paving, chlorinated VOC source material from SA-3 has not migrated significantly to impact underlying groundwater. It also appears likely that chlorinated VOC contamination in the deepest vadose zone soils at SA-l has occurred as a result of vapor migration from underlying groundwater constituents, and not from a surface source. In addition, contaminated groundwater is generally not considered source material under CERCLA, and chlorinated VOCs do not appreciably bond to soils in the saturated zone unless non-aqueous phase liquid (NAPL) is present. Contaminant transport is evident within the groundwater plume and no NAPL was identified or observed during RI investigations. Therefore, the only principal threat that has been shown to exist at the Wallace location in the Retiro Industrial Park is chlorinated VOC contamination in the soil vadose zone, principally from source area SA-2, and potentially due to future contaminant migration from SA-3.

Response 19: The contaminated soil identified during the RI is clearly linked to the extremely high concentrations of PCE and TCE in the groundwater beneath the building occupied by Wallace and is considered “source material” for the groundwater contamination. While concentrations in the soil column may be somewhat variable, the data clearly show the link between the identified contamination in the soil and the groundwater. It is, therefore, appropriate for EPA to select a remedy for OU-1 that addresses these high concentrations of contamination in the soil, and at the same time, using the same technology, address the extremely high concentrations in the very shallow groundwater.

<u>Preferred Alternative - Alternative S3</u>

Comment 20: The Plan states that EPA selected soil vapor extraction (SVE) and dual-phase extraction (DPE)/*in-situ* treatment as the preferred alternative for remediation at both sources. EPA identified five source areas to be remediated. SA-4 SA-5 are located at the CCL property. The Plan proposes *in-situ* treatment for SA-4 and DPE/*in-situ* treatment for SA-5. The Plan, however, does not provide enough information to determine whether excavation at SA-4 would be less expensive and more effective than *in-situ* treatment, considering that contamination in that area appears to be localized at a depth of 5 to 7 feet. Regarding SA-5, the plan proposes the installation of 4 wells at CCL, versus 13 at SA-2 located at Wallace. However, it does not provide a breakdown of the costs for each of the properties when it is likely that costs at one property would be less than at the other. As previously stated, CCL understands based on the Administrative Record, that it is very likely that there is only one source of contamination at the Site. Notwithstanding, EPA should break down the costs of the different remedial alternatives by SAs and properties since the analytical data is vastly different in concentrations at each of the properties and costs would be different. Consequently, for purposes of the remedy selection costs, the two properties and its SAs should not be considered as one big site, with the same weight of importance and remedy.

Response 20: The cost details for Alternative S3, the preferred alternative, are provided in the FS report in Appendix A. The alternative was costed with the assumption that all of the identified areas targeted for remediation would be addressed simultaneously, not as individual remediation projects. EPA does not agree with the assessment that the contamination is from a single source. The soil contamination above the water table on the eastern side of the building occupied by CCL Label could not have originated at another location and the groundwater contamination in this area is clearly linked to the source area on the eastern side of the building. However, additional groundwater investigations will be conducted for Operable Unit 2, as discussed in responses to previous comments.

Comment 21: The remedial actions proposed for SA-2 are redundant and potentially counter-productive to achieve the remediation goals of the Proposed Plan. The conceptual remedy for SA-2 summarized in the Proposed Plan anticipates simultaneous operation of SVE and DPE systems, followed by *in-situ* treatment. Some form of active vapor intrusion mitigation would also ostensibly be initiated soon, and would continue until subsurface conditions preclude significant chlorinated VOC vapor generation and migration. The Wallace location is underlain by a vadose zone between 14 and 30 feet thick. For this relatively thin soil column, simultaneous operation of SVE and DPE technologies is redundant since both rely on reduced pressure extraction. If a third sub-slab vapor ventilation system were installed to address vapor intrusion, the redundancy would be further exaggerated. Additionally, operation of a DPE system in the shallow groundwater stratum would increase the dissolved oxygen concentration of the residual groundwater due to aspiration of atmosphere air. Since subsequent *in-situ* reductive dechlorination requires anaerobic (oxygen free) conditions, the sequential implementation of these two technologies would be counter-productive. Consequently, not only is DPE not necessary for response to Site risks, its application may even preclude the successful implementation of an otherwise viable remedial option for OU-2 groundwater.

Response 21: The purpose of the conceptual description of the remedy for SA-2 is to cover all the components that may be required to reduce the contaminant mass at the SA-2 area and meet the remedial action objectives. The selection and sequencing of these remedial technologies to achieve the maximum contaminant mass reduction would be completed as part of the remedial design. If pre-design investigations indicate the presence of dense non-aqueous phase liquids

(DNAPLs), the application of DPE could quickly and significantly reduce the contaminant mass prior to application of in situ treatment. The final selection and sequence of treatment for area SA-2 and all other treatment areas will be part of the remedial design for OU-1.

Comment 22: The optimum methodology for chlorinated VOC remediation at SA-2 of the Wallace location is SVE. For the same reasons SVE has been selected as the preferred technology for capturing and treating chlorinated VOC contamination at SA-l and SA-3 of the Wallace location, SVE should be applied as the initial remedial technique for SA-2. Subject to development of design criteria during the pre-design investigation, a well-engineered SVE system could capture chlorinated VOCs from the subsurface, extending from the groundwater/vadose zone interface to sub-slab vapor accumulation areas. Additionally, the effectiveness of SVE could be established expeditiously, well before permitting of a DPE effluent discharge could be accomplished for mobilization of that technology. Finally, utilization of SVE to remove source material from the vadose zone would allow for simultaneous pilot testing of *in-situ* groundwater treatment technologies for the elevated chlorinated VOC groundwater concentration areas of OU-2.

Response 22: Based on currently available data at SA-1 and SA-3, the released contaminants may not have reached the groundwater and that is why only SVE has been proposed. As specified in the previous response, the pre-design field investigations will gather additional data that will allow the remedial design to select the final treatment technologies and their sequencing for each source area. EPA has concluded that SVE alone may not be sufficient to address SA-2. The final remedial components and sequencing for SA-2 will be addressed in remedial design.

Comment 23: From the limited data collected to date, reductive dechlorination appears to provide the most promising *in-situ* treatment technique for groundwater remediation. Even with current antagonistic conditions of dissolved oxygen and low organic carbon concentrations in the shallow groundwater, reductive dechlorination of PCE is occurring as evidenced by identified decomposition products. Observed ORP data and favorable Puerto Rico weather conditions should allow conditions to be optimized for chlorinated VOC degradation in areas of highest concentration, followed by monitored natural attenuation of the entire groundwater plume.

Response 23: EPA will thoroughly evaluate potential remedies for OU-2 (groundwater) in a separate feasibility study and present the results to the public in a Proposed Plan for OU-2.

Vapor Intrusion

Comment 24: Wallace has already initiated implementation of an appropriate vapor exposure mitigation technology to protect its employees, and no additional vapor intrusion removal action is necessary. At the Wallace location, elevated sub-slab VOC levels have been measured in the past, but no validated exceedances of OSHA's permissible exposure limits have been identified. Nevertheless, Wallace has implemented a vapor intrusion mitigation initiative consisting of sealing entryways (such as foundation cracks, utility penetrations and floor drains) and applying a seal coating to the floors in its manufacturing buildings; increasing natural building ventilation by installing fans and opening windows; and verifying the effectiveness of these programs through periodic workplace VOC monitoring.

Response 24: The high concentrations of vapors beneath the concrete foundation of the building occupied by Wallace represent a situation that, if conditions in the foundation were to change, concentrated vapors could migrate inside the work space of the building and affect the wellbeing of the employees. EPA expects to continue to work with Wallace through EPA's removal program to protect the health of workers in the future. The remedy selected for OU-1 is expected to remove the source areas that are the source of the vapors.

Comment 25: The subslab soil gas and indoor air sampling results at the former Baytex lot, downgradient from CCL, exhibited concentrations of TCE and PCE that are orders of magnitude higher than those detected at CCL. Therefore, it seems obvious that the presence of these substances at the former Baytex lot is either the result of releases at that lot or as a result from migration of substances from other neighboring properties, but not from CCL.

Response 25: The sub-slab soil gas and indoor air results at the former Baytex building originate from the groundwater contaminant plume that is associated with the building occupied by Wallace. The contamination associated with the building occupied by Wallace exhibits higher concentrations of PCE rather than TCE. The vapor results at the former Baytex building also follow this pattern. The soil and groundwater contamination associated with the building occupied by CCL has higher concentrations of TCE than PCE. This pattern was also observed in the vapor samples collected at the building occupied by CCL. The data appears to support that the elevated vapor levels collected from the former Baytex building originate from the plume associated with the source area identified at the building occupied by Wallace.

<u>Miscellaneous</u>

Comment 26: Has any study been performed in the San Germán area to see if the incidence of cancer has increased during the time the contamination in the three PRASA wells was used for drinking purposes? EPA has also identified some wells that may have been used by people for years and may have caused health problems such as cancer or more serious illnesses.

Response 26: A health study of the San Germán area has not been performed. However, PRASA samples and tests public supply wells on a quarterly basis, so the contamination in the supply wells was identified and verified to be below the federal maximum contaminant level (MCL) from 2001 to 2005. When the concentration of PCE approached the MCL in the Retiro well, PRASA stopped pumping at that location and eventually shut down all three supply wells in the area. At that point, the case was referred to EPA and resulted in the listing of the Site on the National Priorities List in 2008.

EPA is aware that some residents of the Santa Marta neighborhood have private wells. During the remedial investigation, EPA sampled the wells for which we could obtain access. EPA has communicated the sample results to the owners and has worked with the municipality to educate well owners regarding the risks of using well water that could be contaminated. EPA will continue to work with local officials to educate the local residents who could be impacted by the contamination.

Comment 27: Who will assume the cost for the work at the Site? Will companies that caused the problem be held liable? Some of them are still in operation, others are not, but they can be contacted and, if they are liable they must assume responsibility.

Response 27: EPA is evaluating the companies that currently occupy the properties where contamination has been identified and is also evaluating records of past tenants of the properties to determine liability for the contamination.

Comment 28: What mechanism will be established to ensure that once the Site is cleaned up the companies will not re-contaminate the properties?

Response 28: The businesses that currently occupy the industrial park do not currently use the industrial solvents that are associated with the Site. EPA and PREQB have established programs that inspect and evaluate environmental issues at industrial facilities. The facilities in the industrial park will continue to be monitored and inspected to insure that good and lawful waste management procedures are followed.

Comment 29: The version of the Proposed Plan EPA provided contains a misstated name for Wallace. The company currently operating there is Wallace Silversmiths of Puerto Rico, Ltd.

Response 29: EPA regrets the error and will ensure that the correct name will be used in future documents.

