ADDENDUM TO THE FEASIBILITY STUDY REPORT

CHEMICAL COMMODITIES, INC. SITE OLATHE, KANSAS

Prepared by:

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9 June 2004

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9 June 2004

Ms. Mary Peterson
Remedial Project Manager
U.S. Environmental Protection Agency
901 North Fifth Street
Kansas City, KS 66101

Subject: Addendum to the Feasibility Study Report
Chemical Commodities, Inc. Site
Olathe, Kansas

Dear Ms. Peterson:

Enclosed is the Addendum to the Feasibility Study Report (FS Addendum) for the Chemical Commodities, Inc. Site in Olathe, Kansas. Four copies are enclosed for your use. Together with the previously submitted FS Report, this FS Addendum forms a complete Final FS package and is submitted to U.S. Environmental Protection Agency Region 7 (USEPA) in accordance with the requirements of Administrative Order on Consent (AOC) USEPA Docket # CERCLA-7-2000-0019.

The FS Addendum includes a Revised Executive Summary for the Final FS Report and a new remedial alternative scenario S3D, as requested by USEPA. In addition, the FS Addendum includes responses to the Conditions for Approval contained in USEPA's Conditional Approval of the Draft Feasibility Study Report dated May 6, 2004. Responses will be submitted separately to USEPA's General Comments, and to comments received from the Kansas Department of Health and the Environment, the Community Action Group, and the City of Olathe.

As requested, discussion of a preferred alternative has been removed from the FS Addendum. We wish to reiterate that based on our evaluation, soil remedial alternative S4 (capping of the Site, with land use restrictions) and groundwater remedial alternative G2 (in-situ chemical oxidation, with monitored natural attenuation, continued vapor monitoring, and land use restrictions) should be considered the preferred alternative for site remediation. Together, these two components comprise a comprehensive remedial alternative that would mitigate the risk from ingestion, inhalation and dermal contact with on-Site soil by recreational users and construction/maintenance workers by isolating the contaminated soil beneath an engineered cap. Ingestion of and/or direct contact with contaminated groundwater both on Site and off Site would be mitigated by the City of Olathe ordinance and further mitigated on Site by the deed restriction and cap. The off-Site migration of contaminated groundwater would be minimized by the chemical oxidation infiltration trench along the downgradient Site boundary. The cap would minimize potential leaching of contaminants from soil to groundwater and the infiltration trench would mitigate their potential off-Site migration. In-situ chemical oxidation combined with monitored natural attenuation would reduce contaminant concentrations in groundwater to levels that are adequately protective of indoor air quality.

Under this comprehensive remedial alternative, home ventilation units would continue to be used to mitigate the potential inhalation of Site-related contaminants in indoor air until such time as contaminant concentrations in groundwater are reduced to levels that are adequately protective of indoor air quality. A maintenance and monitoring plan would be developed to ensure continued effective operation of the home ventilation units and to minimize any inconvenience to residents.

When evaluated against the balancing criteria, this comprehensive remedial alternative provides long-term effectiveness and permanence. It would mitigate the potential migration of contaminants from soil to groundwater over time and it would treat contaminants that may reach groundwater. It would be very effective in the short-term and would allow for relatively rapid redevelopment of the Site into a variety of open space or recreational park uses with relatively minimal impacts to the community. This comprehensive alternative ranks high in terms of implementability. The total estimated cost is $10,601,000 (capital cost plus non-discounted 30-year operation and maintenance cost).

If you have any questions, please don't hesitate to let us know. Thank you for your cooperation.

Sincerely yours,

Mark Schultheis

Mark Schultheis, P.E.
Associate

Enclosure

cc: Mr. Robert Weber, L.G., KDHE
Ms. Sabine E. Martin, Kansas State University
Mr. Brian Mossman, Boeing
Mr. Michael Basel, Ph.D., P.E., Haley & Aldrich

ADDENDUM TO THE FEASIBILITY STUDY REPORT

CHEMICAL COMMODITIES, INC. SITE
OLATHE, KANSAS

The United States Environmental Protection Agency, Region VII (USEPA) issued its letter entitled "Conditional Approval of the Draft Feasibility Study Report, Chemical Commodities, Inc. Site, Olathe, Kansas" (Conditional Approval Letter). The Feasibility Study Report (FS Report) was dated March 23, 2004 and the Conditional Approval Letter was dated May 6, 2004. This Addendum to the Feasibility Study Report (FS Addendum) comprises the response to the Conditional Approval Letter. Each of the Conditions for Approval contained in the Conditional Approval Letter is repeated, followed by the response, in Section 1 of this FS Addendum. Section 2 of this FS Addendum contains a revision to the Executive Summary provided in the FS Report (Revised Executive Summary). As requested by USEPA, a new alternative scenario has been developed (alternative scenario S3D) which is a third section of this FS Addendum. Finally, a response to one of the Conditions of Approval, Comment #4, is provided as Section 4 of the FS Addendum.

Together the FS Report dated March 23, 2004 and this FS Addendum comprise the Final Feasibility Study Report for the Chemical Commodities, Inc. (CCI) Site in Olathe, Kansas.

The contents of this FS Addendum are as follows:

SECTION 1

RESPONSE TO CONDITIONS FOR APPROVAL

Addendum to the Feasibility Study Report
Dated March 23, 2004
Chemical Commodities, Inc. Site
Olathe, Kansas

Response to Conditional Approval of the Draft Feasibility Study Report
Dated May 6, 2004

Conditions for Approval

Comment 1. *EPA's approval of the Draft FS Report does not imply approval of the preferred alternative identified in the report. Following receipt of a revised report or addendum report, EPA will select its preferred alternative and will present that to the public in a Proposed Plan.*

Response: Comment is noted. A Revised Executive Summary for the Final FS Report has been prepared and is provided as a section of this FS Addendum. The discussion of a preferred alternative has been removed from the Revised Executive Summary.

Comment 2. *The EPA believes that an additional excavation scenario should be evaluated to focus on hot spots as defined by the soil contour maps. The EPA envisions that the excavation would be conducted in cells where the cells are designed to maximize mass removal, while minimizing exposure to area residents through the use of methods such as enclosures around the cell. All excavation scenarios for offsite disposal should be evaluated for transportation by rail, provided that the railroad can assist by defining certain considerations in a timely manner. My contact at Burlington Northern Santa Fe (BNSF) is Judy McDonough. Judy can be reached at (913) 551-3989 or via e-mail at "judith.mcdonough@bnsf.com".*

Response: An additional excavation scenario has been developed and incorporated into a new alternative for the FS Addendum. This alternative, identified as soil alternative scenario S3D, is provided as a section of this FS Addendum. The alternative includes excavation of VOC-contaminated soil above a concentration of 1,000 ppm to a depth of six feet below ground surface (bgs) and metals-contaminated soils that present a human health risk at the Site, also to a depth of six feet bgs. These soils would be transported off-Site for disposal. Clean soil would be imported and compacted for backfill of the excavation and the Site would then be graded and capped. The actual design elements of the cap would be decided during remedial design, and would be chosen so that a wide variety of open space uses could be accommodated. Land use restrictions would be implemented precluding residential and commercial use on a portion of the on-Site property.

Preliminary costs for rail transport of excavated soils have been provided by BNSF. The costs include construction of a new rail spur and other rail improvements that are estimated to range from $100,000 to $250,000 (it is unclear if this cost includes subsequent removal of the spur). Based on the preliminary costs provided by BNSF, rail transport may be the most efficient and effective method for soil volumes greater than 10,000 cubic yards. However, off-Site treatment and disposal, not transportation, are the cost drivers for excavations greater than 10,000 cubic yards so rail versus truck transportation costs do not affect the feasibility study. If a soil remedial alternative is chosen that requires excavation and off-Site transport of 10,000 cubic yards or more, the method of transportation would be more closely assessed during remedial design. For a smaller excavation, including new alternative scenario S3D in the FS Addendum, the potential benefits of rail transport are outweighed by the large capital cost outlay and construction program required for installation of a rail spur.

Comment 3. *Remediation time frames should be provided for the groundwater alternatives. It is understood that methods for calculating remediation time frames would result in estimates with substantial uncertainties. However, the public needs some perspective on how long it will take for certain groundwater alternatives to achieve MCLs. The basis for calculating remediation time frames should be included and uncertainties should be clearly stated.*

Response: Several methods were considered in an attempt to develop a reliable time-frame estimate for remediation of groundwater at this Site. Regardless of the method used the complexities of the groundwater regime, the unpredictably variable nature of contaminant attenuation mechanisms, and the uncertainties inherent in the Site are such that any estimate would be misleading. An estimate of years required to reach remedial goals, whether high or low, would have no foundation that could provide any confidence in the estimate. Active groundwater treatment can help reduce high concentrations and remove contaminant mass, but achieving MCLs is ultimately dependant on the amount of mass actually present, the rate and quantity of mass removed by active treatment, dissolution rates of any remaining NAPL, diffusion rates from the rock matrix and the site-specific attenuation rate. The monitoring program to be implemented as part on any remedial action will be designed to better evaluate these various factors so that a relatively accurate time-frame estimate can be prepared.

Comment 4. *The FS Report should include a discussion of the indoor air data, associated risks, and the installation of vapor control systems in certain homes pursuant to an amendment to the*

RI/FS AOC. This is especially important given that maintenance of the vapor control systems is a common element in all of the groundwater alternatives.

Response: A separate section of this FS Addendum provides a response to this comment, which includes data resulting from the vapor migration assessment and installation of the vapor control systems.

Comment 5. *In accordance with EPA's monitored natural attenuation (MNA) policy, a contingency action must be identified in order for MNA to be selected as a stand-alone remedial alternative. The discussion pertaining to alternative G4 should clarify requirements regarding a contingency action. For the CCI site, EPA views MNA as a possible component of an overall groundwater strategy, but would not consider MNA alone to be an acceptable remedy.*

The EPA does not agree with Table 7-8 with respect to the evaluation of alternative G4. As a stand-alone remedy, EPA does not believe that MNA will be protective of human health and the environment for a large portion of the plume where contaminant concentrations are extremely high. MNA might be protective over the long term for outer portions of the plume where concentrations are lower. In addition, EPA would rank MNA lower on short term effectiveness due to the length of time required to meet the remedial action objectives.

Response: Alternative G4 includes MNA as a component, but not as a stand alone remedial alternative. In addition to MNA, Alternative G4 also includes:

- Institutional controls, consisting of the provisions of City of Olathe Ordinance No. 03-17;
- Engineering controls (ventilation systems) presently in place in homes where vapor samples indicate that action levels have been exceeded;
- Groundwater monitoring; and
- A five-year review of the remedy, which is a requirement under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) for sites where waste is left in place or where the remedial actions do not allow for unrestricted land use.

These additional elements (which are also elements of Alternatives G2 and G3) provide short-term effectiveness of the alternative G4, just as they provide for the short-term effectiveness of each other groundwater remedy. It is acknowledged that implementing an active treatment remedy, such as alternative G2 or G3, may serve to reduce more quickly the mass of contaminants in the source area and concentrated downgradient area of the plume. It is unknown whether such an active treatment remedy may reduce significantly the time required to attain identified target cleanup levels, the MCLs. No matter which groundwater remedy is implemented, there will be active monitoring to provide assurances about the effectiveness of the remedy.

Comment 6. *Section 6.4.4.5, Page 48, Table - The estimated working days for the various alternatives and scenarios need to be reevaluated or the methodology for developing these numbers should be clarified. I realize that some rounding may have been done, but I calculated 2,333 working days for S2C under the 10-hr/day scenario as opposed to 3,000 days, and I calculated 116 working days for S2B under the 24-hr/day scenario as opposed to the 200 days shown in the table. Also, check consistency of these numbers with the numbers used in the detailed cost estimates.*

Response: The estimated working days for alternative scenarios S2B and S2C include the assumption that the soils saturated with groundwater beneath approximately eight feet bgs would require processing twice through the LTTD unit. Calculations performed considering this double processing step increases the number of working days assumed in the FS Report, and used for costing purposes.

The FS Report estimate for duration of LTTD treatment under alternative scenario S2C assumes the following:

- Volume of 50,000 cubic yards to be processed;
- 1.4 tons per in-place cubic yard;
- A LTTD processing rate of 3 tons per hour;
- Operation time of 10 hours per day, with one hour for start-up and one hour for shut down; and
- A requirement that saturated soils (beneath approximately eight ft bgs) would be processed twice through the LTTD unit: once primarily to dry the saturated soils, and a second time to drive off the organics

Based on these assumptions, a calculation of 3,000 days for the duration of alternative S2C, and a calculation of 200 days for alternative S2B, is accurate. In fact, the processing time could be much longer given weather delays and other possible upset conditions.

SECTION 2

REVISED EXECUTIVE SUMMARY

REVISED EXECUTIVE SUMMARY

The Final Feasibility Study (Final FS) Report prepared for the Chemical Commodities, Inc. (CCI) Site in Olathe, Kansas (the Site, Figure ES-1) comprises the FS Report dated March 23, 2004 and the FS Addendum Report dated June 5, 2004. This Revised Executive Summary is written for the Final FS Report.

The CCI Site is a federal Superfund site that was listed on the National Priorities List in 1994. The Final FS Report is submitted to the United States Environmental Protection Agency Region 7 (USEPA) in accordance with the requirements of Administrative Order on Consent (AOC) USEPA Docket # CERCLA-7-2000-0019.

Background *(FS Report Sec. 2.2)*

The Site is located at 320 South Blake Street, in the City of Olathe, Kansas. The CCI property occupies approximately 1.5 acres and includes the area within the CCI fence line and the property owned by Burlington Northern Santa Fe Railway Company (BNSF) as shown on Figure ES-1. Properties surrounding the Site include the BNSF railroad tracks to the east, with light industrial areas and residential areas east of the railroad; open space to the south; Keeler Street and residential areas to the west; and residential areas and light industrial areas to the north.

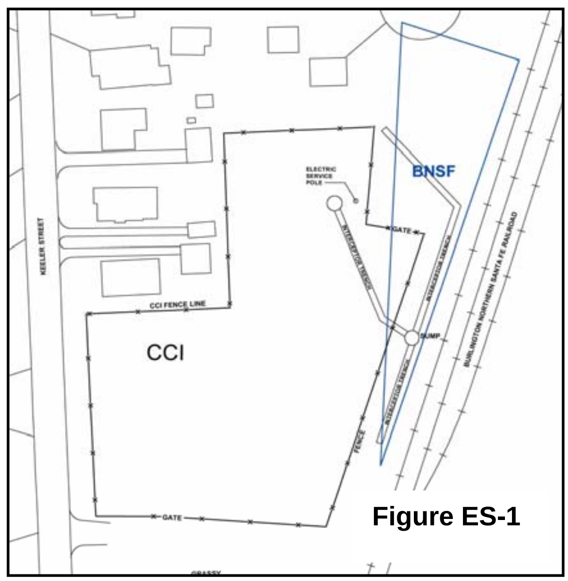


Figure ES-1

CCI was owned and operated by Jerald Gershon from 1951 until the end of 1989. It was a chemical brokerage and recycling facility that bought and sold new, used, off-specification, and surplus chemicals. Chemicals were stored in aboveground and underground storage tanks, a tanker trailer, drums, barrels, boxes, sheds and other containers. Historic Site features are shown in Figure ES-2.

On July 3, 1977, the seventh fire to occur in ten years resulted in a number of complaints from local citizens. Following the fire, both USEPA and the State of Kansas conducted inspections of the CCI facility. Numerous interactions between CCI, USEPA, the State of Kansas and the City of Olathe occurred over the next 12 years until CCI/Gershon declared bankruptcy in 1989. Over the following several years, USEPA performed various removal actions at the Site. These included removing the chemicals from the Site, decontaminating and subsequently demolishing the main warehouse and excavating and disposing the top 12 inches of soil from much of the fenced portion of the Site. An interceptor trench was also installed in an attempt to recover chemical product from the subsurface. The interceptor trench still is operated on a periodic basis. USEPA also conducted studies of indoor air quality in some homes adjacent to the Site and has installed vapor control systems in a number of homes as a result of the studies. In June 1994, the Site was placed on the National Priorities List. Remedial investigation activities began in 1995 and were completed in 2004.

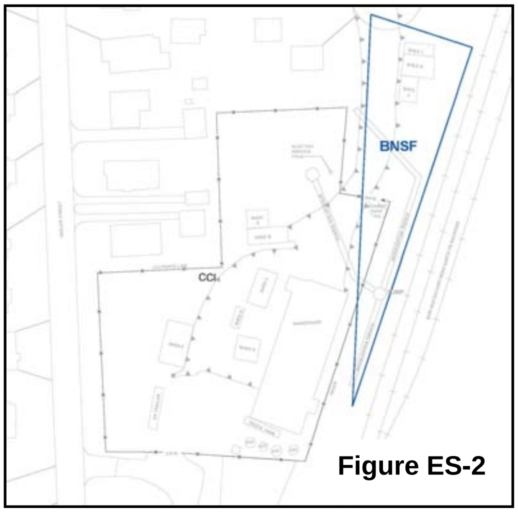
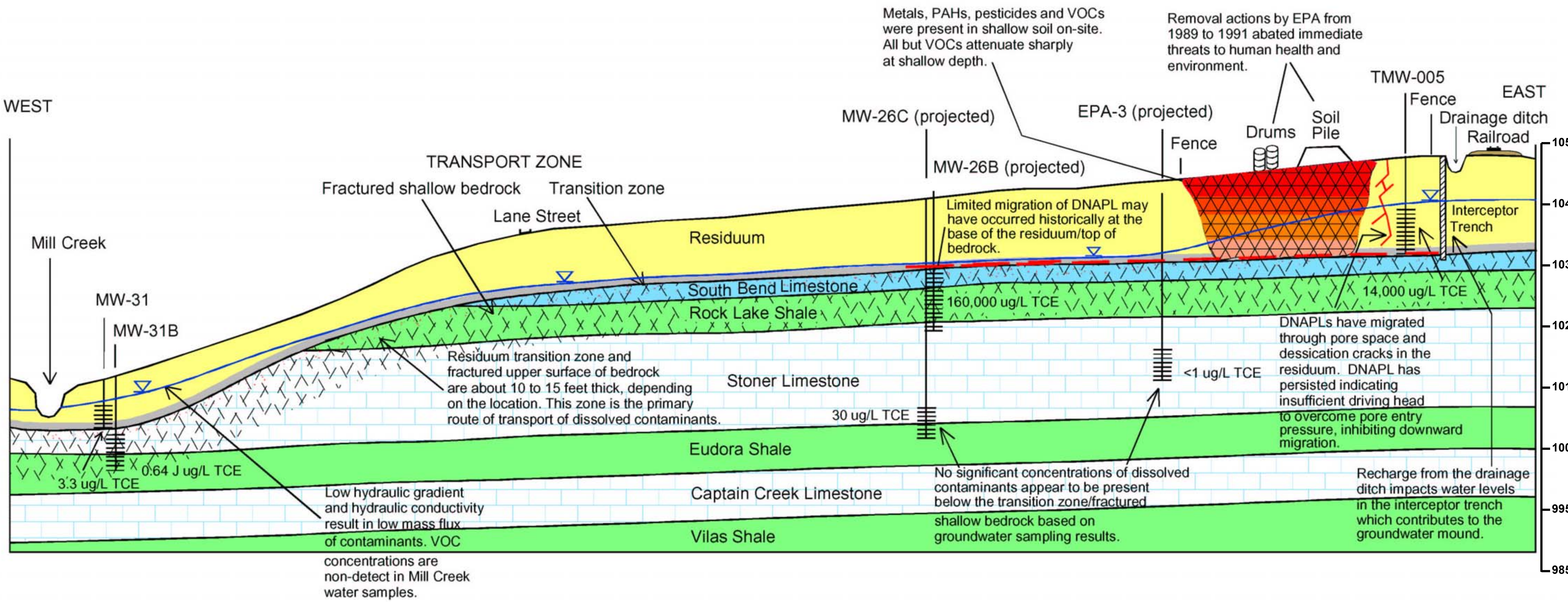


Figure ES-2

Geology and Hydrogeology ***(FS Report Sec. 2.4 and 2.5)***

A conceptual model of Site geology and hydrogeology is shown on Figure ES-3. The Site geology consists of approximately 20 feet of unconsolidated silt and clay residuum overlying limestone and shale bedrock. There is a thin transition zone between the soil residuum and bedrock consisting of gravelly clay/highly weathered bedrock on the order of several inches thick. The transition zone is characterized as having a higher effective permeability than the overlying residuum. Bedrock beneath the Site dips gently towards the northwest. There is a greater amount of weathering and fractures within the upper ten feet of the bedrock than in deeper bedrock.

