September 16, 2015

RECEIVED
By Alameda County Environmental Health 8:43 am, Sep 17, 2015

Mr. Jerry Wickham
Alameda County Environmental Health
1131 Harbor Bay Pkwy
Alameda, CA 94502

Re: Certification of Report
2868-2898 Hannah Street
ACEH Case No. RO0003160
Oakland, California

Dear Mr. Wickham:

I have reviewed the attached report dated September 11, 2015.

I agree with the conclusions and recommendations presented in the referenced report. The information in this report is accurate to the best of my knowledge and all local Agency/Regional Board guidelines have been followed. This report was prepared by Roux Associates, upon whose assistance and advice I have relied.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge.

Sincerely,
2868 HANNAH STREET LLC

John Protoppapas
President of the Managing Member of the LLC

September 11, 2015

GROUNDWATER REMEDIAL ACTION WORK PLAN

2868 Hannah Street
Oakland, California

Prepared for

2868 HANNAH STREET LLC

ROUX ASSOCIATES, INC.

Environmental Consulting & Management

ROUX *555 12th Street, Suite 1725, Oakland, California 94607 ♦ 415-967-6000*

GROUNDWATER REMEDIAL ACTION WORK PLAN
2868 Hannah Street
Oakland, California

The material and data in this report were prepared under the supervision and direction of the undersigned.

ROUX ASSOCIATES, INC.

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Staff Engineer

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Project Geologist

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Principal Engineer

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The Site is currently vacant; however, a one-story "L" shaped brick building was recently demolished on the corner of 32nd Street and Hannah Street. This building was last occupied by Precision Cast Products, Inc., which heat treated large engines.

Summary of Proposed Redevelopment Plan

The planned redevelopment of the Site entails the construction of a mixed-use development that includes a three story structure with ground floor parking. The building will include approximately 11,913 SF of commercial space and 36 residential units. The southern and eastern portions of the Site will consist of surface parking.

Summary of the Remedy

Based on the CSM, enhanced reductive dechlorination (ERD) for groundwater is proposed to address the chlorinated hydrocarbon impacts to groundwater in the southern portion of the Site. The primary constituent of concern is PCE. Therefore the groundwater cleanup goal for the Site is achieving the California groundwater MCL for PCE of 5 micrograms per liter. However, following the implementation of the remediation, if the concentration trend evaluation demonstrates residual pollution in groundwater will not adversely affect present and anticipated land and water uses, the groundwater cleanup goal may be adjusted to the residential ESL for PCE for evaluation of potential vapor intrusion, 63 micrograms per liter (ESL Table E-1). The proposed remedial action is effective in both the short-term and long-term and reduces mobility, toxicity and volume of contaminants and uses standard methods that are well established in the industry.

The proposed remedial action will consist of:

1. Mobilization: Equipment mobilization, marking and staking the proposed injection locations; and underground utility survey.

2. ERD Injection: Approximately 1800 L of emulsified vegetable oil (EVO)/lactate solution will be injected through 15 injection points. The ERD injection locations areas shown on Figure 8.

3. Groundwater Monitoring: Monthly monitoring of geochemical parameters and quarterly collection and analysis of groundwater samples from onsite groundwater monitoring wells.

4. Bioaugmentation: If necessary, KB 1® consortia will be delivered at 6 direct push injection points located in the vicinity of amendment delivery locations.

5. Soil Remediation Completion Report: A Remediation Completion Report will be prepared to document the remedial activities and confirm the remedial requirements have been achieved.

LIST OF ACRONYMS

Acronym	Definition
bgs	Below ground surface
BTEX	Total xylenes (benzene, toluene, and ethylbenzene)
CL	Silty clays
CSM	Conceptual Site Model
CY	Cubic yards
DCE	Dichloroethene
ERD	Enhanced Reductive Chlorination
ESL	Establish Soil Cleanup Objective
EVO	Emulsified vegetable oil
GPM	Gallons per minute
HASP	Health and Safety Plan
MCL	Maximum Contaminant Level
ML	Sandy silts
MSL	Mean sea level
OSHA	Occupational Safety and Health Administration
PAH	Polycyclic aromatic hydrocarbons
PCB	Polychlorinated biphenyls
PCE	Tetrachloroethene
PID	Photoionization detector
RAWP	Remedial Action Work Plan
RCR	Remedial Closure Report
SB	Soil boring
SF	Square foot

LIST OF ACRONYMS

Acronym	Definition
TCE	Trichloroethene
TEPH / TPH	Total extractable petroleum hydrocarbons
TPH-d	Total petroleum hydrocarbons as diesel
TPH-g	Total petroleum hydrocarbons as gasoline
TPH-mo	Total petroleum hydrocarbons as motor oil
TRPH	Total recoverable petroleum hydrocarbons
USA	Underground Service Alert
UST	Underground Storage Tank
VOC	Volatile organic compound

1.0 INTRODUCTION

On behalf of 2868 Hannah Street LLC, Roux Associates, Inc. (Roux Associates) has prepared this Groundwater Remedial Action Work Plan (Groundwater RAWP) for the property located at 2868 Hannah Street in Oakland, California (Site). The purpose of the proposed groundwater remedial action is to immediately address volatile organic compounds (VOCs) present in groundwater at the Site. The proposed remedial approach is using the enhanced reductive dechlorination (ERD) technology to achieve complete dechlorination of tetrachloroethene (PCE) to ethene under Site conditions. The procedures to implement the proposed groundwater remedial action are also presented in this Groundwater RAWP.

The Site is approximately 34,112 square feet (SF) and is located on the northwest corner of 32nd Street and Hannah Street in Oakland, California, approximately 3/4 mile east from San Francisco Bay (Figure 1). The planned development at the Site includes a three-story mixed use building with ground floor parking, containing approximately 11,913 SF of commercial space and 36 residential units. The southern and eastern portions of the Site will consist of surface parking.

Presented below is a description of the site background, an abbreviated conceptual site model, and the proposed groundwater remedial action.

2.0 SITE BACKGROUND

2.1 Site Description

The Site is located on the northwest corner of 32nd Street and Hannah Street in Oakland, California, approximately 3/4 mile east from San Francisco Bay (Figure 1). This area is mixed residential and commercial/industrial land use, with residences on the north and east side of the Site, commercial and industrial facilities on the west of the Site, and vacant land on the south side of the Site.

The Site is currently vacant; however, a one-story "L" shaped brick building was recently demolished on the corner of 32nd Street and Hannah Street. This building was last occupied by Precision Cast Products, Inc., which heat treated large engines. Due to previous onsite remediation, the building most recently had earthen floor, which appeared to have been imported from an offsite location. The rest of the former building was individually protected by steel joints, wood columns, beams, trusses and arches. The shell of the building was corrugated sheet metal nailed to a wood framed structure and contained large glass windows.

2.2 Geologic Setting

2.2.1 Regional Geology

The Site is located along the southwestern margin of the Berkeley Alluvial Plain, which is a subarea of the East Bay Plain area (SFBRWQCB, 1999). Alluvial deposits that generally consist of silts and clays containing thin sandy and gravelly lenses underlie the area. Estuarine mud, known as "Bay Mud," extends east of the San Francisco Bay where it interfingers with the surficial fluvial deposits.

Important regional sands, such as the Merritt Sand, appear to exist intermittently beneath the Site. The depth to bedrock in the Berkeley Alluvial Plain varies from near zero on the north to 500 feet on the south end of the Plain. The Hayward Fault defines the eastern boundary of the Berkeley Alluvial Plain and forms a geologic discontinuity. Bedrock in the East Bay Area is mostly Franciscan Complex melange, which includes marine sandstone and shale, chert, metavolcanics, serpentinized ultramafic rocks, and limestone.