APPENDIX VIII
FIGURES

San German Groundwater Contamination Superfund Site
OU-1

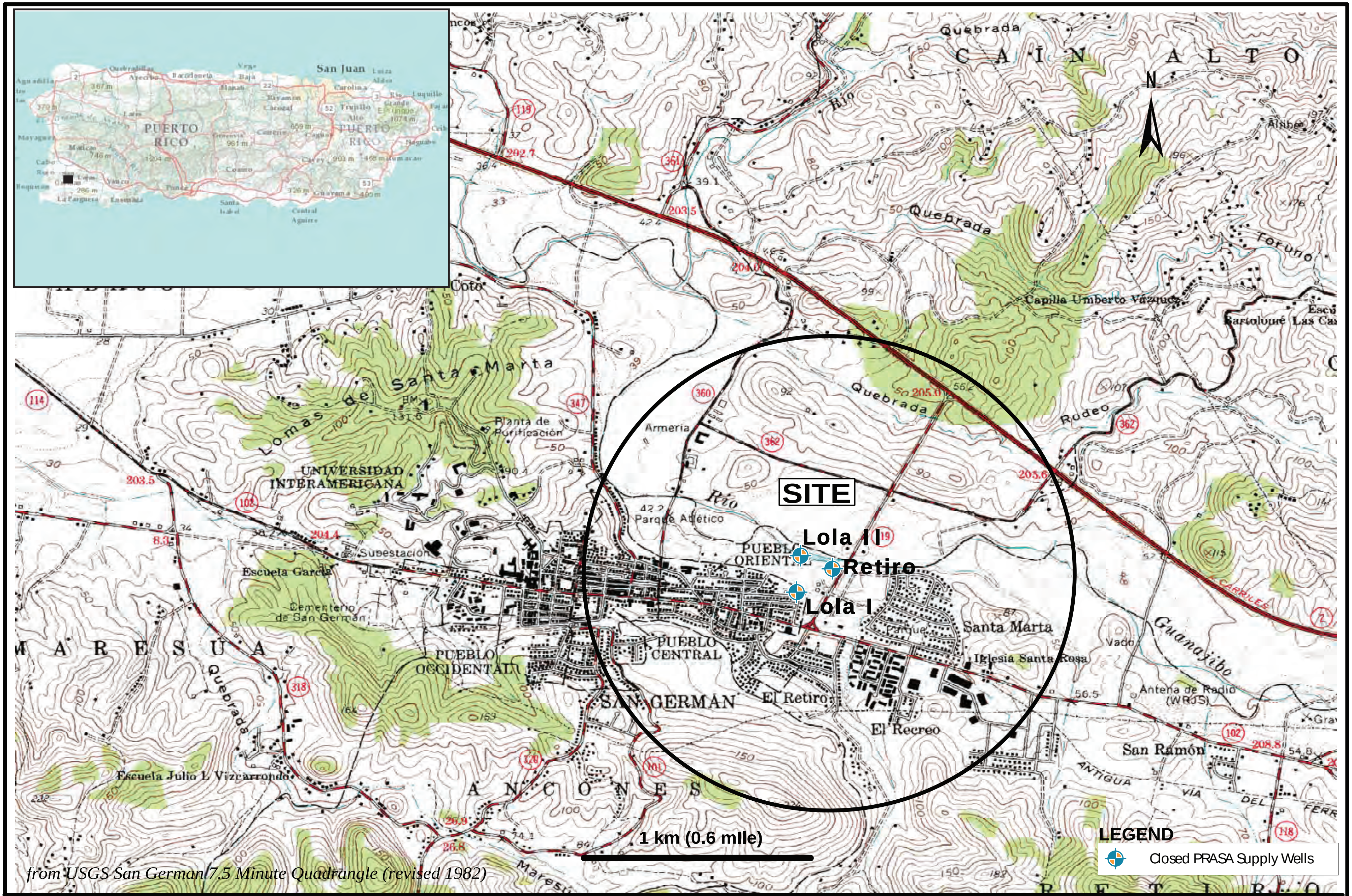
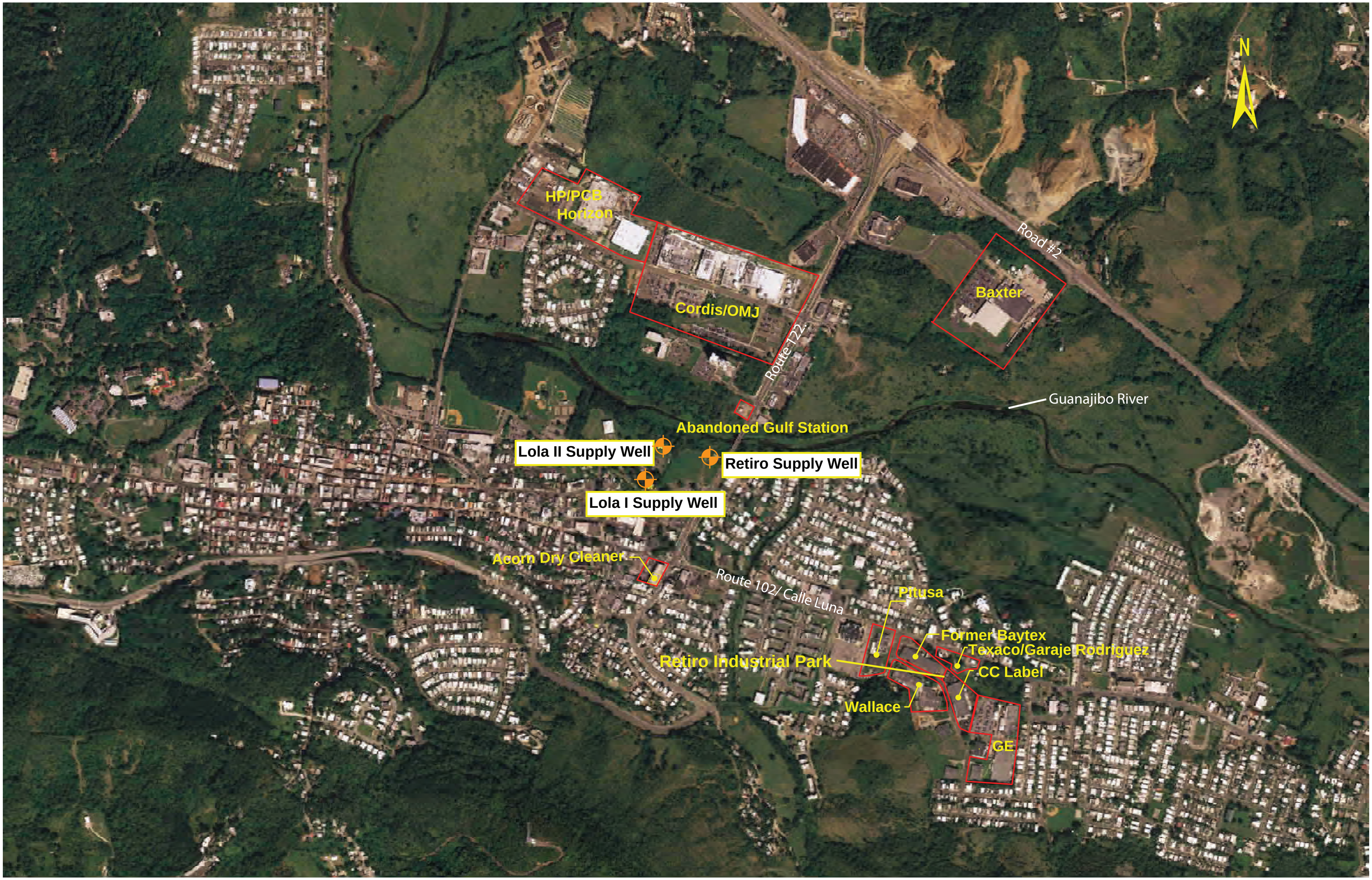


Figure 1
Site Location Map
San German Groundwater Contamination Site
San German, Puerto Rico

CDM Smith

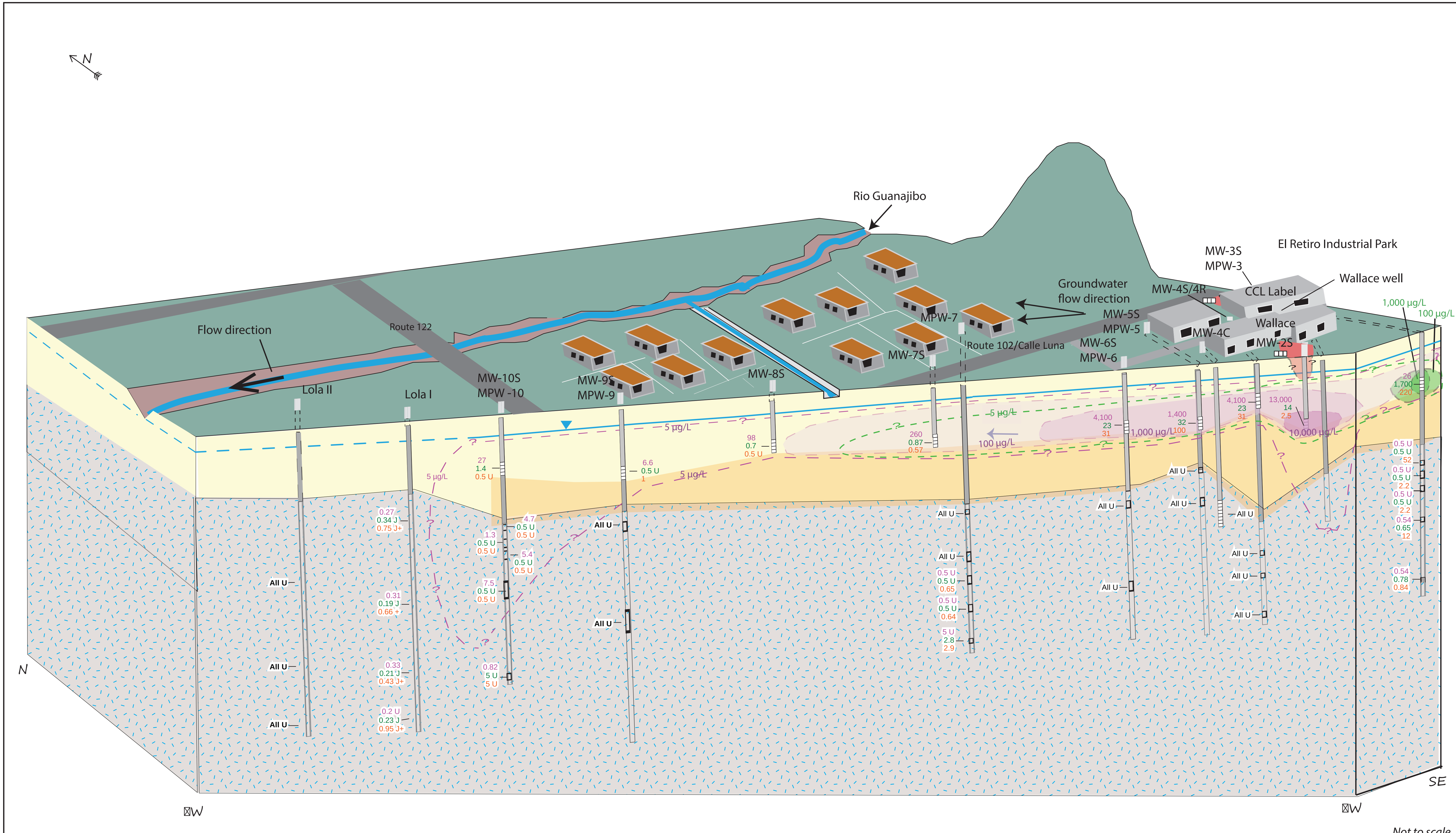


1,000 0 500 1,000

Approximate Scale (in feet)

Figure 2
Site Map
San German Groundwater Contamination Site
San German, Puerto Rico

CDM Smith



Legend

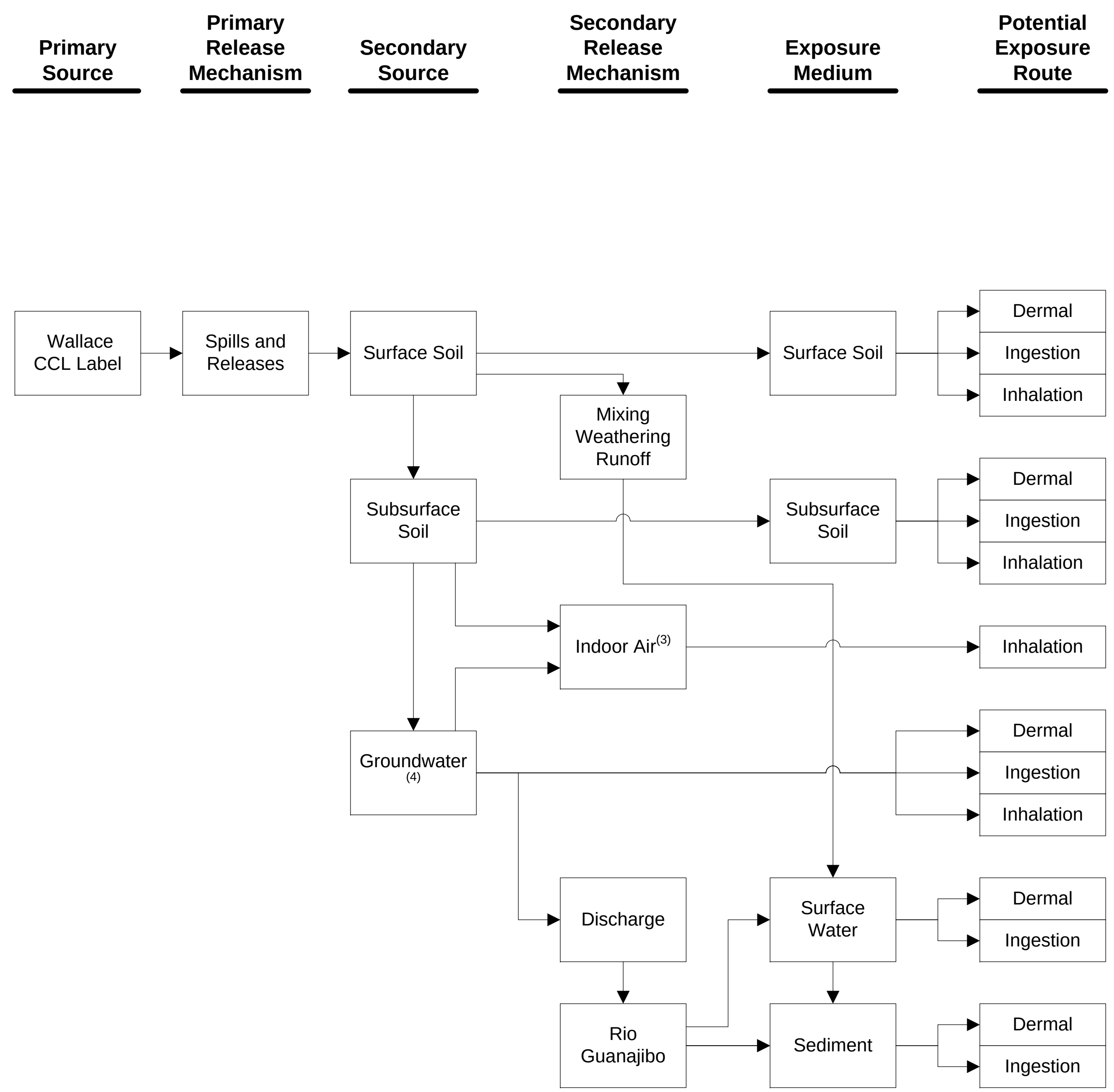
- Saprolite Zone
- Serpentinite Bedrock
- Approximate Spill Area
- Contaminant flow path
- Groundwater level
- Tetrachloroethene (PCE) contamination plume
- Trichloroethene (TCE) contamination plume
- Unknown/unstable zone