SCHEMATIC CROSS SECTION FRON CCI SITE TO MILL CREEK
(LOOKING NORTH)



Note: Vertical exaggeration is approximately 8x.
Source: Haley & Aldrich, December 2003.

FIGURE ES-3
CONCEPTUAL SITE MODEL

CHEMICAL COMMODITIES, INC.
OLATHE, KANSAS

GeoSyntec Consultants

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Shallow groundwater occurs beneath the Site at depths of about eight feet below ground surface. In general, groundwater flows to the west, southwest, and south away from the Site as shown on Figure ES-4. The gradient ranges from 0.058 ft/ft to 0.01 ft/ft. The average horizontal gradient is 0.019 ft/ft. The Pennsylvanian bedrock throughout the region has not been developed as a significant groundwater resource for municipal, agricultural, or industrial supply since well yields are typically less than 10 gallons per minute (gpm) and water salinity increases at depths below 100 feet. No active water supply wells have been identified within a one-mile radius of the Site. Hydraulic conductivity in all units is very low with the transition zone being slightly more permeable than the residuum or bedrock.

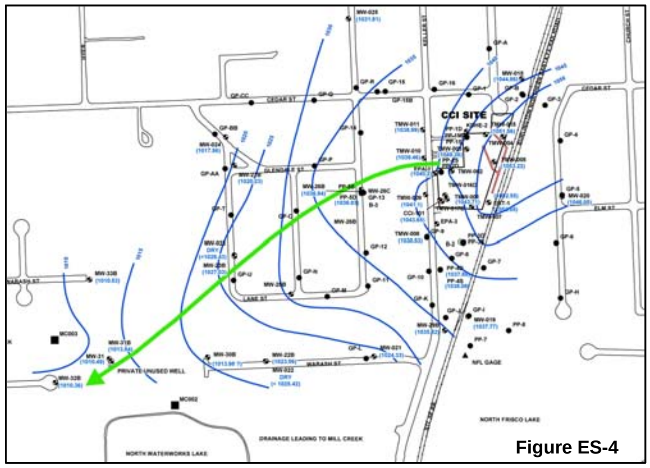

Figure ES-4

Contaminant Distribution ***(FS Report Sec. 3.2 and 3.3)***

Soil, soil vapor, surface water, sediment, groundwater and air have been investigated at the Site. The investigations have included soil, surface water, and sediment sampling at more than 175 locations, the installation of 35 groundwater monitoring wells and 30 temporary groundwater sampling points, and the collection of vapor samples from a number of homes adjacent to the Site. The results indicate that on-Site soil contains volatile organic compounds (VOCs), semi-volatile organic

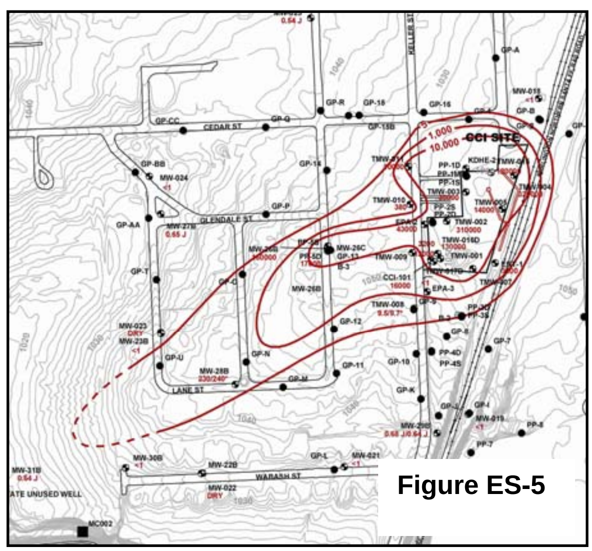

Figure ES-5

compounds (SVOCs), polychlorinated biphenyls (PCBs), metals and pesticides. Groundwater both on-Site and off-Site contains VOCs, notably trichloroethene (TCE), cis-1,2-DCE, 1,2-DCA, tetrachloroethene (PCE) and carbon tetrachloride. Figure ES-5 shows the general distribution of TCE in groundwater. Dense non-aqueous phase liquid was noted in a few wells during remedial investigation activities. Figure ES-3 depicts the conceptual model of contaminant distribution at the Site.

Feasibility Study Process

The Feasibility Study (FS) process is specified by the USEPA and must be followed. The purpose of the FS process is to provide sufficient information on potential remedial options to that informed decisions may be made. The FS process consists of developing remedial alternatives, screening these alternatives and then performing a detailed analysis of the most applicable alternatives. There are many steps required to complete this process including:

- Developing Remedial Action Objectives (RAOs). Remedial Action Objectives are goals specific to various media (i.e., soil, groundwater) that are to be met by a remedy. The RAOs are based on the results of the Remedial Investigation (RI), the Baseline Risk Assessment and the expected future use of the Site *(FS Report Sec. 4);*

- Identifying and selecting applicable remedial technologies for soil and groundwater based on effectiveness, implementability and cost *(FS Report Sec. 5);*

- Developing remedial alternatives for the Site from the retained remedial technologies that either singly or in combination satisfy the RAOs *(FS Report Sec. 6);*

- Screening the remedial alternatives and then performing a detailed analysis of each of the final remedial alternatives *(FS Report Sec. 7);* and

- Performing a comparative analysis of the final remedial alternatives sufficient to provide the information necessary to select an appropriate remedy for the Site *(FS Report Sec. 8)*.

Remedial Action Objectives *(FS Report Sec. 4.3)*

The RAOs are based on the results of:

- The Remedial Investigation that determined that on-Site soil, on-Site groundwater and off-Site groundwater all contain hazardous substances from the Site;

- The expected future land use of the Site based on general consensus among the various stakeholders (USEPA, State of Kansas, Community, City and potentially responsible parties) that the Site will be utilized in the future as open-space and/or a recreational park; and

- The results of the baseline human health risk assessment.

The RAOs developed for the CCI Site are:

- Mitigate risk from ingestion, inhalation, and dermal contact with soils to acceptable risk levels;

- Minimize further off-Site migration of groundwater containing VOCs in excess of target cleanup levels;

- Prevent ingestion of groundwater containing VOCs in excess of target cleanup levels;

- Mitigate risk from direct contact with groundwater containing VOCs in excess of target cleanup levels;

- Mitigate risk associated with inhalation of residential indoor air containing vapors emanating from groundwater; and

- Reduce VOC concentrations in groundwater to levels that are adequately protective of indoor air quality.

Applicable Remedial Technologies *(FS Report Sec. 5.3 and 5.4)*

All potentially applicable technologies for soil remediation were screened based on effectiveness, implementability and cost. The remedial technologies determined to be most applicable to Site soils are:

- Excavation and treatment using low temperature thermal desorption;
- Excavation and off-Site incineration and/or disposal;
- Capping; and
- Land use restriction on the type of future development and use of the Site.

Other technologies identified but eliminated from further consideration are:

- Enhanced in-situ bioremediation;
- Soil vapor extraction;
- Phytoremediation;
- In-situ thermal treatment;
- In-situ chemical oxidation;
- Surfactant flushing; and
- Chemical stabilization.

The technologies listed above were eliminated primarily due to effectiveness concerns caused by the low permeability in soils, which would hinder the ability to inject fluids or recover fluids from soils. Enhanced in-situ bioremediation, in-situ chemical oxidation, surfactant flushing and chemical stabilization were eliminated due to the inability to adequately distribute liquids through the tight clay soils. Soil vapor extraction was eliminated due to the results of pilot testing that showed it to be ineffective at the Site. Phytoremediation was eliminated because it has not been shown to sufficiently treat the chemicals at the depths present in the soil.

All potentially applicable technologies for groundwater remediation were screened based on effectiveness, implementability and cost. The remedial technologies determined to be potentially applicable to address groundwater both on Site and off Site are:

- Pump and treat;
- In-situ chemical oxidation;
- Groundwater monitoring;
- Monitored natural attenuation;
- Vapor control systems; and
- Restrict extraction of groundwater containing chemicals above target cleanup levels.

Other technologies identified but eliminated from further consideration are:

- Enhanced in-situ bioremediation;
- In-situ thermal treatment;
- Air sparging;
- Permeable iron wall; and
- Slurry or sheet pile wall.

The technologies listed above were primarily eliminated due to effectiveness issues. These issues are related primarily to the inability of groundwater technologies to contact or treat constituents in the low permeability zones in the transport zone at the Site, which consists of residuum, transition zone and underlying bedrock. In addition, it would be difficult to install a permeable iron wall or sheet pile wall deep enough into the transport zone to effectively intercept contaminated groundwater that could pass beneath the wall.

Development of Remedial Alternatives ***(FS Report Sec. 6.2 and 6.3)***

Eight remedial alternatives were developed from the retained remedial technologies. A screening step was performed and final remedial alternatives were developed separately for soil and groundwater. The four final remedial alternatives for soil selected for detailed analysis are:

- S1 – No Action: This consists of no remedial actions or institutional controls to address soils above target cleanup levels. Soil alternative S1 is included as required by USEPA guidance.

- S2 – Low Temperature Thermal Desorption (LTTD): This remedial alternative consists of excavating on-Site soil, disposing soils containing metals above target cleanup levels off Site, treating soils containing VOCs on Site with LTTD and then using the treated soil to backfill the excavation. The amount of soil to be excavated and disposed and/or treated may range from 9,500 to 50,000 cubic yards, depending upon the excavation scenario.

- S3 – Off-Site Disposal: This remedial alternative consists of excavating and transporting soil off Site for treatment and/or disposal. The amount of soil to be excavated and disposed may range from 2,500 cubic yards to 50,000 cubic yards, depending upon the excavation scenario. Clean backfill would be brought to the Site to fill the excavation.

- S4 – Capping: This alternative would consist of covering the Site with a four-to-six foot thick engineered cap primarily constructed of clean imported soil. This would prevent access to the underlying impacted soil thus mitigating health risks associated with potential exposures. The actual design elements of the cap would be decided during remedial design, and would be chosen so that a wide variety of open space uses could be accommodated.

Soil remedial alternatives S2, S3 and S4 also include placing a land use restriction on the Site to preclude its use for residential or industrial purposes

The final remedial alternatives for groundwater selected for detailed analysis are:

- G1 – No Action: This alternative consists of no additional remedial actions or institutional controls to address groundwater exceeding target cleanup levels. This alternative is included as required by USEPA guidance.

- G2 – In-Situ Chemical Oxidation: This groundwater remedial alternative consists of introducing a chemical oxidant (potassium permanganate) into groundwater to oxidize and destroy the volatile organic compounds. The oxidant would be introduced by means of an infiltration trench constructed along the downgradient (western) edge of the Site (Figure ES-6). This remedial alternative would reduce contaminant concentrations in groundwater and effectively mitigate any off-Site migration of contaminants in groundwater.

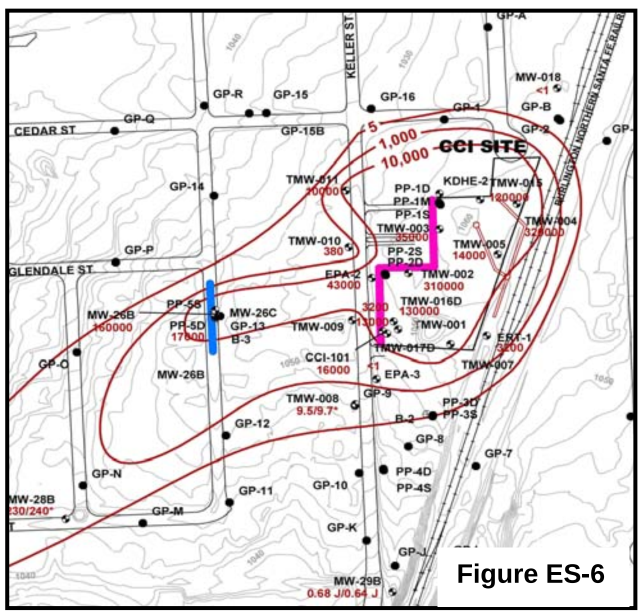

Figure ES-6

Depending on the effectiveness of this methodology, a second trench would be installed along Ocheltree Street as shown on Figure ES-6. Monitored natural attenuation (allowing constituents to degrade naturally) would be utilized to reduce contaminant concentrations in the portion of the plume not directly addressed by in-situ chemical oxidation.

- G3 – Pump and Treat: This groundwater remedial alternative consists of installing a line of extraction wells along the downgradient (western) edge of the Site as shown on Figure ES-7. Depending on the effectiveness of this methodology, a second line of extraction wells would be installed along Ocheltree Street as shown on Figure ES-7. Contaminated groundwater would be pumped from the wells and treated using an air stripper and granular activated carbon. The treated water would then be discharged to the storm drain or sewer system. This remedial alternative also would reduce contaminant concentrations in groundwater and would mitigate any off-Site migration of contaminants in groundwater. Monitored natural attenuation would be utilized to reduce contaminant concentrations in the portion of the plume not directly addressed by pump and treat.

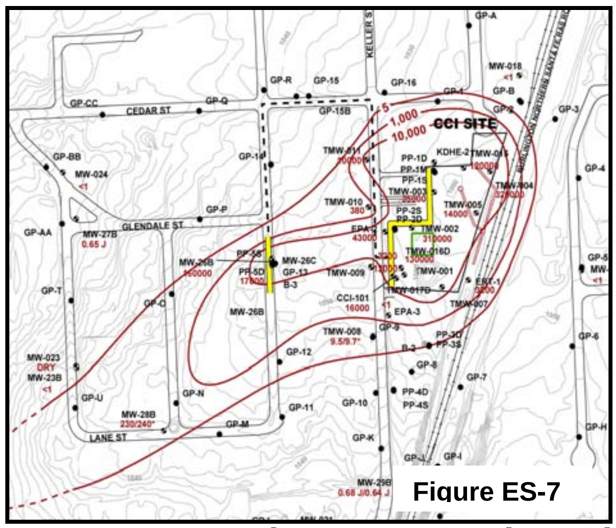

Figure ES-7

- G4 – Monitored Natural Attenuation: This groundwater remedial alternative consists of monitoring the natural processes that will remediate the groundwater over time. Samples from a network of existing monitoring wells would be collected and analyzed periodically to evaluate natural attenuation rates, and to ensure that the plume does not continue to migrate and that contaminant concentrations are being reduced.

In addition to the elements described above, groundwater remedial alternatives G2, G3 and G4 also contain the following common elements:

- Institutional controls to mitigate ingestion or contact with contaminated groundwater (City of Olathe Ordinance No. 03-17);

- Engineering controls (ventilation systems) in homes overlying the groundwater plume where Site-related VOC concentrations in vapor samples exceed USEPA action levels. The engineering controls would include a monitoring and maintenance plan for the ventilation systems;

- Groundwater monitoring to evaluate the effectiveness of remediation over time and to insure that the plume does not spread; and

- A formal review of remediation effectiveness every five years, which is a requirement under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) for sites where waste is left in place or where the remedial actions do not allow for unrestricted land use.

Overview of Detailed Analysis of Remedial Alternatives *(FS Report Sec. 7.2)*

USEPA guidance specifies nine criteria to use for the detailed analysis of each remedial alternative. The first two criteria, considered "threshold criteria," are:

- The overall protection of human health and the environment; and

- The ability to satisfy regulatory criteria (referred to as applicable or relevant and appropriate requirements, or ARARs).

Any remedy that is chosen must satisfy these two criteria. The next five criteria are called "balancing criteria." They are used to make the primary distinctions among the remedial alternatives. These five criteria are:

- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility and volume of waste through treatment;
- Short-term effectiveness;
- Implementability; and
- Cost.

An alternative that meets the threshold criteria and strikes the best "balance" among the five balancing criteria generally is considered to be the preferred remedial alternative.

The final two criteria are:

- Community acceptance; and
- State acceptance.

USEPA guidance requires that these two criteria be evaluated following public comment on the FS Report. Although not formally considered at this stage of the feasibility process, the views of the community and the state have been considered in the development of the FS Report and they will be considered further in the final remedy selection by USEPA.

Detailed Analysis of Soil Remedial Alternatives *(FS Report Sec. 7.3)*

Soil remedial alternative S1 (No Action) does not meet the threshold criteria and thus is not considered further.

Threshold Criteria

Each of the three soil remedial alternatives S2, S3 and S4 would be protective of human health and the environment and would satisfy the regulatory criteria (ARARs). Differences between the protectiveness of the alternatives primarily are short-term considerations, discussed below.

Balancing Criteria

Low Temperature Thermal Treatment (soil alternative S2) Site soil would be excavated and treated. S2 ranks high in terms of long-term effectiveness and permanence as well as reduction of toxicity, mobility and volume of waste through treatment. However, soil remedial alternative S2 ranks low in terms of short-term effectiveness, implementability and cost.

Offsite Disposal (soil alternative S3) is very similar to alternative S2 except that all excavated soil would be hauled off Site for treatment and/or disposal and clean soil would be imported for backfill. The primary differences are that implementation period would be shorter and the truck traffic would be greater for S3 than for S2.

Capping (soil alternative S4) ranks high in terms of long-term effectiveness and permanence but low in terms of reduction of toxicity, mobility and volume of waste through treatment. This alternative ranks moderately high in terms of short-term effectiveness because although it would require a number of truck trips to haul cap materials to the Site, it would not cause VOC emissions that would impact the community or Site workers. Alternative S4 is easily implementable.

Short-term effectiveness measures the effectiveness of an alternative in protecting human health and the environment during implementation of the remedy. Alternatives S2 and S3 would require that contaminated soil be excavated and either treated on Site (S2) or disposed off Site (S3). VOCs would be released into the air during this process potentially affecting nearby residents and requiring significant safety precautions for on-Site workers. Nearby residents also would potentially be disturbed by dust, truck traffic and noise from the Site. Site workers also would be exposed to safety hazards caused by the operation of multiple pieces of heavy equipment operating within a small area. The implementation of S4 would be much quicker and cause significantly less community disruption than either S2 or S3.

