Soil Gas Investigation Work Plan
Cabot Carbon/Koppers Superfund Site
Gainesville, Florida

Prepared for
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1 Introduction

The remedial action for the Cabot portion of the Cabot Carbon/Koppers Superfund Site ("Site") in Gainesville, Florida, selected by the US Environmental Protection Agency's (US EPA's) Record of Decision (US EPA, 1990) was implemented in 1995. To date, operation, maintenance, and monitoring components of the remedy continue at the eastern portion of the Site (*i.e.*, groundwater capture and treatment).

Recently, the Five Year Review (FYR) Report for the Site (E2 Inc., 2011) recommended that potential human health risks *via* vapor intrusion (VI) be assessed at the former Cabot property, which has been redeveloped as a shopping center. Specifically, the FYR indicated that "potential human health risk from indoor air vapor intrusion due to source area contamination beneath existing structures" should be assessed (E2 Inc., 2011, p. 69). Soil and surficial groundwater quality has been evaluated as part of several investigations undertaken at the former Cabot property over approximately 30 years. Although these investigations have found relatively low, stable – or declining – concentration trends (*e.g.*, in groundwater), the FYR recommendation that Cabot undertake a VI assessment is driven by a better understanding of the potential significance of this pathway under certain conditions, as well as US EPA's policy that the VI pathway be evaluated at sites where such evaluation has previously not been conducted.

Mindful of potential disruptions to property owners and store operators of the shopping center on the former Cabot property, the evaluation will commence with an exterior soil gas assessment along the perimeter of the buildings. Prior to preparing this detailed work plan, Gradient developed a short document outlining the proposed soil gas sampling approach for review by the stakeholders. This document was submitted on May 3, 2012 and comments were received from US EPA, the Alachua County Environmental Protection Department (ACEPD), and Florida Department of Environmental Protection (FDEP) during subsequent weeks. This work plan further develops the approach outlined in the May 3, 2012 document and describes the proposed soil gas sampling program, including sampling location selection, sample collection methods and analytical program, data validation, and evaluation of results. Comments from US EPA, ACEPD and FDEP to the May 3, 2012 document have also been taken into account.

We plan to use a tiered approach, similar to that presented in the draft VI guidance developed by US EPA's Office of Solid Waste and Emergency Response (OSWER) (US EPA, 2002),[1] taking into account new observational data collected by US EPA since the draft VI guidance was published (US EPA, 2008, 2012),[2] as well as recent recommendations by US EPA related to the draft VI guidance and the need for an approach based on multiple lines of evidence (US EPA, 2010).[3]

2 Conceptual Site Model and Preliminary Screening

2.1 Site History and Setting

Cabot conducted industrial operations at the former Cabot property from 1945 to the mid-1960s. During that time, Cabot operated a pine processing facility to manufacture pine oils and tars. Predecessors of Cabot conducted similar operations at the Site starting in the 1920s. In the late 1970s, the property was redeveloped for commercial use. As noted previously, the Cabot portion of the Site is currently occupied by a shopping mall — known as the Northside Shopping Center — with several retail stores (*e.g.*, Winn Dixie, Big Lots, Harbor Freight Tools), two automobile dealerships, a boat dealership and service shop, and a number of smaller office buildings. These buildings are shown on the aerial photo provided as Figure 1. Historical features associated with former Cabot processes and current building footprints are shown on Figure 2.

The pine processing operation conducted historically at the former Cabot property consisted of extracting and concentrating oils and tars naturally occurring in pine trees. The tree stumps were pyrolyzed to high temperature in retorts (see historical location on Figure 2) to generate charcoal, light oils, pyroligneous acids, and tars. Initially, liquids generated from the process were allowed to settle in a concrete-lined acid water pond. After 1949, however, the pyrolization liquids were conveyed to three former lagoons located at the northwest corner of the former Cabot property (Figure 2), where light oils and tars were recovered and refined prior to being sold as final products.

A relatively simple process, without use of solvent or other chemicals, pine tree stump pyrolyzation primarily generated relatively low-toxicity compounds, including phenols (but not

[1] See http://www.epa.gov/epawaste/hazard/correctiveaction/eis/vapor/complete.pdf.
[2] See https://iavi.rti.org/attachments/OtherDocuments/OSWER_Database_Report_Combined_3-4-08b.pdf and http://www.epa.gov/oswer/vaporintrusion/documents/OSWER_2010_Database_Report_03-16-2012_Final.pdf.
[3] See http://www.epa.gov/oswer/vaporintrusion/documents/review_of_2002_draft_vi_guidance_final.pdf.

chlorinated phenols), terpenes, terpenoids, and resin acids, which — with the exception of phenols — are not on the standard target compound list (TCL). Minor constituents of the pyrolyzation process may have also included benzene, toluene, ethylbenzene, and xylenes (BTEX), as well as naphthalene, which are found at low concentrations in soils and groundwater at the former Cabot property.

BTEX and naphthalene compounds are notoriously ubiquitous. West of the former Cabot property is the Koppers portion of the Site, where wood-treating operations were conducted from 1916 until 2010 using various chemicals over the years, including chromate copper arsenate salts, pentachlorophenol (PCP), and creosote. Consistent with historical operations, chemicals of concern (COCs) found in groundwater from the Koppers property have included benzene and naphthalene, which may have migrated from Koppers' historical source areas in groundwater toward the northeast onto the former Cabot property (US EPA Region IV, 2011). In addition, given the commercial setting of the Cabot portion of the Site, other potential contaminant sources, such as automobile dealerships, urban use and/or parking lot, may have contributed BTEX to the subsurface.

2.2 Conceptual Site Model and Tier 1 (Primary) Screening

VI can occur when vapors associated with volatile organic compounds (VOCs) that may be present in contaminated subsurface soil or groundwater migrate into indoor space of overlying buildings. In the OSWER's draft guidance (US EPA, 2002), Tier 1 primary screening consists of determining if volatile and toxic contaminants are present and if buildings are located near subsurface contaminants.

In the conceptual model associated with the former Cabot property portion of the Site, VOC vapors could originate from potential residual source contaminants underlying commercial buildings currently on the property. These residual sources, if present, may have resulted from manufacturing operations that historically took place on the property. Specifically:

- Potential receptors of interest on the Cabot property would include commercial workers at the shopping mall, dealerships, and/or office buildings;
- Under a complete VI pathway, these receptors would be exposed to VOC vapors originating from potential subsurface sources located underneath the buildings and entering structures through foundation cracks and/or along preferential pathways (*e.g.*, sumps, utility lines); and

- Potential subsurface sources underlying current building structures could be related to the historical Cabot processes, including the retorts (underlying Big Lots, see Figure 2), the refinery operation (underlying Winn Dixie), or ancillary equipment.

As noted previously, compounds associated with the former Cabot processes primarily include relatively low-toxicity compounds (*e.g.*, phenols, terpenes, terpenoids, and resin acids). These compounds would not constitute COCs with VI potential and are not listed in Table 1 of OSWER's draft guidance for Tier 1 screening.

Minor constituents of pine processing operations include BTEX and naphthalene, which have been found in several soil and groundwater samples collected at locations underlying — or proximate to — existing Site structures. These COCs are listed in Table 1 of OSWER's draft guidance and, in consideration of their VI potential, need to be evaluated further as part of this assessment.

2.3 Existing Data Review and Tier 2 (Secondary) Screening

In the OSWER's draft guidance (US EPA, 2002), Tier 2 secondary screening consists of reviewing existing data (*e.g.*, soil gas or groundwater quality) to determine if these data are adequate to support a VI assessment and to compare the data to conservative target concentrations. The findings of a Tier 2 screening help determine whether a Tier 3 (site-specific assessment that includes soil gas, sub-slab vapor, and/or indoor air sampling) is needed to further evaluate the VI exposure pathway.

Figures 3 and 4 show soil and groundwater quality data for BTEX and naphthalene obtained from sampling conducted on the former Cabot property portion of the Site. In groundwater (Figure 3), concentrations of benzene and naphthalene in several samples exceed conservative VI screening levels developed in OSWER's draft guidance and summarized in Table 1 below; however, none of the groundwater monitoring wells are adjacent to the existing commercial buildings, and only a few of the wells are screened at the water table. Therefore, measured VOC concentrations in groundwater may not be representative of VOCs with VI potential into building structures.