1.3 - Tetrachloroethene detection
2.8 - Trichloroethene detection
2.9 - cis-1,2-Dichloroethene detection
U - Not detected
Concentrations in micrograms per liter

J - Estimated value
J+ - Estimated high value

Figure 3
Conceptual Site Model
San German Groundwater Contamination Site
San German, Puerto Rico

CDM Smith



Exposure Medium	Potential Exposure Route	Current Land-Use Receptor: Wallace, CCL Label [1] – Worker	Current: Wallace, CCL Label [1] – Trespasser	Current: Rio Guanajibo – Recreational User	Future Land-Use Receptor: Potential Source Areas [2] – Scenario 1: Industrial/ Commercial – Worker	Future: Scenario 2: Residential – Resident	Future: All Scenarios – Trespasser	Future: All Scenarios – Construction Worker	Future: Rio Guanajibo – Recreational User
Surface Soil	Dermal	●	●	○	●	●	●	●	○
	Ingestion	●	●	○	●	●	●	●	○
	Inhalation	●	●	○	●	●	●	●	○
Subsurface Soil	Dermal	○	○	○	○	○	○	●	○
	Ingestion	○	○	○	○	○	○	●	○
	Inhalation	○	○	○	○	○	○	●	○
Indoor Air	Inhalation	●	○	○	●	●	○	○	○
Groundwater	Dermal	○	○	○	○	●	○	○	○
	Ingestion	○	○	○	●	●	○	○	○
	Inhalation	○	○	○	○	●	○	○	○
Surface Water	Dermal	○	○	●	○	○	○	○	●
	Ingestion	○	○	●	○	○	○	○	●
Sediment	Dermal	○	○	●	○	○	○	○	●
	Ingestion	○	○	●	○	○	○	○	●

Legend:

● complete exposure pathway

○ incomplete/insignificant exposure pathway

Note:

[1] Samples collected from Acorn Dry Cleaners, Pitusa-National Lumber, and Former Baytex were under pavement, so they are not evaluated under current land-use scenario. Same receptors are evaluated for each exposure area separately.

[2] Potential Source Areas are Acorn Dry Cleaners, Wallace, Pitusa-National Lumber, Former Baytex, and CCL Label. Same receptors are evaluated for each exposure area separately.

[3] Indoor air is evaluated qualitatively.

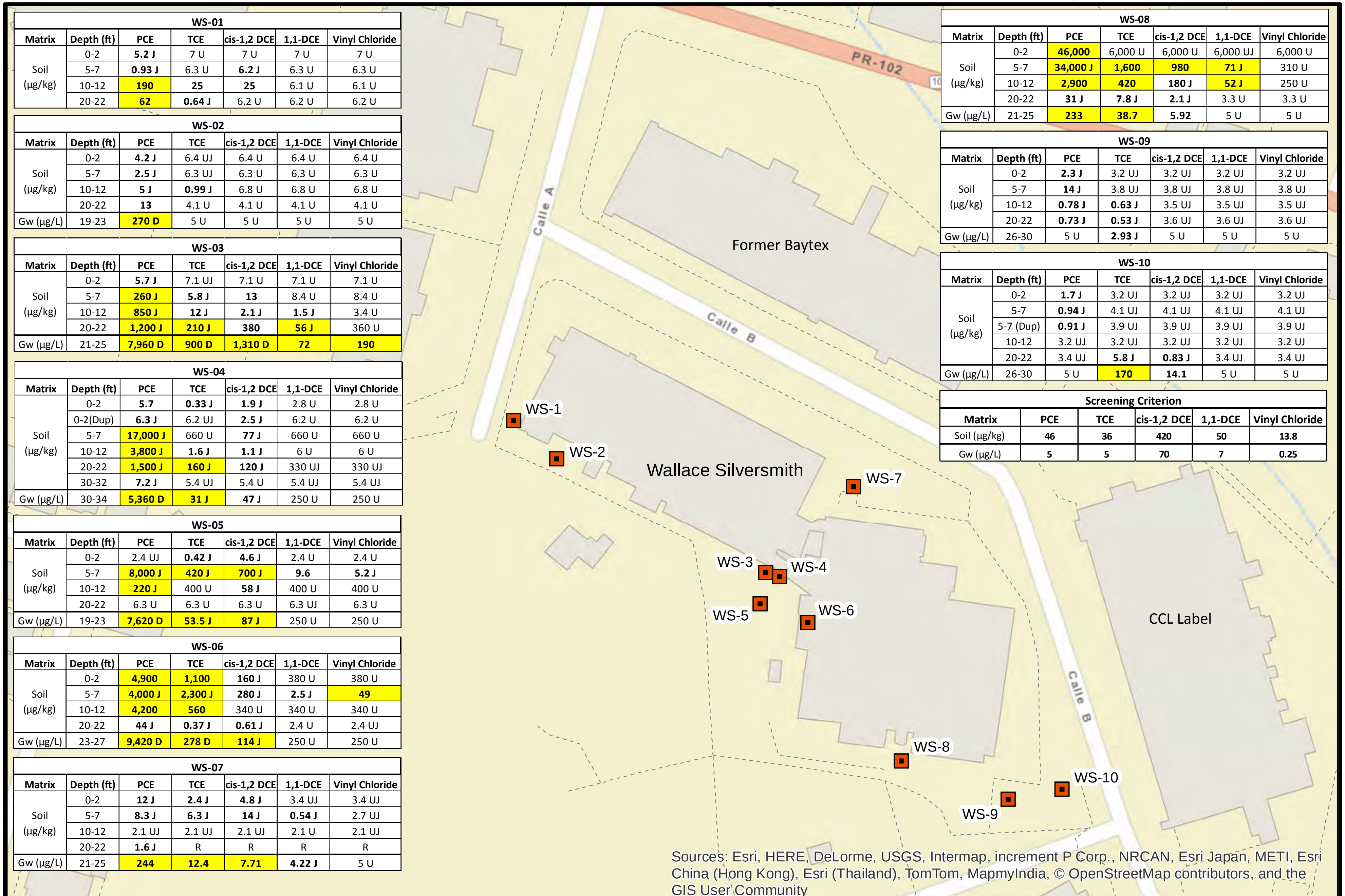
[4] Groundwater is evaluated as one plume using all monitoring well samples.

Trespasser and Recreational User: Adolescents (12 to <18 years old)

Resident: Adults and Children (birth to <6 years old)

Figure 4
Conceptual Site Model
San German Groundwater Contamination Site
San German, Puerto Rico

CDM Smith



WS-01

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	5.2 J	7 U	7 U	7 U	7 U
	5-7	0.93 J	6.3 U	6.2 J	6.3 U	6.3 U
	10-12	190	25	25	6.1 U	6.1 U
	20-22	62	0.64 J	6.2 U	6.2 U	6.2 U

WS-02

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	4.2 J	6.4 UJ	6.4 U	6.4 U	6.4 U
	5-7	2.5 J	6.3 UJ	6.3 U	6.3 U	6.3 U
	10-12	5 J	0.99 J	6.8 U	6.8 U	6.8 U
	20-22	13	4.1 U	4.1 U	4.1 U	4.1 U
Gw (µg/L)	19-23	270 D	5 U	5 U	5 U	5 U

WS-03

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	5.7 J	7.1 UJ	7.1 U	7.1 U	7.1 U
	5-7	260 J	5.8 J	13	8.4 U	8.4 U
	10-12	850 J	12 J	2.1 J	1.5 J	3.4 U
	20-22	1,200 J	210 J	380	56 J	360 U
Gw (µg/L)	21-25	7,960 D	900 D	1,310 D	72	190

WS-04

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	5.7	0.33 J	1.9 J	2.8 U	2.8 U
	0-2(Dup)	6.3 J	6.2 UJ	2.5 J	6.2 U	6.2 U
	5-7	17,000 J	660 U	77 J	660 U	660 U
	10-12	3,800 J	1.6 J	1.1 J	6 U	6 U
	20-22	1,500 J	160 J	120 J	330 UJ	330 UJ
	30-32	7.2 J	5.4 UJ	5.4 U	5.4 UJ	5.4 UJ
Gw (µg/L)	30-34	5,360 D	31 J	47 J	250 U	250 U

WS-05

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	2.4 UJ	0.42 J	4.6 J	2.4 U	2.4 U
	5-7	8,000 J	420 J	700 J	9.6	5.2 J
	10-12	220 J	400 U	58 J	400 U	400 U
	20-22	6.3 U	6.3 U	6.3 U	6.3 UJ	6.3 U
Gw (µg/L)	19-23	7,620 D	53.5 J	87 J	250 U	250 U

WS-06

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	4,900	1,100	160 J	380 U	380 U
	5-7	4,000 J	2,300 J	280 J	2.5 J	49
	10-12	4,200	560	340 U	340 U	340 U
	20-22	44 J	0.37 J	0.61 J	2.4 U	2.4 UJ
Gw (µg/L)	23-27	9,420 D	278 D	114 J	250 U	250 U

WS-07

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	12 J	2.4 J	4.8 J	3.4 UJ	3.4 UJ
	5-7	8.3 J	6.3 J	14 J	0.54 J	2.7 UJ
	10-12	2.1 UJ	2.1 UJ	2.1 UJ	2.1 U	2.1 UJ
	20-22	1.6 J	R	R	R	R
Gw (µg/L)	21-25	244	12.4	7.71	4.22 J	5 U

WS-08

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	46,000	6,000 U	6,000 U	6,000 UJ	6,000 U
	5-7	34,000 J	1,600	980	71 J	310 U
	10-12	2,900	420	180 J	52 J	250 U
	20-22	31 J	7.8 J	2.1 J	3.3 U	3.3 U
Gw (µg/L)	21-25	233	38.7	5.92	5 U	5 U

WS-09

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	2.3 J	3.2 UJ	3.2 UJ	3.2 UJ	3.2 UJ
	5-7	14 J	3.8 UJ	3.8 UJ	3.8 UJ	3.8 UJ
	10-12	0.78 J	0.63 J	3.5 UJ	3.5 UJ	3.5 UJ
	20-22	0.73 J	0.53 J	3.6 UJ	3.6 UJ	3.6 UJ
Gw (µg/L)	26-30	5 U	2.93 J	5 U	5 U	5 U

WS-10

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	1.7 J	3.2 UJ	3.2 UJ	3.2 UJ	3.2 UJ
	5-7	0.94 J	4.1 UJ	4.1 UJ	4.1 UJ	4.1 UJ
	5-7 (Dup)	0.91 J	3.9 UJ	3.9 UJ	3.9 UJ	3.9 UJ
	10-12	3.2 UJ	3.2 UJ	3.2 UJ	3.2 UJ	3.2 UJ
	20-22	3.4 UJ	5.8 J	0.83 J	3.4 UJ	3.4 UJ
Gw (µg/L)	26-30	5 U	170	14.1	5 U	5 U

Screening Criterion

Matrix	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	46	36	420	50	13.8
Gw (µg/L)	5	5	70	7	0.25

LEGEND

■ Soil/Groundwater Screening Location

Notes:
PCE- tetrachloroethene
TCE- trichloroethene
DCE - dichloroethene
Gw - groundwater
µg/kg - micrograms per kilogram
µg/L - micrograms per liter

D - diluted
J - estimated
U - not detected
ft - feet

N

0 50 100 200 Feet

Figure 5
Wallace Soil and Groundwater Screening Sampling Results
San German Groundwater Contamination Site
San German, Puerto Rico

CDM Smith

PN-01						
Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	**1.4 J**	3 UJ	3 U	3 U	3 U
	5-7	**0.79 J**	2.9 U	2.9 U	2.9 U	2.9 U
	10-12	**0.53 J**	3.1 U	3.1 U	3.1 U	3.1 U
	20-22	**0.53 J**	3.3 UJ	3.3 U	3.3 U	3.3 U
Gw (µg/L)	22-26	**262 D**	**3.29 J**	5 U	**6.28**	5 U

PN-02						
Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	**0.9 J**	3.4 U	3.4 U	3.4 U	3.4 U
	0-2	3.8 UJ	3.8 UJ	3.8 U	3.8 U	3.8 U
	5-7	**1.2 J**	3.3 UJ	3.3 UJ	3.3 UJ	3.3 UJ
	10-12	**0.89 J**	2.8 UJ	2.8 UJ	2.8 UJ	2.8 UJ
	20-22	3.3 UJ	3.3 UJ	3.3 U	**0.47 J**	3.3 UJ
	30-32	**130**	**0.35 J**	**0.39 J**	**2.7 J**	3.3 U