2.2.2 Site Lithology

According to ERAS, soils at the Site consisted primarily of silt (ML) to 15 to 19 feet bgs. At 15 to 19 feet, sand and gravel stringers were encountered in a number of soil borings. According to Enrest, soils at the Site primarily consisted of medium plasticity silty clays (CL) and low plasticity sandy silts (ML) to 16 feet bgs. Logged soil borings advanced at the Site did not depict any significantly thick zones of higher permeability to a minimum depth of approximately 16.5 feet bgs.

During remedial soil excavation activities, native soils encountered beneath the vaults consisted of brown silty clays to approximately 10 feet bgs. Sand lenses were noted from 9 to 11 feet bgs and groundwater was generally encountered at 10 to 15 feet bgs. Some soils exhibited a characteristic blue-green color and mild to strong petroleum hydrocarbon odor. These field indications of TPH impact were used to help determine the limits of remedial soil excavation.

2.2.3 Site Hydrogeology

Groundwater has generally been observed at approximately 10 to 15 feet bgs and at 20 to 25 feet bgs. The estimated groundwater flow direction east of the Site is west and the previously calculated groundwater flow direction beneath the Site is west-northwest. Groundwater gradient was estimated at 0.001 to 0.008 foot per foot (ft/ft).

The State Water Resources Control Board Geotracker GAMA website includes approximate locations of water supply wells in California. No water supply wells are shown within the immediate Oakland, Emeryville, or Berkeley areas. However, Roux Associates is currently conducting a water supply well search to identify the locations of the nearest supply wells, if any. The closest surface water body is San Francisco Bay, located approximately 0.75 miles northwest from the Site.

2.3 Previous Investigations and Remediation Activities

Historic soil, groundwater, and soil vapor data are included in Tables 1, 2, and 3 respectively. A summary of the previous investigations and remediation activities are included as Appendix A.

3.0 NATURAL AND EXTENT OF CONTAMINATION

The nature and extent of contamination and Conceptual Site Model (CSM) for the Site were presented in Roux Associates' Soil Remedial Action Work Plan dated August 18th, 2015. Section 3 includes discussion of the nature and extent of contamination and CSM relevant to the proposed groundwater remedial action.

3.1 Product Releases and Potential Source Areas Potentially Impacting Groundwater

The exact nature and extent of hazardous waste related activities associated with former paint and putty factory is unknown. However, PCE impacts in soil and groundwater at borings B-18 and EB6 may have originated from activities related to the former paint and putty factory which operated from the 1930s to the 1980s. Due to the lack of degradation breakdown products such as trichloroethylene (TCE) and cis- or trans-dichloroethylene (DCE) in groundwater and solvents were not used at the former facility, a more recent release following the closure of the facility is likely responsible for the PCE reported in groundwater. In addition, the lack of elevated photoionization detector (PID) readings in soil borings EB6 and EB7, the lack of any significant PCE in groundwater samples EB7-W and EB8-W, and the general lack of VOCs in soil vapor sample B-5SV (collected approximately 45 feet north of EB6) suggest that historical Site practices are not the source of the PCE reported in groundwater in soil boring EB6.

Historical records indicate that a former dry cleaner was located at 1546 32nd Street, 40 feet northwest of the Site. This facility was present for several decades, beginning in approximately 1925. PCE from this adjacent site may have impacted groundwater beneath the Site.

3.2 Chlorinated Hydrocarbon Distribution in Groundwater

The primary constituent of concern is PCE. Only low concentrations of PCE degradation products have been detected onsite.

Grab groundwater samples from borings B-18 and EB6 showed elevated concentrations of PCE. Grab groundwater samples from north and northeast borings B-8, B-5, and EB7 showed no significant detections of PCE, indicating that the PCE source is not within the Site building.

Based on the March 2015 remedial investigation sample results, the highest PCE concentration was detected in RB-3 (11,500 micrograms per liter [µg/L]) located approximately 40 feet east of boring RB-1. The lowest PCE concentration was observed in boring RB-5 (499 µg/L) located across Hannah Street from the site. Currently PCE concentrations are bounded to the north and south, however; are not fully delineated to the east. Concentrations to the west likely continue to decrease similar to the observed groundwater concentrations.

3.3 Conceptual Site Model

The source of hydrocarbons in the northern portion of the site are suspected percolation wells removed during previous remedial efforts. On the southern portion of the property, a source has not been identified for PCE; however, shallow soil impacts in RB-1 and RB-3 indicate the source was located surrounding this area. Therefore, the current source for PCE is residual PCE concentrations in shallow soil.

To date nearly 60 borings have been advanced at the site with approximately 30 borings being conducted following the completion of soil remediation on the northern portion of the site. Currently the extent of petroleum hydrocarbons is well characterized. However, PCE concentrations have yet to be fully delineated to the east. Roux Associates' August 10, 2015 *Phase II Environmental Site Assessment Results* included a work plan to collect additional samples to further investigate the extent of PCE in soil. Additionally in ACEH's August 13, 2015 conditional approval of the proposed investigation, it was requested that a deeper soil boring be advanced to determine if PCE is present above screening levels in deeper groundwater. Following the completion of this investigation, the Site will be adequately characterized.

Following the completion of proposed soil and groundwater remediation, Roux Associates will evaluate the potential receptors and associated risk with any residual concentrations, if any, that remain following remediation. Figure 4 presents the Conceptual Site Model (CSM) for the Site under current conditions based on the available data.

4.0 PROPOSED GROUNDWATER REMEDIAL ACTION

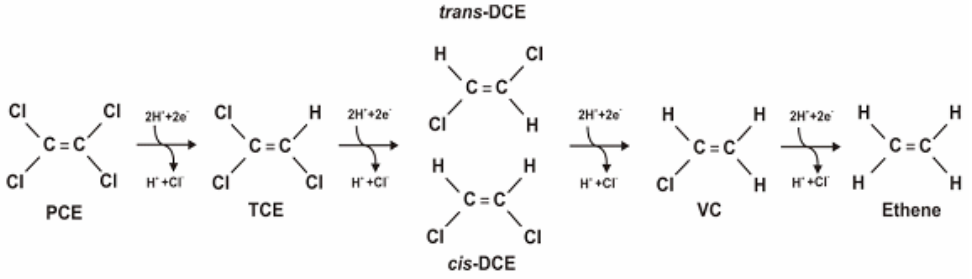
Based on the CSM, an ERD groundwater remediation program is proposed to address the chlorinated hydrocarbon impacts to groundwater in the southern portion of the Site. The proposed remedial action is effective in both the short-term and long-term and reduces mobility, toxicity and volume of contaminants and uses standard methods that are well established in the industry.

4.1 Groundwater Remedial Action Goal

As described in the CSM, the primary constituent of concern is PCE. Therefore the groundwater cleanup goal for the Site is achieving the California groundwater MCL for PCE of 5 µg/L. However, following the implementation of the remediation, if the concentration trend evaluation demonstrates residual pollution in groundwater will not adversely affect present and anticipated land and water uses, the groundwater cleanup goal may be adjusted to the residential ESL for PCE for evaluation of potential vapor intrusion, 63 µg/L (SFRWQCB ESL Table E-1).

4.2 ERD Technology Overview

The reductive dechlorination process occurs in the absence of oxygen, to develop conditions where bacteria can convert PCE to ethene and chloride. During reductive dechlorination, hydrogen sequentially replaces the chlorine atoms of PCE, resulting in stepwise conversion of PCE to TCE, cis-1,2-dichloroethene (cis-1,2-DCE), vinyl chloride (VC), and the non-chlorinated end-product, ethene.