Truck traffic and duration of the remedy could be quite extensive depending upon the excavation scenario. Four excavation scenarios were considered: S2A and S3A: excavation to two feet, plus selected areas exceeding cleanup levels to six feet;

S2B and S3B: excavation to two feet, plus selected areas exceeding cleanup levels to six feet, plus areas where dense non-aqueous phase liquids were found to bedrock; S2C and S3C: excavation of the Site to bedrock; and S3D: excavation to six feet and off-Site disposal of soils that contain high concentrations of Site contaminants. No S2D excavation scenario was developed, because the amount of soil to be excavated under this scenario would not make mobilization of a LTTD unit cost-effective. The truck traffic and duration of these alternatives are shown below:

Soil Remedial Alternative	Estimated Working Days @ 10-hr/day, 5 days/wk, 3 tons/hr	Estimated Working Days @ 24-hr/day, 7 days/wk, 10 tons/hr	Estimated Truck Trips for Hauling Soil and Cap Components
S2A	400 days	60 days	140 trips
S2B	1,000 days	200 days	140 trips
S2C	3,000 days	300 days	140 trips
S3A	27 days	Not Applicable	665 trips
S3B	56 days	Not Applicable	1,400 trips
S3C	140 days	Not Applicable	3,500 trips
S3D	60 days	Not Applicable	425 trips
S4	30 days	Not Applicable	500 trips

Comparative Analysis of Soil Remedial Alternatives *(FS Report Sec. 8.2)*

Soil remedial alternatives S2 (Low Temperature Thermal Desorption), S3 (Off-Site Disposal) and S4 (Capping) all meet the threshold criteria of protecting human health and the environment and satisfying ARARs. All are effective and permanent in the long-term. In terms of reducing the toxicity, mobility and volume of waste through treatment, S2 is much better than S3 or S4 because S3 moves the waste to a different location with only a small amount of treatment, and S4 does not provide for any treatment.

S4 ranks the highest in terms of short-term effectiveness, implementability and cost. VOC emissions and worker safety are significant issues with S2 and S3 and there are numerous implementability issues associated with digging a large excavation on a small site in a residential neighborhood. S4 can be implemented in a much shorter time period and there is much less uncertainty regarding the construction schedule. The estimated costs for the soil remedial alternatives are:

Soil Remedial Alternative	Capital Cost	Capital Cost Plus Non-Discounted 30 Yrs O&M Cost
S2A	$4,858,000 - $5,734,000	$4,858,000 - $5,734,000
S2B	$12,532,000 - $15,237,000	$16,462,000 - $19,167,000
S2C	$35,619,000 - $44,117,000	$39,549,000 - $48,047,000
S3A	$6,189,000	$6,189,000
S3B	$11,518,000	$15,448,000
S3C	$21,100,000	$25,030,000
S3D	$3,050,000	$4,230,000
S4	$1,143,000	$2,323,000

Detailed Analysis of Groundwater Remedial Alternatives *(FS Report Sec. 7.4)*

No Action (groundwater remedial alternative G1) is not retained because it does not include any measures to ensure that institutional controls and engineering controls currently in place are maintained. USEPA continues to collect indoor air data to identify additional homes that may contain chlorinated solvent vapors above health-based action levels. The groundwater plume is not being contained or treated in any way currently that would serve to reduce or prevent the further migration of contaminants that could cause further vapor intrusion. The No Action alternative also would not provide for the monitoring of plume stability or the progress of natural attenuation.

Threshold Criteria

Each of the three groundwater remedial alternatives G2, G3 and G4 would be protective of human health and the environment and would satisfy the regulatory criteria (ARARs).

Balancing Criteria

In-Situ Chemical Oxidation (groundwater alternative G2) ranks high in long-term effectiveness and permanence and reduction of toxicity, mobility and volume of waste through treatment. It ranks moderately high in terms of short-term effectiveness. Some VOC emissions may occur during trenching operations, and if an infiltration trench were to be installed on Ocheltree Street it would require partial road closure and other disruptions during construction and possibly during the delivery of the chemical oxidant.

Pump and Treat (groundwater remedial alternative G3) ranks high in long-term effectiveness and permanence. It is expected to be moderately effective in reducing the toxicity, mobility and volume of waste through treatment. It ranks moderately high in terms of short-term effectiveness. It would require partial road closure and other disruptions if extraction wells were installed on Ocheltree Street, and during installation of subsurface pipelines from the Ocheltree wells back to a treatment unit on Site.

Monitored Natural Attenuation (groundwater remedial alternative G4) also ranks high in long-term effectiveness and permanence. It is ranked relatively low in terms of the reduction of toxicity, mobility and volume of waste through treatment due to the relative time required to significantly reduce contaminant concentrations. It ranks high in terms of short-term effectiveness.

Comparative Analysis of Groundwater Remedial Alternatives *(FS Report Sec. 8.3)*

Groundwater remedial alternatives G2, G3 and G4 all satisfy the remedial action objective to reduce contaminant concentrations in groundwater. G2 and G3 also satisfy the remedial action objective to minimize further off-Site migration of groundwater containing VOCs. G2 is expected to be more effective than G3 at mitigating the off-Site migration of contaminated groundwater because it will provide continuous treatment and allow chemical oxidant to penetrate into the fractured portion of the upper bedrock where contaminant migration would be most likely to occur.

All groundwater remedial alternatives meet the threshold criteria of protecting human health and the environment and satisfying ARARs and all are effective and permanent in the long-term. G2 is expected to be much more effective than G3 at reducing toxicity, mobility and volume through treatment because it will intersect and allow treatment of a much larger cross-sectional area of the groundwater transport zone. The radius of influence of each extraction well is limited to the number and size of fractures it may or may not intercept and the amount of water it can extract. Both G2 and G3 are likely to be more effective than G4 because they are expected to reduce high contaminant concentrations to some extent over the next several decades. The time frame to achieve complete remediation using any of the groundwater remedial alternatives is uncertain.

There are some minor short-term effectiveness issues with G2 and G3 related to offsite construction. G4 would require the installation of no new monitoring wells. None of the groundwater remedial alternatives pose significant implementation issues.

The estimated costs for the groundwater remedial alternatives are:

Groundwater Remedial Alternative	Capital Cost	Capital Cost Plus Non-Discounted 30 Yrs O&M Cost
G2	$757,000	$8,278,000
G3	$1,181,000	$11,974,000
G4	$166,000	$5,280,000

Remedy Selection

Final remedy selection will be determined after review of the feasibility study by USEPA, which will include an evaluation of the last two criteria: State Acceptance and Community Acceptance.

SECTION 3

REMEDIAL ALTERNATIVE SCENARIO S3D

1. ALTERNATIVE S3D DESCRIPTION – EXCAVATION AND OFF-SITE DISPOSAL

1.1 Overview of Alternative Scenario S3D

In the FS Report, soil alternative S3 was described and analyzed. Soil alternative S3 included three excavation scenarios: S3A, S3B and S3C. In this FS Addendum, a fourth excavation scenario, alternative scenario S3D, is described and analyzed. The elements of this scenario are as follows:

- Clear and grub the Site of remaining vegetation and debris.

- Excavate soils containing VOCs above a concentration of 1,000 ppm to a depth of six feet bgs and metals-contaminated soils that present a human health risk at the Site also to a depth of six feet bgs within the footprint shown on Figure 1.

- Transport excavated soils off-Site for disposal.

- Soils that exceed land disposal restriction (LDR) concentrations would be incinerated. Soils exceeding hazardous waste concentrations would be sent to a Class A facility, where pre-treatment to meet land disposal restrictions would be conducted if required. Other soils would be sent to a Class C facility for disposal.

- Import soils for backfill of the excavation.

- Compact and grade Site to desired finish grade (assumed to be present grade).

- Provide a soil cap for the Site. The conceptual design of a cap is shown in Figure 2. The actual design elements of the cap would be decided during remedial design, and would be chosen so that a wide variety of open space uses could be accommodated. For discussion and costing assumptions, the following elements are assumed for the cap:

  – Vegetative Soil Layer (approximately 2 feet thick);
  – Passive Gas Collection Layer and Marker Layer; and
  – Geotextile Layers.

- The overall Site elevation would be raised approximately two feet after excavation and cap installation.

- Construct surface water control features such as asphalt or concrete drains for management of storm water.

- Revegetate the cap.

- Develop operation and maintenance plan for the cap and surface water controls.

- Common element: land use restrictions against residential and commercial use of the portion of the on-Site property owned by Mr. Gershon and on the remainder of the Site (Burlington Northern Santa Fe Railroad property).

For alternative scenario S3D, excavation of certain high concentration metals-contaminated soil and VOC-contaminated soil to a depth of six feet would be conducted. This would remove metals-impacted soils that exceed human health risk levels and approximately 50% of the mass of VOCs contained in vadose zone soils (i.e., less than approximately eight feet bgs) based on RI sampling results. VOCs remaining in Site soils would be capped to mitigate human health risk and would attenuate over time.

The soil results reported in the RI present VOC constituents in various depth ranges at the Site, including the 0-1 ft bgs range and in the 2-9 ft bgs range. All soil volume estimations are approximations for FS Addendum purposes and would be modified based on actual field conditions found during remediation.

A more detailed description of alternative scenario S3D follows.

1.2 Detailed Description

In soil alternative scenario S3D, the top six feet of metals-contaminated soil and VOC-contaminated soil would be excavated within the footprint shown on Figure 1. Such an excavation would remove an estimated 50% of the mass of VOCs contained in vadose zone soils as well as metals-contaminated soils that exceed human health risk levels. VOCs remaining in Site soils would attenuate over time.

The total volume of soils to be excavated under this scenario is estimated at 2,500 cubic yards (CY). Of this total, the volume of soils containing metals above target cleanup levels is estimated at 2,000 CY. In general, total chromium soil concentrations exceeding the established background value (23 ppm) define the lateral extent of the volume of soils containing metals above target cleanup levels. The maximum remediation depth of six feet for VOC-contaminated soils and metals-contaminated soils defines the vertical extent of excavation. The volume of soils to be excavated would be confirmed through field sampling during implementation. Excavated soils containing metals and VOCs above target cleanup levels would be disposed off-Site.

Alternative scenario S3D would require development and implementation of a storm water management plan. Significant rain events during implementation of the remedy would cause delays due to additional excavation dewatering and drying of soils.

1.2.1 Soil Characterization

A portion of the soil volume may be classified as a TCLP characteristic hazardous waste. For these soils, LDR criteria must be satisfied prior to disposal, which include meeting the applicable treatment standards for constituent concentration and moisture content determined by the paint filter test.

The TCLP test is conducted by leaching a specific mass of a soil sample in a specific volume of liquid. Assuming that all of the contaminant would dissolve into the liquid, the maximum soil concentration that will pass the TCLP test can be calculated as follows:

Assumption: TCE is the driving chemical
TCE has a TCLP value of 0.5 mg/l

What is soil concentration that will yield a TCLP extract concentration of 0.5 mg/l?

Given:
1 kg of soil = 1,000 g = 1 Liter (density of water),
The volume of extract liquid equals 20 times the weight of the soil sample

("X" mg TCE/Kg soil)/20 liters of extract = 0.5 mg/l

X = 10 mg/kg or ppm of TCE

Therefore, soil with TCE concentrations greater than 10 ppm has the potential to be classified as a characteristic hazardous waste.

Soils disposed in a landfill must also satisfy LDRs. The Universal Treatment Standard (UTS) value for TCE is 6 mg/kg or ppm. However, with regard to contaminated soil, regulations state that if soil concentrations do not exceed 10 times the UTS, treatment is not required before disposal. Therefore, only soil with TCE concentrations greater than 60 ppm (10 times UTS) either would require treatment prior to landfill disposal or need to be incinerated.

Figure 1 presents the area of soils that would be excavated for off-Site disposal overlain with the total VOC concentrations from the 2 to 9 foot depth. TCE has been identified to comprise a majority of the VOC mass in impacted soils. As shown in Figure 1, a significant portion of the soils to be excavated likely contain concentrations greater than 10 ppm, of which some are likely greater than 60 ppm. Therefore, for FS Addendum purposes, it is assumed that of the total soil volume to be disposed (2,500 CY), 50% (1,250 CY) would require incineration, 40% (1,000 CY) would be classified as hazardous waste but would not require treatment before disposal in a Class A landfill, and the remaining 10% (250 CY) would be non-hazardous and would be disposed in a Class C landfill.

1.2.2 Implementation

Excavation in the clayey soils at the Site likely could be performed to depths of six feet bgs without the need for shoring. Since the depth to shallow groundwater beneath the Site has been measured at approximately eight feet bgs, it is anticipated that excavation dewatering would not be required for the excavation contemplated under alternative scenario S3D. Actual limits of excavation would need to be confirmed through sample collection.

It is assumed that the interceptor trench would be removed by the time this alternative would be implemented.

Excavation and loading operations may require the use emission controls such as foams, tarps, water spray or an enclosure with air treatment. An air treatment system on the tent would consist of a series of blowers and a vapor phase activated carbon treatment unit. If used, an enclosure would require continual movement to track with the excavation working area.

For alternative scenario S3D, excavated soils would be segregated for classification and loaded into trucks near the working face under a tent, if deemed required. Trucks would be washed prior to exiting the Site. Soils would be hauled for appropriate disposal at the appropriate designated facility. Backfill soils would include locally available borrow soils of suitable quality and quantity. Backfilling of areas would occur sequentially as areas are excavated.

1.2.3 Duration

For duration estimates, it is assumed that a truck can be loaded and exit the Site every 20 minutes. A 10-hr working day, with eight hours of active loading and hauling, would result in approximately 25 truck trips per day. The trucks are assumed to have a 20 CY (loose) capacity. A soil bulking factor of 1.4 was used to estimate the volume of soil requiring transportation compared to the volume of soil in the ground.

Alternative scenario S3D assumes a total of 2,500 CY in-place, and 3,500 CY excavated, of soil for disposal. Alternative scenario S3D would therefore require approximately 175 round-trip truck trips (soils for disposal leaving and clean soil arriving) for excavation and delivery of backfill materials, plus an additional 250 truck trips to deliver remaining materials required for capping the Site. At 25 trucks per day, transportation would require approximately 20 days. Additional time (approximately 20 – 30 days) would be required for mobilization, clearing and grubbing, and placement of the cap materials. With mobilization and completion, alternative scenario S3D may require approximately 60 days to implement. Delays due to soil drying, weather, and other factors are not considered; it is assumed that soil drying, if needed, would be performed at a rate equal to off-Site transport. A table showing the durations for various volumes and hours of operation follows:

Excavation Scenario	Volume of Soil to be Processed	Estimated Working Days @ 10-hr/day, 5 days/wk
S3D	2,500 in-place CY (3,500 loose CY)	60 days (transportation of contaminated and clean materials; capping; mobilization)

Trucks leaving the Site would be washed at the truck wash station prior to exiting onto public streets to remove soils containing hazardous constituents from tires and other areas on the trucks. Figure 1 shows the preliminary location of the truck wash.

1.2.4 Transportation

It is assumed that non-hazardous soils to be disposed in a Class C landfill would require an approximate 50 mile round trip haul. Soils ultimately classified as hazardous would be disposed in a hazardous waste landfill requiring an approximate 800 mile round trip haul. Soils that ultimately do not satisfy UTSs would require incineration, requiring an approximate 1,200-mile round trip haul.

During preparation of the FS Addendum, an option was considered to perform the transportation of soils using trains instead of trucks. In a letter dated April 22, 2004, a preliminary cost estimate for a rail transportation option was presented by BNSF's consultant [TRC Environmental Corp., 2004]. The option considered a volume of 40,000 CY of soil to be transported by rail. In subsequent conversation with TRC Environmental, it was made clear that the unit cost for the lower volume of soil contemplated for transportation under alternative scenario S3D is far greater than for the higher volumes of soil to be transported under the alternative scenarios presented in the FS Report due to the fixed cost associated with construction of a rail siding. It is clear that truck transport for alternative scenario S3D would be more cost-effective than rail transport.

1.2.5 Mass of VOCs to be Removed

Table 1 includes VOC mass estimate calculations for the 0-2 and 0-20 foot depth intervals at the Site. The mass estimate calculations are based on the total VOC concentrations included in the RI and represented in the FS Report for the 0-1, 2-9, 10-15, and greater than 15-foot depth intervals. Table 1 includes a calculation and summation of total VOC mass for numerous sub-areas of these VOC concentration maps. For each sub-area an "average VOC" concentration was estimated. As listed on Table 1, conservative VOC mass estimates for the 0-1 ft bgs, 2-9 ft bgs, and 10-20 ft bgs depth intervals are approximately 85 pounds, 3,914 pounds, and 928 pounds of VOCs, respectively. It is expected that with surface disturbances and the passage of time since the RI data were collected, the mass of VOCs in the 0-1 ft depth interval is even lower than the 85 pounds shown in the estimate calculations.

As the mass estimate calculations show, most of the VOCs in soils at the Site can be expected to be found in the vadose zone soils (<8 ft bgs), below the top foot or two of the surface. In this zone (2-9 ft bgs), the mass estimate calculations show a VOC mass of 3,914 pounds. Of this amount, 2,206 pounds, or 56%, are estimated to be within the 1,000 ppm contour. It is evident that approximately 50% or more of the VOC mass in vadose zone soils can be removed by excavating the highest VOC concentration areas of the Site in the 2-9 ft bgs depth interval. Based on this analysis, the excavation approach for alternative scenario S3D is to accomplish significant mass removal by excavating the highest VOC concentrations at the Site. These areas are shown for illustration purposes in Figure 1 and will be confirmed through additional sampling to be conducted as part of remedial design. For cost estimation purposes, it is assumed that this volume of VOC-contaminated soils is approximately 500 CY.

1.2.6 Emissions

Both dust and VOC emissions need to be considered for any remedial alternative involving excavation and on-Site treatment. Fugitive dust emissions could be controlled with common soil management techniques such as water spray. VOC emissions, however, would be created when soils are excavated and handled. An engineering assumption is made that up to 25% of the VOCs in unsaturated soils may be released during excavation and loading on a truck for off-Site transport. In order to estimate the potential VOC emissions to ambient air, an understanding of the approximate mass of VOCs present in soils is required.

Soils excavated from the 0-1 ft bgs and 2-9 ft bgs depth interval are estimated to contain 3,999 lbs of VOCs (see Table 1). Based on an engineering assumption that up to 25% of these VOCs may be released during these activities, excavation and loading of 500 CY of soil from 0 to 6 feet bgs under alternative scenario S3D may result in ambient emissions of approximately 1000 total pounds of VOCs. Actual emissions would be affected by atmospheric conditions (i.e., humidity, wind speed, temperature), and actual equipment used for excavation and loading.