PN-03						
Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	3.7 UJ	3.7 UJ	3.7 U	**0.47 J**	3.7 U
	5-7	3 UJ	3 UJ	3 U	3 U	3 U
	10-12	3.3 UJ	3.3 UJ	3.3 U	3.3 U	3.3 U
	20-22	3.1 UJ	**2.2 J**	3.1 U	3.1 U	3.1 U

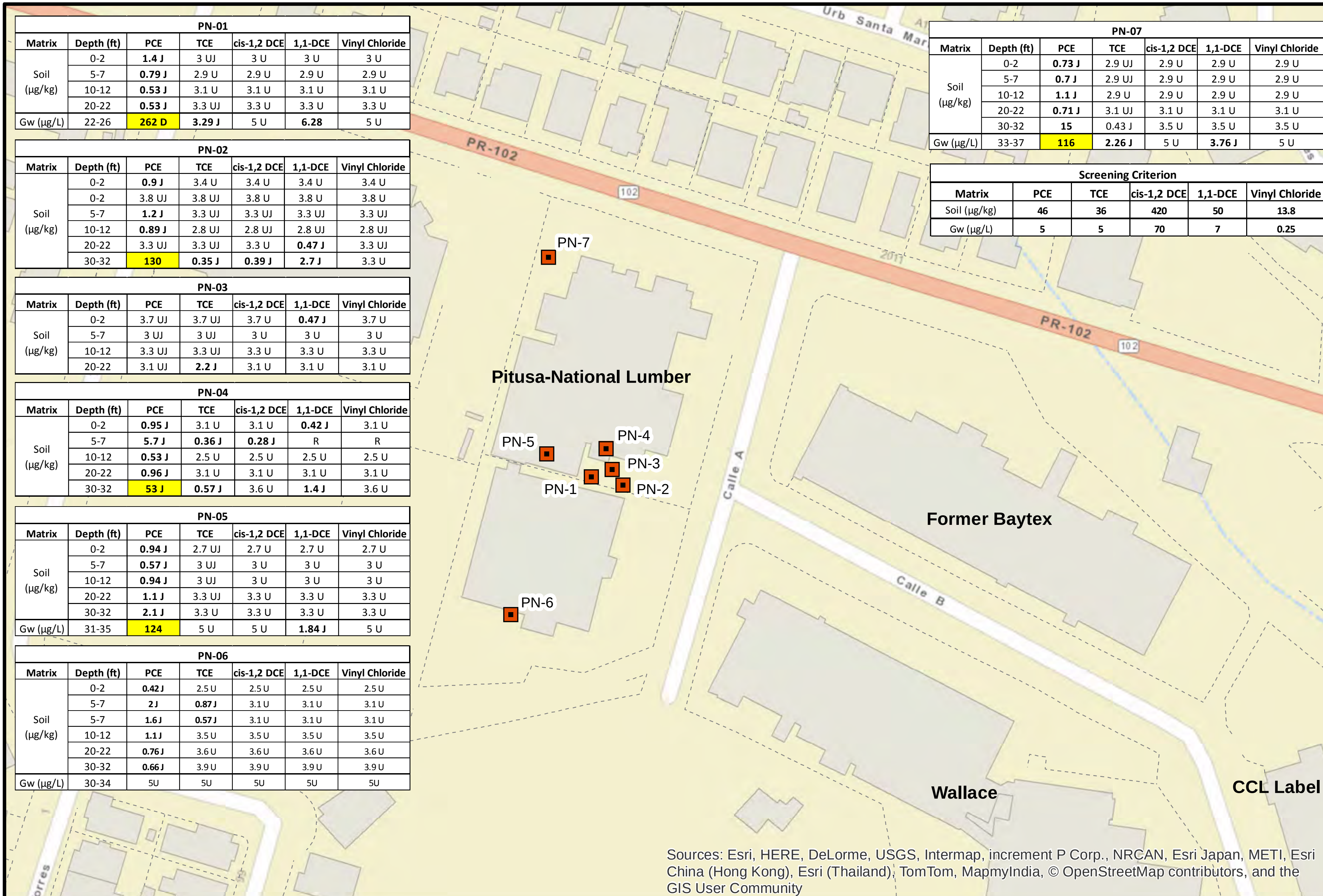
PN-04						
Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	**0.95 J**	3.1 U	3.1 U	**0.42 J**	3.1 U
	5-7	**5.7 J**	**0.36 J**	**0.28 J**	R	R
	10-12	**0.53 J**	2.5 U	2.5 U	2.5 U	2.5 U
	20-22	**0.96 J**	3.1 U	3.1 U	3.1 U	3.1 U
	30-32	**53 J**	**0.57 J**	3.6 U	**1.4 J**	3.6 U

PN-05						
Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	**0.94 J**	2.7 UJ	2.7 U	2.7 U	2.7 U
	5-7	**0.57 J**	3 UJ	3 U	3 U	3 U
	10-12	**0.94 J**	3 UJ	3 U	3 U	3 U
	20-22	**1.1 J**	3.3 UJ	3.3 U	3.3 U	3.3 U
	30-32	**2.1 J**	3.3 U	3.3 U	3.3 U	3.3 U
Gw (µg/L)	31-35	**124**	5 U	5 U	**1.84 J**	5 U

PN-06						
Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	**0.42 J**	2.5 U	2.5 U	2.5 U	2.5 U
	5-7	**2 J**	**0.87 J**	3.1 U	3.1 U	3.1 U
	5-7	**1.6 J**	**0.57 J**	3.1 U	3.1 U	3.1 U
	10-12	**1.1 J**	3.5 U	3.5 U	3.5 U	3.5 U
	20-22	**0.76 J**	3.6 U	3.6 U	3.6 U	3.6 U
	30-32	**0.66 J**	3.9 U	3.9 U	3.9 U	3.9 U
Gw (µg/L)	30-34	5U	5U	5U	5U	5U

PN-07						
Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	**0.73 J**	2.9 UJ	2.9 U	2.9 U	2.9 U
	5-7	**0.7 J**	2.9 UJ	2.9 U	2.9 U	2.9 U
	10-12	**1.1 J**	2.9 U	2.9 U	2.9 U	2.9 U
	20-22	**0.71 J**	3.1 UJ	3.1 U	3.1 U	3.1 U
	30-32	**15**	0.43 J	3.5 U	3.5 U	3.5 U
Gw (µg/L)	33-37	**116**	**2.26 J**	5 U	**3.76 J**	5 U

Screening Criterion					
Matrix	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	**46**	**36**	**420**	**50**	**13.8**
Gw (µg/L)	**5**	**5**	**70**	**7**	**0.25**



Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

LEGEND

■ Soil/Groundwater Screening Location

Notes:
PCE- tetrachloroethene
TCE- trichloroethene
DCE - dichloroethene
Gw - groundwater
µg/kg - micrograms per kilogram
µg/L - micrograms per liter

D - diluted
J - estimated
U - not detected
ft - feet

N

0 50 100 200 Feet

Figure 6
Pitusa Soil and Groundwater Screening Sampling Results
San German Groundwater Contamination Site
San German, Puerto Rico

CDM Smith

FB-01

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	**0.98 J**	3.2 UJ	3.2 U	3.2 U	3.2 U
	5-7	**0.88 J**	3.1 UJ	3.1 U	3.1 U	3.1 U
	10-12	**0.87 J**	2.9 UJ	2.9 U	2.9 U	2.9 U
	20-22	**97 J**	3.3 UJ	3.3 U	**2.6 J**	3.3 U
GW (µg/L)	20-24	**832**	**3.45 J**	**7.52**	**13.9**	5 U

FB-02

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	**0.69 J**	3.5 UJ	3.5 U	3.5 U	3.5 U
	5-7	**0.58 J**	2.9 U	2.9 U	2.9 U	2.9 U
	10-12	**0.82 J**	2.7 U	2.7 U	2.7 U	2.7 U
	20-22	**93 J**	**1.2 J**	**0.75 J**	3.5 UJ	3.5 U
	30-32	**33**	3.2 U	3.2 U	3.2 UJ	3.2 U
GW (µg/L)	32-36	**906 D**	**7.28**	**8.04**	**14.6**	5 U

FB-03

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	**0.91 J**	3.2 UJ	3.2 U	3.2 UJ	3.2 U
	5-7	**0.84 J**	3.3 U	**2.6 J**	3.3 U	3.3 U
	10-12	**6.1**	**0.52 J**	**0.58 J**	4.2 UJ	4.2 U
	10-12 (dup)	**0.71 J**	2.3 U	2.3 U	**0.29 J**	2.3 U
	20-22	**53**	**0.36 J**	**0.4 J**	**0.65 J**	2.9 U
GW (µg/L)	24-28	**1,500 D**	**10.6**	**9.41**	**20.1**	5 U

FB-04

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	**1.4 J**	2.9 U	2.9 U	2.9 U	2.9 U
	5-7	**1.1 J**	3.6 U	3.6 U	3.6 U	3.6 U
	10-12	**150**	**8.6**	**9.6**	5.7 UJ	5.7 U
	20-22	**3.1**	3 U	3 U	3 U	3 U
	30-32	**3.7**	2.8 U	2.8 U	2.8 U	2.8 U
GW (µg/L)	32-36	**134**	**12**	**13.7**	5 U	5 U

FB-05

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	**0.83 J**	3.1 U	3.1 U	3.1 U	3.1 U
	5-7	**1.5 J**	**0.36 J**	**3.6**	3.5 U	**1.2 J**
	10-12	**180 J**	**5.4**	**6.3**	3 U	3 U
GW (µg/L)	20-24	**2,690 D**	**122 D**	**158 D**	50 U	50 U

FB-06

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	**0.55 J**	3.5 U	3.5 U	3.5 U	3.5 U
	5-7	**0.93 J**	3.2 U	**2.5 J**	3.2 U	3.2 U
	10-12	**5.3 J**	**2.5 J**	**1.6 J**	R	R
	20-22	**32**	**2 J**	**2.1 J**	2.7 U	2.7 U
	30-32	**20 J**	**0.94 J**	**0.68 J**	2.9 U	2.9 U
GW (µg/L)	32-36	**246**	**24.1**	**89.3**	5 U	5 U

FB-07

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	**1.1 J**	**0.49 J**	R	R	R
	5-7	**1.8 J**	**0.86 J**	**1.2 J**	3.4 U	3.4 U
	10-12	**3.1 J**	**4.3**	**4.7**	3.4 U	3.4 U
GW (µg/L)	32-36	5 U	**16.1**	5 U	5 U	5 U

FB-08

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	**1.2 J**	2.8 U	2.8 U	2.8 U	2.8 U
	5-7	**38**	**3.1**	**0.34 J**	3 U	3 U
	10-12	**12**	**3.1 J**	**1.1 J**	3.4 U	3.4 U
GW (µg/L)	32-36	**47.4**	**29.9**	**19.1**	5 U	5 U