Electron donors such as hydrogen gas, commonly produced in-situ via the fermentation of sugars or edible oils, promote development of anoxic conditions and stimulate the activity of dechlorinating bacteria.

Reductive dechlorination of PCE can stall at TCE and cis-1,2-DCE in the absence of specific dechlorination organisms such as *Dehalococcoides ethenogenes* (*Dehalococcoides*). In certain situations, in-situ remediation requires the addition of bioaugmentation cultures such as KB-1® to facilitate the complete dechlorination of TCE to ethene.

Typical strategies for the ERD of PCE therefore involve the stimulation of microbial dechlorination with electron donor additions to the subsurface (biostimulation) and/or the addition of dechlorinating microorganisms to the contaminated area (bioaugmentation). Currently, there is not sufficient data for the Site regarding the native dechlorinating micro-organisms to determine whether bioaugmentation would be required for the ERD program to be effective. Upon completion of ERD injection activities and the establishment of reducing conditions in shallow groundwater at the Site, sampling and analysis of the microbial communities may be used in conjunction with quarterly groundwater monitoring data to assess the necessity of bioaugmentation.

4.3 ERD Design and Approach

This section details the design rationale for implementing ERD at the Site, including the selection of electron donor amendment, amendment delivery method, bioaugmentation method, and the general approach to implementation.

4.3.1 Electron Donor Selection

A combination of lactate and EVO was selected as the electron donor amendment for biostimulation. A summary of these amendments and justification for their selected is outlined below.

Lactate is a low viscosity, soluble organic acid which is rapidly metabolized by microorganisms. Lactate fermentation produces lower molecular weight organic compounds (e.g. acetic acid), as well as hydrogen gas, which is considered an optimal electron donor for reductive dechlorination.

The kinetics of microbial lactate degradation can induce rapid microbial population growth, facilitate the establishment of anoxic, reducing conditions, and stimulate the initial rate of

microbial dechlorination. However, the rapid rate of lactate degradation necessitates frequent donor introduction within the treatment zone (e.g., continuous or regular injections). When lactate is used alone, this is typically done using groundwater recirculation or drip irrigation systems that require routine maintenance. Such systems can increase operation and maintenance (O&M) costs associated with the treatment remedy.

EVOs are viscous, low-solubility electron donors that release organic acids slowly over time in response to microbial degradation. Subsequent fermentation of these organic acids produces hydrogen gas, which can be used for reductive dechlorination. Newman Zone (NZ®) is a miscible, commercially available, relatively low-cost EVO mixture that is manufactured for EISB applications. NZ® contains a soybean oil-based substrate with proprietary amounts of various organic acids (including some lactate) and nutrients. The components of soybean oil are primarily linoleic acid, oleic acid, palmitic acid, and stearic acid. Sodium bicarbonate in the mixture provides some buffering capacity to offset decreases in pH that can occur during EVO biodegradation.

Because high-molecular weight oils must first be broken down prior to fermentation and hydrogen production, EVOs, such as NZ®, generally provide a means to sustain lower rates of hydrogen production over longer periods of time compared to lactate. EVO generally requires less frequent applications resulting in lower O&M costs associated with this remedy. However, EVOs are less likely to promote the rapid establishment of reducing conditions when injected alone.

Roux Associates proposes to use NZ® brand EVO and lactate as the electron donors. During implementation, EVO will be used as the primary ERD donor based on reasonable cost, reduced operation and maintenance burden, high delivery efficiency, and longevity, and lactate will be added to the EVO in order to promote the rapid onset of biological activity. Product and Safety Data Sheets for NZ® brand EVO are included in Appendix B.

4.3.2 Amendment Delivery Method Selection

Active recirculation, temporary recirculation, and batch injections were evaluated for amendment delivery method at the Site. Batch injections via temporary direct-push points were selected for

the Site, based on Site characteristics. The following section summarizes each method and describes the selected amendment delivery method at the Site.

4.3.2.1 Active and Temporary Recirculation Options

In recirculation approaches, groundwater is extracted from one well (or group of wells), amended with electron donor compounds, and reinjected into one or more nearby injection wells. This activity establishes a recirculation cell and, if successful, distributes donor between extraction and injection well pairs. In active systems, this process is performed continuously, while in temporary systems recirculation activities and donor dosing are performed as discrete events. In general, recirculation cells can only be reliably established between wells sharing conductive, continuous, and coarse-grained layers with significant hydraulic communication. When successful, recirculation approaches can support good subsurface donor distribution. Furthermore, additional amendments, if necessary, can often be performed, as needed, using the previously constructed recirculation apparatus.

Recirculation approaches typically require the installation of permanent amendment delivery wells and the approach will only be successful when performed in the appropriate geological conditions. Additionally, active recirculation approaches can incur significantly more O&M costs than other amendment delivery technologies. Examples of potential O&M costs include well maintenance, well fouling and rehabilitation, injection equipment (e.g. pump) maintenance, and on-going amendment, as needed. Additionally, active recirculation approaches typically require a large operational footprint and Site control to accommodate recirculation equipment and safely store large quantities of electron donor. Passive recirculation approaches reduce the requirement for a large long-term footprint, but may still incur a variety of O&M costs.

4.3.2.2 Batch Amendment Injection Options

Direct-push "batch" injections of electron donors generally involves pumping of water amended with electron donor directly into individual delivery points, such as injection wells screened over a target interval or temporary direct-push borings.

Temporary direct-push injection points are typically established by advancing injection tooling via a direct-push drill rig to the target depth interval, and then pumping amendment into the

chosen interval. When injections are completed, injection tooling is retracted and boring is grouted to the surface. Batch injection using temporary direct-push borings can allow for significant and closely-spaced amendment delivery to the subsurface without the installation of long-term or permanent fixtures, such as wells. Batch injection through temporary borings can also be useful in amending donor into tight, discontinuous water bearing zones, because multiple injection points are used for the injection process. Furthermore, injection tooling can be designed to accommodate short screens which are advanced in stages through an individual boring location, thereby allowing for successful injection over a relatively large overall injection interval and into course- and fine-grained units.

Despite these advantages, amendment delivery using the batched methodology at large sites can be time-consuming and require several field mobilizations, as multiple injection points are required. Furthermore, any re-amendment required after implementation of this methodology would require re-mobilization and, in the case of temporary points, boring of new injection locations.

4.3.2.3 Amendment Delivery Selection

Based upon an analysis of available technologies and the available information for the Site, batch amendment delivery using a direct-push injection approach is selected. Site lithology suggests that recirculation cells may be difficult to establish under Site conditions and that recirculation approaches are unlikely to be successful.

Additionally, the use of temporary direct-push borings allows for closer spacing of injection points for injection into discrete intervals allowing for distribution of amendment into course- and fine-grained zones.

4.3.3 Bioaugmentation Method Selection

Bioaugmentation could be accomplished using strategies including active recirculation, temporary recirculation, and batch injections were evaluated for use at the Site.

As with amendment delivery, recirculation approaches for bioaugmentation are unlikely to be successful. Recirculation approaches may also risk oxygenation of the microbial consortia

during bioaugmentation, which is detrimental to culture viability. Therefore, bioaugmentation through temporary direct-push borings is selected as the preferred bioaugmentation approach.

4.3.4 ERD Design and Layout

The layout of the ERD injection points at the Site is shown in Figure 8. Based upon the technology screening, Roux Associates recommends implementing ERD using a mixture of EVO and lactate donors, possible bioaugmentation using KB-1®, and performance monitoring using existing Site wells and three additional performance monitoring wells. Product and Safety Data Sheets for KB-1® are included in Appendix C.