1.2.7 Health and Safety

Extensive monitoring of ambient air quality would be performed within the work zone. Of primary concern would be ambient air VOC concentrations. Given an OSHA 8-hour working permissible exposure level of 100 ppm (v/v) for TCE and soil concentrations as high as 6,000 ppm, it is likely that respiratory protection would be required for workers during some portions of the work. Because it is not possible for a worker to detect breakthrough of TCE in the breathing zone, OSHA standards would not allow use of a respirator when TCE concentrations exceed safe levels. Instead, respiratory protection for TCE would include the use of supplied breathing air, or Level B protection. The expected concentrations of VOCs in the breathing zone, however, likely would not require work in Level B protection. Use of Level B or Level C protection decreases worker productivity and affects the cost of construction. Accordingly, an allowance for performing 30% of the Site work in Level C PPE is included in the costs estimates for alternative scenario S3D.

1.2.8 Community Monitoring

Extensive ambient air monitoring would be required for the adjacent community. Community ambient air monitoring would likely include monitoring for wind speed and direction, dusts, real-time total VOCs, and laboratory-speciated VOCs using SUMMA canister sampling techniques. Monitoring would likely be performed at several locations around the perimeter of the Site and possibly at a community location.

The specific health-based thresholds for the community would be calculated from a short-term human health risk assessment. If community health-based action levels are reached, mitigation measures such as excavation beneath a tented enclosure, application of foams, or application of water spray may be used or work activities may be modified or ceased until ambient air conditions return to prescribed levels.

An emissions monitoring and control plan for the community would be developed to address monitoring and control of emissions from the excavation. Additional measures to mitigate impacts to the community would include development of a traffic control plan, washing truck tires prior to exiting the Site, and street sweeping.

1.2.9 Noise

In published information from the Federal Highway Administration (FHA) construction equipment consisting of graders, front-end loaders, and backhoes were measured to produce peak noise levels (at 15 meters distance) generally below 90 dBA. These peak values are estimated to be within the range that is currently experienced with the existing rail line. Based on information gathered from rail studies, trains were measured to produce noise levels ranging from 80 to 100 dBA at distances from 40 to 300 feet. However, it should be noted that the construction activities would be ongoing throughout the day while current noise from trains is limited to specific time periods.

1.2.10 Cap Construction

Currently, the Site is relatively flat and would require only limited re-grading. Additional grading would be conducted at the conclusion of the soil excavation to provide appropriate grade transitions at the boundaries of the cap and to provide for the required final grades of the cover.

Once the Site grading is complete, the capping system components would be installed sequentially. The cap design would include first a geotextile separator to separate contaminated soil from overlying crushed aggregate. The crushed aggregate layer (approximately one ft thick) would include a passive system for collection and venting of soil vapor that may emanate from beneath the cap, along with a provision to collect vapor actively if subsurface migration becomes an issue. Atop this aggregate would be a geotextile filter to prevent fines from entering the crushed aggregate layer. Finally, soil fill would be placed at a minimum thickness of two feet. Each layer can be installed over the 1.5-acre Site within a couple days. Soil or rock components can be installed at rates of approximately 750 CY per day. The quality of cap construction would be monitored and tested by a third party as part of a construction quality assurance (CQA) program. Cap construction is estimated to require between 25 and 30 working days.

Cap construction would require the import of vegetative layer soils, crushed aggregate, and geotextile materials. Depending on the ultimate design of the cap, it is estimated that up to 250 truck trips may be required to deliver these materials, most of which would be associated with delivery of the vegetative layer soils. However, the duration of truck traffic for cap construction is estimated to be only 15 working days due to the fact that clean materials are being dumped at the Site instead of loaded for removal.

Alternative scenario S3D would remove highly contaminated soils to a depth of six ft. The extent of this excavation, after grading, would average about one ft over the entire Site. After excavation, the cap would be about 3 ft in thickness. The net increase in overall Site elevation would be approximately 2 ft.

1.2.11 Cap Maintenance

Maintenance activities would include quarterly inspections and air quality monitoring, annual settlement monitoring, and cover and drainage system repairs. Quarterly the cover system would be walked and inspected for evidence of cracking, erosion or other signs of damage. Air quality monitoring would be performed for VOCs. Although the cap would be evaluated for settlement, significant settlement is not likely due to the absence of municipal wastes. Reports documenting inspections, monitoring and repair activities would be prepared at prescribed intervals.

2. ALTERNATIVE S3D EVALUATION – EXCAVATION AND OFF-SITE DISPOSAL

2.1 Overall Protection of Human Health and the Environment

The exposure pathways of concern for on-Site soils are direct contact and inhalation of VOCs. Excavation and off-Site disposal of soils would provide overall long-term protection of human health by removing the soils that contain concentrations of hazardous substances exceeding target cleanup levels. There would be significant short-term impacts, however, of varying severity depending on the excavation scenario.

The baseline ecological risk assessment identified no significant ecological receptors; therefore overall protection of the environment in on-Site areas is not a concern that must be addressed through remediation.

2.2 Compliance with ARARs

ARARs potentially applicable to Site remedial actions are shown in Tables 7-1 through 7-6 of the FS Report. Excavation and off-Site disposal of soils containing metals can be performed in compliance with applicable disposal and transportation regulations. Off-Site disposal requires compliance with land disposal restrictions (LDRs) and hazardous waste regulations to the extent that soils constitute hazardous remediation wastes. This may necessitate treatment (e.g., off-Site incineration). Special precautions would be required to ensure that short-term community and worker exposures to dust, noise, truck traffic, and VOC emissions are limited to acceptable levels during soil excavation and handling, per ambient air quality health standards. Groundwater extracted through excavation dewatering would require treatment and discharge in accordance with substantive State water pollution and Federal NPDES regulations. The estimated VOC emissions are below the threshold level that would trigger any state or federal air permitting requirements.

2.3 Long-term Effectiveness and Permanence

With alternative scenario S3D, metal-impacted soils posing a potential risk to future receptors would be removed in addition to approximately 50% of the VOC mass within the vadose zone, and the Site would then be capped. Once completed, implementation of alternative scenario S3D would provide long-term mitigation of potential human health risks from exposure to Site soils. Most material above target cleanup levels would be removed from the Site. Any remaining soil contamination would be covered by a soil cap incorporating a passive gas control system and crushed aggregate layer which would serve as a marker barrier for future excavation. Long-term attenuation of the remaining VOC-impacted soil would negate the need for a cap at some future point in time. Therefore, alternative scenario S3D would be a permanent solution that presents acceptable residual human health risks. Under alternative scenario S3D, the majority of soils above target cleanup levels would be transported to an off-Site landfill. Some of these soils would be incinerated, while others may be pre-treated prior to disposal. This would enhance the long-term effectiveness of this alternative scenario. Since soils would be either removed off-Site or treated, no long-term controls or systems would require maintenance.

2.4 Reduction in Toxicity, Mobility, or Volume Through Treatment

Soils excavated and removed for off-Site disposal would be incinerated or disposed of in an off-Site landfill. Some of the excavated soils may be pre-treated prior to landfill disposal. Each of these steps (incineration and pre-treatment) would result in an overall reduction of toxicity, mobility and volume through treatment. Soils that remain on-Site above target cleanup levels would retain toxic characteristics and may be mobile due to rainwater infiltration and leaching. Such mobility, however, would not pose a threat either to receptors or to the groundwater resource if alternative scenario S3D were combined with an appropriate remedy for containment and/or treatment of groundwater.

2.5 Short-term Effectiveness

Alternative scenario S3D contains several short-term effectiveness issues, discussed below:

- Duration of the alternative;
- Aesthetic impacts (noise and dust);
- Truck traffic;
- VOC emissions;
- Worker health and safety; and
- Community health and safety.

2.5.1 Duration of the Alternative

Assuming 10-hr working days, implementation of alternative scenario S3D may require approximately 60 working days to complete, assuming no weather delays.

This duration includes an estimation of approximately 5 days of actual excavation of contaminated soils.

2.5.2 Aesthetic Impacts

During implementation there would be aesthetic impacts including noise and dust. If unabated, these could present significant environmental impacts on the surrounding community. Specific mitigation measures would be developed during design.

2.5.3 Truck Traffic

It is estimated that approximately 425 truck trips would be required to implement alternative scenario S3D. These trips would occur at an assumed rate of 25 trucks per day, over about 20 working days. The truck traffic would also include round trip heavy-duty traffic, since there would be the same volume of clean soil imported as soils hauled away to be landfilled.

Consideration was given to performing the transportation of soils using trains instead of trucks. A train option would require construction of a train siding. It would also likely increase the time required for the S3D remedy, because of the logistical difficulty associated with scheduling trains as compared to scheduling trucks.

2.5.4 VOC Emissions

Calculations of likely emissions of VOCs during soil excavation and treatment are shown on Table 1. Excavation, movement, spreading, drying, and processing of soils would create significant concerns regarding fugitive VOC emissions. Such emissions would require control technology such as a temporary enclosure over the excavation or applying foam over the open face of the excavation.

2.5.5 Worker Health and Safety

During much of the excavation and treatment, workers likely would be in Level B protective gear (supplied air) whenever workspace concentrations of TCE exceed OSHA levels. Supplied air would be required because workers cannot detect TCE at levels that are safe, so use of a respirator cartridge (Level C) is not protective. There would be an increased likelihood of high vapor concentrations of TCE requiring

Level B protection for excavation near bedrock because of the historic presence of DNAPL.

2.5.6 Community Health and Safety

Extensive ambient air monitoring would be required for the adjacent community during excavation and treatment. Community ambient air monitoring would include monitoring for wind speed and direction, particulates, real-time total VOCs, and laboratory-speciated VOCs using SUMMA canister sampling techniques. Monitoring would be performed at several locations around the perimeter of the Site and possibly at a community location. The specific health-based thresholds for the community would be calculated from a short-term human health risk assessment. If community health-based action levels are reached, mitigation measures such as a temporary enclosure over the excavation, application of foams or water spray may be used or work activities may be modified or ceased until ambient air conditions return to prescribed levels.

An emergency response plan for the community would be developed in case of unexpectedly large emissions from the excavation.

2.6 Implementability

Excavation of Site soils can be performed with locally available earth moving equipment and contractors trained to handle hazardous material, although excavation of soils to bedrock would present significant implementation.

Although required equipment is available, the short-term impacts identified in Section 2.5 would also pose implementability issues. There could be delays associated with several implementation issues:

- Frequent worker rest breaks because of the need to work in Level B protective gear;
- Weather-related delays due to rainfall making the Site temporarily unworkable;
- Management of water from rain events;
- Temporary work stoppages because of community concerns regarding noise, traffic, odors, and emissions; and

- Logistical issues associated with multiple operations being conducted simultaneously at the relatively small Site (excavation; dewatering; shoring; loading of trucks for off-Site transport; trucking in imported soils; backfilling of soils in the excavation).

2.7 Cost

A cost estimate was prepared for alternative scenario S3D. Detailed costing information, including costing assumptions for each element of the cost estimates, is shown in Table 2. The cost summary for implementation of alternative scenario S3D follows:

Alternative Scenario	Capital Cost	Annual O&M	Capital Cost Plus 5% Discounted 30 Yr O&M Cost	Capital Cost Plus Non-Discounted 30 Yrs O&M Cost
S3D	$3,050,000	$39,000	$3,655,000	$4,230,000

3. COMPARATIVE ANALYSIS OF ALTERNATIVES

3.1 General

In this FS Report, the soil remedial alternatives and then the groundwater remedial alternatives are compared with each other using the detailed analysis criteria. In this FS Addendum, the comparative analysis of soil alternatives is updated to include alternative scenario S3D.

The purpose of this comparative analysis is to identify the relative advantages and disadvantages of each remedial alternative, and to provide a basis for USEPA to identify the preferred remedial alternative.

In Table 3, each soil remedial alternative is assigned a ranking for each detailed analysis criterion. These rankings range from "low" to "high," and are accompanied with a numeric ranking from 1 to 5[1]. The soil remedial alternatives are:

- S1 – No Action;
- S2 – Off-Site Disposal and LTTD;
- S3 – Off-Site Disposal; and
- S4 – Capping.

3.2 Overall Protection of Human Health and the Environment

Soil remedial alternatives S2, S3, and S4 would perform equally well with respect to overall protection of human health and the environment. All would meet the threshold requirement of protectiveness, and all are rated "High" with a numeric rating of 5. Specific comparative points follow.

- With the exception of the no action alternative S1, each of the three remaining alternatives meets the threshold requirement of providing overall long-term protection of human health and the environment.

- Alternative S2 would provide long-term protection by removing soils containing metals that exceed target cleanup levels and treating various volumes and depths of soils containing organics that exceed target cleanup levels.

[1] A numeric ranking of "1" is lowest, or worst; "5" is highest, or best. With respect to cost, "1" is most expensive; "5" is least expensive.

- Alternative S3 would provide long-term protection by removing and disposing off Site various volumes and depths of soils with concentrations of hazardous substances that exceed target cleanup levels.

- Alternative S4 would provide long-term protection by mitigating potential exposures to soils with the cap. It would be more protective than alternatives S2 and S3 if the more intensive excavation scenarios (S2B, S2C, S3B, and S3C) were chosen, because these excavation scenarios each present significant short-term protectiveness concerns that may make them difficult to implement.

3.3 Compliance With ARARs

Soil remedial alternatives S2, S3, and S4 would perform equally well with respect to compliance with ARARs. These three would meet the threshold requirement of compliance, and all are rated “High” with a numeric rating of 5.

3.4 Long-term Effectiveness and Permanence

Soil remedial alternatives S2, S3, and S4 would perform equally well with respect to long-term effectiveness and permanence. These three alternatives provide long-term, permanent solutions that are protective of human health and the environment. Each is rated “High” with a numeric rating of 5. Specific comparative points follow.

- With the exception of the no action alternative S1, each of the three remaining alternatives provides a long-term, permanent solution that is protective of human health and the environment.

- Alternatives S2 and S3 would provide long-term mitigation of human health risks related to exposures to Site soils.

- With excavation Scenarios S2B, S2C, S3B and S3C some or all soils containing organics would be excavated to bedrock. When compared with Scenarios S2A, S3A or S3D, the additional soil removed under the more intensive excavation scenarios would not contribute significantly to long-term effectiveness because the deeper soils pose no risk to Site receptors, nor does their removal provide any benefit to the groundwater remedy since there is no longer significant migration of VOCs in these deeper soils to groundwater. Therefore, the added long-term benefit of Scenarios S2B, S2C, S3B and S3C is doubtful.

- Alternative S3D would provide removal of approximately 50% of the VOC-contaminated soils contained in vadose zone soils (i.e., less than approximately eight feet bgs) based on RI sampling results, as well as the majority of the mass of metals-contaminated soils. VOCs remaining in Site soils would be attenuated over time.

- Alternative S4 would be easiest to implement and would provide a permanent solution that would be adequately protective. There would be no risk of off-Site contamination from soil disposal. Future management of off-Site materials is not required.

3.5 Reduction of Toxicity, Mobility, and Volume Through Treatment

Soil remedial alternative S2 would perform better than most of the remedial alternative scenarios under S3 and better than alternative S4 with respect to reduction of toxicity, mobility and volume through treatment. S2 would treat various volumes of soil depending on the excavation scenario. S3 would provide for treatment only of those soils that exceed land disposal restrictions. Alternative scenario S3D possibly would include additional treatment of soils through a permanganate treatment step, if it is shown to be effective during remedial design. Alternative S4 would provide no treatment. Alternative S2 scenarios are rated "Moderate-to-High" for this category and assigned a numeric rating of 4. Alternative scenarios S3A, S3B, and S3C are rated "Low-to-Moderate" and assigned a numerical rating of 2. Alternative scenario S3D is rated "Moderate" for this category because of the potential addition of permanganate treatment. Alternative S4 is rated "Low" and assigned a rating of 1.

3.6 Short-term Effectiveness

Soil remedial alternative S4 would perform better than remedial alternatives S2 and S3 with respect to short-term effectiveness. It is rated "Moderate-to-High" for this category and assigned a numeric rating of 4. S2 and S3 each would be accompanied by significant short-term impacts, including noise, dust, truck traffic, and other associated effects such as VOC emissions. These concerns would present moderate to highly significant short-term effects on the surrounding community, depending upon the excavation scenario, and would require specific mitigation measures. Alternative S2 is rated "Low" for this category and assigned a numeric rating of 1. S3 is rated "Moderate" for Scenario S3A, "Low-to-Moderate" for Scenario S3B, "Low" for Scenario S3C, and "Moderate-to-High" for Scenario S3D. The numeric ratings are 3, 2, 1 and 4, respectively for S3A, S3B, S3C, and S3D. Alternative S4 presents very few, and easily manageable, short-term effects during implementation of the remedy. Specific comparative points follow:

- For alternatives S2 and S3, both of which involve excavation of soils, there would be significant impacts during implementation, including noise, dust, truck traffic, and other associated effects such as VOC emissions associated with the more intensive excavation scenarios (S2B, S2C, S3B and S3C). These concerns would present significant short-term effects on the surrounding community and would require specific mitigation measures.

- Implementation of S2 would require from about 60 work days to over 3,000 work days. Implementation of S3 would require 27 to 140 work days. S4 would require 25 to 30 work days.

- Additional short-term concerns regarding Scenarios S2B, S2C, S3B and S3C include the need for shoring and dewatering.

- It is uncertain whether engineering and administrative controls would prove adequate to control potential impacts on adjacent residents under alternative Scenarios S2B, S2C, S3B and S3C, therefore temporary relocation may be required. An emergency response plan would be created with appropriate contingencies.

- Truck traffic is also a concern. S3 would have the greatest impact requiring approximately 425 to 3,500 truck trips through the neighborhood during implementation. S2 and S4 would have significantly less truck traffic. S2 would require approximately 140 truck trips for off-Site disposal of soils containing metals; S4 would require approximately 500 truck trips to deliver cap materials.

- Site worker impacts would be more severe for S2B, S2C, S3B, and S3C than for S2A, S3A, S3D or S4. For the former four scenarios, Level B work is expected to be a significant requirement, which would slow down work.

3.7 <u>Implementability</u>

Soil remedial alternative S4 would perform better than remedial alternative S2 and most of the S3 scenarios with respect to implementability. It is rated “High” for this category and assigned a numeric rating of 5. S2 and S3 each would be accompanied by significant impacts that would be difficult to handle and therefore affect implementability. The most significant of these impacts is VOC emissions. These concerns would present significant short-term effects on the surrounding community and would require specific mitigation measures. Alternatives S2 and S3 are rated “Moderate” for Scenarios S2A and S3A, “Low-to-Moderate” for Scenarios S2B and S3B; “Low” for Scenarios S2C and S3C, and “Moderate-to-High” for Scenario S3D. The numeric ratings are 3 for S2A and S3A; 2 for S2B and S3B; 1 for S2C and S3C; and 3 for S3D. Specific comparative points follow.

- Under alternative S4, construction of the cap system would be the easiest to implement. Conditions present at the Site would pose no unusual or technically challenging construction issues.

- Alternatives S2 and S3 would require excavation with shoring and dewatering for many of the scenarios. For control of VOC emissions, a temporary enclosure may be required for drying, processing, and treating of clayey soils. Although other methods are available, emissions control would be very difficult to accomplish given the range of activities that would be underway at the Site. Implementability of deep excavation to bedrock may be difficult to accomplish.