In soil (Figure 4), BTEX (with the exception of benzene) and/or naphthalene were found in several samples collected within or adjacent to the footprint of existing structures, suggesting contamination may be present in the unsaturated zone; however, the OSWER draft guidance does not provide VI screening levels for soil.

Overall, our Tier 2 screening suggests that supplemental field data are needed, and a soil gas sampling and analysis plan should be implemented as part of a Tier 3 assessment to determine whether the VI pathway is complete.

Table 1
Groundwater Screening Levels Developed by US EPA

Compound Name	**Vapor Intrusion Screening Level in Groundwater (μg/l)**
Benzene	5.0
Toluene	1,500
Ethylbenzene	700
m-Xylene	23,000
o-Xylene	33,000
p-Xylene	22,000
Naphthalene	150

Notes:

The above VI screening levels in groundwater expressed in units of micrograms per liter (μg/l) are based on Table 2c of OSWER's draft guidance referenced in Section 1 (USEPA 2002). The above values are calculated by US EPA based on target indoor air concentrations for residential use where the soil gas to indoor air attenuation factor is 10^{-3} and the partitioning across the water table obeys Henry's Law. For carcinogenic compounds, target indoor air concentrations assume a conservative 10^{-6} cancer risk. In certain instances, such as benzene, the maximum contaminant level (MCL) is substituted to the calculated groundwater concentration. Note that since the publication of US EPA (2002), the target indoor air concentrations of several compounds (e.g., naphthalene) have been updated. These new target indoor air concentrations can be found on the US EPA website on regional screening levels for chemical contaminants at Superfund sites (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/).

3 Scope of Work for Tier 3 Assessment

The scope-of-work proposed herein presents a soil gas sampling and analysis plan to conduct the first phase of a Tier 3 VI assessment. As further detailed below, the soil gas sampling results will be compared to appropriate screening levels to determine whether a potential VI exposure pathway exists and whether additional field activities (*e.g.*, sampling of additional soil gas) conducted as part of additional phases of a Tier 3 assessment are needed to further evaluate this pathway.

For the first phase of this Tier 3 assessment, we will collect soil gas samples from twelve locations using Summa canisters and flow controllers to provide time-weighted average samples. Consistent with US EPA's request, we propose to collect these samples during the August-September timeframe when soil gas concentrations in the subsurface tend to be highest due to the low moisture content of vadose zone soils (*e.g.*, Tri-Service Environmental Risk Assessment Workgroup, 2009).[4] Section 3.1 provides the rationale for selecting sampling locations. Sections 3.2 and 3.3 outline the proposed public outreach plan and sampling protocol to be used to conduct the field program, respectively. Sections 3.4 through 3.6 present the data validation, evaluation of soil gas sampling results, and report preparation.

3.1 Rationale for Selecting Soil Gas Sampling Locations

Figure 2 shows a site map superimposing existing buildings present on the former Cabot property and historical features associated with the Cabot operation. We propose that the soil gas sampling be undertaken proximate to the Winn Dixie building and the former K-Mart (now vacant) and Big Lots stores in the southern portion of the mall. These structures directly overlie former Cabot process areas where pine oil/tar was handled, *i.e.*, the pine oil/tar refinery and retort areas, respectively, and hence have the highest likelihood of vadose zone soil contamination. Available soil data also indicate that low levels of BTEX concentrations have been detected in soil samples collected in the vicinity of these areas (Figure 4). Note that a field reconnaissance has confirmed that asphalt and/or concrete are present at all of the proposed soil gas sampling locations. Therefore, exterior soil gas sampling is expected to be an appropriate approach for assessing the VI potential into structures located at the Site.

[4] See http://clu-in.org/download/char/dodvihdbk200901.pdf, Appendix D, p. 102/172.

While the proposed soil gas investigation focuses on building locations overlying historical Cabot processes and potential historical source areas, it also avoids sampling locations where the potential for VOC presence in indoor air exists as a result of ambient sources (see for example, US EPA, 2011).[5] Likewise, the approach also avoids locations where subsurface contamination, if present, may be the result of activities unrelated to Cabot processes. Specifically:

1. A boat dealership and service shop (P&J Marine) and an automobile dealership are located on the former Cabot property at its southwestern and northeastern corners, respectively (see Figure 1). In addition, prior investigations conducted at the automobile dealership located on the former Cabot property revealed soil and groundwater contamination related to fuel oil underground storage tanks and an oil-water separator. Such subsurface sources are not related to the former Cabot processes but could yield contaminants having a similar chemical signature (*i.e.*, BTEX). These VOCs may also be present in gasoline and other petroleum products within the automobile or boat service areas. For that reason, we do not plan to conduct soil gas sampling in the area of the dealership buildings.
2. Similarly, several businesses present on the shopping plaza may use chemical products that potentially contribute to the presence of VOCs in indoor air. This would include, for example, Lee Nails (a beauty salon) and Harbor Freight Tools, where a hydrocarbon smell was noted during a preliminary building reconnaissance conducted on October 5, 2011.
3. Further, the area of the briquette warehouse and briquette plant associated with the former Cabot operations are occupied by several buildings (see Figures 1 and 2), including P&J Marine, as well as several office buildings immediately to the North. Given the nature of historical activities (*i.e.*, manufacturing charcoal briquettes from pyrolyzed wood and storing the briquettes) and current building usage (*i.e.*, boat dealership and service shop), we do not plan to conduct sampling at this location.

In consideration of the above, we propose to conduct soil gas sampling in the immediate vicinity of the Winn Dixie building and the former K-Mart and Big Lots stores.

3.2 Public Outreach Plan

As part of a public outreach plan, a factsheet related to the proposed soil gas investigation program has been prepared. The factsheet provides background information about the Cabot portion of the Site and explains why the soil gas investigation is being conducted at this time.

[5] See http://www.epa.gov/oswer/vaporintrusion/documents/oswer-vapor-intrusion-background-Report-062411.pdf.

The soil gas investigation fact sheet and work plan will be made available on the ACEPD Cabot-Koppers Superfund website, http://www.alachuacounty.us/cabotkoppers, and the in the Document Library at http://cabotkoppersdocs.alachuacounty.us. The fact sheet will also be available from the field crew at the time sampling activities are conducted.

The factsheet will be used to communicate with the current property owners and obtain access authorization to conduct the sampling program. We will also provide courtesy notification to the store operators (*i.e.*, building tenants) prior to commencing the work.

3.3 Soil Gas Sampling Program

Soil gas samples will be collected from temporary implants installed at the proposed twelve locations shown on Figure 5. These locations are tentative and will be confirmed at the time the sampling program is conducted. Currently, we anticipate that samples will be collected at a depth of about 3 to 5 feet below ground surface (ft bgs), consistent with guidance from the Interstate Technology & Regulatory Council (ITRC) (ITRC, 2007).[6] Even though the soil gas sampling depth is greater than typical depth for sub-slab vapor samples, this approach is intended to limit the effects of short circuiting that is more prone to occur during exterior soil gas sampling. This depth may be adjusted based on the result of integrity testing (see Section 3.3.3). Initially, we will attempt to conduct soil gas sampling at a depth of 3 ft bgs. If integrity testing (prior to sampling) suggests that this depth is not sufficient to limit the effects of atmospheric short circuiting, then the sampling depth will be increased to 5 ft bgs, a depth that remains above water table.[7]

The soil gas samples will be collected into Summa canisters over a 1-hour period as detailed below. The implant installation and sampling will be conducted consistent with typical published protocols (*e.g.*, NYSDOH, 2006)[8] and is further described below.

3.3.1 Buried Utility Identification and Exploration Clearance

Prior to commencing the soil gas sampling program, Sunshine 811 will be contacted and utility companies notified so that buried utilities can be marked on the ground in advance of field activities. If

[6] Refer to ITRC's 2007 VI guidance at http://www.itrcweb.org/documents/VI-1.pdf (Section D.4.17, p. 113/172).
[7] In the area of the shopping center buildings, the water table is located at a depth on the order of 8 to 10 ft bgs.
[8] See http://www.health.ny.gov/environmental/investigations/soil_gas/svi_guidance/docs/svi_main.pdf, Section 2.7.2, p. 32/92.

need be, a private utility locating company will be subcontracted to help further delineate buried utilities in the immediate vicinity of the proposed exploration locations. Final exploration locations will be determined on the basis of the utility survey.