Amendment will be delivered by batch injections through approximately 15 temporary direct-push injection points spaced approximately 10 to 15 feet apart and configured into three rows (Figure 8). This configuration was designed to optimally treat shallow groundwater by providing closely-spaced injections in rows that shallow groundwater would have to flow through before leaving the Site. Electron donor amendments will consist of NZ® brand EVO supplemented with additional lactate. EVO injection mass was estimated based on achieving a target radius of influence at each injection location. The target lactate injection mass will be selected in order to give an equivalent electron donor stoichiometry ratio between lactate to EVO (approximately 1.7:1).

Once reducing conditions develop in shallow groundwater, sampling and analysis of the microbial communities will be used in conjunction with quarterly groundwater monitoring data to assess the necessity of bioaugmentation. If deemed necessary, bioaugmentation will be conducted by delivering KB-1® at approximately 6 direct-push injection points located in the vicinity of amendment delivery locations. Anaerobic process water for injections will be generated by bulking water from a fire hydrant adjacent to the Site and supplementing the water with lactate to support the biological development of reducing conditions.

Three new performance monitoring wells will be installed at the Site to assist in the monitoring of ERD. These monitoring wells will also be used to monitor ERD throughout the operational period.

4.4 Description of Proposed Groundwater Remedial Action

The proposed remedial action will consist of:

1. Mobilization: Equipment mobilization, marking and staking the proposed injection locations; and underground utility survey.

2. ERD Injection: Approximately 1800 L of EVO/lactate solution will be injected through 15 injection points. The ERD injection locations areas shown on Figure 8.

3. Groundwater Monitoring: Monthly monitoring of geochemical parameters and quarterly collection and analysis of groundwater samples from onsite groundwater monitoring wells.

4. Bioaugmentation: If necessary, KB 1® consortia will be delivered at 6 direct push injection points located in the vicinity of amendment delivery locations.

5. Soil Remediation Completion Report: A Remediation Completion Report will be prepared to document the remedial activities and confirm the remedial requirements have been achieved.

4.5 Post-ERD Injection Sampling

Groundwater monitoring well are as shown on Figure 6.

Monthly Groundwater Monitoring

Following the ERD injection event, monthly groundwater monitoring events consisting of assessing geochemical parameters in the groundwater will occur.

Quarterly Groundwater Monitoring

Following the implementation of the ERD program, performance monitoring activities will be conducted on a quarterly basis. Quarterly performance monitoring activities will be conducted using low flow sampling techniques and will include the following analyses (in addition to VOCs):

- Dissolved gases (ethene, ethane and methane) by Method RSK 175M;
- Total and dissolved iron and manganese by EPA Method 6010/6020;
- Anions (nitrate, sulfate, sulfide, and bromide) by EPA Method 300.0; and
- Total organic carbon by EPA Method 9060.

4.6 Contingency Remedial Actions

A second ERD injection event may be conducted approximately 9 to 12 months after the first ERD injection event based on the performance monitoring results. The purpose of the second ERD injection event is to address potential PCE concentration rebounds or stalling of PCE breakdown at intermediate products (i.e. VC) in groundwater.

5.0 REMEDIAL CONSTRUCTION MANAGEMENT

5.1 Construction Health and Safety Plan

Roux Associates will prepare a site-specific Health and Safety Plan. Remedial work performed under the Groundwater RAWP will be in full compliance with applicable health and safety laws and regulations, including Site and OSHA worker safety requirements and HAZWOPER requirements. Confined space entry, if any, will comply with OSHA requirements and industry standards and will address potential risks. The parties performing the remedial construction work will ensure that performance of work is in compliance with the HASP and applicable laws and regulations.

All field personnel involved in remedial activities will participate in training required under 29 CFR 1910.120, including 40-hour hazardous waste operator training and annual 8-hour refresher training. Site Safety Officer will be responsible for maintaining workers training records.

Personnel entering any exclusion zone will be trained in the provisions of the HASP and be required to sign a HASP acknowledgment. Site-specific training will be provided to field personnel. Additional safety training may be added depending on the tasks performed. Emergency telephone numbers will be posted at the site location before any remedial work begins. A safety meeting will be conducted before each shift begins. Topics to be discussed include task hazards and protective measures (physical, chemical, environmental); emergency procedures; PPE levels and other relevant safety topics. Meetings will be documented in a log book or specific form.

An emergency contact sheet with names and phone numbers is included in the HASP. That document will define the specific project contacts for use in case of emergency.

5.2 Permitting

Prior to commencing field activities, Roux will obtain permits from the Alameda County Public Works Agency for the direct-push borings. Additionally, Roux will obtain a hydrant meter permit from East Bay Municipal Utility District for use of hydrant water to generate EVO/lactate

mixture for ERD injections. Permits will be kept on-site and made available for inspection during working hours.

5.3 Site Preparation

Pre-Construction Meeting

A pre-construction meeting will be held at the Site with all parties involved in the remedial process prior to the start of remedial construction activities.

Mobilization

Mobilization includes field personnel orientation, equipment mobilization, marking/staking injection locations and utility mark-outs. Each field team member will attend an orientation meeting to become familiar with the general operation of the Site, health and safety requirements, and field procedures.

Utility Marker Layouts, Easement Layouts

Roux Associates will contact Underground Service Alert (USA) a minimum of two days prior to subsurface activities to notify utility operators of the planned work and to request marking of nearby utilities. Additionally, Roux Associates will retain a private utility locator to clear proposed excavation area prior to excavation.

Proper safety and protective measures pertaining to utilities and easements, and compliance with all laws and regulations will be employed during invasive and other work contemplated under this RAWP.

Equipment and Material Staging

Equipment and materials will be stored and staged in a manner that complies with applicable laws and regulations. The location of proposed equipment and material staging areas is shown in Figure 8.

5.4 ERD Injection

EVO/lactate amendment will be delivered by batch injections through a total of 15 temporary direct push injection points as shown on Figure 8. Approximately 120 gallons of amendment will be injected per injection point at a flow rate of 3 gallons per minute (GPM). The

amendment zone for all injection points is between 10 and 20 feet bgs. These parameters are predicted to yield an approximate radius of influence of 5.7 feet. ERD injection calculations are provided in Table 4.

EVO and lactate will be stored onsite in totes and drums prior to injection. Amendment for the batch injections will be mixed onsite using potable water from an adjacent fire hydrant.

If necessary, an additional ERD injection event may be conducted approximately 9 to 12 months after the first ERD injection event to address potential PCE concentration rebounds or stalling of PCE breakdown at intermediate products (i.e. – vinyl chloride) in groundwater. The necessity of additional injection events will be determined based on the performance monitoring results.

5.5 Bioaugmentation

Once reducing conditions develop in shallow groundwater, sampling and analysis of the microbial communities will be used in conjunction with quarterly groundwater monitoring data to assess the necessity of bioaugmentation. If deemed necessary, bioaugmentation will be conducted by delivering KB-1® at approximately 6 direct-push injection points located in the vicinity of amendment delivery locations.

5.6 Demobilization

Demobilization will include:

- As necessary, restoration of temporary access areas and areas that may have been disturbed to accommodate support areas (e.g., staging areas, storage areas, and access area);
- Removal of sediment from erosion control measures and disposal of materials in accordance with applicable laws and regulations;
- Equipment decontamination; and
- General refuse disposal.

Equipment will be decontaminated and demobilized at the completion of all field activities.