- On-Site LTTD treatment under alternative S2 can be performed by only a few select contractors that specialize in this type of work. The treatment rate of LTTD for saturated, cohesive, clayey soils found on the Site is uncertain.

3.8 Cost

Soil remedial alternative S4 is significantly less expensive than the other two alternatives and excavation scenarios that meet the threshold requirements for a remedy. A summary of costs for all remedial alternatives is shown in Table 4, and a comparison follows based on non-discounted 30-yr O&M cost:

- The estimated cost of S2 ranges from $4,858,000 to $5,734,000 for S2A, from $16,462,000 to $19,167,000 for S2B, and from $39,549,000 to $48,047,000 for S2C;

- The estimated cost of S3 ranges from $6,189,000 for S3A, to $15,448,000 for S3B, to $25,030,000 for S3C, and $4,230,000 for S3D; and

- The estimated cost of S4 is $2,323,000.

3.9 State Acceptance

In accordance with RI/FS Guidance, this criterion will be addressed when USEPA is making its final remedial decision and the ROD is being prepared.

3.10 Community Acceptance

In accordance with RI/FS Guidance, this criterion will be addressed when USEPA is making its final remedial decision and the ROD is being prepared. It is noted that an active community group, the Community Action Group exists at the Site. This group is engaged in the cleanup process. The CAG has provided, and continues to provide, useful input.

4. REFERENCES

TRC Environmental Corp., 2004. Letter from John R. Larson to Ms. Judith McDonough, Burlington Northern and Santa Fe Railway Company. April 22.

TABLE 1
VOC MASS ESTIMATE - ALTERNATIVE SCENARIO S3D
0 - 20 FEET DEPTH
CHEMICAL COMMODITIES, INC.

TOTAL VOC MAP DEPTH INTERVAL[1] (ft)	SUBAREAS					
	THICKNESS (ft)	AVERAGE VOC CONCENTRATION ppm (w/w)	COVERAGE (square feet)	VOLUME (cubic feet, cf)	SOIL DENSITY (lb/cf)	VOC MASS (lbs)
0-1	1	0.52	17,495	17,495	101	0.91
	1	1.09	35,443	35,443	101	3.91
	1	10	12,525	12,525	101	12.67
	1	28	100	100	101	0.28
	1	100	696	696	101	7.04
	1	165	13	13	101	0.21
	1	213	113	113	101	2.42
	1	736	392	392	101	29.18
	1	1231	225	225	101	28.02
					TOTAL ESTIMATED VOC MASS 0-1 FT (lbs)	**85**
2-9	8	4	19,635	157,079	101	57.65
	8	5	3,231	25,847	101	12.77
	8	10	26,254	210,032	101	212.42
	8	100	13,799	110,391	101	1116.46
	8	128	50	400	101	5.18
	8	123	2,000	16,003	101	199.07
	8	286	450	3,601	101	104.15
	8	1000	1,153	9,222	101	932.64
	8	6413	1	4	101	2.59
	8	3645	113	900	101	331.84
	8	3686	315	2,520	101	939.59
					TOTAL ESTIMATED VOC MASS TO BE REMOVED (lbs)	**2207**
					TOTAL ESTIMATED VOC MASS 2-9 FT (lbs)	**3914**
					TOTAL VOC MASS ABOVE SATURATED ZONE (lbs)	**3999**
10-15	6	1.0	20,681	124,086	101.1	13.03
	6	2.7	10,397	62,383	101.1	17.24
	6	10	30,208	181,250	101.1	183.31
	6	100	3,894	23,364	101.1	236.30
	6	113	888	5,326	101.1	60.87
	6	114	575	3,451	101.1	39.78
	6	126	41	243	101.1	3.10
	6	339	91	547	101.1	18.75
	6	348	113	675	101.1	23.76
	6	410	113	675	101.1	27.99
15-20	5	0	22,955	114,774	101.1	0.00
	6	10	24,800	148,801	101.1	150.49
	6	13	475	2,850	101.1	3.75
	6	18	275	1,650	101.1	3.00
	6	27	2,000	12,002	101.1	32.77
	6	34	800	4,801	101.1	16.51
	6	36	225	1,350	101.1	4.92
	6	44	1,375	8,251	101.1	36.72
	6	56	225	1,350	101.1	7.65
	6	100	800	4,801	101.1	48.55
					TOTAL VOC MASS BELOW SATURATED ZONE (lbs)	**928**

Estimated VOC Release To Atmosphere From Soil Excavation and Processing						
ABOVE SATURATED ZONE: Assume 25% of Total VOC Mass Released:						
3,999	**lbs**	**x**	**25%**	**=**	**1,000**	**lbs**

ESTIMATED VOC EMISSIONS 1,000 lbs

Notes
(1) - [MWH, 2001]
Bedrock located at approximately 20 ft
ppm - parts per million, by weight
Soils are mostly clay, average moisture content of 22%.
Gray shading indicates highest VOC concentration areas in 2-9 ft bgs depth interval

TABLE 2
ESTIMATED COSTS
SOIL ALTERNATIVE S3D - OFF-SITE DISPOSAL

SOIL ALTERNATIVE S3D:

Soil Excavation

- The Site would be cleared and grubbed of remaining vegetation and debris.
- Excavate soils containing metals and organics that exceed target levels to 6 feet bgs (2,500 CY in place).
- Transport excavated soils off-Site for disposal.
- Import soils for backfill of excavation.

Soil Cap

- Compact and grade Site to desired finish grade.
- Construct cap on top of the backfilled soils followed by construction of a surface water drainage system and revegetating the Site.
- Revegetate Site.

General

- Develop O&M Plan.
- Impose land use restrictions.

ITEM	Units	Unit ($)	Qnty	Extended ($)	Notes / Assumptions
General Costs					
Security[1]	Day	$ 108	38	$ 4,104	$9 per hour, 12 hrs per day (overnight), number of days from duration total.
Equipment Decontamination Station[2]	Ea	$ 15,000	1	$ 15,000	
Temporary Electrical Power[1]	HSF/Mo	$ 39	823	$ 32,110	Lighting and power for entire Site.
Clear and Grub[1]	Acre	$ 6,700	1.5	$ 10,050	
Haul Clear and Grub Material to Class C Facility[5]	CY	$ 4.75	565	$ 2,684	20 CY trailer capacity (1.4 bulking factor), 50 mile round trip.
Clear and grub disposal at Class C facility[5]	Ton	$ 30.00	565	$ 16,950	Top 2" of Site, 1.4 tons per CY in place.
Health & safety - Air Monitoring[2]	Day	$ 1,500	38	$ 57,000	Process rate of 10 tons/hr (24/hrs per day 6 day/wk).
SWPPP[2]	Ea	$ 25,000	1	$ 25,000	
Materials Handling/Transportation Plan[2]	Ea	$ 25,000	1	$ 25,000	
Survey[2]	LS	$ 50,000	2	$ 100,000	
Contractor & Misc. Overhead[3]			8%	$ 23,032	
Permitting[3]			1%	$ 2,879	
Engineering Design[3]			15%	$ 43,185	
Construction CQA[3]			10%	$ 28,790	
Contingency[3]			20%	$ 57,580	
Subtotal				**$ 443,363**	

TABLE 2
ESTIMATED COSTS
SOIL ALTERNATIVE S3D - OFF-SITE DISPOSAL

Excavation, Treatment, and Disposal of VOC Impacted Soil							
Mob/Demob[2]	LS	$	10,000	1	$	10,000	
Emissions Control[2]	LS	$	112,000	1	$	112,000	
Traffic Control[2]	Day	$	650	8	$	5,200	Assumes 65/hr on-Site truck traffic manager, 10 hours per day.
Liner for Materials Handling Area[1]	SF	$	1.25	21,600	$	27,000	
Berm for Materials Handling Area[1]	CY	$	4.50	4,000	$	18,000	Assumes 2 ft berm.
On-Site Soil Excavation and Haul[1]	CY	$	4.50	3,500	$	15,750	Backhoe excavate & stockpile; 1.4 bulking factor.
Haul to Class A Landfill facility[5]	CY	$	63.00	1,400	$	88,200	20 CY trailer cap, 40% of total soil volume, 1.4 tons per CY in place, 800 mile round trip.
Haul to Incineration Facility[5]	CY	$	110.00	1,750	$	192,500	20 CY trailer cap, 50% of total soil volume, 1.4 tons per CY in place, 1,200 mile round trip.
Class A Facility Disposal, no treatment[5]	Ton	$	60.00	1,400	$	84,000	40% of total soil volume, 1.4 tons per CY in place.
Soil Incineration[5]	Ton	$	340.00	1,750	$	595,000	50% of total soil volume, 1.4 tons per CY in place.
Haul to Class C Facility[5]	CY	$	4.75	350	$	1,663	20 CY trailer capacity (1.4 bulking factor), 50 mile round trip.
Class C Facility Disposal[5]	Ton	$	30.00	350	$	10,500	10% of total soil volume, 1.4 tons per CY in place.
Confirmatory soil testing[2]	Ea	$	375	35	$	13,125	VOCs, PAH, PCB & pesticide testing, 1 per 100 CY.
Estimated duration[2]	Day			8			
Contractor & Misc. Overhead[3]				6%	$	70,376	
Permitting[3]				1%	$	11,729	
Engineering Design[3]				12%	$	140,753	
Construction CQA[3]				8%	$	93,835	
Contingency[3]				20%	$	234,588	
Capital Costs Subtotal					**$**	**1,724,218**	
Level B Work Surcharge[1]					**$**	**-**	0% of Site work is conducted in Level B @ 55% of normal work efficiency.
Level C Work Surcharge[1]					**$**	**278,528**	30% of Site work is conducted in Level C @ 65% of normal work efficiency.
Subtotal					**$**	**2,002,746**	

TABLE 2
ESTIMATED COSTS
SOIL ALTERNATIVE S3D - OFF-SITE DISPOSAL

CAP CONSTRUCTION COSTS						
Regrading[2]	SY	$ 1.50	7,260	$	10,890	
Geotextile Filter Layers[2]	SF	$ 1.00	65,000	$	65,000	
Crushed Rock[2]	SF	$ 1.30	65,000	$	84,500	
Final Soil Cover[2]	SF	$ 0.90	65,000	$	58,500	
Surface Water Management System[2]	LF	$ 20	1,600	$	32,000	
Passive Gas Collection System[2]	SF	$ 1.75	65,000	$	113,750	
Fine Grading & Revegetation[1]	SY	$ 1.00	7,260	$	7,260	
Final Landscaping[2]	LS	$ 20,000.00	1	$	20,000	Assume entire Site (1.5 acres).
Water for Compaction[1]	Day	$ 10	30	$	300	7,000 gal/day, $1. per 100 CF.
Estimated Duration[2]	Day		30			
Contractor & Misc. Overhead[3]			8%	$	31,376	
Permitting[3]			1%	$	3,922	
Engineering Design[3]			15%	$	58,830	
Construction CQA[3]			10%	$	39,220	
Contingency[3]			20%	$	78,440	
Subtotal				**$**	**603,988**	
Capital Costs Total				**$**	**3,050,096**	

TABLE 2
ESTIMATED COSTS
SOIL ALTERNATIVE S3D - OFF-SITE DISPOSAL

Operation and Maintenance Costs							
Routine Site Inspections[2]	Each	$	500	4	$	2,000	Cover Inspections performed quarterly.
Settlement Monitoring[2]	Each	$	750	1	$	750	
Air Quality Grid Monitoring[2]	Each	$	1,000	4	$	4,000	VOC emissions from cover.
Cover & Drainage System Repairs[2]	LS	$	10,000	1	$	10,000	Regrading, revegetation, concrete.
Annual Reporting[2]	Annually	$	15,000	1	$	15,000	
5 Year Status Report[2]	5 Yrs	$	20,000	0.2	$	4,000	
Annual O&M Contingency[2]				10%	$	3,575	
Subtotal					**$**	**39,325**	
ANNUAL O&M 30-YR NPV SUBTOTAL					**$**	**604,522**	5 % Discount rate
30 Year O&M SUBTOTAL					**$**	**1,179,750**	
TOTAL CAPITAL & 30-YR O&M Current $					**$**	**4,229,846**	
TOTAL CAPITAL & 30-YR O&M NPV					**$**	**3,654,618**	

[1] Cost based on Means guide
[2] Cost based on professional experience
[3] Cost factor based on "A guide to developing and documenting cost estimates during the feasibility study", USEPA, July 2000
[4] Cost based on personal communication with vendor
[5] Cost based on estimate from vendor

Additional Assumptions

The Site soil weighs 1.4 tons per CY in place.
The soil bulking factor is 1.4.
The excavation will be performed 10 hours per day.

TABLE 3

SOIL REMEDIAL ALTERNATIVES – COMPARATIVE ANALYSIS
CHEMICAL COMMODITIES, INC.
OLATHE, KANSAS

Comparative Analysis Criterion	Alternative S1	Alternative S2			Alternative S3				Alternative S4
	No Action	Off-Site Disposal of Soils with Metals; LTTD of Other Soils			Off-Site Disposal of Soils				Capping of Soils
		S2A	S2B	S2C	S3A	S3B	S3C	S3D	
Overall Protection of Human Health and the Environment	Does not meet threshold requirement.	Meets threshold requirement.	Meets threshold requirement.	Meets threshold requirement.	Meets threshold requirement.	Meets threshold requirement.	Meets threshold requirement.	Meets threshold requirement.	Meets threshold requirement.
Compliance with ARARs	Does not meet threshold requirement.	Meets threshold requirement.	Meets threshold requirement.	Meets threshold requirement.	Meets threshold requirement.	Meets threshold requirement.	Meets threshold requirement.	Meets threshold requirement.	Meets threshold requirement.
Long-Term Effectiveness and Permanence	N/A	High: 5	High: 5	High: 5	High: 5	High: 5	High: 5	High: 5	High: 5
Reduction of Toxicity, Mobility, and Volume Through Treatment	N/A	Moderate-to-High: 4	Moderate-to-High: 4	Moderate-to-High: 4	Low-to-Moderate: 2	Low-to-Moderate: 2	Low-to-Moderate: 2	Moderate: 3	Low: 1
Short-Term Effectiveness	N/A	Low: 1	Low: 1	Low: 1	Moderate: 3	Low-to-Moderate: 2	Low: 1	Moderate-to-High: 4	Moderate-to-High: 4
Implementability	N/A	Moderate: 3	Low-to-Moderate: 2	Low: 1	Moderate: 3	Low-to-Moderate: 2	Low: 1	Moderate-to-High: 4	High: 5
Cost	N/A	Low-to-Moderate: 2	Low: 1	Low: 1	Low-to-Moderate: 2	Low: 1	Low: 1	Low-to-Moderate: 2	Moderate-to-High: 4
State Acceptance	N/A	To be addressed when USEPA is making its final remedial decision and the ROD is being prepared.							
Community Acceptance	N/A	To be addressed when USEPA is making its final remedial decision and the ROD is being prepared.							
OVERALL RANKING	**Does not meet threshold requirement.**	**Moderate: 15**	**Moderate: 13**	**Low-to-Moderate: 12**	**Moderate: 15**	**Low-to-Moderate: 12**	**Low-to-Moderate: 10**	**Moderate-to-High: 18**	**Moderate-to-High: 19**

Note: a numeric ranking of "1" is lowest, or worst; "5" is highest, or best. With respect to cost, "1" is most expensive; "5" is least expensive.
N/A: Not Applicable.

Table 4

Cost Estimate Summary - Remedial Alternatives
Chemical Commodities, Inc.
Olathe, Kansas

Remedial Alternative	Capital Cost	Annual O&M	Capital Cost Plus 5% Discounted 30-Yr O&M Cost	Capital Cost Plus Non-Discounted 30-Yr O&M Cost
Soil Alternatives				
S1 – No Action	$0	$0	$0	$0
S2A – Off-Site Disposal and LTTD (24-Hour Per Day LTTD Operation)	$4,858,000	$0	$4,858,000	$4,858,000
S2A – Off-Site Disposal and LTTD (10-Hour Per Day LTTD Operation)	$5,734,000	$0	$5,734,000	$5,734,000
S2B – Off-Site Disposal and LTTD (24-Hour Per Day LTTD Operation)	$12,532,000	$131,000	$14,545,000	$16,462,000
S2B – Off-Site Disposal and LTTD (10-Hour Per Day LTTD Operation)	$15,237,000	$131,000	$17,251,000	$19,167,000
S2C – Off-Site Disposal and LTTD (24-Hour Per Day LTTD Operation)	$35,619,000	$131,000	$37,633,000	$39,549,000
S2C – Off-Site Disposal and LTTD (10-Hour Per Day LTTD Operation)	$44,117,000	$131,000	$46,131,000	$48,047,000
S3A – Off-Site Disposal	$6,189,000	$0	$6,189,000	$6,189,000
S3B – Off-Site Disposal	$11,518,000	$131,000	$13,531,000	$15,448,000
S3C – Off-Site Disposal	$21,100,000	$131,000	$23,113,000	$25,030,000
S3D - Off-Site Disposal and Capping	$3,050,000	$39,000	$3,655,000	$4,230,000
S4 – Capping	$1,143,000	$39,000	$1,748,000	$2,323,000
Groundwater Alternatives				
G1 – No Action	$0	$0	$0	$0
G2 – In-Situ Chemical Oxidation	$757,000	$251,000	$4,611,000	$8,278,000
G3 – Pump and Treat	$1,181,000	$360,000	$6,711,000	$11,974,000
G4 – MNA with Engineering and Institutional Controls Only	$166,000	$170,000	$2,787,000	$5,280,000

Note: All costs are rounded to the nearest thousand dollars.