As noted previously, store operators (*i.e.*, building tenants) will be notified in advance of the exploration program. Since we will not conduct field activities inside the buildings and that no truck-mounted equipment will be mobilized for this program, we anticipate that disruptions to the store operators will not be substantial; however, we will attempt to select sampling locations and operate under a schedule to limit potential disruptions to the stores. For example, we anticipate that during store peak hours, sampling activities will primarily take place in areas located in the back of the buildings while sampling that is more visible to the public will take place during off-peak hours (*e.g.*, early morning).

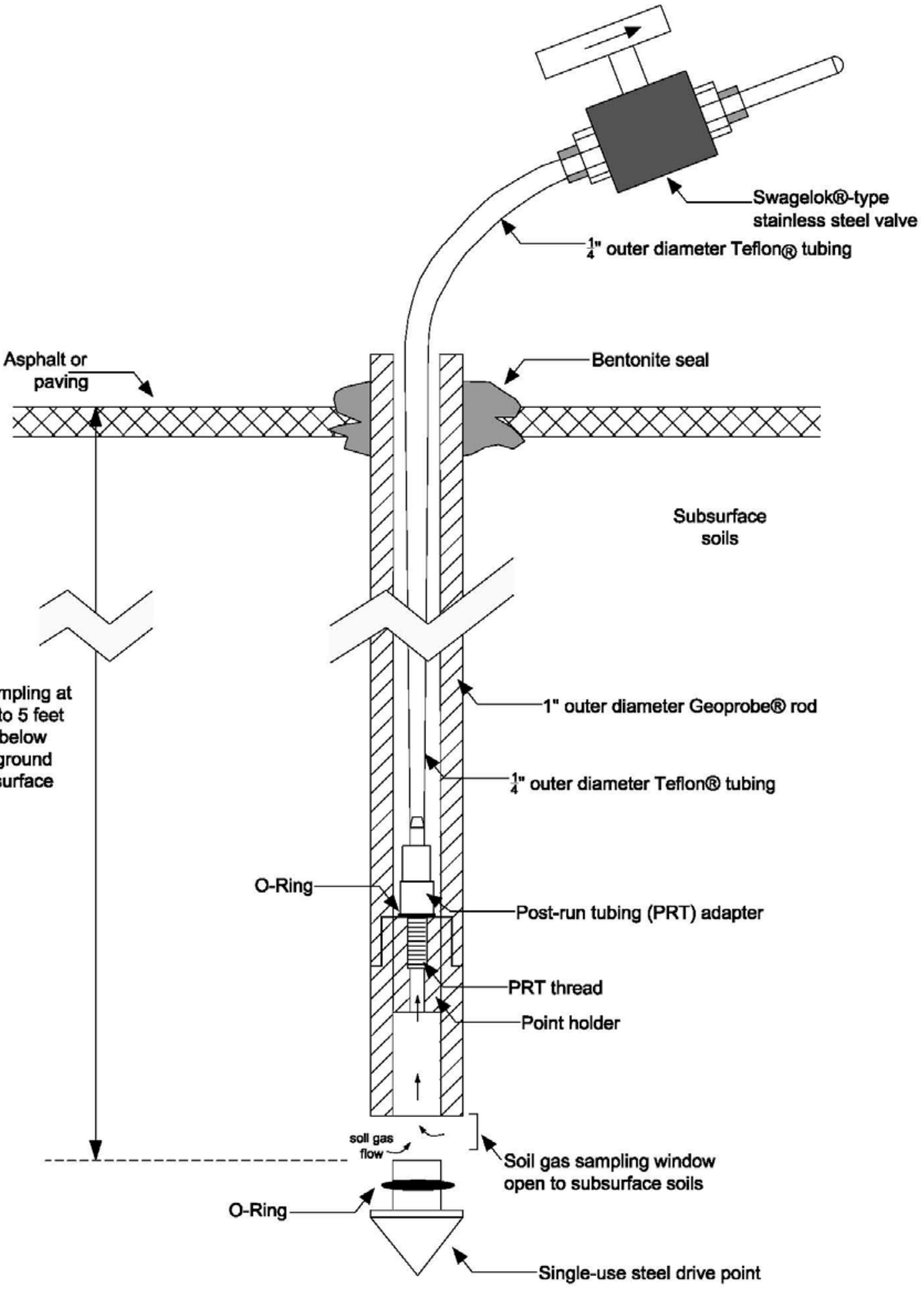
3.3.2 Soil Gas Sampling Implant Installation

Soil gas samples will be collected using temporary implants installed with a Geoprobe® soil gas collection system. The installation procedure will be as follows (see schematic provided as Exhibit 1):

- Each proposed soil gas sampling location will be about 5 feet away from the building walls;
- To further limit the potential for sample short-circuiting to the atmosphere, the temporary soil gas implants will be installed — to the extent possible — at locations within paved areas with limited evidence of damage or cracking;
- Prior to installing each soil gas implant, the field crew will confirm the absence of marked buried utilities on the ground at the proposed exploration location;
- Prior to commencing the work and between sampling locations, the field crew will decontaminate reusable field equipment in direct contact with the subsurface using a detergent wash and distilled water rinse (*e.g.*, Geoprobe® steel rods);
- At each proposed location, the asphalt or paving will be broken using a hammer drill (approximately 1-inch diameter hole) to expose underlying soil;
- The temporary soil gas implant will be advanced using a series of two to three 1-inch outer diameter, 0.5-inch inner diameter, hollow steel rods connected together by flush-threaded couplings. A single-use steel tip will be connected to the bottom of the lower rod and secured with a rubber o-ring. The field crew will use either a small Geoprobe® rig or a 30-pound portable slide hammer[9] to advance the steel rods into the subsurface to the targeted soil gas sampling depth (3 to 5 feet below ground surface, as indicated previously);

[9] The work can be completed by a crew of one to two persons and does not require a mechanized drilling rig. See, for example, http://geoprobe.com/sites/default/files/pdfs/17743_manual_slide_hammer_operation_-_booklet_v.0112.pdf.

Exhibit 1
Schematic of Temporary Implant to Conduct Soil Gas Sampling



- Once the target depth is reached, the rods will be retracted by a vertical distance of about 2-inches to release the disposable steel tip and create a soil gas sampling window at the base of the rods;
- Single-use ¼-inch outer diameter Teflon® tubing will be lowered into the hollow rods to allow purge and soil gas sample collection. The tubing will be connected to the lower end of the rod train using a Geoprobe® post-run tubing (PRT) system consisting of a threaded tip and o-ring designed to prevent potential infiltration of ambient air into the soil gas sample;[10]
- At ground surface, the annular space between the borehole and rod train will be sealed using bentonite to prevent short-circuiting of ambient air to the soil gas sampling window;
- The top extremity of the Teflon® tubing will be connected to a Swagelok®-type stainless steel valve (using Swagelok®-type, stainless steel nuts and ferules);
- Following temporary implant installation, we will conduct integrity testing using the approach described in Section 3.3.3;
- Following canister sampling and implant screening (Section 3.3.4), the Teflon® tubing will be pulled from the rod train and disposed of as solid waste. The Geoprobe® rods will be retrieved from the ground. The PRT adapter (which remains threaded in place) will be inspected to verify that it was correctly threaded and that a proper seal was achieved during sampling. As noted previously, reusable parts, such as the steel rods and PRT adapter, will be decontaminated between consecutive uses; and
- Following rod train retrieval, the hole will be backfilled with bentonite chips and the pavement or asphalt patched.