FB-09

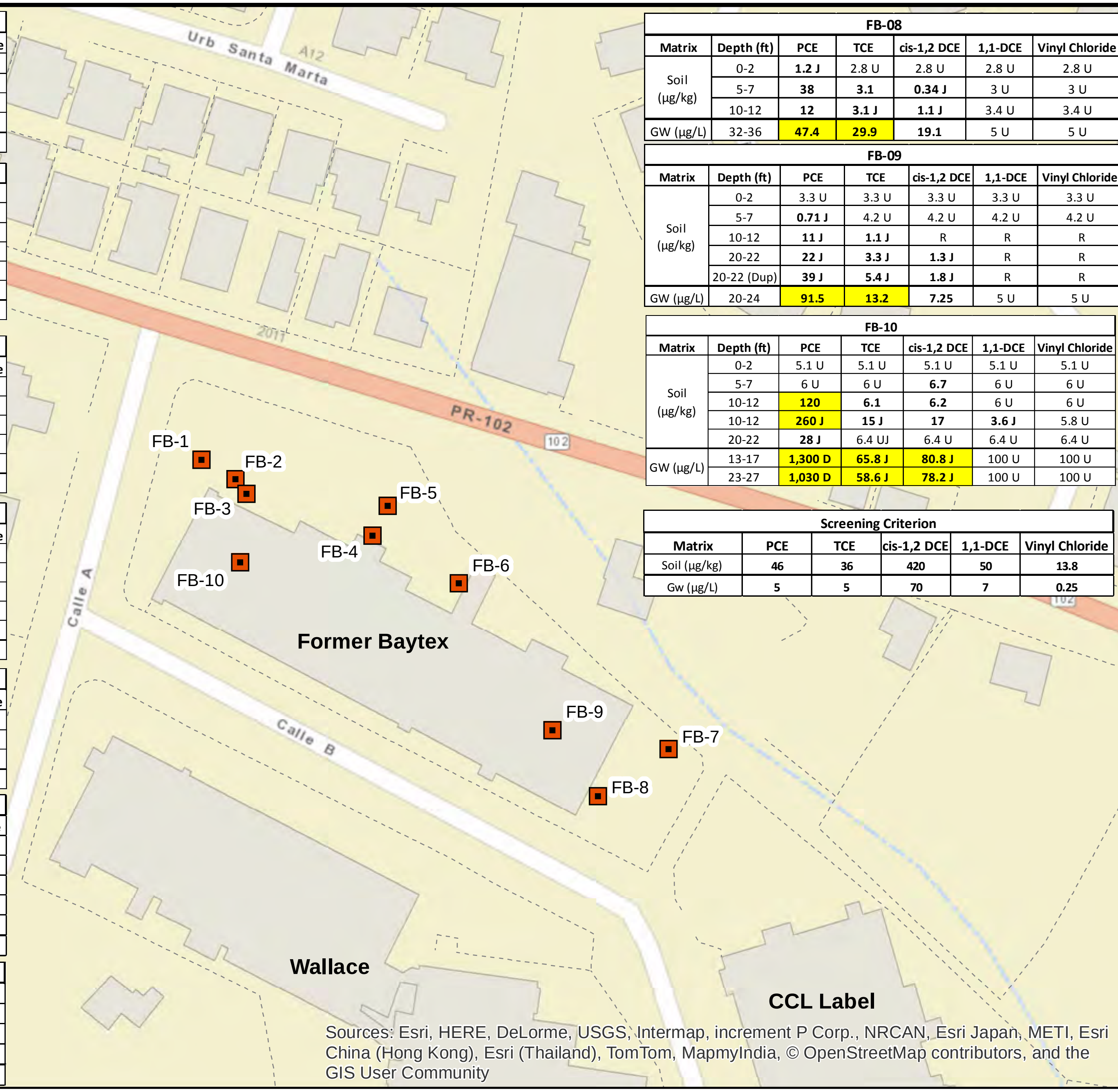
Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U
	5-7	**0.71 J**	4.2 U	4.2 U	4.2 U	4.2 U
	10-12	**11 J**	**1.1 J**	R	R	R
	20-22	**22 J**	**3.3 J**	**1.3 J**	R	R
	20-22 (Dup)	**39 J**	**5.4 J**	**1.8 J**	R	R
GW (µg/L)	20-24	**91.5**	**13.2**	**7.25**	5 U	5 U

FB-10

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U
	5-7	6 U	6 U	**6.7**	6 U	6 U
	10-12	**120**	**6.1**	**6.2**	6 U	6 U
	10-12	**260 J**	**15 J**	**17**	**3.6 J**	5.8 U
	20-22	**28 J**	6.4 UJ	6.4 U	6.4 U	6.4 U
GW (µg/L)	13-17	**1,300 D**	**65.8 J**	**80.8 J**	100 U	100 U
	23-27	**1,030 D**	**58.6 J**	**78.2 J**	100 U	100 U

Screening Criterion

Matrix	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	46	36	420	50	13.8
Gw (µg/L)	5	5	70	7	0.25



LEGEND

■ Soil/Groundwater Screening Location

Notes:
PCE- tetrachloroethene
TCE- trichloroethene
DCE - dichloroethene
Gw - groundwater
µg/kg - micrograms per kilogram
µg/L - micrograms per liter

D - diluted
J - estimated
U - not detected
ft - feet

N

0 50 100 200 Feet

Figure 7
Former Baytex Soil and Groundwater Screening Sampling Results
San German Groundwater Contamination Site
San German, Puerto Rico

CDM Smith

CCL-1

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	5.6 U	5.6 U	5.6 U	5.6 U	5.6 U
	5-7	9.8 U	9.8 U	9.8 U	9.8 U	9.8 U
	10-12	71	2,500	90	7.4 U	7.4 U
	20-22	24	3,600	10	5.3 U	5.3 U
Gw (µg/L)	19.5-23.5	450	27,700	52 J	100 U	100 U

CCL-2

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	5.2 U	5.2 U	5.2 U	5.2 U	5.2 U
	5-7	10 U	10 U	65	10 U	3.2 J
	10-12	6.8 U	69	3.9 J	6.8 U	6.8 U
	20-22	5.1 U	110	2.5 J	5.1 U	5.1 U
	20-22 (Dup)	5.4 U	30	1.2 J	5.4 U	5.4 U
Gw (µg/L)	26-30	5 U	775	11	5 U	5 U

CCL-3

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	4.8 U	4.8 U	2.8 J	4.8 U	4.8 U
	5-7	7.2 U	7.2 U	7.2 U	7.2 U	7.2 U
	10-12	6.8 U	40	51	6.8 U	6.8 U
	20-22	5.2 U	1.1 J	2.4 J	5.2 U	5.2 U
Gw (µg/L)	20-24	5 U	26.1	39.6	5 U	5 U

CCL-4

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	11 U	3.7 J	11 U	11 U	11 U
	5-7	640 U	230 J	4,400	9.1 U	520 J
	10-12	6.5 U	12	22	6.5 U	6.5 U
	20-22	2.7 J	25	2.3 J	4.8 U	4.8 U
Gw (µg/L)	20-24	18.7	127	505	1.89 J	25.2

CCL-5

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	5.5 U	5.5 U	5.5 U	5.5 U	5.5 U
	5-7	12 U	23	11 J	12 U	12 U
	10-12	7.2 U	7.2 U	7.2 U	7.2 U	7.2 U
	20-22	4.4 U	8.9	2.1 J	4.4 U	4.4 U
Gw (µg/L)	17-21	5 U	13.4	17.4	5 U	5 U

CCL-6

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	6.4 U	6.4 U	6.4 U	6.4 U	6.4 U
	0-2 (Dup)	5.5 U	5.5 U	5.5 U	5.5 U	5.5 U
	5-7	7.1 U	3.7 J	2.9 J	7.1 U	7.1 U
	10-12	7 U	7.5	6 J	7 U	7 U
	20-22	4.6 U	7.2	8.4	4.6 U	4.6 U
Gw (µg/L)	18-22	0.66 J	46.5	40.4	5 U	5 U

CCL-7

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	8.9 U	8.9 U	8.9 U	8.9 U	8.9 U
	5-7	6.1 U	4.8 J	130	6.1 U	3.4 J
	10-12	7 U	5.8 J	2.9 J	7 U	7 U
Gw (µg/L)	13-17	0.72 J	18.3	76.6	5 U	5 U

CCL-8

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	6.3 U	6.3 U	2.6 J	6.3 U	1.7 J
	5-7	8.9 U	2,800	3,300	84	390 J
	10-12	6.1 U	5.3 J	10	6.1 U	6.1 U
Gw (µg/L)	13-17	250 U	1,230	5,560	250 U	250 U

CCL-9

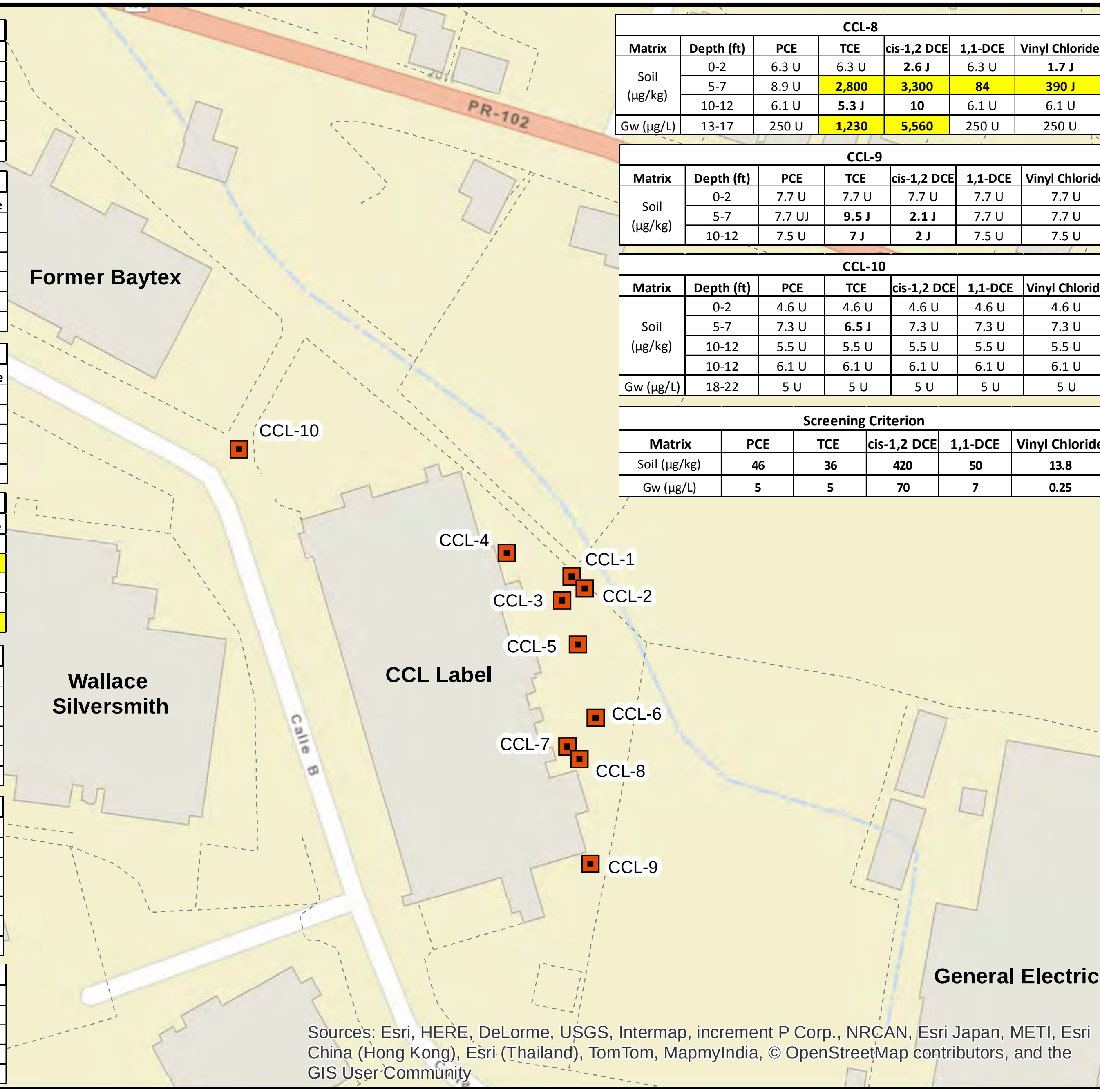
Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	7.7 U	7.7 U	7.7 U	7.7 U	7.7 U
	5-7	7.7 UJ	9.5 J	2.1 J	7.7 U	7.7 U
	10-12	7.5 U	7 J	2 J	7.5 U	7.5 U

CCL-10

Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	4.6 U	4.6 U	4.6 U	4.6 U	4.6 U
	5-7	7.3 U	6.5 J	7.3 U	7.3 U	7.3 U
	10-12	5.5 U	5.5 U	5.5 U	5.5 U	5.5 U
	10-12	6.1 U	6.1 U	6.1 U	6.1 U	6.1 U
Gw (µg/L)	18-22	5 U	5 U	5 U	5 U	5 U

Screening Criterion

Matrix	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	46	36	420	50	13.8
Gw (µg/L)	5	5	70	7	0.25



Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

LEGEND

■ Soil/Groundwater Screening Location

Notes:
PCE- tetrachloroethene
TCE- trichloroethene
DCE - dichloroethene
Gw - groundwater
µg/kg - micrograms per kilogram
µg/L - micrograms per liter

D - diluted
J - estimated
U - not detected
ft - feet

N

0 50 100 200 Feet

Figure 8
CCL Label Soil and Groundwater Screening Sampling Results
San German Groundwater Contamination Site
San German, Puerto Rico