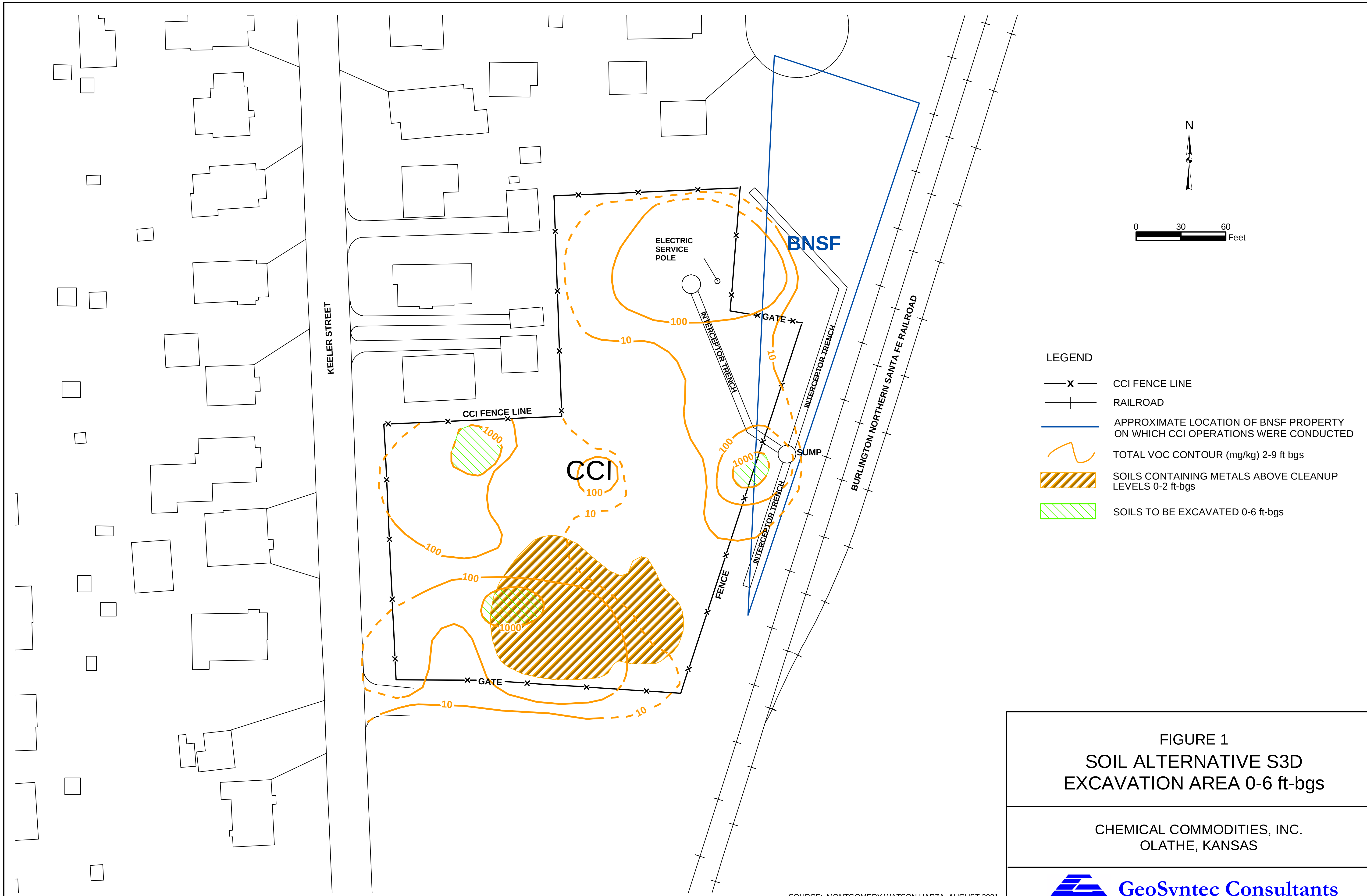

FIGURE 1

SOIL ALTERNATIVE S3D
EXCAVATION AREA 0-6 ft-bgs

CHEMICAL COMMODITIES, INC.
OLATHE, KANSAS

GeoSyntec Consultants

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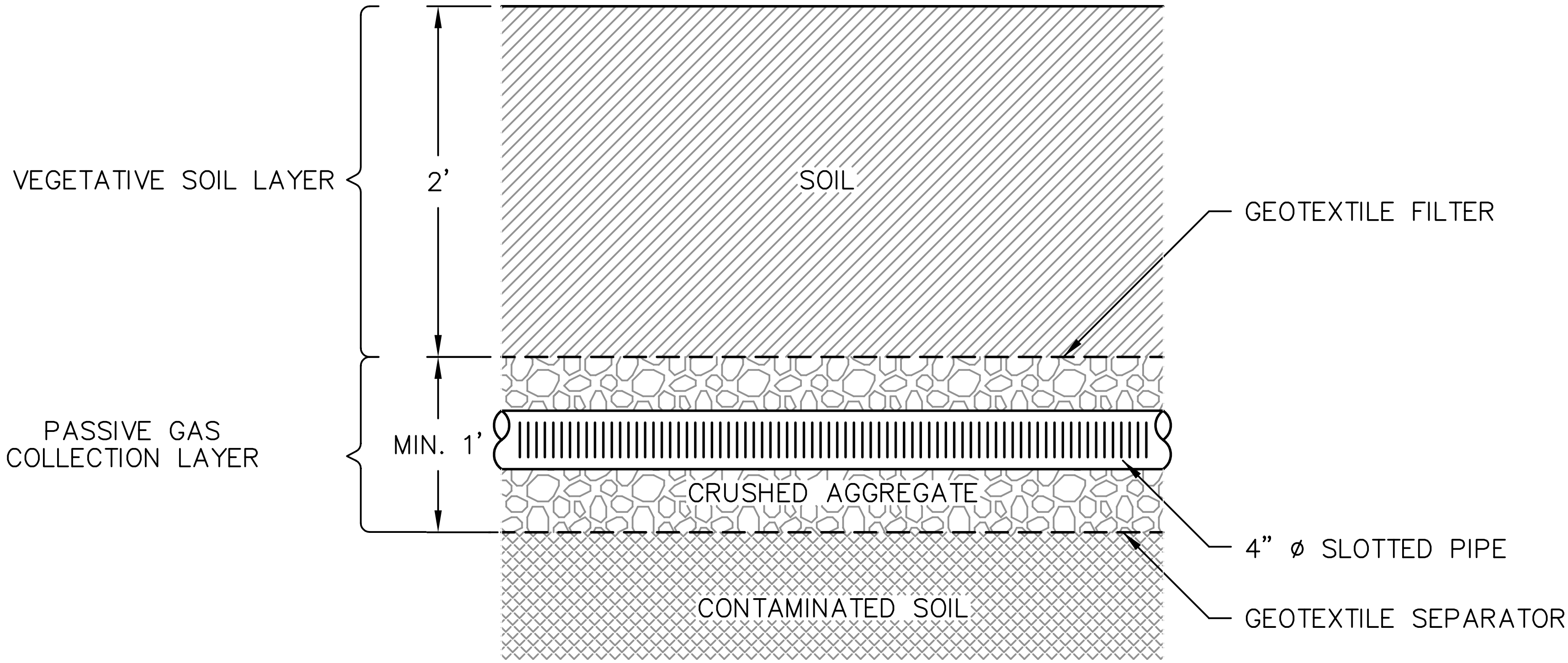

NOT FOR CONSTRUCTION

NOT TO SCALE

GEOSYNTEC CONSULTANTS

CONCEPTUAL CAP DESIGN
CHEMICAL COMMODITIES, INC.

FIGURE NO.	2
PROJECT NO.	HR0763-01
DOCUMENT NO.	
DATE:	JUNE 2004

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SECTION 4

RESPONSE TO COMMENT #4
INDOOR AIR

Addendum to the Feasibility Study Report
Dated March 23, 2004
Chemical Commodities, Inc. Site
Olathe, Kansas

Response to Conditional Approval of the Draft Feasibility Study Report
Comment #4
Dated May 6, 2004

Comment 4. *The FS Report should include a discussion of the indoor air data, associated risks, and the installation of vapor control systems in certain homes pursuant to an amendment to the RI/FS AOC. This is especially important given that maintenance of the vapor control systems is a common element in all of the groundwater alternatives.*

Response: USEPA conducted indoor vapor monitoring in the vicinity of the Site between August and October 2002. Nine homes were sampled during this phase and the results were evaluated to determine future actions. The sampling results showed highly variable levels of VOCs in homes and in crawl spaces. After evaluating the Phase I results, USEPA recommended installation of vapor mitigation systems in homes above certain action levels developed by USEPA, and in certain homes near the Site that did not have exceedences. USEPA also recommended additional indoor air sampling. Vapor mitigation systems were installed in 21 homes in Phase I. An additional 27 homes were incorporated into the air sampling plan for Phase II, which began in September 2003.

Table 1 (attached) contains a summary of the analytical data obtained to date by USEPA. The table shows that several compounds were included in the vapor sampling, and also shows the level of variability in the data. Further, there is no reliable background data set to indicate whether all of these compounds are from the groundwater plume or whether other sources may be contributing. The Agency for Toxic Substances and Disease Registry (ATSDR) has reviewed CCI data and has concluded that the levels at which the groundwater chemicals have been detected in indoor air are very low, below levels that would be expected to cause a health hazard.

Also attached is Figure 1, which shows locations where USEPA has collected data as of December 2003. An overlay on Figure 1 shows the current configuration of the plume of TCE in groundwater. Finally, Figure 2 shows the locations where the twenty-one vapor mitigation systems were installed during Phase I.

Address/ Sample Location	Sample Date	Sample Type		1,1,1-Trichloroethane	1,1,2,2-Tetrachloroethane	1,1-Dichloroethene	1,2-Dichloroethane	Carbon Tetrachloride	Chloroform	cis-1,2-Dichloroethene	Chloromethane	trans-1,2-Dichloroethene	Methylene Chloride	Tetrachloroethene	Trichloroethene	Vinyl Chloride	Notes
	Health-based Air Action Level[c]:			***2300***	***NA***	***209***	***0.70***	***1.3***	***0.8***	***37***	***10.5***	***NA***	***40.3***	***6.6***	***2.0***	***NA***	
301 S. Blake	10/29/2003	IA		NR	NR	NR	NR	***2***	0.44	NR	NR	NR	0.91	NR	1.6	NR	Confirmation Sample
	10/29/2003	CS		NR	NR	NR	NR	***2.5***	<0.19	NR	NR	NR	<0.67	NR	***2.4***	NR	Confirmation Sample
303 S. Blake	7/17/1997	CS		ND	NR	ND	NR	NR	ND	ND	1.4	NR	ND	NR	***2.4***	NR	
226 S. Keeler	8/27/2003	CS		<0.051	<0.066	<0.038	<0.039	<0.06	0.36	<0.038	<0.02	<0.038	<0.095	0.065	0.098	<0.024	
	8/27/2003	CS		0.045	<0.058	<0.038	<0.034	<0.053	0.37	<0.033	<0.017	<0.038	<0.085	0.057	0.11	<0.021	
230 S. Keeler	9/10/2003	IA		<0.045	<0.058	<0.033	0.045	0.055	<0.041	<0.033	0.086	<0.033	<0.085	<0.057	<0.044	0.021	
	9/10/2003	IA		<0.045	<0.058	<0.033	<0.034	<0.053	<0.041	<0.033	0.25	<0.033	<0.085	0.097	0.049	<0.021	
300 S. Keeler	2000[a]	IA		18	NR	NA	NA	NA	<2.5	NA	2	NR	6.4	<3.4	<2.7	NR	
	2000[a]	IA		26	NR	NA	NA	NA	<2.5	NA	2.3	NR	11	<3.4	<2.7	NR	
	2000[a]	IA		37	NR	NA	NA	NA	<2.5	NA	3.4	NR	16	<4.4	<3.5	NR	
	10/27/2003	CS		NR	NR	NR	NR	0.7	<0.15	NR	NR	NR	<0.55	NR	0.27	NR	Confirmation Sample
	10/27/2003	IA		NR	NR	NR	NR	0.85	***5.6***	NR	NR	NR	0.86	NR	0.2	NR	Confirmation Sample
301 S. Keeler	4/14/2003	IA		0.32	0.11	0.081	0.035	0.61	0.1	0.12	0.99	0.052	0.78	0.11	0.35	0.042	
	4/14/2003	IA		0.22	<0.06	0.04	<0.035	0.17	0.05	0.039	0.48	<0.035	0.15	0.2	0.71	<0.022	
	4/14/2003	CS		0.078	<0.054	<0.031	<0.032	0.23	0.074	0.032	0.29	<0.031	0.46	0.2	***7.1***	<0.019	
	4/14/2003	CS		0.25	0.084	<0.03	<0.03	0.83	0.23	0.11	1.2	<0.03	0.56	0.69	***10***	0.034	
	12/18/2003	CS		0.083	<0.054	<0.031	<0.032	0.054	<0.038	<0.031	0.092	<0.031	<0.078	0.11	0.42	<0.019	
	12/18/2003	CS		<0.04	<0.051	<0.029	<0.03	<0.047	<0.036	<0.029	0.063	<0.029	<0.074	<0.05	<0.039	<0.019	
	12/18/2003	IA		0.072	<0.052	<0.03	<0.03	0.058	<0.037	<0.03	0.069	<0.03	<0.074	0.14	0.52	<0.019	
	12/18/2003	IA		<0.039	<0.05	<0.029	<0.03	0.049	<0.036	<0.029	0.082	<0.029	<0.074	<0.05	<0.038	<0.018	
302 S. Keeler	2000[a]	IA		<2.8	NR	NA	NA	NA	2.7	NA	5.1	NR	2.6	<3.4	***4.8***	NR	
	2000[a]	IA		<2.8	NR	NA	NA	NA	<2.5	NA	3.9	NR	2.1	***7.4***	***3.6***	NR	
	2000[a]	IA		<2.8	NR	NA	NA	NA	<2.5	NA	4.2	NR	<1.8	<3.4	<2.7	NR	
	9/11/2002	CS		1.28	<0.05	<0.018	<0.029	<0.045	<0.035	0.0347	<0.015	<0.029	0.812	0.0758	0.29	<0.018	
	9/11/2002	CS		2.61	<0.084	<0.048	<0.049	0.0767	0.06	0.262	0.567	<0.048	1.59	0.414	1.53	0.052	
	9/19/2002	CS		0.100	<0.066	<0.32	<3.29	<3.87	0.179	0.0484	7.35	<1.71	0.53	0.138	0.24	<1.71	
	9/19/2002	OA		<0.049	<0.063	<0.036	<0.037	<0.058	0.744	0.109	***31.5***	<0.036	<15	<0.062	0.186	<0.023	
	9/11/2002	IA		0.943	0.0545	<0.048	<0.049	<0.045	<0.035	<0.028	4.41	<0.028	0.494	0.0545	0.131	<0.018	
	7/1/2003	CS		5.5	2.6	1	***0.7***	***2.8***	***1.2***	1.7	0.88	1.9	2.1	0.48	***3.1***	0.68	Confirmation Sample
	7/1/2003	CS		4.4	0.21	0.18	0.2	0.7	0.37	0.48	0.31	0.093	1.1	0.15	1.5	0.078	Confirmation Sample
	7/1/2003	IA		10	0.17	0.14	0.4	0.96	0.5	0.44	0.42	<0.036	1.1	0.22	1.5	<0.023	Confirmation Sample
	7/1/2003	IA		8.3	0.22	0.25	0.37	0.57	0.65	0.36	2.3	<0.028	7.4	0.19	1.5	<0.018	Confirmation Sample
303 S. Keeler	4/11/2003	IA		<0.053	<0.068	<0.039	<0.04	0.3	***0.84***	0.21	3.1	<0.039	0.21	0.16	1.1	<0.025	
	4/11/2003	IA		0.17	<0.049	<0.028	<0.029	0.56	***3.1***	0.27	6.1	<0.028	<1.4	0.14	***2.0***	<0.018	
311 S. Keeler	4/10/2003	IA		0.24	0.077	0.1	<0.032	0.59	0.49	0.64	0.71	<0.031	0.35	0.23	1.8	<0.019	
	4/10/2003	IA		0.24	0.07	0.1	<0.032	0.59	0.55	0.6	0.78	<0.031	0.31	0.19	1.8	<0.019	
	4/10/2003	CS		0.67	0.24	0.23	<0.062	0.7	0.23	0.69	0.99	<0.03	0.95	0.56	***4.9***	0.11	
	4/10/2003	CS		0.28	<0.052	0.097	<0.03	0.53	0.084	0.77	0.76	<0.034	1.7	0.21	***2.3***	<0.019	
	4/10/2003	CS		0.11	<0.049	0.033	<0.029	0.26	0.065	0.19	0.4	<0.028	1.7	0.21	0.6	<0.018	
	12/4/2003	CS		0.067	<0.049	<0.028	<0.029	0.045	<0.035	<0.028	0.052	<0.028	<0.071	<0.048	<0.037	<0.018	
	12/4/2003	CS		<0.045	<0.058	<0.033	<0.034	<0.053	<0.041	<0.033	0.052	<0.033	0.088	<0.057	0.071	<0.021	
	12/4/2003	IA		<0.044	<0.056	<0.032	<0.033	<0.051	<0.04	<0.032	0.055	<0.032	<0.081	0.12	<0.043	<0.021	
	12/4/2003	IA		<0.042	<0.054	<0.031	<0.032	<0.049	0.05	<0.031	0.052	<0.031	<0.078	0.29	<0.041	<0.019	
312 S. Keeler	2000[a]	IA		29	NR	NA	NA	NA	<2.5	NA	<1	NR	4	<3.4	***2.7***	NR	
	2000[a]	IA		29	NR	NA	NA	NA	***4.0***	NA	<1	NR	4.3	<3.4	<2.7	NR	
	2000[a]	IA		37	NR	NA	NA	NA	***6.1***	NA	1.9	NR	5.4	<3.4	<2.7	NR	
	7/17/1997	CS		46	NR	2.2	NR	NR	***1.0***	ND	ND	NR	3.3	NR	ND	NR	
	9/11/2002	CS		0.366	0.366	<0.061	<0.036	<0.029	<0.056	0.117	<0.038	<0.035	2.9	0.145	0.35	<0.023	
	9/11/2002	IA		1.5	<0.06	<0.035	<0.035	<0.055	<0.043	0.129	6.09	<0.035	11.7	0.179	0.404	<0.022	
	9/11/2002	IA(dup)		6.1	<0.057	<0.034	<0.034	<0.052	<00.41	0.197	6.3	<0.033	14.1	0.276	0.656	<0.021	
	10/27/2003	IA		NR	NR	NR	NR	0.84	***2.6***	NR	NR	NR	2.6	NR	1.4	NR	Confirmation Sample
	10/27/2003	CS		NR	NR	NR	NR	***3.2***	0.64	NR	NR	NR	2.2	NR	***69***	NR	Confirmation Sample
316 S. Keeler	2000[a]	IA		<2.8	NR	NA	NA	NA	<2.5	NA	2.6	NR	3	<3.4	***5.2***	NR	
	2000[a]	IA		<2.8	NR	NA	NA	NA	<2.5	NA	5.8	NR	2	***14***	***5.2***	NR	
	2000[a]	IA		<2.8	NR	NA	NA	NA	***4***	NA	5.6	NR	2.3	***9.3***	***6.2***	NR	
	7/17/1997	CS		ND	NR	ND	NR	NR	ND	ND	ND	NR	ND	NR	ND	NR	
	9/24/2002	CS		0.233	<0.07	0.0645	<0.041	0.109	<0.05	1.45	0.525	<0.04	0.222	0.758	***4.97***	<0.026	
	9/24/2002	CS		0.133	0.133	<0.1	<0.041	<0.096	<0.074	0.685	0.525	<0.06	0.742	2	***5.46***	<0.039	
	9/24/2002	CS(dup)		0.0666	0.0666	<0.084	<0.062	<0.077	<0.06	0.363	0.252	<0.48	0.138	0.255	***2.35***	<0.031	
	10/27/2003	IA		NR	NR	NR	NR	***6.9***	***1.3***	NR	NR	NR	0.77	NR	***12***	NR	Confirmation Sample