3.3.3 Integrity Testing of Temporary Sampling Implant

Integrity testing will immediately follow implant installation described above. The integrity of the temporary sampling implant will be demonstrated by leak-testing using the following procedure (refer to schematic provided as Exhibit 2):

- Helium (the tracer gas) will be dispersed around the implant beneath an overturned bucket or shroud;
- While the helium is flowing, a soil gas sample will be collected into a Tedlar® bag connected to a peristaltic pump and a micromanometer;
- Samples will be collected at two to three different flow rates and vacuums (approximately 0.1, 0.5, and 1 in. H_20) to assess the relationship between purge rate and resulting vacuum;

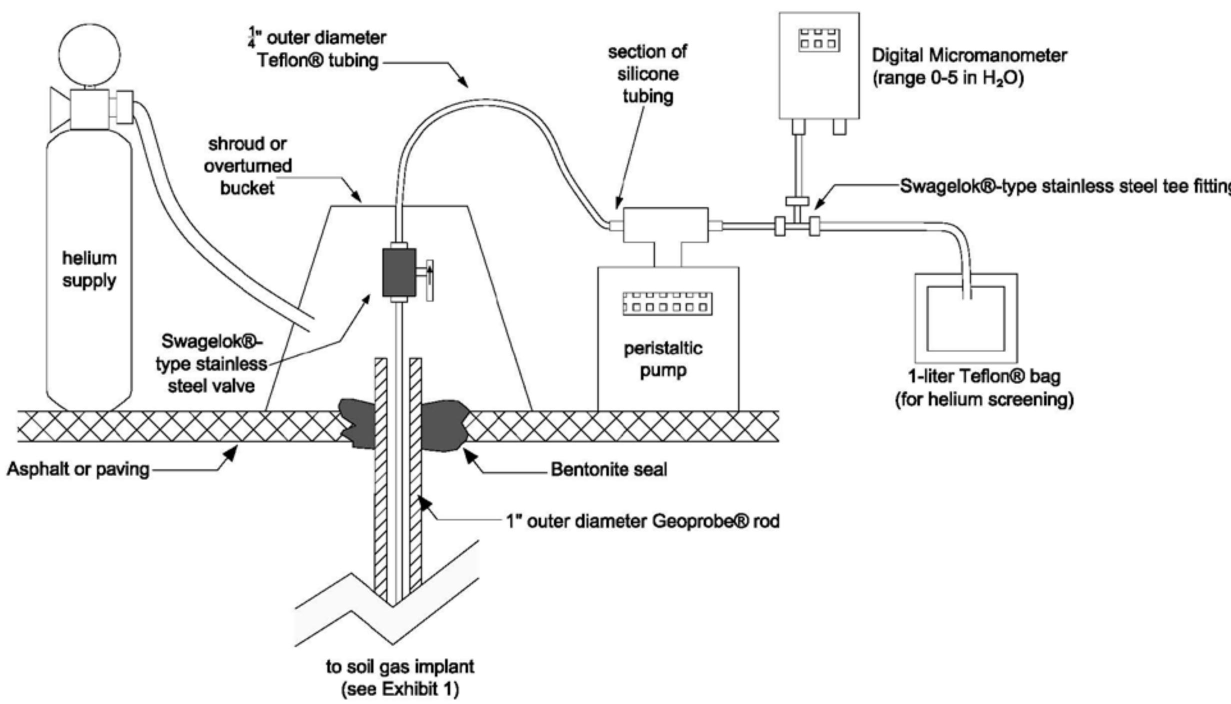
[10] See manufacturer's guidance document at http://geoprobe.com/sites/default/files/pdfs/soil_gas_prt_oper.pdf for additional information.

- Flow rates will be calculated by measuring the time to fill the Tedlar® bag (with a known volume of 1 liter); and
- To assess whether potential leakage of helium has occurred through the implant annular seal, fittings, or PRT adapter, the contents of the Tedlar® bag will be screened with a helium detector.

If the integrity testing fails (*i.e.*, helium is detected), the following attempts will be made:

- Verifying and, if need be, repairing the bentonite seal at the annular space between the borehole and rod train (see Section 3.3.2);
- Rethreading the PRT adapter and Teflon® tubing at the lower end of the Geoprobe® rod train (Section 3.3.2);
- Retrieving the Geoprobe® rod train, closing the borehole, and attempting to re-install the temporary implant at a nearby location; and
- Increasing soil gas sampling depth (*e.g.*, from 3 ft bgs to 5 ft bgs).

Exhibit 2
Integrity Testing of Soil Gas Sampling Implant



3.3.4 Soil Gas Sample Collection

Soil gas samples will be collected from the temporary implants following installation and integrity testing. The sampling procedure will be as follows (refer to schematics provided as Exhibit 3 and Exhibit 4):

- Each implant will be purged of one to three internal Teflon® tubing volumes using a disposable syringe (each foot of ¼-inch diameter Teflon® tubing below or above ground is equivalent to a volume of about 10 milliliter [ml]);
- During purging, the vacuum will be monitored using a micromanometer to verify that the vacuum does not exceed a few inches of water column (in. H_20);
- Following the purge, the implant will be connected to a 1-liter, stainless steel, Summa-type canister connected to a flow controller (controlling flow to an average rate of about 13 milliliters per minute [ml/min] to produce a 1-hour time-weighted average sample);
- Sampling will be initiated by opening the Swagelok® and canister valves, recording initial vacuum displayed by the flow controller gauge, and verifying that this initial vacuum is no less than 25 inches of mercury (in. Hg);
- From time to time during sample collection, the sampling crew will verify that the canister vacuum is decreasing;
- Sampling will be stopped (*i.e.*, the valves closed and the canister disconnected) after about an hour once the vacuum reaches about 5 in. Hg;
- The sampling crew will record sample name, initial and final vacuums, initial and final sampling times, canister and flow controller serial numbers, and other pertinent information on the field sampling summary and laboratory chain-of-custody forms; and
- Following canister sample collection, a volume of soil gas will be collected into a 1-liter Tedlar® bag using a peristaltic pump. The Tedlar® bag will be screened for the potential presence of VOCs using a photoionization detector (PID) equipped with a 10.6 electron-volt (eV) lamp and calibrated daily in the field to a 100 parts per million by volume (ppmv) isobutylene-in-air standard. The Tedlar® bag will also be screened for oxygen, methane, and carbon dioxide using a multi-gas meter.

Additional sampling information can be found in typical Summa canister sampling guidance (*e.g.*, Air Toxics Ltd., 2007).[11]

[11] See http://www.airtoxics.com/literature/AirToxicsLtdSamplingGuide.pdf, Section 3.0, p. 9/26.