5.7 Reporting and Record Keeping

Daily Reports

Daily reports providing a general summary of activities for each day of *active remedial work* will be completed by the Roux field manager. Those reports will include:

- Project number and statement of the activities and an update of progress made and locations of work performed;
- Quantities of material handled at the Site; and
- Photograph of notable Site conditions and activities.

Daily reports will be included as an Appendix in the Remedial Closure Report (RCR).

Record Keeping and Photo-Documentation

Job-site record keeping will be maintained on-Site during the project. Representative photographs will be taken of the Site prior to any remedial activities and during major remedial activities to illustrate remedial program elements. Photographs will be submitted at the completion of the project in the RCR in digital format (i.e., jpeg files).

6.0 SCHEDULE

The remedial ERD activities will occur immediately following the receipt of approval from ACEH. A Preliminary schedule is included in Figure 9.

7.0 REFERENCES

ACC Environmental Consultants, Inc. (ACC), 2008. *Revised Work Plan – Subsurface Investigation, 1549 32nd Street, Oakland, California.* April 4.

Applied Remedial Services, Inc. (ARS Inc.), 2015a. *Phase I Environmental Site Assessment, 1549 32nd Street and 2868 Hannah Street, Oakland, California, 94607.* February 3.

ARS Inc., 2015b. *Site Conceptual Model, 1549 32nd Street, Oakland, California.* February 16.

Environmental Risk Specialties Corporation (ERS), 2005. *Investigative Report, 1549 32nd Street, California*. December 14.

ERS, 2009. *Work Plan for Additional Subsurface Investigation, 1549 32nd Street, California*. March 13.

Roux Associates (Roux), 2015. *Soil Remedial Action Work Plan, 2868 Hannah St, Oakland, California.* August 18.

San Francisco Bay Regional Water Quality Control Board (SFBRWQCB), 1999. *East Bay Plain Groundwater Basin Beneficial Use Evaluation Report.* June.

TABLES

1. Historical Analytical Data for Soil
2. Historical Analytical Data for Groundwater
3. Historical Analytical Data for Soil Vapor
4. ERD Injection Calculations

Table 1. Historical Analytical Data for Soil
2868 Hannah Street, Oakland, California

Sample ID	Consultant	Sample Date	Media	Sample Depth (feet)	TEPH 100/640	TPH-MO 100/640	TPH-D 100/640	TPH-HO 100/640	TPH-G 100/500	Benzene .74/27	Toluene 9.3/130	EB 4.7/43	Xylenes 11/100	PCE .55/63	TCE 1.7/130	VC	Acetone	cis-1,2-Dichloroethylene (cis-1,2-DCE)	trans-1,2-Dichloroethylene
ESL Table A-1 - Shallow Soils (<3m bgs) GW is a source or potential source of drinking water, mg/kg						**100**	**100**		**100**	**0.04**	**2.86**	**3.28**	**2.26**	**0.55**	**0.46**	**0.032**			
SB-1-2.5	ERAS	3/27/2002	Soil	2.5	--	**8300**	--	--	11	0.053	0.065	0.046	0.17	--	--	--	--	--	--
SB-2-2.5	ERAS	3/27/2002	Soil	2.5	--	<50	--	--	<1.0	<0.005	<0.005	<0.005	<0.005	--	--	--	--	--	--
SB-3-3	ERAS	3/27/2002	Soil	3	--	<50	--	--	17	<0.005	<0.005	<0.005	<0.005	--	--	--	--	--	--
SB-4-3	ERAS	3/27/2002	Soil	3	--	**2100**	--	--	5.3	<0.005	0.0071	<0.005	0.020	--	--	--	--	--	--
SS-N	Enrest	4/26/2002	Soil	10.0	--	**3,300**	--	--	--	--	--	--	--	--	--	--	--	--	--
Pit A	Enrest	4/26/2002	Soil		--	--	--	--	--	<0.020	<0.020	<0.020	<0.060	--	--	--	--	--	--
Oil	Enrest	4/26/2002	Soil		--	--	--	--	--	**5.81**	3.62	<2.5	10.74	--	--	--	--	--	--
Source Pt@7	Enrest	5/21/2002	Soil	7.0	--	**20,800**	--	--	--	<0.005	<0.005	<0.005	<0.010	<0.005	<0.005	--	--	--	--
PZ-1	ERAS	4/1/2003	Soil	3.0-3.5	--	<13	8.1	<13	<0.050	<0.005	<0.005	<0.005	<0.010	<0.005	<0.005	--	--	--	--
PZ-1	ERAS	4/1/2003	Soil	11.0-12.0	--	<13	12	<13	<0.050	<0.005	<0.005	<0.005	<0.010	<0.005	<0.005	--	--	--	--