Address/ Sample Location	Sample Date	Sample Type		1,1,1-Trichloroethane	1,1,2,2-Tetrachloroethane	1,1-Dichloroethene	1,2-Dichloroethane	Carbon Tetrachloride	Chloroform	cis-1,2-Dichloroethene	Chloromethane	trans-1,2-Dichloroethene	Methylene Chloride	Tetrachloroethene	Trichloroethene	Vinyl Chloride	Notes
	Health-based Air Action Level[c]:			***2300***	***NA***	***209***	***0.70***	***1.3***	***0.8***	***37***	***10.5***	***NA***	***40.3***	***6.6***	***2.0***	***NA***	
	10/27/2003	IA		NR	NR	NR	NR	***6.0***	***1.3***	NR	NR	NR	0.61	NR	***12***	NR	Confirmation Sample
317 S. Keeler	10/27/2003	CS		NR	NR	NR	NR	0.9	0.23	NR	NR	NR	<0.63	NR	1.6	NR	Confirmation Sample
	10/27/2003	IA		NR	NR	NR	NR	0.45	***3.5***	NR	NR	NR	1.4	NR	1.1	NR	Confirmation Sample
318 S. Keeler	2000[a]	IA		<2.8	NR	NA	NA	NA	<2.5	NA	3.4	NR	2	<3.4	***4.9***	NR	
	2000[a]	IA		<2.8	NR	NA	NA	NA	<2.5	NA	<1	NR	ND	<3.4	<2.7	NR	
	2000[a]	IA		<2.8	NR	NA	NA	NA	<2.5	NA	<1	NR	ND	<3.4	<2.7	NR	
	2001[b]	IA		<4.4	NR	NA	NA	NA	<3.9	NA	<1.6	NR	<2.8	<5.4	<4.3	NR	
	Sept. 2001	IA		NA	NR	NA	NA	NA	NA	NA	NA	NR	ND	NA	NA	NR	
	Dec01/Jan02	IA		1.2	NR	0.1	ND	0.59	0.6	3.3	NA	NR	ND	1.3	***5.6***	NR	
	10/10/2002	CS		19.4	0.112	8.87	0.304	0.301	0.402	***306***	0.273	5.24	0.177	***11.7***	***186***	0.114	
	10/10/2002	CS		0.194	<0.049	<0.028	<0.029	0.153	<0.035	0.121	4.2	<0.028	<0.46	0.248	0.186	<0.018	
	10/10/2002	CS(dup)		150	0.314	72.5	***0.987***	0.441	***0.893***	***967***	0.357	18.5	5.3	***36.5***	***377***	0.148	
	10/10/2002	IA		5.55	<1.3	2.54	<0.78	<1.2	<0.94	***101***	0.966	<0.77	<1.9	4.07	***30.6***	<0.47	
	10/10/2002	IA		8.87	0.251	4.43	0.0987	0.256	0.293	***101***	1.74	2.22	ND	6	***81.9***	0.0416	
	10/10/2002	OA		1.5	<0.058	0.605	<0.034	0.0767	0.0893	9.27	0.567	0.383	0.383	2.96	***13.1***	<0.021	
	10/27/2003	CS		NR	NR	NR	NR	0.75	0.17	NR	NR	NR	<0.62	NR	***3.2***	NR	Confirmation Sample
	10/27/2003	IA		NR	NR	NR	NR	1.0	0.75	NR	NR	NR	<0.62	NR	***2.2***	NR	Confirmation Sample
319 S. Keeler	2001[b]	IA		<18	NR	NA	NA	NA	<16	NA	<6.8	NR	<11	<22	<18	NR	
	9/19/2002	CS		<0.043	<0.56	<0.32	<0.034	<0.51	<0.4	<0.32	<0.17	<0.32	<0.81	<0.55	<0.43	<0.2	
	9/19/2002	IA		0.051	0.053	<0.03	<0.37	<0.47	0.223	0.0383	2.31	<0.03	0.777	0.124	0.147	<0.019	
	9/19/2002	IA		0.0998	<0.052	<0.03	<0.03	<0.047	***0.893***	0.242	4.2	0.242	<1.5	0.186	0.601	<0.019	
	10/29/2003	IA		NR	NR	NR	NR	0.61	***1.1***	NR	NR	NR	1.7	NR	<0.18	NR	Confirmation Sample
	10/29/2003	IA		NR	NR	NR	NR	0.69	***1.1***	NR	NR	NR	1.7	NR	<0.20	NR	Confirmation Sample
325 S. Keeler	10/27/2003	IA		NR	NR	NR	NR	0.71 J	***0.91 J***	NR	NR	NR	1.3 J	NR	<0.15 J	NR	Confirmation Sample
	10/27/2003	IA(dup)		NR	NR	NR	NR	0.68	0.77	NR	NR	NR	0.61	NR	<0.19	NR	Confirmation Sample
331 S. Keeler	2001[b]	IA		37	NR	NA	NA	NA	<16	NA	<6.8	NR	<11	<22	<18	NR	
	Sept. 2001	IA		NA	NR	NA	NA	NA	NA	NA	NA	NR	ND	NA	NA	NR	
	Dec01/Jan02	IA		2.5	NR	ND	0.13	0.52	***0.92***	ND	NA	NR	4.1	0.41	ND	NR	
	9/11/2002	CS		0.233	<0.063	0.0443	<0.015	<0.045	<0.035	6.45	0.0735	<0.029	<0.029	0.496	***13.1***	0.026	
	9/11/2002	CS		0.283	<0.098	0.0725	<0.462	<0.09	<0.069	1.69	0.462	<0.056	1.66	0.614	***22.4***	0.052	
	9/19/2002	CS		7.77	<6.84	<0.32	<3.29	***28.1***	***993***	***60.5***	***1150***	<3.87	***388***	***10.3***	***104***	<1.71	
	9/11/2002	IA		0.277	<0.077	<0.044	<0.045	<0.07	<0.55	0.766	0.176	<0.044	0.186	0.414	***12***	<0.018	
	7/1/2003	CS		1.1	<0.13	0.19	0.099	0.58	0.4	4.8	0.23	0.15	0.42	2.1	***8.2***	0.057	Confirmation Sample
	7/1/2003	CS		0.94	0.084	0.21	0.11	0.58	0.36	4	0.42	<0.033	0.31	2.3	***7.1***	0.13	Confirmation Sample
	7/1/2003	IA		1.2	<0.063	0.039	0.074	0.31	***0.84***	0.23	0.44	<0.036	0.64	0.18	0.6	<0.023	Confirmation Sample
	7/1/2003	IA		1.3	<0.056	0.081	0.091	0.47	***1.3***	0.35	1.2	<0.032	1.4	1.1	0.87	<0.021	Confirmation Sample
335 S. Keeler	7/17/1997	CS		3.5	NR	0.9	NR	NR	ND	25	ND	NR	5	NR	***6.4***	NR	
	10/27/2003	CS		NR	NR	NR	NR	0.82	0.33	NR	NR	NR	0.66	NR	1.1	NR	Confirmation Sample
	10/27/2003	IA		NR	NR	NR	NR	0.71	***1.5***	NR	NR	NR	1.5	NR	0.23	NR	Confirmation Sample
401 S. Keeler	2001[b]	IA		<3.8	NR	NA	NA	NA	***3.8***	NA	<1.4	NR	6.4	<4.7	<3.7	NR	
	Sept. 2001	IA		NA	NR	NA	NA	NA	NA	NA	NA	NR	ND	NA	NA	NR	
	Dec01/Jan02	IA		2.9	NR	ND	ND	0.78	***1.3***	ND	NA	NR	ND	0.39	ND	NR	
	10/27/2003	IA		NR	NR	NR	NR	0.72	***3.8***	NR	NR	NR	0.71	NR	<0.18	NR	Confirmation Sample
	10/27/2003	IA		NR	NR	NR	NR	0.72	***3.3***	NR	NR	NR	0.72	NR	0.21	NR	Confirmation Sample
405 S. Keeler	9/9/2003	CS		<0.039	<0.05	<0.029	<0.03	<0.046	<0.036	<0.029	0.038	<0.029	<0.074	<0.05	<0.038	<0.018	
	9/9/2003	OA		<0.049	<0.063	<0.036	<0.037	<0.058	<0.045	<0.036	0.082	<0.036	<0.092	<0.062	<0.048	<0.023	
	9/9/2003	CS		<0.044	<0.056	<0.032	<0.033	<0.051	<0.04	<0.032	<0.031	<0.032	<0.081	<0.055	<0.043	<0.021	
2224 Ocheltree	10/16/2003			<0.038	<0.049	<0.028	<0.029	<0.045	<0.035	<0.028	0.027	<0.028	<0.071	<0.048	<0.037	<0.018	
	10/16/2003			<0.12	<0.15	<0.085	<0.086	<0.13	<0.1	<0.085	<0.044	<0.085	<0.22	<0.14	<0.11	<0.055	
2226 Ocheltree	9/9/2003	CS		0.13	<0.066	<0.038	<0.039	<0.06	<0.047	<0.038	0.076	<0.038	<0.095	<0.065	<0.05	<0.024	
	9/9/2003	CS		0.23	0.18	0.073	0.078	0.18	0.1	0.081	0.15	0.14	<0.092	0.11	0.13	0.052	
3301 Ochletree	10/16/2003	BA		<0.045	<0.058	<0.033	<0.034	<0.053	0.079	<0.033	0.046	<0.033	<0.085	<0.057	<0.044	<0.021	
	10/16/2003	BA		<0.039	<0.05	<0.029	<0.03	<0.046	0.074	<0.029	0.059	<0.029	0.39	0.076	<0.038	<0.018	
	10/16/2003	BA (dup)		<0.038	<0.049	<0.028	<0.029	<0.045	0.079	<0.028	0.1	<0.028	0.42	<0.048	<0.037	<0.018	
3302 Ocheltree	4/11/2003	CS		0.48	0.11	0.17	0.045	0.64	0.29	0.23	1.1	0.03	4.2	0.52	0.71	<0.018	
	4/11/2003	CS		0.21	<0.05	0.029	<0.03	0.54	0.094	0.29	0.55	<0.029	0.78	0.14	1.8	<0.018	
	4/9/2003	IA		0.29	<0.049	0.069	<0.029	0.51	0.19	0.21	0.52	<0.028	2.8	0.26	1.3	<0.018	
	4/9/2003	IA		0.43	0.13	0.21	<0.037	0.59	0.79	0.27	4.6	<0.036	8.8	0.43	1.3	<0.023	
	4/9/2003	IA		0.29	<0.052	0.23	<0.03	0.53	***1.1***	0.27	0.76	<0.03	3.9	1.0	1.5	<0.019	

Address/ Sample Location	Sample Date	Sample Type		1,1,1-Trichloroethane	1,1,2,2-Tetrachloroethane	1,1-Dichloroethene	1,2-Dichloroethane	Carbon Tetrachloride	Chloroform	cis-1,2-Dichloroethene	Chloromethane	trans-1,2-Dichloroethene	Methylene Chloride	Tetrachloroethene	Trichloroethene	Vinyl Chloride	Notes
	Health-based Air Action Level[c]:			***2300***	***NA***	***209***	***0.70***	***1.3***	***0.8***	***37***	***10.5***	***NA***	***40.3***	***6.6***	***2.0***	***NA***	
3304 Ocheltree	4/9/2003	IA		0.31	<0.056	0.093	<0.033	1.1	0.26	0.73	0.67	<0.032	0.39	0.45	***6.0***	<0.021	
	4/9/2003	CS		0.089	<0.052	<0.03	<0.03	0.26	0.055	0.16	0.27	<0.03	0.23	0.097	***3.5***	<0.019	
	4/9/2003	IA		0.35	0.2	0.29	0.045	1.1	0.29	0.69	1.2	<0.035	0.71	0.5	***9.3***	0.052	
	4/9/2003	CS		0.39	0.091	0.089	<0.034	0.53	0.16	0.44	0.61	<0.033	0.92	0.46	***4.9***	<0.021	
3306 Ocheltree	9/9/2003	CS		<0.047	<0.06	<0.035	<0.035	<0.055	<0.043	<0.035	0.023	<0.035	<0.088	<0.059	<0.046	<0.022	
	9/9/2003	CS		<0.051	<0.066	<0.038	<0.039	<0.06	<0.047	<0.038	0.025	<0.038	<0.095	<0.065	0.1	<0.024	
	12/4/2003	CS		0.061	<0.058	<0.033	<0.034	0.34	0.14	<0.033	0.052	<0.033	<0.085	1.2	***6.6***	<0.021	
	12/4/2003	CS		0.083	<0.054	<0.031	<0.032	0.35	0.14	<0.031	0.094	<0.031	<0.078	1.2	***6.6***	<0.019	
	12/4/2003	IA		0.042	<0.052	<0.03	<0.03	0.19	0.5	<0.03	0.12	<0.03	<0.074	0.52	***2.3***	<0.019	
	12/4/2003	IA		0.061	<0.056	<0.032	<0.033	0.2	0.65	<0.032	0.15	<0.032	<0.081	1.2	***2.8***	<0.021	
4400 Ocheltree	10/29/2003	IA		NR	NR	NR	NR	0.59	***2.1***	NR	NR	NR	0.7	NR	0.2	NR	Confirmation Sample
	10/29/2003	CS		NR	NR	NR	NR	0.47	<0.15	NR	NR	NR	3.5	NR	0.2	NR	Confirmation Sample
	10/29/2003	OA		NR	NR	NR	NR	0.58	<0.17	NR	NR	NR	0.98	NR	<0.19	NR	Confirmation Sample
4402 Ocheltree	2001[b]	IA		<43	NR	NA	NA	NA	<38	NA	<16	NR	<27	<53	<42	NR	
	Sept. 2001	IA		NA	NR	NA	NA	NA	NA	NA	NA	NR	ND	NA	NA	NR	
	Dec01/Jan02	IA		0.5	NR	0.096	ND	***1.7***	***1.1***	ND	NA	NR	ND	1.8	***21***	NR	
	10/9/2002	CS		0.433	<0.056	0.564	<0.033	1.15	0.546	0.806	0.315	<0.032	0.254	4.21	***131***	<0.021	
	10/9/2002	CS		0.721	0.621	0.846	<0.03	***1.41***	0.596	0.967	0.63	0.326	0.565	4.21	***126***	0.138	
	10/9/2002	IA		0.383	<0.07	0.484	<0.041	0.959	0.452	0.766	0.651	0.0605	0.318	2.96	***44.2***	<0.026	
	10/9/2002	IA		0.372	<0.06	0.403	<0.035	0.831	0.402	0.806	0.756	<0.035	0.424	3.1	***76.5***	<0.022	
	7/1/2003	CS		0.12	0.054	0.25	0.039	0.36	0.6	0.056	0.63	<0.031	0.18	<0.053	0.36	<0.019	Confirmation Sample
	7/1/2003	CS		0.12	<0.056	0.056	0.038	0.31	0.28	0.048	0.46	0.035	0.24	<0.055	0.42	<0.021	Confirmation Sample
	7/1/2003	IA-garage		0.083	<0.056	<0.032	<0.033	0.29	0.29	<0.032	0.38	<0.032	0.26	0.069	0.25	<0.021	Confirmation Sample
	7/1/2003	IA		0.083	<0.054	<0.031	0.032	0.26	0.42	0.031	0.38	<0.031	0.53	0.09	0.66	<0.019	Confirmation Sample
	7/1/2003	IA		<0.28	<0.35	<0.2	<0.21	0.36	0.49	<0.2	0.34	<0.2	0.67	0.57	<0.27	0.16	Confirmation Sample
4404 Ocheltree	2001[b]	IA		<5	NR	NA	NA	NA	<4.4	NA	<1.9	NR	<3.2	<6.2	<4.9	NR	
	Sept. 2001	IA		NA	NR	NA	NA	NA	NA	NA	NA	NR	ND	NA	NA	NR	
	Dec01/Jan02	IA		0.52	NR	ND	0.15	0.58	0.46	ND	NA	NR	ND	0.34	ND	NR	
	10/11/2002	CS		0.133	<0.052	<0.03	<0.03	0.0831	0.0794	0.375	0.294	<0.03	0.222	0.414	1.58	<0.019	
	10/11/2002	CS-Sump		0.105	<0.068	<0.039	<0.04	0.0895	0.0844	0.0725	0.693	<0.039	0.237	0.441	1.69	<0.025	
	10/11/2002	IA		0.139	<0.077	<0.044	<0.045	0.0831	0.0794	0.0967	0.882	<0.044	1.52	0.221	0.929	<0.029	
	10/11/2002	IA		0.139	<0.06	<0.035	<0.33	0.0767	0.0844	0.0967	0.609	<0.035	2.22	0.248	0.929	<0.022	
	11/5/2003	IA		NR	NR	NR	NR	***1.5***	***0.91***	NR	NR	NR	0.90	NR	***4.8***	NR	Confirmation Sample
	11/5/2003	IA		NR	NR	NR	NR	***1.6***	***1.0***	NR	NR	NR	0.91	NR	***5.8***	NR	Confirmation Sample
4405 Ocheltree	2001[b]	IA		<7.4	NR	NA	NA	NA	<6.6	NA	<2.8	NR	***180***	<9.2	***11***	NR	
	9/24/2002	BA		0.721	<0.06	1.33	<0.035	***2.05***	0.695	0.0443	1.22	<0.035	14.5	***9.65***	***142***	0.022	
	9/24/2002	BA		0.277	<0.06	0.484	<0.035	0.703	0.258	0.0443	0.42	<0.035	11.3	***6.89***	***98.3***	<0.022	
	9/24/2002	IA		0.0721	<0.06	0.484	<0.035	0.062	0.0695	0.0846	0.378	<0.035	0.353	0.241	0.983	<0.022	
	10/29/2003	BA		NR	NR	NR	NR	0.59	0.66	NR	NR	NR	15	NR	0.48	NR	Confirmation Sample
	10/29/2003	BA		NR	NR	NR	NR	0.57	0.68	NR	NR	NR	16	NR	0.59	NR	Confirmation Sample
4406 Ocheltree	Sept. 2001	IA		NA	NR	NA	NA	NA	NA	NA	NA	NR	ND	NA	NA	NR	
	Dec01/Jan02	IA		0.4	NR	ND	ND	0.49	0.42	ND	NA	NR	ND	0.88	ND	NR	
4407 Ocheltree	10/27/2003	IA		NR	NR	NR	NR	0.87	***1.6***	NR	NR	NR	0.76	NR	<0.20	NR	Confirmation Sample
	10/27/2003	IA		NR	NR	NR	NR	0.73	***1.3***	NR	NR	NR	<0.60	NR	<0.19	NR	Confirmation Sample
4408 Ocheltree	2001[b]	IA		6.8	NR	NA	NA	NA	<3.7	NA	<1.6	NR	2.9	<5.1	<4.1	NR	
	10/27/2003	CS		NR	NR	NR	NR	0.69	0.27	NR	NR	NR	<0.55	NR	0.23	NR	Confirmation Sample
	10/27/2003	IA		NR	NR	NR	NR	0.71	0.75	NR	NR	NR	0.92	NR	0.28	NR	Confirmation Sample
4409 Ocheltree	9/9/2003	CS		<0.051	<0.066	<0.038	<0.039	<0.06	<0.047	<0.038	0.2	<0.038	<0.095	<0.065	<0.05	<0.024	
	9/9/2003	CS		<0.049	<0.063	<0.036	<0.037	<0.058	<0.045	<0.036	0.082	<0.036	<0.092	<0.062	<0.048	<0.023	
4410 Ocheltree	10/27/2003	CS		NR	NR	NR	NR	0.76	<0.17	NR	NR	NR	<0.62	NR	<0.19	NR	Confirmation Sample
	10/27/2003	IA		NR	NR	NR	NR	0.87	***1.4***	NR	NR	NR	0.96	NR	0.45	NR	Confirmation Sample
4411 Ocheltree	9/9/2003	CS		<0.045	<0.058	<0.085	<0.034	<0.053	<0.041	<0.033	1.1	<0.033	<0.085	<0.057	<0.071	<0.021	
	9/9/2003	CS		<0.053	<0.068	<0.039	<0.04	<0.063	<0.049	<0.039	0.036	<0.039	<0.099	<0.068	<0.087	<0.025	
4413 Ocheltree	9/9/2003	CS		<0.047	<0.06	<0.035	<0.035	0.16	0.049	<0.035	0.23	<0.035	<0.088	<0.076	0.38	<0.022	
	9/9/2003	CS		<0.047	<0.06	<0.035	<0.035	0.15	0.055	<0.035	0.27	<0.035	<0.088	<0.062	0.37	<0.022	
4414 Ocheltree	9/18/2003	CS		<0.047	<0.06	<0.035	<0.035	<0.055	0.047	<0.035	0.046	<0.035	<0.088	<0.059	<0.046	<0.022	
	9/18/2003	CS		<0.049	<0.063	<0.036	<0.37	<0.058	<0.045	<0.036	0.1	<0.036	0.1	<0.062	<0.048	<0.023	
	9/18/2003	CS(dup)		<0.045	<0.058	<0.033	<0.034	<0.053	<0.041	<0.033	0.027	<0.033	<0.085	<0.057	<0.044	<0.021	
4416 Ocheltree	9/18/2003	CS		<0.042	<0.054	<0.031	<0.032	<0.049	<0.038	<0.031	0.067	<0.031	<0.078	<0.053	<0.041	<0.019	