Exhibit 3
Purge of Soil Gas Sampling Implant

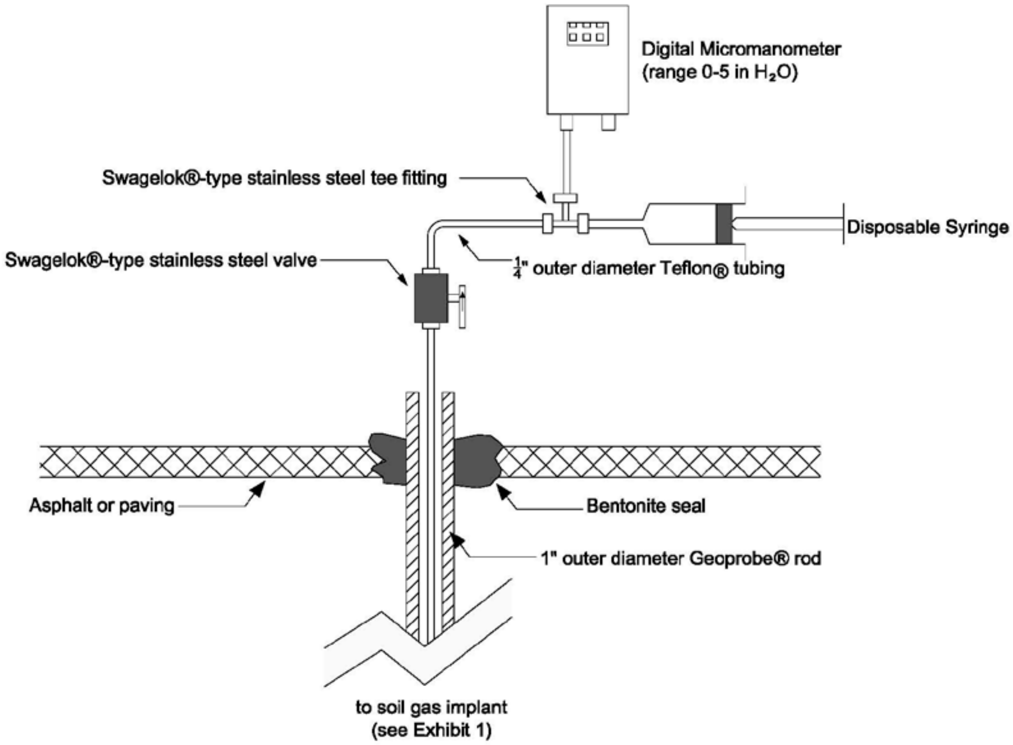
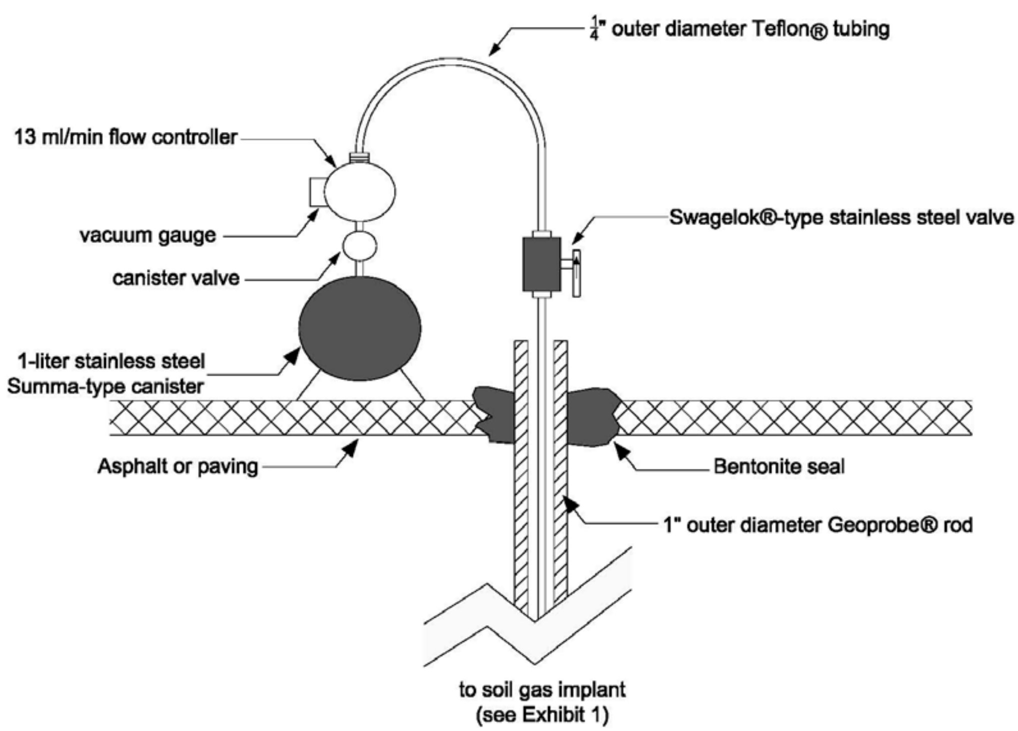


Exhibit 4
Soil Gas Sampling Using Summa-Type Canister



Following sample collection, the canisters will be submitted to a Florida-accredited analytical laboratory to undergo analysis by gas chromatography/mass spectrometry (GS/MS) based on US EPA Method TO-15 in the full-scan mode. The target compound list will be consistent with typical TO-15 lists proposed by analytical laboratories (*e.g.*, on the order of 60 to 80 analytes). Typical reporting limits associated with compounds that may be related to Cabot historical activities are provided in Table 2 (not an exhaustive list). The canisters and controllers will be individually certified clean for the list of target compounds.

Table 2
Selected Compound List and Typical Reporting Limit

Compound Name	Soil Gas Sample TO-15 Reporting Limit[a] (1-liter canister) (µg/m^3)	US EPA Industrial Indoor Air Screening Level[b] (µg/m^3)
Benzene	3.2	1.6
Toluene	3.8	22,000
Ethylbenzene	4.3	4.9
m-Xylene	4.3	440
o-Xylene	4.3	440
p-Xylene	4.3	440
Naphthalene	5.2	0.36

Notes:

(a) *Assumes a typical reporting limit of 1 part per billion by volume (ppbv) on the basis of a dilution factor of about 2 for field samples collected into 1-liter Summa canisters and analyzed by method TO-15 in the full-scan mode. The actual reporting limits for individual samples will vary with sample volume. Assuming VOC concentrations of a few micrograms per cubic meter (µg/m^3), the dilution factor is about 2. Larger VOC concentrations, if present, will result in more elevated dilution factors and higher reporting limits.*

(b) *Industrial indoor air screening level based on the US EPA website on regional screening levels for chemical contaminants at Superfund sites (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/). For carcinogenic compounds (e.g., benzene, ethylbenzene, and naphthalene), a 10^{-6} cancer risk is assumed.*

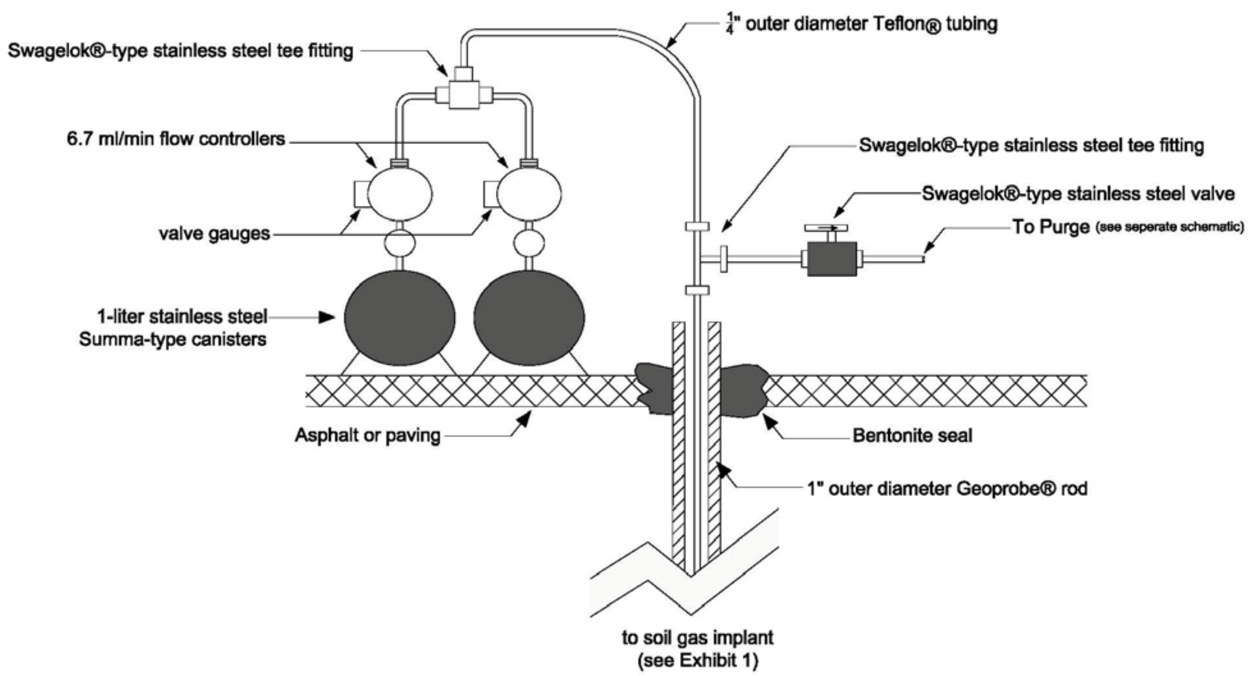
(c) *The actual list of compounds to be analyzed will be consistent with typical TO-15 lists proposed by analytical laboratories and will include on the order of 60 to 80 analytes.*

3.3.5 Quality Control Sampling

Quality control samples will include one blind duplicate soil gas sample and one equipment blank. The blind duplicate soil gas sample will be collected at one of the proposed sampling locations using two Summa canisters and flow controllers connected in parallel with a Swagelok®-type, stainless steel tee fitting as illustrated on the schematic provided as Exhibit 5. Two 2-hour time-weighted average flow controllers (controlling flow to an average rate of about 6.7 ml/min) will be used to maintain a sample collection rate similar to that of a single canister equipped with a 1-hour flow controller.

The equipment blank will be collected by filling a pre-evacuated, 1-liter, certified clean canister with ultra-high purity (UHP) compressed nitrogen supplied by the analytical laboratory in a 6-liter pressurized canister. The 1-liter canister will be equipped with a 1-hour flow controller and connected to the nitrogen canister using Teflon® tubing. The quality control samples will be analyzed for the TO-15 target compound list.