PZ-2	ERAS	4/3/2003	Soil	1.0-2.0	--	<13	<1.0	80	<0.050	<0.005	<0.005	<0.005	<0.010	<0.005	<0.005	--	--	--	--
PZ-2	ERAS	4/3/2003	Soil	11.5-12.5	--	<13	<1.0	20	<0.050	<0.005	<0.005	<0.005	<0.010	<0.005	<0.005	--	--	--	--
E-5	ERAS	4/2/2003	Soil	2.5-3.5	--	<1,300	<100	**3,400**	0.31	<0.0125	<0.0125	<0.0125	0.023	<0.0125	<0.0125	--	--	--	--
E-5	ERAS	4/2/2003	Soil	11.0-12.0	--	<13	3.8	<13	<0.050	<0.005	<0.005	<0.005	<0.010	<0.005	<0.005	--	--	--	--
E-6	ERAS	4/1/2003	Soil	4.0-5.0	--	<260	<20	**640**	<0.050	<0.005	<0.005	<0.005	<0.010	<0.005	<0.005	--	--	--	--
E-6	ERAS	4/1/2003	Soil	8.5-9.0	--	<260	<20	**2,000**	<0.050	<0.005	<0.005	<0.005	<0.010	<0.005	<0.005	--	--	--	--
E-7	ERAS	4/1/2003	Soil	4.0-5.0	--	<13	4.8	<13	0.068	<0.005	<0.005	<0.005	<0.010	<0.005	<0.005	--	--	--	--
E-7	ERAS	4/1/2003	Soil	11.0-12.0	--	<13	<1	<13	<0.050	<0.005	<0.005	<0.005	<0.010	<0.005	<0.005	--	--	--	--
E-8	ERAS	4/1/2003	Soil	4.0-5.0	--	<312.5	<25	<312.5	0.051	<0.005	<0.005	<0.005	<0.010	<0.005	<0.005	--	--	--	--
E-8	ERAS	4/1/2003	Soil	11.0-12.0	--	<13	9.6	<13	<0.050	<0.005	<0.005	<0.005	<0.010	<0.005	<0.005	--	--	--	--
E-9	ERAS	4/2/2003	Soil	1.0-2.0	--	<650	<50	**1,500**	<0.050	<0.005	<0.005	<0.005	<0.010	<0.005	<0.005	--	--	--	--
E-9	ERAS	4/2/2003	Soil	11.0-12.0	--	<13	<1	<13	<0.050	<0.005	<0.005	<0.005	<0.010	<0.005	<0.005	--	--	--	--
E-10	ERAS	4/1/2003	Soil	3.0-4.0	--	<1,300	<100	**3,700**	0.28	<0.005	0.015	<0.005	0.013	<0.005	<0.005	--	--	--	--
E-10	ERAS	4/1/2003	Soil	11.0-12.0	--	<13	<1	26	<0.050	<0.005	<0.005	<0.005	<0.010	<0.005	<0.005	--	--	--	--
E-11	ERAS	4/2/2003	Soil	4.0-4.5	--	<130	<10	**220**	0.12	<0.005	<0.005	<0.005	<0.010	<0.005	<0.005	--	--	--	--
E-11	ERAS	4/2/2003	Soil	10.0-11.0	--	<13	9.0	<13	<0.050	<0.005	<0.005	<0.005	<0.010	<0.005	<0.005	--	--	--	--
E-12	ERAS	4/2/2003	Soil	2.0-3.0	--	<13	<1	<13	<0.050	<0.005	<0.005	<0.005	<0.010	<0.005	<0.005	--	--	--	--
E-12	ERAS	4/2/2003	Soil	11.0-12.0	--	<13	<1	<13	<0.050	<0.005	<0.005	<0.005	<0.010	<0.005	<0.005	--	--	--	--
E-13	ERAS	4/2/2003	Soil	2.0-3.0	--	<13	2.6	<13	<0.050	<0.005	<0.005	<0.005	<0.010	<0.005	<0.005	--	--	--	--
E-13	ERAS	4/2/2003	Soil	11.0-12.0	--	<13	<1	<13	<0.050	<0.005	<0.005	<0.005	<0.010	<0.005	<0.005	--	--	--	--
NSW3@7'	ERAS	1/21/2004	Soil	7	--	--	--	**160**	--	--	--	--	--	--	--	--	--	--	--
SE-2-7'	ERAS	12/30/2003	Soil	7	--	--	--	<13	--	--	--	--	--	--	--	--	--	--	--
SS-1-7'	ERAS	12/30/2003	Soil	7	--	--	--	**130**	--	--	--	--	--	--	--	--	--	--	--
SW4-7	ERAS	12/30/2003	Soil	7	--	--	--	<13	--	--	--	--	--	--	--	--	--	--	--
SWB-7'	ERAS	8/23/2003	Soil	7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
XX@7'	ERAS	1/21/2004	Soil	7	--	--	--	**300**	--	--	--	--	--	--	--	--	--	--	--
YY@7'	ERAS	1/21/2004	Soil	7	--	--	--	32	--	--	--	--	--	--	--	--	--	--	--
SW-D-7A	ERAS	12/8/2003	Soil	7	--	--	--	66	--	--	--	--	--	--	--	--	--	--	--
SW-E-7A	ERAS	12/8/2003	Soil	7	--	--	--	<13	--	--	--	--	--	--	--	--	--	--	--
SW-F-7A	ERAS	12/8/2003	Soil	7	--	--	--	<13	--	--	--	--	--	--	--	--	--	--	--
OT2@7'	ERAS	1/21/2004	Soil	7	--	--	--	**830**	--	--	--	--	--	--	--	--	--	--	--
OT1@7'	ERAS	1/21/2004	Soil	7	--	--	--	**440**	--	--	--	--	--	--	--	--	--	--	--
OT6@7'	ERAS	1/21/2004	Soil	7	--	--	--	<13	--	--	--	--	--	--	--	--	--	--	--
OT5@7'	ERAS	1/21/2004	Soil	7	--	--	--	<13	--	--	--	--	--	--	--	--	--	--	--
OT4@7'	ERAS	1/21/2004	Soil	7	--	--	--	15	--	--	--	--	--	--	--	--	--	--	--
OT3@7'	ERAS	1/21/2004	Soil	7	--	--	--	<13	--	--	--	--	--	--	--	--	--	--	--
WB2-9'	ERAS	1/21/2004	Soil	9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
SC-5-8'	ERAS	12/30/2003	Soil	8	--	--	--	<13	--	--	--	--	--	--	--	--	--	--	--
OTB1@10'	ERAS	1/21/2004	Soil	10	--	--	--	24	--	--	--	--	--	--	--	--	--	--	--
OTB2@10'	ERAS	1/21/2004	Soil	10	--	--	--	26	--	--	--	--	--	--	--	--	--	--	--