CDM Smith

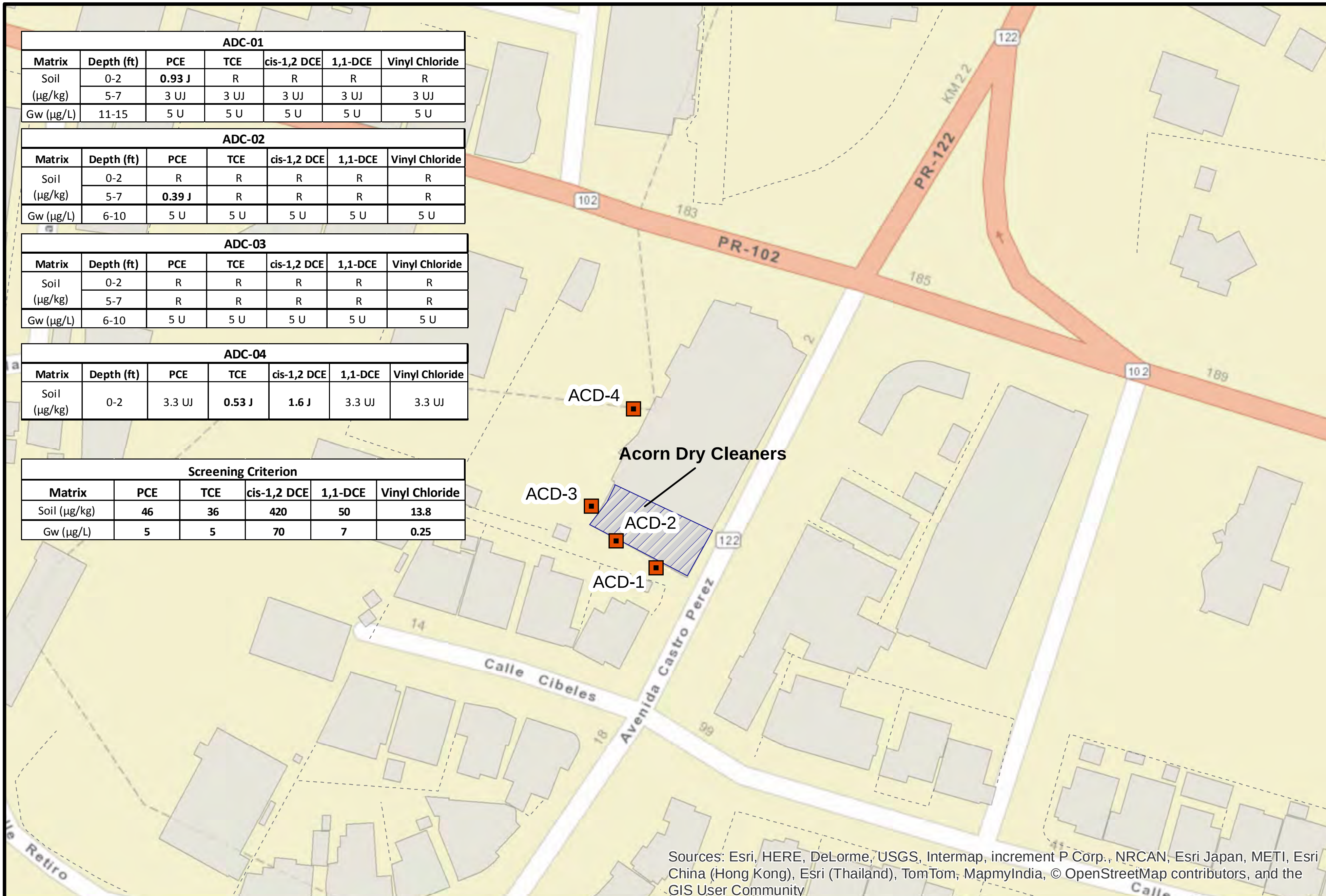
ADC-01						
Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	**0.93 J**	R	R	R	R
	5-7	3 UJ	3 UJ	3 UJ	3 UJ	3 UJ
Gw (µg/L)	11-15	5 U	5 U	5 U	5 U	5 U

ADC-02						
Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	R	R	R	R	R
	5-7	**0.39 J**	R	R	R	R
Gw (µg/L)	6-10	5 U	5 U	5 U	5 U	5 U

ADC-03						
Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	R	R	R	R	R
	5-7	R	R	R	R	R
Gw (µg/L)	6-10	5 U	5 U	5 U	5 U	5 U

ADC-04						
Matrix	Depth (ft)	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	0-2	3.3 UJ	**0.53 J**	**1.6 J**	3.3 UJ	3.3 UJ

Screening Criterion					
Matrix	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Soil (µg/kg)	46	36	420	50	13.8
Gw (µg/L)	5	5	70	7	0.25



LEGEND

Soil/Groundwater Screening Location

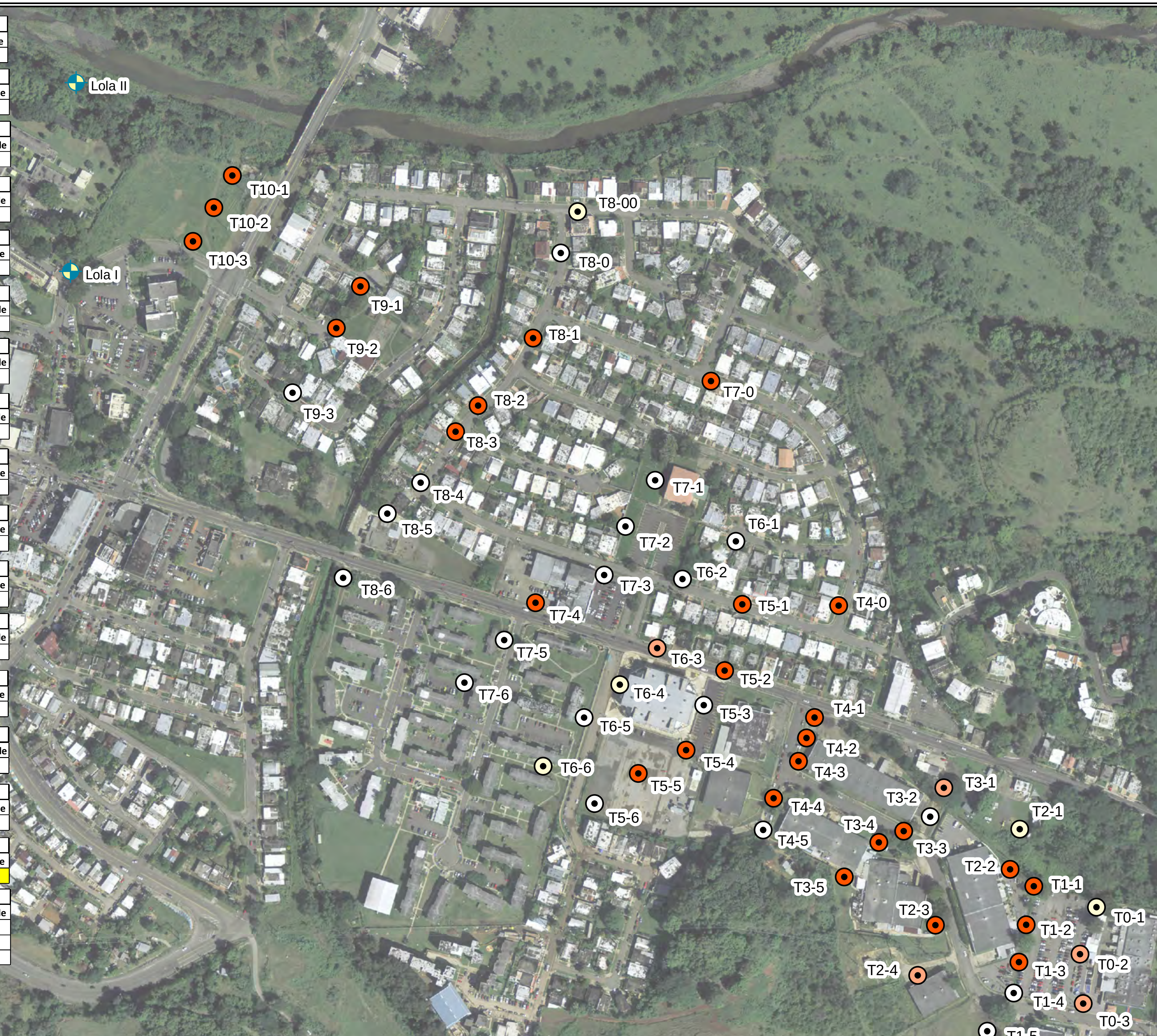
Notes:
PCE- tetrachloroethene
TCE- trichloroethene
DCE - dichloroethene
Gw - groundwater
µg/kg - micrograms per kilogram
µg/L - micrograms per liter

D - diluted
J - estimated
U - not detected
ft - feet

0 40 80 160 Feet

Figure 9
Acorn Dry Cleaners Soil and Groundwater Screening Sampling Results
San German Groundwater Contamination Site
San German, Puerto Rico

CDM Smith



T10-1

Matrix	Depth (ft)	PCE	TCE	cis-1,2-DCE	1,1-DCE	Vinyl chloride
GW[1]	32-36	**34.3**	**1.03 J**	5 U	5 U	5 U

T10-2

Matrix	Depth (ft)	PCE	TCE	cis-1,2-DCE	1,1-DCE	Vinyl chloride
GW[1]	39.5-43.5	**39.4**	**0.61 J**	5 U	5 U	5 U

T10-3

Matrix	Depth (ft)	PCE	TCE	cis-1,2-DCE	1,1-DCE	Vinyl chloride
GW[1]	49.2-53.2	**22.3**	**0.71 J**	5 U	5 U	5 U

T9-1

Matrix	Depth (ft)	PCE	TCE	cis-1,2-DCE	1,1-DCE	Vinyl chloride
GW[1]	41-45	**35.9**	**0.87 J**	**0.97 J**	5 U	5 U

T9-2

Matrix	Depth (ft)	PCE	TCE	cis-1,2-DCE	1,1-DCE	Vinyl chloride
GW[1]	32.5-36.5	**25.3**	5 U	5 U	5 U	5 U

T8-1

Matrix	Depth (ft)	PCE	TCE	cis-1,2-DCE	1,1-DCE	Vinyl chloride
GW[1]	30.5-34.5	**21.3**	**8.57**	**12.9**	**0.82 J**	5 U

T8-2

Matrix	Depth (ft)	PCE	TCE	cis-1,2-DCE	1,1-DCE	Vinyl chloride
GW[1]	24.7-28.7	**103**	**0.6 J**	5 U	**1.9 J**	5 U

T8-3

Matrix	Depth (ft)	PCE	TCE	cis-1,2-DCE	1,1-DCE	Vinyl chloride
GW[1]	26.6-30.6	**34.6**	5 U	5 U	**0.75 J**	5 U

T7-0

Matrix	Depth (ft)	PCE	TCE	cis-1,2-DCE	1,1-DCE	Vinyl chloride
GW[1]	13.8-17.8	**6.89**	**16.1**	**64.5**	**1.06 J**	5 U

T7-4

Matrix	Depth (ft)	PCE	TCE	cis-1,2-DCE	1,1-DCE	Vinyl chloride
GW[1]	29.3-33.3	**114**	5 U	5 U	**1.88 J**	5 U

T6-3

Matrix	Depth (ft)	PCE	TCE	cis-1,2-DCE	1,1-DCE	Vinyl chloride
GW[1]	31.8-35.8	**0.95 J**	5 U	5 U	5 U	5 U

T5-1

Matrix	Depth (ft)	PCE	TCE	cis-1,2-DCE	1,1-DCE	Vinyl chloride
GW[1]	28.5-32.5	**11.9**	**2.49 J**	**2.78 J**	5 U	5 U

T5-2

Matrix	Depth (ft)	PCE	TCE	cis-1,2-DCE	1,1-DCE	Vinyl chloride
GW[1]	31.8-35.8	**250**	**0.76 J**	**0.7 J**	**13.3**	5 U

T5-4

Matrix	Depth (ft)	PCE	TCE	cis-1,2-DCE	1,1-DCE	Vinyl chloride
GW[1]	37-41	**441 D**	**12.2**	**1.21 J**	**3.81 J**	5 U

T5-5

Matrix	Depth (ft)	PCE	TCE	cis-1,2-DCE	1,1-DCE	Vinyl chloride
GW[1]	28.5-32.5	**131**	**0.64 J**	5 U	**0.95 J**	5 U

T4-0

Matrix	Depth (ft)	PCE	TCE	cis-1,2-DCE	1,1-DCE	Vinyl chloride
GW[1]	24-28	**3,730 D**	**335 D**	**203**	**42**	**6.41**

T4-1

Matrix	Depth (ft)	PCE	TCE	cis-1,2-DCE	1,1-DCE	Vinyl chloride
GW[1]	7-11	**816 D**	25 U	25 U	**18 J**	25 U
	17-21	**767 D**	25 U	25 U	**21.8 J**	25 U
	27-31	**430 D**	**0.88 J**	**0.99 J**	**9.29**	5 U

T4-2

Matrix	Depth (ft)	PCE	TCE	cis-1,2-DCE	1,1-DCE	Vinyl chloride
GW[1]	3 to 7	**205 D**	**2.91 J**	**1.2 J**	**4.59 J**	5 U
	13-17	**921 D**	**6.41**	**2.18 J**	**13.3**	5 U
	23-27	**1,010 D**	**6.75**	**2.42 J**	**16.4**	5 U

T4-3

Matrix	Depth (ft)	PCE	TCE	cis-1,2-DCE	1,1-DCE	Vinyl chloride
GW[1]	41-45	**17.2**	**0.88 J**	5 U	5 U	5 U

T4-4

Matrix	Depth (ft)	PCE	TCE	cis-1,2-DCE	1,1-DCE	Vinyl chloride
GW[1]	32-36	**2,000 D**	**11 J**	**100 U**	**17.6 J**	100 U