Exhibit 5
Collection of Duplicate Soil Gas Samples



3.4 Data Validation Review

The soil gas data collected as part of the field program will be entered in a database using electronic data delivery files provided by the analytical laboratory. A data validation review will be conducted to assess and confirm the usability of the analytical results. The objectives of this review will be to:

- Assess whether the soil gas data were generated and reported in accordance with applicable analysis and assessment guidance, including US EPA Method TO-15 (US EPA, 1999a) and other applicable documents (US EPA, 2002; US EPA, 1999b);

- Assess whether the data met method data quality objectives for acceptable accuracy (*e.g.*, quality control samples and surrogates), precision (*e.g.*, field and laboratory duplicates), and sensitivity (as it compares to US EPA screening levels); and
- Update the project database with appropriate data quality qualifiers, as needed.

Assuming this investigation concludes that additional investigations and sampling activities are warranted, the data validation will only include a basic review of the following data package: laboratory narrative, sample data sheets, laboratory blanks, laboratory control samples (LCS), continuous calibration verification (CCV) results, and the executed chain-of-custody. It will be assumed that tunes, initial calibrations, and qualitative and quantitative determination of the VOCs provided in each report are acceptable unless an issue is raised in the laboratory narrative.

Conversely, if this investigation concludes — on the basis of the analytical data — that no further sampling or investigations are needed, the validation will also include (in addition to the above) a review of the comprehensive data package, such as tunes and initial calibrations, or raw data for samples and quality control.

3.5 Evaluation of Soil Gas Sampling Results

The soil gas sampling data collected as part of the field program described in Section 3.3 will be used to assess whether or not a potential VI pathway may exist at key buildings that overlie former process areas associated with the historical Cabot operation. Consistent with Tier 3 site-specific assessment guidelines, we will use the data to answer the following key questions:

1. Are there soil gas sample(s) for which VOCs are present at concentration(s) above laboratory reporting limits?
2. Are there soil gas sample(s) for which VOC concentration(s) may exceed the US EPA industrial/commercial indoor air screening level(s) for those VOC(s) (see Table 2) using appropriate attenuation factor(s) (*i.e.*, the ratio of indoor air concentration to soil gas concentration) derived from the US EPA database (US EPA, 2008, 2012) and other information sources?[12] How do the potential indoor air exposure related risks compare to risk targets used by US EPA for remedial decision making?

[12] Soil gas-to-indoor air attenuation is dependent on a number of factors including building type (*e.g.*, residential *vs.* industrial/commercial) and contaminant type (*e.g.*, chlorinated VOCs *vs.* BTEX) with suggested 'generic' attenuation factors ranging from 0.1 to 10^{-3}. Among supporting references, see US EPA VI database reports at https://iavi.rti.org/attachments/OtherDocuments/OSWER_Database_Report_Combined_3-4-08b.pdf and http://www.epa.gov/oswer/vaporintrusion/documents/OSWER_2010_Database_Report_03-16-2012_Final.pdf (Table 19 at p. 79/188). See also US EPA petroleum VI publications (http://www.epa.gov/oust/cat/pvi/pvicvi.pdf and http://www.epa.gov/oust/cat/pvi/pvi-communication-paper.pdf). In addition, see discussion in VI guidance from other states

3. How do VOC concentrations in indoor air that may be predicted from soil gas sampling data using typical attenuation factor(s) compare to typical background levels found in the literature (US EPA, 2011; Dawson, 2008, 2010)?[13]

The above-described evaluation will be used to determine the next step, if any. Depending on the measured soil gas concentrations, the next steps could include additional soil gas sampling in selected areas to further delineate and understand the extent of elevated soil gas concentrations. We will keep US EPA and other stakeholders informed of our findings and seek US EPA's input if a follow-up investigation is needed.

3.6 Report Preparation

The findings of this assessment will be documented along with our conclusions and recommendations in a report to be provided to US EPA. The report will include a narrative describing the results, summary figures and tabulated data, and copies of the analytical laboratory report, sampling records, and data validation review report.

4 Schedule

As previously mentioned, we propose to collect these samples during the August-September timeframe consistent with US EPA's recommendation. While receiving approval of this work plan from US EPA, property owner(s) will be contacted to obtain access agreement. Upon obtaining owner's agreement, we will provide courtesy notification to the building tenants and anticipate that a few weeks will be needed to schedule the sampling program. In its present scope, the soil gas sampling program should take no more than two to three days to complete. No sampling will be conducted during hurricanes, severe storms, or significant wind events.

We would anticipate that analytical results would be received approximately two to three weeks following data collection. Data validation review, assessment, and report preparation would follow and is anticipated to take approximately six to eight weeks. Therefore, assuming that site access is granted in the late Spring and sampling proceeds during the month of August 2012, results of the soil gas sampling program would be reported in October 2012.

(http://dnr.wi.gov/files/PDF/pubs/rr/RR800.pdf on large commercial buildings at p. 14/27 and http://www.anr.state.vt.us/dec/wastediv/SMS/pubs/IROCP.pdf on petroleum VI in Appendix C at p. 72/97).

[13] See https://iavi.rti.org/attachments/WorkshopsAndConferences/05_EPA_Background.pdf and https://iavi.rti.org/attachments/WorkshopsAndConferences/04_Kurtz_Draft_AEHS_Background_3-08-10.pdf.

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Figures

NOTE:
All site features and locations are approximate.

MAP REFERENCE:
Pictometry Oblique Imagery purchased from MapMart. Photo dated March 23, 2007.