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2868 Hannah Street, Oakland, California

Sample ID	Consultant	Sample Date	Media	Sample Depth (feet)	TEPH 100/640	TPH-MO 100/640	TPH-D 100/640	TPH-HO 100/640	TPH-G 100/500	Benzene .74/27	Toluene 9.3/130	EB 4.7/43	Xylenes 11/100	PCE .55/63	TCE 1.7/130	VC	Acetone	cis-1,2-Dichloroethylene (cis-1,2-DCE)	trans-1,2-Dichloroethylene
ESL Table A-1 - Shallow Soils (<3m bgs) GW is a source or potential source of drinking water, mg/kg						**100**	**100**		**100**	**0.04**	**2.86**	**3.28**	**2.26**	**0.55**	**0.46**	**0.032**			
SWA-1@4'	ERAS	10/6/2003	Soil	4	--	--	--	**2,200**		<0.005	<0.005	<0.005	<0.010	<0.005	<0.005	--	--	--	--
OT1@7'	ERAS	1/21/2004	Soil	7	--	--	--	**440**	--	<0.005	<0.005	<0.005	<0.010	<0.005	<0.005	--	--	--	--
OT2@7'	ERAS	1/21/2004	Soil	7	--	--	--	**830**	--	<0.005	<0.005	<0.005	<0.010	<0.005	<0.005	--	--	--	--
SWB-1@4'	ERAS	10/6/2003	Soil	4	--	--	--	**1,100**	--	<0.005	<0.005	<0.005	<0.010	<0.005	<0.005	--	--	--	--
SWC-1@4'	ERAS	10/6/2003	Soil	4	--	--	--	**140**	--	<0.005	<0.005	<0.005	<0.010	<0.005	<0.005	--	--	--	--
SWD-1@4'	ERAS	10/6/2003	Soil	4	--	--	--	**1,000**	--	--	--	--	--	--	--	--	--	--	--
SWE-1@4'	ERAS	10/6/2003	Soil	4	--	--	--	**2,800**	--	--	--	--	--	--	--	--	--	--	--
SWF-1@4'	ERAS	10/6/2003	Soil	4	--	--	--	**1,400**	--	--	--	--	--	--	--	--	--	--	--
SWG-1@4'	ERAS	10/6/2003	Soil	4	--	--	--	<13	--	--	--	--	--	--	--	--	--	--	--
SWH-1@4'	ERAS	10/6/2003	Soil	4	--	--	--	**3,800**	--	<0.005	<0.005	<0.005	<0.010	<0.005	<0.005	--	--	--	--
BH-1@9'	ERAS	10/6/2003	Soil	9	--	--	--	**600**	--	--	--	--	--	--	--	--	--	--	--
BH-2@6'	ERAS	10/6/2003	Soil	6	--	--	--	**4,200**	--	--	--	--	--	--	--	--	--	--	--
BH-3@9'	ERAS	10/6/2003	Soil	9	--	--	--	**470**	--	--	--	--	--	--	--	--	--	--	--
BH-4@10'	ERAS	10/6/2003	Soil	10	--	--	--	**160**	--	--	--	--	--	--	--	--	--	--	--
SW-A-7	ERAS	10/23/2003	Soil	7	--	--	--	**910**	--	--	--	--	--	--	--	--	--	--	--
SW-B-7	ERAS	10/23/2003	Soil	7	--	--	--	**1,300**	--	--	--	--	--	--	--	--	--	--	--
SW-D-7	ERAS	10/23/2003	Soil	7	--	--	--	**5,900**	--	--	--	--	--	--	--	--	--	--	--
SW-E-7	ERAS	10/23/2003	Soil	7	--	--	--	**3,800**	--	--	--	--	--	--	--	--	--	--	--
SW-F-7	ERAS	10/23/2003	Soil	7	--	--	--	**5,900**	--	--	--	--	--	--	--	--	--	--	--
BH-1-9	ERAS	10/23/2003	Soil	7	--	--	--	**440**	--	--	--	--	--	--	--	--	--	--	--
BH-2-9	ERAS	10/23/2003	Soil	7	--	--	--	61	--	--	--	--	--	--	--	--	--	--	--
SWI@7'	ERAS	12/15/2003	Soil	7	--	--	--	**670**	--	--	--	--	--	--	--	--	--	--	--
SWJ@7'	ERAS	12/15/2003	Soil	7	--	--	--	**3,400**	--	--	--	--	--	--	--	--	--	--	--
B5,9'-9.5'	ERAS	12/15/2003	Soil	9-9.5	--	--	--	**1,900**	--	--	--	--	--	--	--	--	--	--	--
B6,9'9.5'	ERAS	12/15/2003	Soil	9-9.5	--	--	--	98	--	--	--	--	--	--	--	--	--	--	--
B7,9'-90.5'	ERAS	12/15/2003	Soil	9-9.5	--	--	--	<13	--	--	--	--	--	--	--	--	--	--	--
SN3-3	ERAS	12/30/2003	Soil	3	--	--	--	<13	--	--	--	--	--	--	--	--	--	--	--
SN3-7	ERAS	12/30/2003	Soil	7	--	--	--	**1,700**	--	--	--	--	--	--	--	--	--	--	--
SW4-9	ERAS	12/30/2003	Soil	9	--	--	--	<13	--	--	--	--	--	--	--	--	--	--	--
NSW2@7'	ERAS	1/12/2004	Soil	7	--	--	--	**2,400**	--	--	--	--	--	--	--	--	--	--	--
WB2@9'	ERAS	1/12/2004	Soil	9	--	--	--	<13	--	--	--	--	--	--	--	--	--	--	--
B4@4'	Enrest	4/21/2005	Soil	4	<50	--	--	--	<0.5							--	--	--	--
B4@9'	Enrest	4/21/2005	Soil	9	--	--	--	--	--	<0.005	<0.005	<0.005	<0.010	<0.005	<0.005	--	--	--	--
B10@4'	Enrest	4/21/2005	Soil	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B10@9'	Enrest	4/21/2005	Soil	9	60	--	--	--		<0.005	<0.005	<0.005	<0.010	<0.005	<0.005	--	--	--	--
B11@4'	Enrest	4/21/2005	Soil	4	--	--	--	--	????	--	--	--	--	--	--	--	--	--	--
B11@9	Enrest	4/21/2005	Soil	9	--	--	--	--	<0.5	--	--	--	--	--	--	--	--	--	--
B5@4'	Enrest	4/21/2005	Soil	4	<50	--	--	--	<0.5	<0.005	<0.005	<0.005	<0.010	<0.005	<0.005	--	--	--	--
B5@9'	Enrest	4/21/2005	Soil	9	<50	--	--	--	<0.5	<0.005	<0.005	<0.005	<0.010	<0.005	<0.005	--	--	--	--
B8@4'	Enrest	4/21/2005	Soil	4	<50	--	--	--	<0.5	--	--	--	--	--	--	--	--	--	--
B8@9'	Enrest	4/21/2005	Soil	9	<50	--	--	--	<0.5	--	--	--	--	--	--	--	--	--	--
B2@4'	Enrest	4/21/2005	Soil	4	--	--	--	--	<0.5	<0.005	<0.005	<0.005	<0.010	<0.005	<0.005	--	--	--	--
B2@9'	Enrest	4/21/2005	Soil	9	--	--	--	--	<0.5	????	????	????	????	????	????	--	--	--	--
B1@4'	Enrest	4/21/2005	Soil	4	<50	--	--	--	<0.5	<0.005	<0.005	<0.005	<0.010	<0.005	<0.005	--	--	--	--
B1@9'	Enrest	4/21/2005	Soil	9	**120**	--	--	--	<0.5	<0.005	<0.005	<0.005	<0.010	<0.005	<0.005	--	--	--	--
B14@4'	Enrest	4/22/2005	Soil	4	<50	--	--	--	<0.5	--	--	--	--	--	--	--	--	--	--
B14@9'	Enrest	4/22/2005	Soil	9	<50	--	--	--	<0.5	--	--	--	--	--	--	--	--	--	--
B7@4'	Enrest	4/22/2005	Soil	4	<50	--	--	--	<0.5	--	--	--	--	--	--	--	--	--	--
B7@9'	Enrest	4/22/2005	Soil	9	70	--	--	--	3.44	--	--	--	--	--	--	--	--	--	--
B18@4'	Enrest	4/22/2005	Soil	4	<50	--	--	--	<0.5	--	--	--	--	--	--	--	--	--	--
B18@9'	Enrest	4/22/2005	Soil	9	<50	--	--	--	<0.5	--	--	--	--	--	--	--	--	--	--