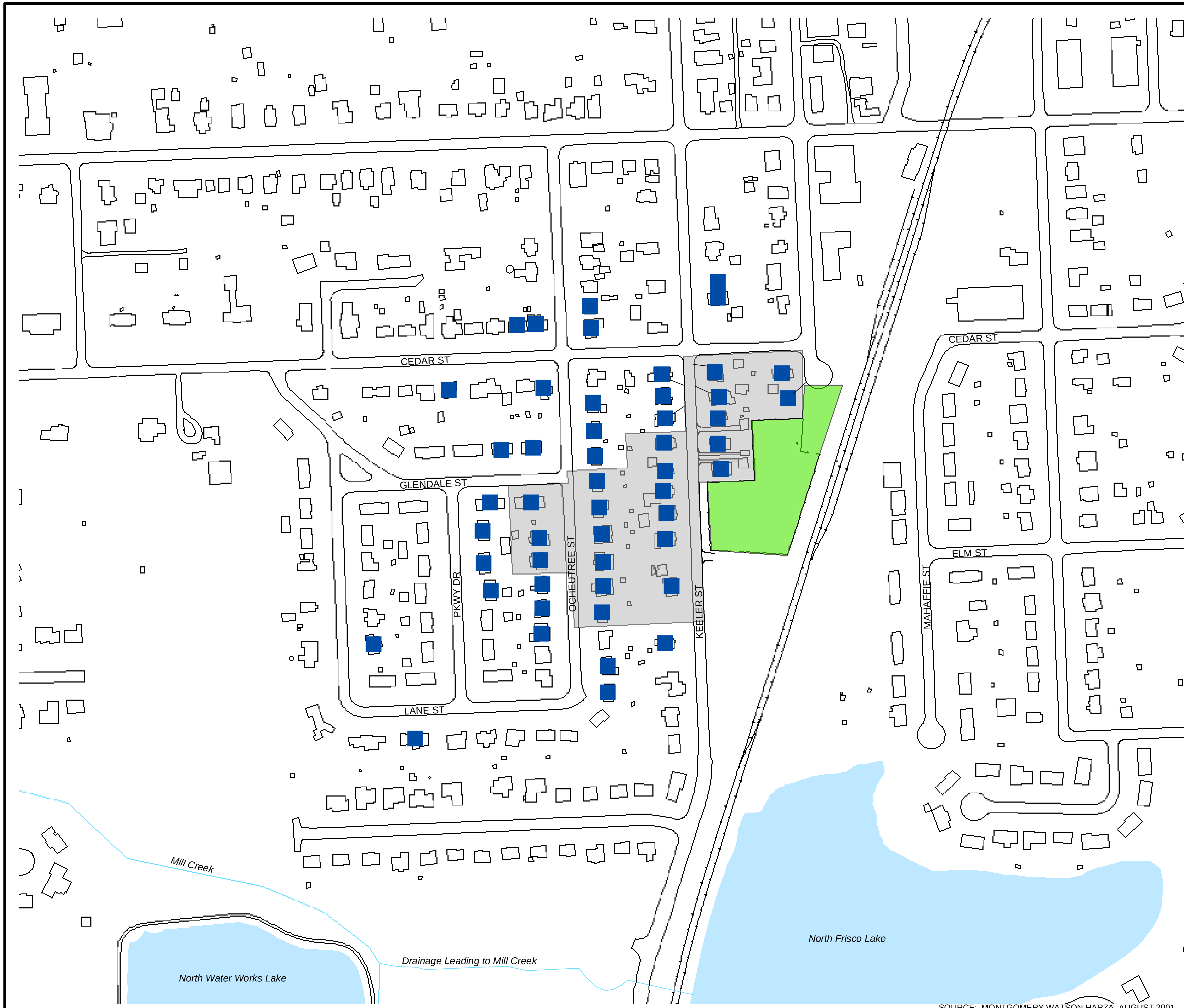
Address/ Sample Location	Sample Date	Sample Type		1,1,1-Trichloroethane	1,1,2,2-Tetrachloroethane	1,1-Dichloroethene	1,2-Dichloroethane	Carbon Tetrachloride	Chloroform	cis-1,2-Dichloroethene	Chloromethane	trans-1,2-Dichloroethene	Methylene Chloride	Tetrachloroethene	Trichloroethene	Vinyl Chloride	Notes
	Health-based Air Action Level[c]:			***2300***	***NA***	***209***	***0.70***	***1.3***	***0.8***	***37***	***10.5***	***NA***	***40.3***	***6.6***	***2.0***	***NA***	
	9/18/2003	CS		<0.045	<0.058	<0.033	<0.034	<0.053	<0.041	<0.033	<0.017	<0.033	<0.085	<0.057	<0.044	<0.021	
603 E. Glendale	10/2/2003	CS		<0.28	<0.35	<0.2	<0.21	<0.32	<0.25	<0.2	<0.1	<0.2	3.9	1.9	<0.27	<0.13	
	11/6/2003	IA		NR	NR	NR	NR	0.62	0.22	NR	NR	NR	<0.63	NR	0.25	NR	
	11/6/2003	IA		NR	NR	NR	NR	0.56	0.21	NR	NR	NR	<0.62	NR	0.22	NR	
	11/6/2003	OA		NR	NR	NR	NR	0.62	<0.14	NR	NR	NR	0.88	NR	0.28	NR	
	12/11/2003	IA		<0.04	<0.051	<0.029	<0.03	<0.047	<0.036	<0.029	0.059	<0.029	0.39	0.058	<0.039	<0.019	
	12/11/2003	IA		<0.041	<0.053	<0.031	<0.031	0.05	<0.038	<0.031	0.073	<0.031	0.78	0.053	<0.04	<0.019	
	12/11/2003	CS		<0.043	<0.055	<0.032	<0.033	<0.051	<0.039	<0.032	0.029	<0.032	<0.081	<0.054	<0.042	<0.02	
	12/11/2003	CS		<0.042	<0.054	<0.031	<0.032	<0.049	<0.038	<0.031	0.044	<0.031	<0.078	<0.053	<0.041	<0.019	
604 E. Glendale	12/11/2003	IA		<0.044	<0.056	<0.032	<0.033	<0.051	<0.04	<0.032	0.099	<0.032	0.12	<0.055	0.06	<0.021	
	12/11/2003	IA		<0.041	<0.053	<0.031	<0.031	<0.049	<0.038	<0.031	0.1	<0.031	0.6	<0.052	0.054	<0.019	
	12/11/2003	CS		<0.04	<0.052	<0.03	<0.03	<0.047	<0.037	<0.03	0.063	<0.03	<0.074	0.06	0.082	<0.019	
	10/2/2003	CS		<0.047	<0.06	<0.035	0.12	<0.055	<0.043	<0.035	0.097	<0.035	<0.088	0.083	0.16	<0.022	
	10/2/2003	CS		<0.038	<0.049	<0.028	<0.029	<0.045	<0.035	<0.028	0.038	<0.028	0.46	0.9	0.14	<0.018	
605 E Glendale	10/27/2003	CS		NR	NR	NR	NR	0.68	***2.5***	NR	NR	NR	0.95	NR	<0.19	NR	Confirmation Sample
	10/27/2003	IA		NR	NR	NR	NR	0.75	<0.18	NR	NR	NR	0.77	NR	<0.20	NR	Confirmation Sample
608 E. Glendale	10/2/2003	CS		0.23	0.26	0.15	0.13	0.7	0.099	<0.036	0.1	<0.036	0.2	0.61	***3.3***	0.088	
	10/2/2003	CS		<0.053	<0.068	<0.039	<0.04	0.3	<0.049	<0.039	<0.021	<0.039	<0.099	0.34	***2.1***	<0.025	
4414 Lane	2001[b]	IA		<4	NR	NA	NA	NA	***3.7***	NA	<1.5	NR	19	***14***	<3.9	NR	
	Sept. 2001	IA		NA	NR	NA	NA	NA	NA	NA	NA	NR	ND	NA	NA	NR	
	Dec01/Jan02	IA		ND	NR	ND	ND	0.45	0.45	ND	NA	NR	9.9	6.0	ND	NR	
4421 Lane	7/2/2003	BA		0.45	<0.05	0.029	0.037	0.3	***1.1***	<0.029	0.31	<0.029	2.5	0.22	0.093	<0.018	
	7/2/2003	BA		0.33	<0.052	<0.03	0.049	0.4	***5.5***	<0.03	1.4	<0.03	3	0.16	0.093	<0.019	
	7/2/2003	IA		0.4	<0.05	<0.029	0.078	0.29	***0.84***	0.037	0.67	<0.029	5.3	0.19	0.17	0.091	
	7/2/2003	CS		0.23	<0.049	<0.028	<0.029	0.33	***3.3***	<0.028	0.88	<0.028	2.4	0.15	0.06	<0.018	
	7/2/2003	OA		0.11	<0.054	<0.031	<0.032	0.32	0.074	<0.031	0.44	<0.031	0.19	<0.053	<0.041	<0.019	
4404 Parkway	12/11/2003	IA		<0.044	<0.056	<0.032	<0.033	<0.051	<0.04	<0.032	0.27	<0.032	<0.081	0.15	0.11	<0.021	
	12/11/2003	IA		<0.044	<0.056	<0.032	<0.033	<0.051	<0.04	<0.032	0.12	<0.032	<0.081	0.068	0.098	<0.021	
	12/11/2003	CS		<0.045	<0.058	<0.033	<0.034	<0.053	<0.041	<0.033	0.061	<0.033	<0.085	0.069	<0.044	<0.021	
	12/11/2003	CS		<0.041	<0.053	<0.031	<0.031	<0.049	<0.038	<0.031	0.046	<0.031	<0.078	0.052	<0.04	<0.019	
	10/2/2003	CS		<0.039	<0.05	<0.029	<0.03	<0.046	<0.036	<0.029	0.034	<0.029	0.078	<0.05	<0.038	<0.018	
	10/2/2003	CS		<0.045	<0.058	<0.033	<0.034	<0.053	<0.041	<0.033	0.021	<0.033	0.18	<0.057	<0.044	<0.021	
4408 Parkway	4/9/2003	IA		0.17	<0.052	<0.03	0.053	0.54	0.74	0.085	1.7	<0.03	0.46	0.15	0.54	<0.019	
	4/9/2003	IA		0.22	0.084	0.19	0.058	0.58	0.6	0.093	4.4	<0.03	0.6	0.12	0.55	0.029	
	4/9/2003	OA		0.19	<0.05	<0.029	<0.03	0.56	0.069	0.093	0.8	<0.029	0.32	0.12	0.5	<0.018	
	10/2/2003	CS		<0.049	<0.063	<0.036	<0.037	<0.058	<0.045	0.052	0.025	<0.036	<0.092	0.13	0.087	<0.023	
	10/2/2003	CS		0.097	0.19	0.14	0.091	0.12	0.1	0.052	0.12	0.13	0.25	0.097	0.26	0.11	
	10/2/2003	CS		<0.062	<0.063	<0.036	<0.037	0.058	<0.045	<0.036	0.021	<0.036	<0.092	<0.062	0.05	<0.023	
4412 Parkway	10/2/2003	Backgroud OA		<0.045	<0.058	<0.033	<0.034	<0.053	<0.041	0.31	0.055	<0.033	0.16	0.43	0.26	0.099	
	10/2/2003	CS		<0.044	<0.056	<0.032	<0.033	<0.051	<0.04	0.085	0.038	<0.032	0.46	0.17	<0.043	0.049	
	10/2/2003	CS		<0.045	0.067	0.052	<0.034	<0.053	0.042	0.069	0.094	<0.033	0.74	0.16	<0.044	0.07	
517 E. Cedar	Sept. 2001	IA		NA	NR	NA	NA	NA	NA	NA	NA	NR	4.6	NA	NA	NR	
	Dec01/Jan02	IA		0.72	NR	0.079	ND	0.67	0.24	ND	NA	NR	21	1.2	***4.7***	NR	
522 Cedar	9/18/2003	BA		<0.047	<0.06	<0.035	<0.035	0.096	0.043	<0.035	0.14	<0.035	0.56	<0.059	<0.046	<0.022	
	9/18/2003	BA		<0.042	<0.054	<0.031	<0.032	<0.049	<0.038	<0.031	0.061	<0.031	0.39	<0.053	<0.041	<0.019	
524 Cedar	9/18/2003	BA		<0.042	<0.054	0.032	<0.032	<0.049	<0.038	<0.031	0.12	<0.031	0.53	<0.053	<0.041	<0.019	

Note: All concentrations µg/m^3.
BOLD/ITALIC values indicate an exceedence of the Health-based Air Action Level.
"confirmation" indicates sample collected to confirm/evaluate operation of ventilation system installed at this residence

[a]Collected during EPA 2000 (2001a) sampling. Indoor air samples collected over 24 hours at each residence on three different days.
[b]Collected during EPA 2001 (2002a) sampling effort. See text for explanation.
[c]Health-based Air Action Levels as presented in Table 1 of addendum to Consent Order (EPA, December 23, 2002).

BA = Basement air
CS = Crawl Space air
dup = duplicate
IA = Indoor air

NA = not analyzed/not available
ND = not detected
NR = not reported; result not reported or not analyzed
OA = Outdoor air



N

0 125 250 Feet

LEGEND

- SAMPLED HOME
- RIVER
- ROAD
- PHASE I AREA HOMES
- PROPERTY BOUNDARY
- LAKE

FIGURE 1

CCI SITE, GROUNDWATER TCE PLUME, AND PROPERTIES INCLUDED IN AIR SAMPLING PROGRAM

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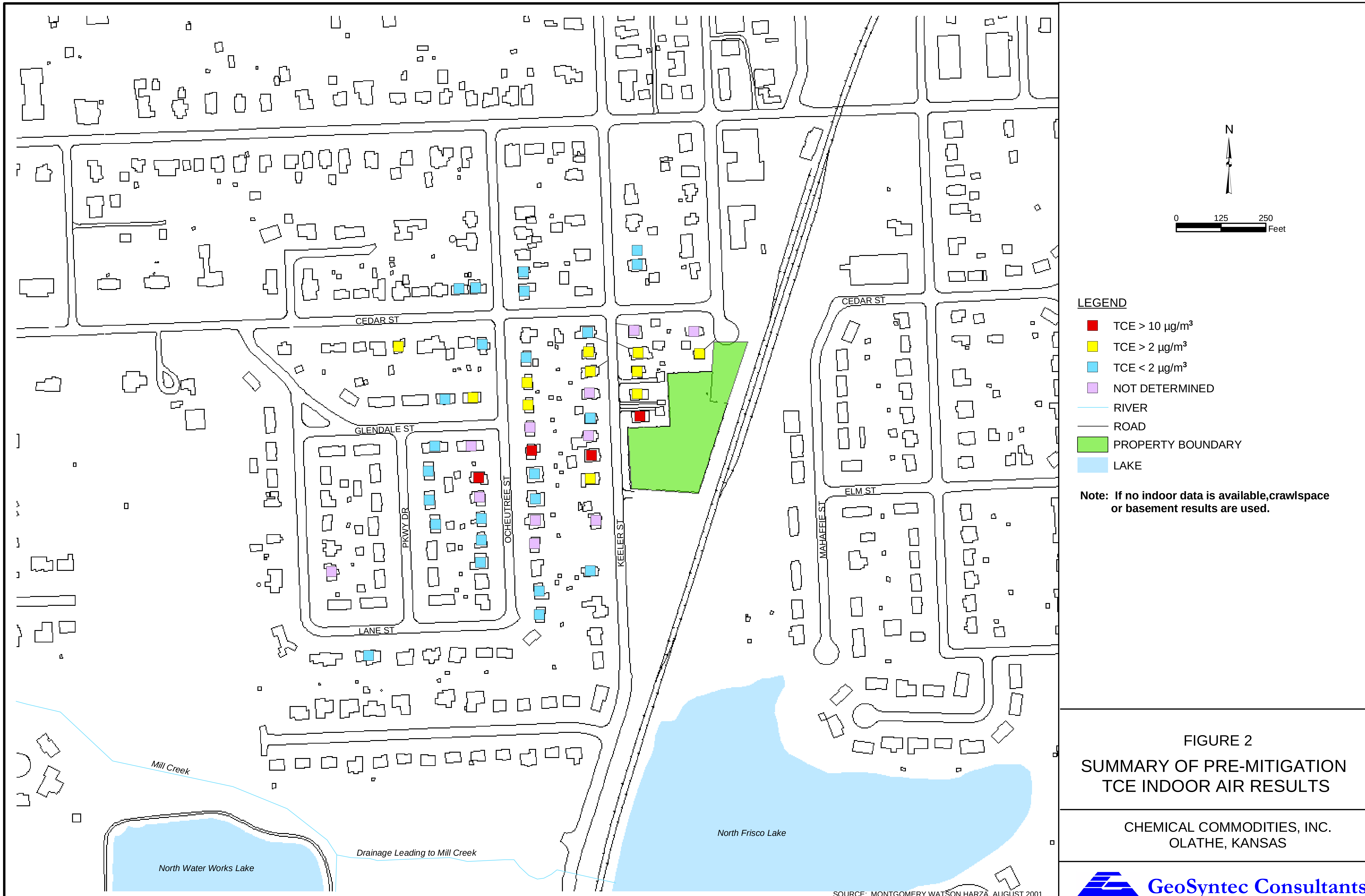

FIGURE 2

SUMMARY OF PRE-MITIGATION TCE INDOOR AIR RESULTS

CHEMICAL COMMODITIES, INC.
OLATHE, KANSAS

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