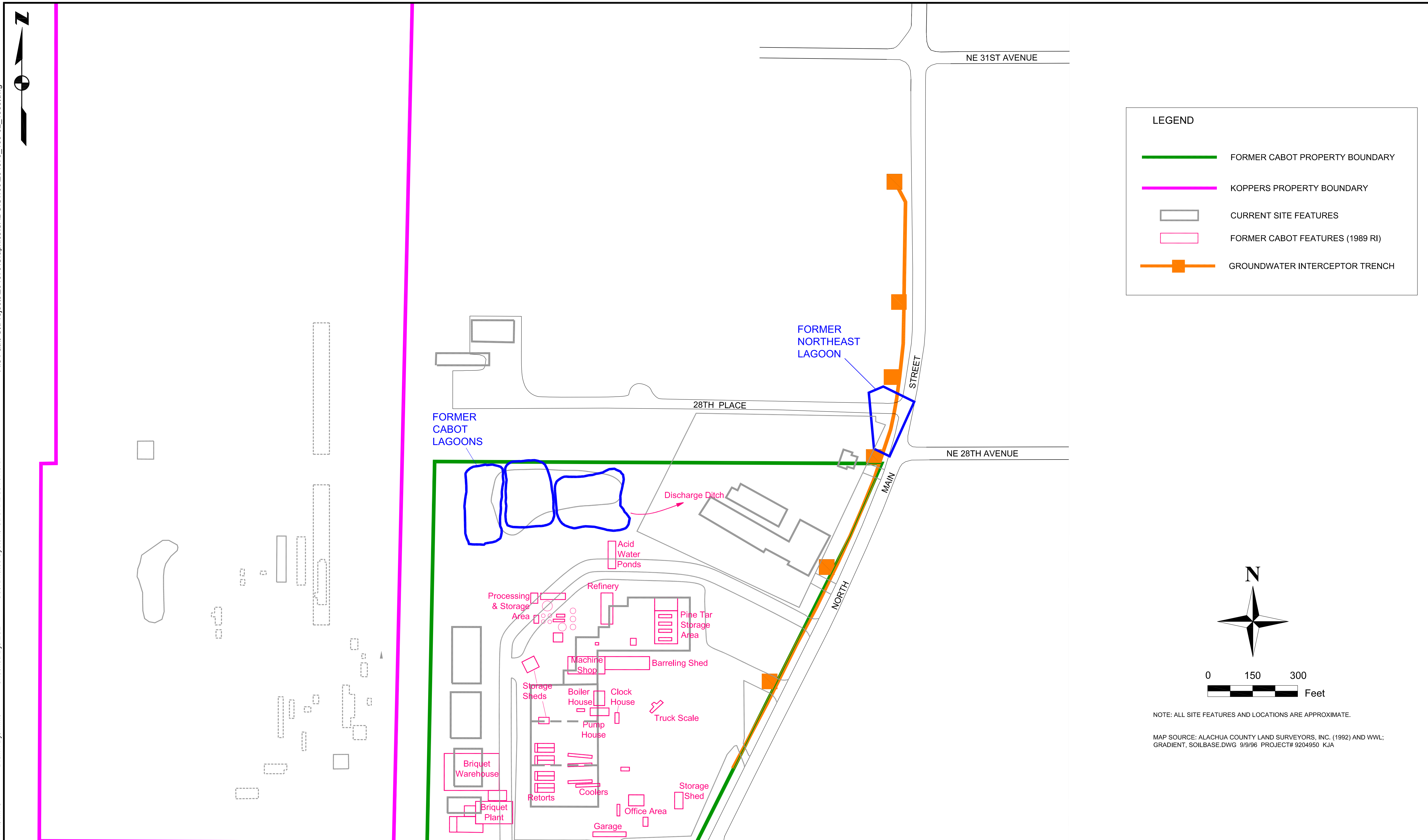
Gradient

Site Location Plan

Cabot Carbon/Koppers Superfund Site
Gainesville, Florida

FIGURE
1

Date: 1/9/2012



Gradient

Historical Features

Cabot Carbon/Koppers Superfund Site
Gainesville, Florida

FIGURE
2

Date: 01/03/2012

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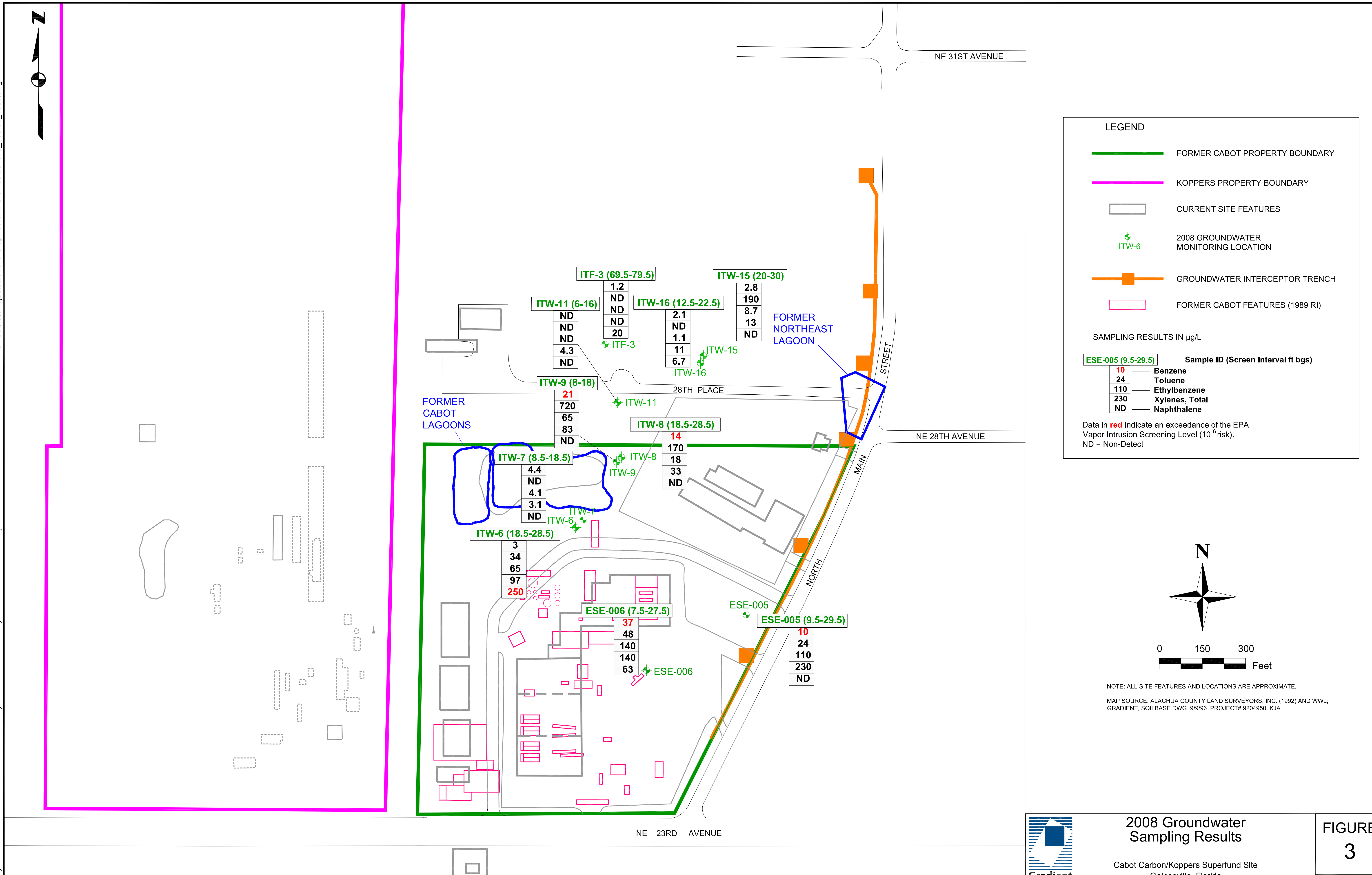