T3-1

Matrix	Depth (ft)	PCE	TCE	cis-1,2-DCE	1,1-DCE	Vinyl chloride
GW[1]	18.6-22.6	5 U	5 U	5 U	5 U	5 U
	27.5-31.5	5 U	**1.09 J**	5 U	5 U	5 U

T3-3

Matrix	Depth (ft)	PCE	TCE	cis-1,2-DCE	1,1-DCE	Vinyl chloride
GW[1]	34.5-38.5	**59.4**	**44.5**	**7.54**	**1.27 J**	5 U

T3-4

Matrix	Depth (ft)	PCE	TCE	cis-1,2-DCE	1,1-DCE	Vinyl chloride
GW[1]	26.1-30.1	**1,430 D**	**43.8**	**13.7**	**20**	5 U

T3-5

Matrix	Depth (ft)	PCE	TCE	cis-1,2-DCE	1,1-DCE	Vinyl chloride
GW[1]	41.2-45.2	**26,800 ED**	**5.93**	**9.54**	**126**	5 U

T2-2

Matrix	Depth (ft)	PCE	TCE	cis-1,2-DCE	1,1-DCE	Vinyl chloride
GW[1]	26.5-30.5	**885 J**	**65,400 D**	2500 U	2500 U	2500 U

T2-3

Matrix	Depth (ft)	PCE	TCE	cis-1,2-DCE	1,1-DCE	Vinyl chloride
GW[1]	25.1-29.1	5 U	**212**	**27**	**1.33 J**	5 U

T2-4

Matrix	Depth (ft)	PCE	TCE	cis-1,2-DCE	1,1-DCE	Vinyl chloride
GW[1]	28.1-32.1	5 U	**1.44 J**	5 U	5 U	5 U

T1-1

Matrix	Depth (ft)	PCE	TCE	cis-1,2-DCE	1,1-DCE	Vinyl chloride
GW[1]	33.5-37.5	5 U	**235**	**118**	5 U	**1.51 J**

T1-2

Matrix	Depth (ft)	PCE	TCE	cis-1,2-DCE	1,1-DCE	Vinyl chloride
GW[1]	25.5-29.5	5 U	**107**	**26.2**	5 U	5 U

T1-3

Matrix	Depth (ft)	PCE	TCE	cis-1,2-DCE	1,1-DCE	Vinyl chloride
GW[1]	17.25-21.25	5 U	**42.4**	**10.1**	5 U	5 U

T0-2

Matrix	Depth (ft)	PCE	TCE	cis-1,2-DCE	1,1-DCE	Vinyl chloride
GW[1]	21.7-25.7	5 U	**2.53 J**	**0.76 J**	5 U	5 U

T0-3

Matrix	Depth (ft)	PCE	TCE	cis-1,2-DCE	1,1-DCE	Vinyl chloride
GW[1]	10.8-14.8	5 U	**1.32 J**	**2.01 J**	5 U	5 U

Screening Criterion

Matrix	PCE	TCE	cis-1,2 DCE	1,1-DCE	Vinyl Chloride
Gw (µg/L)	**5**	**5**	**70**	**7**	**0.25**

Values that exceed screening criteria are highlighted in yellow

Values in bold represent detections

Legend

- Groundwater Sample with SRCs above SC
- Groundwater Sample with SRCs below SC
- Groundwater Sample without SRCs detected
- Dry location
- Public Supply Well Location

Notes:

PCE- tetrachloroethene
TCE- trichloroethene
DCE - dichloroethene
GW - groundwater
ft - feet below ground surface
J - estimated value
1 concentration in micrograms per liter (µg/L)

U - not detected
E - exceed equipment calibration
D - diluted
SRCs - Site-Related Contaminants
SC - Screening Criteria
Yellow highlight indicates a detection above the screening criteria
Box results for samples with non detect SRCs are not included in map

Feet: 0 75 150 300 450 600

Figure 10
Groundwater Transect Site-Related Contamination Results
San German Groundwater Contamination Site
San German, Puerto Rico

CDM Smith

Legend

- Monitoring Well Location
- Temporary Piezometer Location
- Staff Gauge

Acronyms:

MW-2S - Shallow Monitoring Well

MPW-7 - Multiport Bedrock Monitoring Well

MW-4C - Bedrock Monitoring Well with Screen

N

0 145 290 580 870 1,160 Feet

Figure 11
Monitoring Well and Piezometer Locations
San German Groundwater Contamination Site
San German, Puerto Rico

CDM Smith

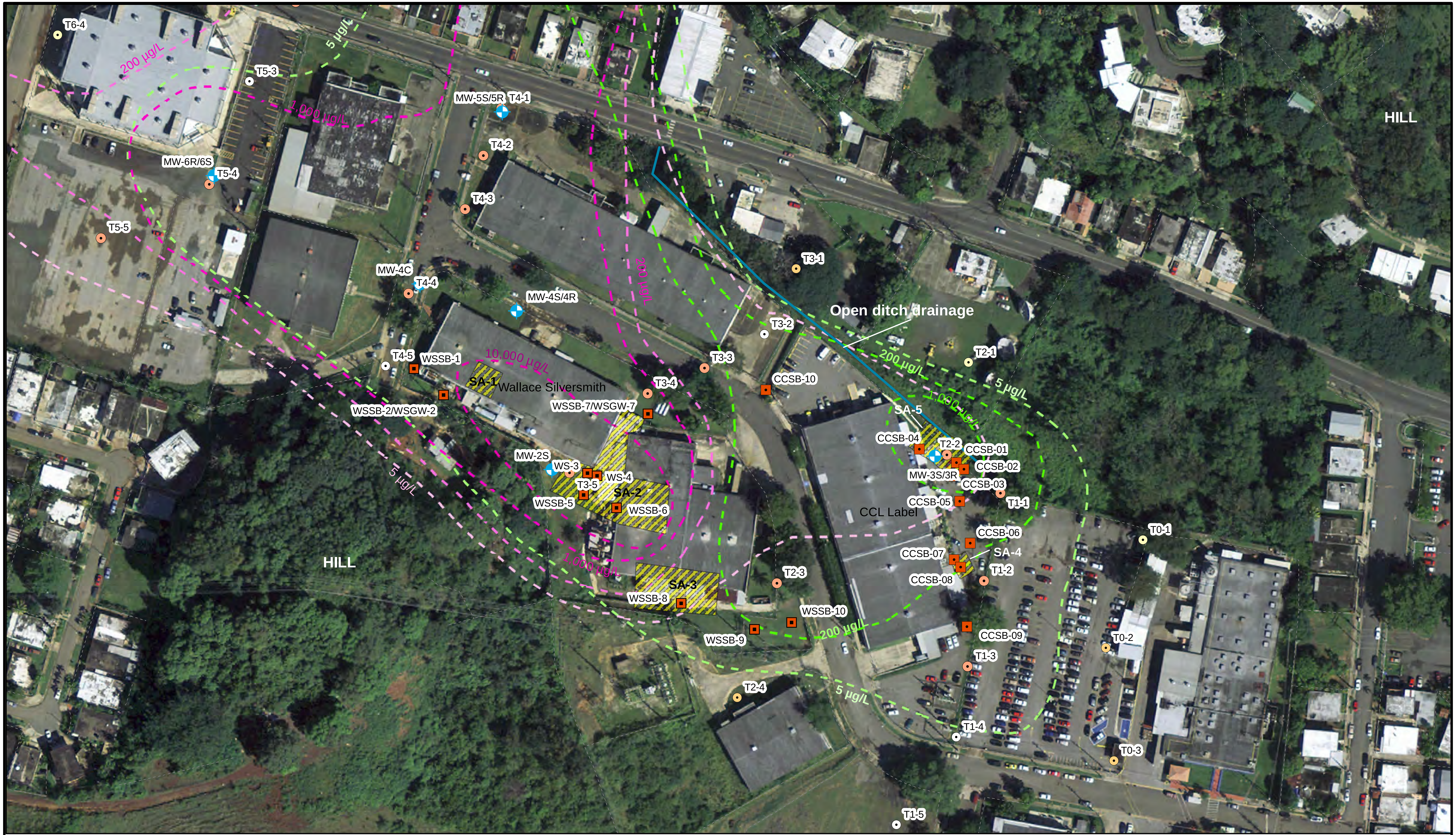
Legend

- Surface Water and Sediment Sampling Location
- Potential Source Areas
- Pore Water/Temporary Piezometer Location
- Catch Basin Sampling Location

Feet
0 180 360 720 1,080 1,440

Figure 12
Surface Water, Sediment and Pore Water Sampling Locations
San German Groundwater Contamination Site
San German, Puerto Rico

CDM Smith



LEGEND

- Soil Screening Location
- Monitoring well
- Groundwater Scrceening
- SA-1 - Source area 1, estimated
- PCE isoconcentration contour
- TCE isoconcentration contour
- Drainage ditch

Notes:
PCE- tetrachloroethene
TCE- trichloroethene
DCE - dichloroethene
Gw - groundwater
µg/kg - micrograms per kilogram
µg/L - micrograms per liter

D - diluted
J - estimated
U - not detected
ft - feet

0 50 100 200 Feet

Figure 13
Contamination Source Areas
San German Groundwater Contamination Site
San German, Puerto Rico

CDM Smith

APPENDIX IX
TABLES

San German Groundwater Contamination Superfund Site
OU-1

TABLE 1
Summary of Chemicals of Concern and Medium-Specific Exposure Point Concentrations

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical of Concern	Concentration Detected		Concentration Units	Frequency of Detection	Exposure Point Concentration (EPC)	EPC Units	Statistical Measure
		Min	Max					
Tap Water	Trichloroethene	0.6	1,700	ug/l	33/104	182	ug/l	97.5% KM (Chebyshev) UCL
	Tetrachloroethene	0.82	13,00	ug/l	33/104	1,198	ug/l	97.5% KM (Chebyshev) UCL
	Vinyl chloride	0.27	84	ug/l	14/104	5.5	ug/l	95% Approximate Gamma KM-UCL

UCL – upper-confidence limit

Summary of Chemicals of Concern and Medium-Specific Exposure Point Concentrations

This table presents the chemicals of concern (COCs) and exposure point concentrations (EPCs) for each of the COCs in groundwater. The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the site), the EPC and how it was derived. A qualitative analysis also identified trichloroethene and tetrachloroethene as COCs in soil due to elevated soil gas concentrations.

TABLE 2. Selection of Exposure Scenarios

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis
Current	Soil	Surface soil	Acorn, Former Baytex, Pitusa	Worker	Adult	Ing/Der/Inh	Quantitative
				Trespasser	Adolescent (12-18)	Ing/Der/Inh	Quantitative
			CCL Label, Wallace	Worker	Adult	Ing/Der/Inh	Quantitative
				Trespasser	Adolescent (12-18)	Ing/Der/Inh	Quantitative
	Groundwater	Groundwater	Groundwater	Worker	Adult	Ing	None
		Indoor air	Indoor air	Worker	Adult	Inh	Qualitative
	Surface water	Surface water	Rio Guanajibo	Recreational user	Adolescent (12-18)	Ing/Der	Quantitative
	Sediment	Sediment	Rio Guanajibo	Recreational user	Adolescent (12-18)	Ing/Der	Quantitative
Future	Soil	Surface soil	Acorn, Former Baytex, Pitusa, CCL Label, and Wallace	Worker	Adult	Ing/Der/Inh	Quantitative
				Trespasser	Adolescent (12-18)	Ing/Der/Inh	Quantitative
				Resident	Adult/Child	Ing/Der/Inh	Quantitative
		Surface and subsurface soil	Acorn, Former Baytex, Pitusa, CCL Label, and Wallace	Construction worker	Adult	Ing/Der/Inh	Quantitative
	Groundwater	Groundwater	Groundwater	Worker	Adult	Ing	Quantitative
				Resident	Adult/Child	Ing/Der/Inh	Quantitative
		Indoor air	Indoor air	Worker	Adult	Inh	Qualitative
				Resident	Adult/Child	Inh	Qualitative
	Surface water	Surface Water	Rio Guanajibo	Recreational user	Adolescent (12-18)	Ing/Der	Quantitative
	Sediment	Sediment	Rio Guanajibo	Recreational user	Adolescent (12-18)	Ing/Der	Quantitative

Ing – Ingestion

Der – Dermal

Inh - Inhalation

Summary of Selection of Exposure Pathways

The table describes the exposure pathways that were evaluated for the risk assessment. Exposure media, exposure points, and characteristics of receptor populations are included.