2008 Groundwater Sampling Results

Cabot Carbon/Koppers Superfund Site
Gainesville, Florida

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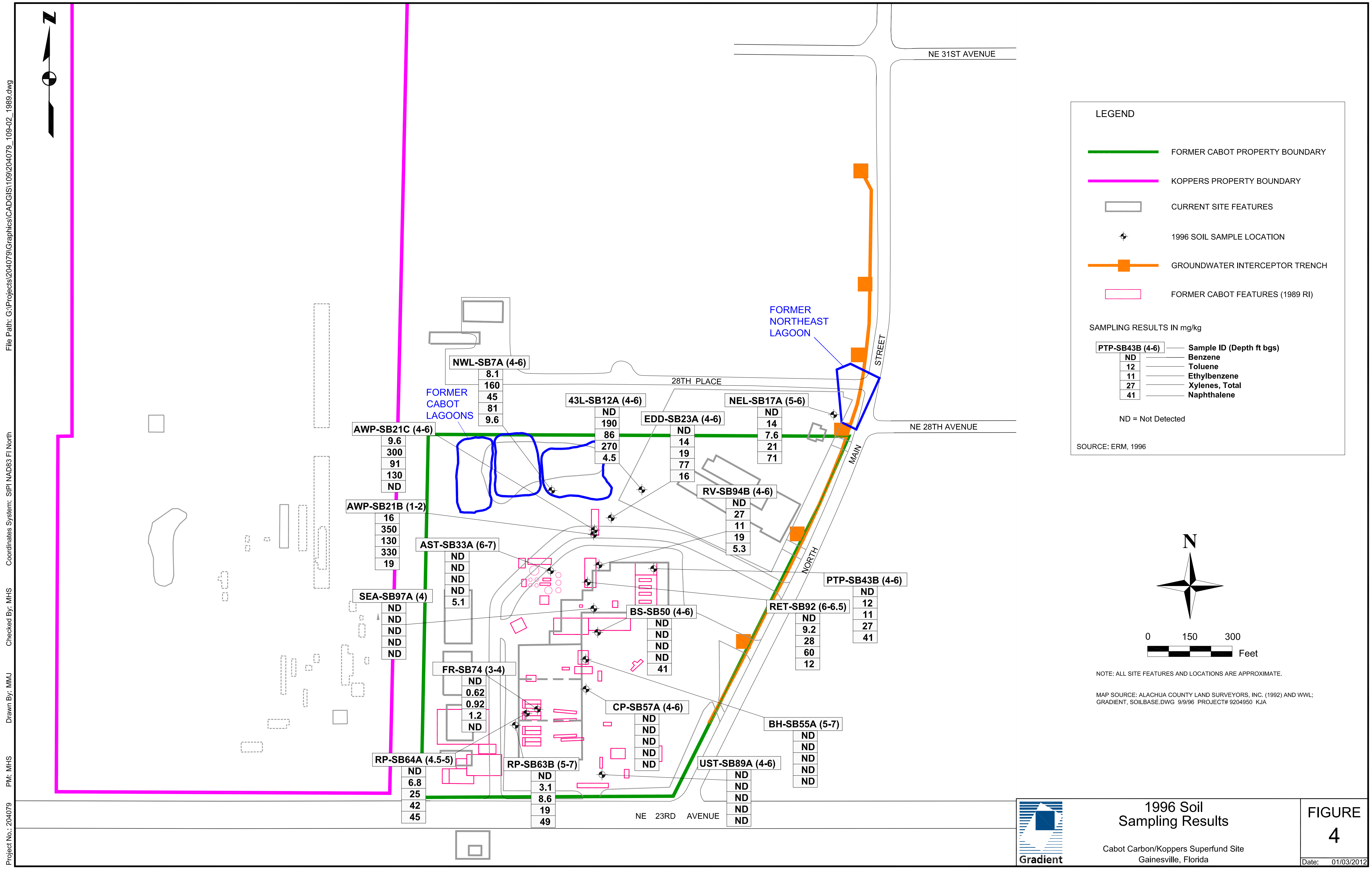
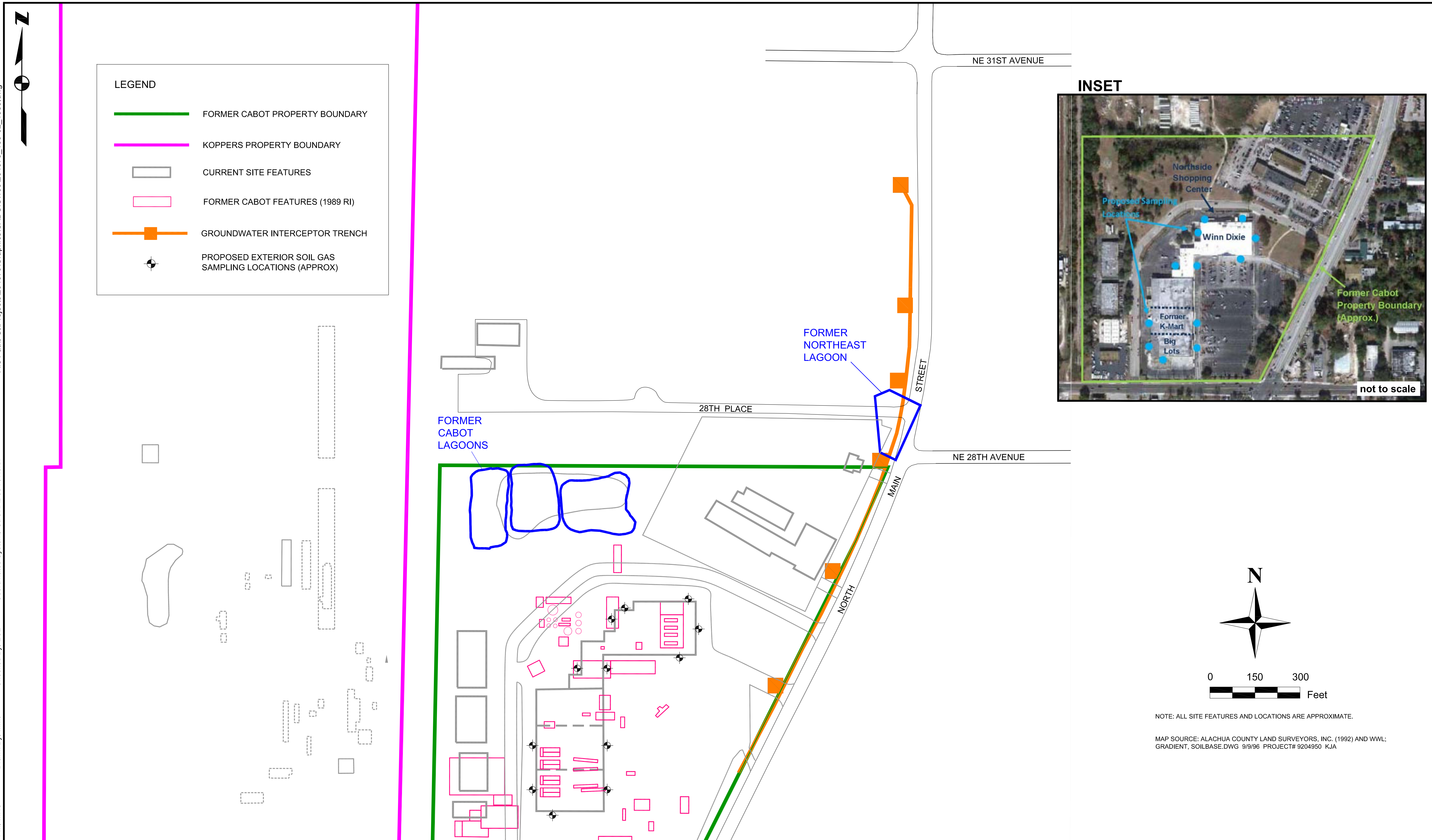
Checked By: MHS
Drawn By: MMJ
PM: MHS
Project No.: 204079



N
NE 31ST AVENUE
LEGEND
FORMER CABOT PROPERTY BOUNDARY
KOPPERS PROPERTY BOUNDARY
CURRENT SITE FEATURES
1996 SOIL SAMPLE LOCATION
GROUNDWATER INTERCEPTOR TRENCH
FORMER CABOT FEATURES (1989 RI)
SAMPLING RESULTS IN mg/kg
PTP-SB43B (4-6) Sample ID (Depth ft bgs)
ND Benzene
12 Toluene
11 Ethylbenzene
27 Xylenes, Total
41 Naphthalene
ND = Not Detected
SOURCE: ERM, 1996
FORMER NORTHEAST LAGOON
STREET
NORTH
MAIN
28TH PLACE
NE 28TH AVENUE
FORMER CABOT LAGOONS
NWL-SB7A (4-6)
8.1
160
45
81
9.6
43L-SB12A (4-6)
ND
190
86
270
4.5
EDD-SB23A (4-6)
ND
14
19
77
16
NEL-SB17A (5-6)
ND
14
7.6
21
71
AWP-SB21C (4-6)
9.6
300
91
130
ND
RV-SB94B (4-6)
ND
27
11
19
5.3
AWP-SB21B (1-2)
16
350
130
330
19
AST-SB33A (6-7)
ND
ND
ND
ND
5.1
PTP-SB43B (4-6)
ND
12
11
27
41
SEA-SB97A (4)
ND
ND
ND
ND
ND
BS-SB50 (4-6)
ND
ND
ND
ND
41
RET-SB92 (6-6.5)
ND
9.2
28
60
12
FR-SB74 (3-4)
ND
0.62
0.92
1.2
ND
CP-SB57A (4-6)
ND
ND
ND
ND
ND
BH-SB55A (5-7)
ND
ND
ND
ND
ND
RP-SB64A (4.5-5)
ND
6.8
25
42
45
RP-SB63B (5-7)
ND
3.1
8.6
19
49
UST-SB89A (4-6)
ND
ND
ND
ND
ND
NE 23RD AVENUE
N
0 150 300
Feet
NOTE: ALL SITE FEATURES AND LOCATIONS ARE APPROXIMATE.
MAP SOURCE: ALACHUA COUNTY LAND SURVEYORS, INC. (1992) AND WWL; GRADIENT, SOILBASE.DWG 9/9/96 PROJECT# 9204950 KJA
Gradient
1996 Soil Sampling Results
Cabot Carbon/Koppers Superfund Site
Gainesville, Florida
FIGURE 4
Date: 01/03/2012
Project No.: 204079 PM: MHS Drawn By: MMJ Checked By: MHS Coordinates System: StPl NAD83 Fl North File Path: G:\Projects\204079\Graphics\CADGIS\109\204079_109-02_1989.dwg



NOTE: ALL SITE FEATURES AND LOCATIONS ARE APPROXIMATE.

MAP SOURCE: ALACHUA COUNTY LAND SURVEYORS, INC. (1992) AND WWL; GRADIENT, SOILBASE.DWG 9/9/96 PROJECT# 9204950 KJA

Gradient

Proposed Exploration Location Plan

Cabot Carbon/Koppers Superfund Site
Gainesville, Florida

FIGURE 5

Date: 06/06/2012

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