TABLE 3

Non-Cancer Toxicity Data Summary

Pathway: Oral/Dermal

Chemical of Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Absorp. Efficiency (Dermal)	Adjusted RfD (Dermal)	Adj. Dermal RfD Units	Primary Target Organ	Combined Uncertainty /Modifying Factors	Sources of RfD: Target Organ	Dates of RfD:
Trichloroethene	Chronic	5E-04	mg/kg-day	1	5E-04	mg/kg-day	Heart	10 to 1000	IRIS	02/24/15
Tetrachloroethene	Chronic	6E-03	mg/kg-day	1	6E-03	mg/kg-day	CNS	1000	IRIS	02/24/15
Vinyl chloride	Chronic	3E-03	mg/kg-day	1	3E-03	mg/kg-day	Liver	30	IRIS	02/24/15

Pathway: Inhalation

Chemical of Concern	Chronic/ Subchronic	Inhalation RfC	Inhalation RfC Units	Inhalation RfD	Inhalation RfD Units	Primary Target Organ	Combined Uncertainty /Modifying Factors	Sources of RfD: Target Organ	Dates:
Trichloroethene	Chronic	2E-03	mg/m^3	-----	-----	Heart	10 to 100	IRIS	02/24/15
Tetrachloroethene	Chronic	4E-02	mg/m^3	-----	-----	CNS	1000	IRIS	02/24/15
Vinyl chloride	Chronic	1E-01	mg/m^3	-----	-----	Liver	30	IRIS	02/24/15

Key

-----: No information available
CNS – Central Nervous System
IRIS: Integrated Risk Information System, U.S. EPA

Summary of Toxicity Assessment

This table provides non-carcinogenic risk information which is relevant to the contaminants of concern in soil, indoor air and groundwater. When available, the chronic toxicity data have been used to develop oral reference doses (RfDs) and inhalation reference doses (RfDi).

TABLE 4

Cancer Toxicity Data Summary

Pathway: Oral/Dermal

Chemical of Concern	Oral Cancer Slope Factor	Units	Adjusted Cancer Slope Factor (for Dermal)	Slope Factor Units	Weight of Evidence/ Cancer Guideline Description	Source	Date
Trichloroethene	4.6E-02	$(mg/kg/day)^{-1}$	4.6E-02	$(mg/kg/day)^{-1}$	Carcinogenic to humans	IRIS	02/24/15
Tetrachloroethene	2.1E-03	$(mg/kg/day)^{-1}$	2.1E-03	$(mg/kg/day)^{-1}$	Likely to be carcinogenic to humans	IRIS	02/24/15
Vinyl chloride	7.2E-01	$(mg/kg/day)^{-1}$	7.2E-01	$(mg/kg/day)^{-1}$	A	IRIS	02/24/15

Pathway: Inhalation

Chemical of Concern	Unit Risk	Units	Inhalation Slope Factor	Slope Factor Units	Weight of Evidence/ Cancer Guideline Description	Source	Date
Trichloroethene	4.1E-06	$1(ug/m^3)$	-----	-----	Carcinogenic to humans	IRIS	02/24/15
Tetrachloroethene	2.6E-07	$1(ug/m^3)$	-----	-----	Likely to be carcinogenic to humans	IRIS	02/24/15
Vinyl chloride	4.4E-06	$1(ug/m^3)$	-----	-----	A	IRIS	02/24/15

Key:

IRIS: Integrated Risk Information System. U.S. EPA
-----: No information available

EPA Weight of Evidence:

A – Known human carcinogen

Summary of Toxicity Assessment

This table provides carcinogenic risk information which is relevant to the contaminants of concern in soil, indoor air and groundwater. Toxicity data are provided for both the oral and inhalation routes of exposure.

TABLE 5

Risk Characterization Summary - Noncarcinogens

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult/Child

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk			
					Ingestion	Dermal	Inhalation	Exposure Routes Total
Groundwater	Groundwater	Tap water	Trichloroethene	Heart	**10/18**	**1.9/3**	**74/56**	**87/77**
			Tetrachloroethene	CNS	**6/10**	**3.5/5.8**	**23/17.7**	**33/33.5**
			Vinyl chloride	Liver	-----	-----	-----	-----
							Hazard Index Total=	**120/110.5**

CNS – central nervous system

Summary of Risk Characterization - Non-Carcinogens

The table presents hazard quotients (HQs) for each route of exposure and the hazard index (sum of hazard quotients) for exposure to groundwater. The Risk Assessment Guidance for Superfund states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse non-cancer effects. A qualitative analysis also identified trichloroethene and tetrachloroethene as COCs in soil due to elevated soil gas concentrations.

TABLE 6

Risk Characterization Summary - Carcinogens

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult/Child

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Dermal	Inhalation	Exposure Routes Total
Groundwater	Groundwater	Tap water	Trichloroethene	**2E-04**	3E-05	**3E-04**	**5E-04**
			Tetrachloroethene	3E-05	2E-05	9E-05	**1E-04**
			Vinyl chloride	**3E-04**	1E-05	**8E-04**	**1E-03**
						Total Risk =	**1.6E-03**

Summary of Risk Characterization – Carcinogens

The table presents cancer risks for groundwater exposure. As stated in the National Contingency Plan, the point of departure is 10^{-6} and the acceptable risk range for site-related exposure is 10^{-6} to 10^{-4}. A qualitative analysis also identified trichloroethene and tetrachloroethene as COCs in soil due to elevated soil gas concentrations.

Table 7
Chemical-specific ARARs, Criteria, and Guidance
San German Groundwater Contamination Site
San German, Puerto Rico

Regulatory Level	ARAR	Status	Requirement Synopsis	Feasibility Study Consideration
Federal	National Primary Drinking Water Standards (40 CFR 141) - MCLs	Relevant and Appropriate	Establishes health-based standards for public drinking water systems. Also establishes drinking water quality goals set at levels at which no adverse health effects are anticipated, with an adequate margin of safety. Groundwater at the site is currently not used as a source of drinking water.	The standards were used to develop the PRGs to accommodate any future use of site groundwater as a source of drinking water supply.
Federal	Soil Screening Guidance	To Be Considered	Presents a framework for developing risk-based, soil screening levels (SSLs) for protection of human health.	The guidance document was used to develop PRGs for soil to protect the groundwater as a future source of drinking water supply.

Acronyms:
ARARs - Applicable or Relevant and Appropriate Requirements
CFR - Code of Federal Regulations
MCL - Maximum Contaminant Limit
PRGs - Preliminary Remediation Goals
SSL - Soil Screening Level

Table 8
Action-specific ARARs, Criteria, and Guidance
San German Groundwater Contamination Site
San German, Puerto Rico

Regulatory Level	ARARs	Status	Requirement Synopsis	Feasibility Study Consideration
General - Site Remediation				
Federal	OSHA Recording and Reporting Occupational Injuries and Illnesses (29 CFR 1904)	Applicable	This regulation outlines the record keeping and reporting requirements for an employer under OSHA.	These regulations apply to the companies contracted to implement the remedy. All applicable requirements will be met.
Federal	OSHA Occupational Safety and Health Standards (29 CFR 1910)	Applicable	These regulations specify an 8-hour time-weighted average concentration for worker exposure to various organic compounds. Training requirements for workers at hazardous waste operations are specified in 29 CFR 1910.120.	Proper respiratory equipment will be worn if it is not possible to maintain the work atmosphere below the 8-hour time-weighted average at these specified concentrations.
Federal	OSHA Safety and Health Regulations for Construction (29 CFR 1926)	Applicable	This regulation specifies the type of safety equipment and procedures to be followed during site remediation.	All appropriate safety equipment will be on-site, and appropriate procedures will be followed during remediation activities.
Federal	RCRA Identification and Listing of Hazardous Wastes (40 CFR 261)	Applicable	This regulation describes methods for identifying hazardous wastes and lists known hazardous wastes.	This regulation is applicable to the identification of hazardous wastes that are generated, treated, stored, or disposed during remedial activities.

Regulatory Level	ARARs	Status	Requirement Synopsis	Feasibility Study Consideration
Federal	RCRA Standards Applicable to Generators of Hazardous Wastes (40 CFR 262)	Applicable	Describes standards applicable to generators of hazardous wastes.	Standards will be followed if any hazardous wastes are generated on-site.
Federal	RCRA Standards for Owners/Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities – General Facility Standards (40 CFR 264.10 – 264.19)	Relevant and Appropriate	This regulation lists general facility requirements including general waste analysis, security measures, inspections, and training requirements.	Facility will be designed, constructed, and operated in accordance with this requirement. All workers will be properly trained.
Commonwealth of Puerto Rico	Regulation of the Puerto Rico Environmental Quality Board (PREQB) for the Prevention and Control of Noise Pollution	Applicable	This standard provides the standards and requirements for noise control.	This standard will be applied to any remediation activities performed at the site.
Waste Transportation				
Federal	Department of Transportation (DOT) Rules for Transportation of Hazardous Materials (49 CFR Parts 107, 171, 172, 177 to 179)	Applicable	This regulation outlines procedures for the packaging, labeling, manifesting, and transporting hazardous materials.	Any company contracted to transport hazardous material from the site will be required to comply with this regulation.
Federal	RCRA Standards Applicable to Transporters of Hazardous Waste (40 CFR 263)	Applicable	Establishes standards for hazardous waste transporters.	Any company contracted to transport hazardous material from the site will be required to comply with this regulation.

Waste Disposal				
Federal	RCRA Land Disposal Restrictions (40 CFR 268)	Applicable	This regulation identifies hazardous wastes restricted for land disposal and provides treatment standards for land disposal.	Hazardous wastes will be treated to meet disposal requirements.
Federal	RCRA Hazardous Waste Permit Program (40 CFR 270)	Applicable	This regulation establishes provisions covering basic EPA permitting requirements.	All permitting requirements of EPA must be complied with.
Commonwealth of Puerto Rico	PREQB Regulation for the Control of Non-Hazardous Solid Waste (November 1997)	Applicable	This regulation establishes standards for the generation, management, transportation, recovery, disposal and management of non-hazardous solid waste.	Control activities for the non-hazardous wastes must comply with the treatment and disposal standards.
Commonwealth of Puerto Rico	PREQB Regulation for the Control of Hazardous Solid Waste (September 1998)	Applicable	This regulation establishes standards for management and disposal of hazardous wastes.	All remedial activities must adhere to these regulations while handling hazardous waste during remedial operations.
Stormwater Management				
Federal	Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects under section 438 of the Energy Independence and Security Act	Applicable	This regulation establishes standards for stormwater management.	If site activities require development of more than 5,000 square feet, project will take the guidance into consideration.

Water Discharge or Subsurface Injection				
Federal	National Pollutant Discharge Elimination System (NPDES) (40 CFR 100 et seq.)	Applicable	NPDES permit requirements for point source discharges must be met, including the NPDES Best Management Practice (BMP) Program. These regulations include, but are not limited to, requirements for compliance with water quality standards, a discharge monitoring system, and records maintenance.	Project will meet NPDES permit requirements for point source discharges.
Federal	Safe Drinking Water Act – Underground Injection Control (UIC) Program (40 CFR 144, 146)	Relevant and Appropriate	Establish performance standards, well requirements, and permitting requirements for groundwater re-injection wells.	Project will evaluate the requirement for injection of reagent for in situ treatment.
Commonwealth of Puerto Rico	Puerto Rico Water Quality Standards (PRWQS) Regulation, March 2010	Applicable	This regulation is to preserve, maintain and enhance the quality of the waters of Puerto Rico and regulate any discharge of any pollutant to the waters of Puerto Rico by establishing water quality standards. Water quality standards and use classifications are promulgated for the protection of the uses assigned to coastal, surface, estuarine, wetlands, and groundwaters of Puerto Rico.	Project will meet PRWQS requirements for point source discharges.

APPENDIX X
EQB CONCURRENCE

San German Groundwater Contamination Superfund Site
OU-1

COMMONWEALTH OF
PUERTO RICO
Environmental Quality Board

July 14, 2015

Dr. Adalberto Bosque, Remedial Project Manager
US Environmental Protection Agency (USEPA)
Caribbean Environmental Protection Division (CEPD)
City View Plaza II-Suite 7000
48 Road 165 km 1.2
Guaynabo, P.R. 00968-8069

RE: SAN GERMAN GROUNDWATER CONTAMINATION SITE PROPOSED PLAN CONCURRENCE LETTER

Dear Mr. Bosque:

The Puerto Rico Environmental Quality Board (PREQB) has completed its review of the aforementioned document. This Proposed Plan (PP) dated July, 2015, identifies the preferred alternative to address soil source contamination areas subject of the OU-1 action at the San Germán Groundwater Contamination Site. All PREQB's comments and concerns were addressed through several meetings with USEPA and CDM Smith (USEPA contractor) representatives held on February 10, 2015 at CEPD facilities, on April 27, 2015 at San Germán and on June 15 at CEPD facilities. The preferred remedy, which is Alternative S3 (Soil Vapor Extraction/Dual Phase Extraction/ In-Situ Treatment) fulfills the requirement of protecting the public health and the environment from potential risk at the site. Therefore, PREQB concurs with the remedial technology selected in the PP.

If you have any questions, please feel free to contact the undersigned at (787) 767-8181 ext. 3234 or 3236 or Mr. Pascual E. Velázquez, State Remedial Project Manager assigned to this case at (787) 767-8181 ext. 3253 or by email at juanbaba@jca.pr.gov or pascualvelazquez@jca.pr.gov respectively.

Cordially,

Juan J. Babá Peebles
Manager
Superfund Program
Environmental Emergencies Response Area
Puerto Rico Environmental Quality Board