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ESL Table A-1 - Shallow Soils (<3m bgs) GW is a source or potential source of drinking water, mg/kg						**100**	**100**		**100**	**0.04**	**2.86**	**3.28**	**2.26**	**0.55**	**0.46**	**0.032**			
EB1-4.0	ERSC	9/18/2008	Soil	4	--	**370**	52	--	--	--	--	--	--	<4.8	<4.8	--	--	--	--
EB1-8.0	ERSC	9/18/2008	Soil	8	--	**230**	**250**	--	--	--	--	--	--	<5.0	<5.0	--	--	--	--
EB1-12.0	ERSC	9/18/2008	Soil	12	--	<5.0	<0.99	--	--	--	--	--	--	--	--	--	--	--	--
EB2-4.0	ERSC	9/18/2008	Soil	4	--	**130**	22	--	--	--	--	--	--	<4.9	<4.9	--	--	--	--
EB2-8.0	ERSC	9/18/2008	Soil	8	--	**140**	33	--	--	--	--	--	--	<4.7	<4.7	--	--	--	--
EB2-12.0	ERSC	9/18/2008	Soil	12	--	<5.0	<0.99	--	--	--	--	--	--	--	--	--	--	--	--
EB8-7.5	ERSC	9/18/2008	Soil	7.5	--	8.8	3.3	--	--	--	--	--	--	<4.8	<4.8	--	--	--	--
EB8-16.0	ERSC	9/18/2008	Soil	16	--	<5.0	1.7	--	--	--	--	--	--	--	--	--	--	--	--
EB7-7.5	ERSC	9/18/2008	Soil	7.5	--	<5.0	2.2	--	--	--	--	--	--	<4.6	<4.6	--	--	--	--
EB7-15.0	ERSC	9/18/2008	Soil	15	--	<5.0	2.4	--	--	--	--	--	--	--	--	--	--	--	--
EB6-7.5	ERSC	9/18/2008	Soil	7.5	--	<5.0	<1.0	--	--	--	--	--	--	**48**	<4.6	--	--	--	--
EB6-16.0	ERSC	9/18/2008	Soil	16	--	<5.0	<1.0	--	--	--	--	--	--	--	--	--	--	--	--
EB5-7.4	ERSC	9/18/2008	Soil	7.4	--	**2,500**	**5,500**	--	--	--	--	--	--	<4.9	<4.9	--	--	--	--
EB5-16.0	ERSC	9/18/2008	Soil	16	--	<5.0	11	--	--	--	--	--	--	--	--	--	--	--	--
EB9-7.4	ERSC	9/18/2008	Soil	7.4	--	**670**	**1,700**	--	--	--	--	--	--	<4.9	<4.9	--	--	--	--
EB9-15.5	ERSC	9/18/2008	Soil	15.5	--	**130**	**290**	--	--	--	--	--	--	--	--	--	--	--	--
EB3-9.0	ERSC	9/18/2008	Soil	9	--	7.3	12	--	--	--	--	--	--	<4.9	<4.9	--	--	--	--
EB3-15.5	ERSC	9/18/2008	Soil	15.5	--	<5.0	2.7	--	--	--	--	--	--	--	--	--	--	--	--
EB4-9.0	ERSC	9/18/2008	Soil	9	--	<5.0	2.3	--	--	--	--	--	--	<5.0	<5.0	--	--	--	--
EB4-16.5	ERSC	9/18/2008	Soil	16.5	--	<5.0	4.3	--	--	--	--	--	--	--	--	--	--	--	--
Vault E	ERAS	4/1/2003	Solids		--	<6,500	<500	**18,000**	--	--	--	--	--	--	--	--	--	--	--
Vault F	ERAS	4/1/2003	Solids		--	93	<5	<65	--	--	--	--	--	--	--	--	--	--	--
Vault G	ERAS	4/1/2003	Solids		--	<13	<1	18	--	--	--	--	--	--	--	--	--	--	--
Vault H	ERAS	4/1/2003	Solids		--	<13,000	<1,000	**29,000**	--	--	--	--	--	--	--	--	--	--	--
Vault I	ERAS	4/1/2003	Solids		--	<13,000	<1,100	**43,000**	--	--	--	--	--	--	--	--	--	--	--
Vault J	ERAS	4/1/2003	Solids		--	<65	<5	**110**	--	--	--	--	--	--	--	--	--	--	--
RB-1		27/3/2015	--	5	--	15,100 J	1,810 J	--	503 [c]	--	--	--	--	559	4.8 J	<1.0	<10	<1.2	<0.52
RB-1		27/3/2015	--	10	--	6,910 J	1,170 J	--	2,340 E [a]	--	--	--	--	2,640	46.9	1.3 J	<10	46.1	1.7 J
RB-1		27/3/2015	--	15	--	2,650 J	1,158 J	--	2,690 E [b]	--	--	--	--	3,270	42.4	7.2	<10	45.1	5.1 J
RB-1		27/3/2015	--	20	--	2.510 J	1,260 J	--	7,040 [c]	--	--	--	--	4,050	<33	<65	<650	<72	<33
RB-2		27/3/2015	--	5	--	<2000	<990	--	<57	--	--	--	--	<0.68	<0.57	<1.1	<11	<1.2	<0.57
RB-2		27/3/2015	--	10	--	<2100	<1000	--	<52	--	--	--	--	<0.63	<0.52	<1.0	<10	<1.2	<0.52
RB-2		27/3/2015	--	15	--	<2100	1,270 J	--	<60	--	--	--	--	<0.72	<0.60	<1.2	<12	<1.3	<0.60
RB-2		27/3/2015	--	20	--	<2100	1,050 J	--	<56	--	--	--	--	<0.67	<0.56	<1.1	<11	<1.2	<0.56
RB-3		27/3/2015	--	5	--	<2000	<1000	--	4,150 J [c]	--	--	--	--	1,140	<31	<61	<610	<67	<31
RB-3		27/3/2015	--	10	--	<2000	1,140 J	--	16,900 J [c]	--	--	--	--	9,640	116 J	<220	<2,200	243 J	<110
RB-3		27/3/2015	--	15	--	<2100	1,280 J	--	22,300 J [c]	--	--	--	--	11,800	213 J	<230	<2,300	325 J	<120
RB-3		27/3/2015	--	20	--	<2100	<1100	--	12,800 [c]	--	--	--	--	6,300	69.9 J	<110	<1,100	<130	<57
RB-4		27/3/2015	--	5	--	5,050 J	1,860 J	--	<55	--	--	--	--	<0.67	<0.55	<1.1	<11	<1.2	<0.55
RB-4		27/3/2015	--	10	--	<2000	<1000	--	<48	--	--	--	--	<0.58	<0.48	<0.97	<9.7	<1.1	<0.48
RB-4		27/3/2015	--	15	--	<2100	1,210 J	--	<59	--	--	--	--	<0.70	<0.59	<1.2	<12	<1.3	<0.59
RB-4		27/3/2015	--	20	--	<2100	<1000	--	52.1 J	--	--	--	--	<0.62	<0.51	<1.0	<10	<1.1	<0.51
RB-5		27/3/2015	--	5	--	3900 J	2640 J	--	59.8 J	--	--	--	--	<0.67	<0.56	3.1 J	15.9 J	<1.2	<0.56
RB-5		27/3/2015	--	10	--	<2100	1400 J	--	3,690 J [c]	--	--	--	--	1,110	89.2	11.9	<9.5	80.7	3.7 J
RB-5		27/3/2015	--	15	--	<2000	1530 J	--	316 [c]	--	--	--	--	209 J	13	3.8 J	<9.3	17.9	1.2 J
RB-5		27/3/2015	--	20	--	<2000	1160 J	--	164 [c]	--	--	--	--	114	2.2 J	<0.96	<9.6	2.3 J	<0.48

Notes:

(--): Results were not analyzed or unavailable

???: Laboratory analytical results could not be interpreted

TEPH 100/640: ESL (2013)- 1st No. is ESL-Residential Scenario soil in mg/kg / 2nd No. is ESL-Groundwater Scenario, water is not a source of drinking water in ug/l

* Result flagged by the laboratory as primarily due to single spike and not resembling TPHg

Residential Land Use Soil Gas 42 ug/m3/Indoor Air 0.084 ug/m3 (Benzene)

! Residential Land Use Soil Gas 1.6E+05 ug/m3/Indoor Air 310 ug/m3 (Toluene)

^ Residential Land Use Soil Gas 490 ug/m3/Indoor Air 0.97 ug/m3 (Ethylbenzene)

& Residential Land Use Soil Gas 490 ug/m3/Indoor Air 0.97 ug/m3 (Xylene)

> Residential Land Use Soil Gas 0.41 ug/m3/Indoor Air 210 ug/m3 (Perchloroethylene)

" Residential Land Use Soil Gas 0.59 ug/m3/Indoor Air 300 ug/m3 (Trichloroethylene)

TPH-HO: Total Petroleum Hydrocarbons as Hydaulic Oil, EB: Ethylbenzene, TCE: Trichloroethylene

j = Estimated value

E = value exceeds calibration range

a = Result reported as an estimated value from low-level run (exceeded calibration range). Compound was < RL in methanol extract run due to dilution for a single peak (Tetrachloroethene).

b = Result reported as an estimated value from low-level run (exceeded calibration range). Compound was < RL in methanol due to dilution for a single peak (Tetrachloroethene).

c = Atypical pattern; value primarily due to a single peak(s).

<x.xx = Concentration not detected above x.xx reporting limit

Concentration exceeds environmental screening level (ESL)

Volatile Organic Compounds (VOCs) and TPHg by EPA Method 8260

TPHd and TPHmo by EPA Method 8015

Table 2. Historical Analytical Data for Groundwater
2868 Hannah Street, Oakland, California

Sample ID	Consultant	Sample Date	Media	Sample Depth (feet)	TEPH 100/640	TPH-MO 100/640	TPH-D 100/640	TPH-HO 100/640	TPH-G 100/500	Benzene .74/27	Toluene 9.3/130	EB 4.7/43	Xylenes 11/100	PCE .55/63	TCE 1.7/130	VC	Acetone	cis-1,2-Dichloroethylene (cis-1,2-DCE)	Xylene (total)
ESL Table E-1 - GW Screening Levels for Evaluation of Potential Vapor					--	--	--	--	--	2.7E+01	9.5E+04	3.1E+02	3.7E+04	6.3E+01	1.3E+02	1.8E+00	--	--	--
SB-1	Enrest	4/26/2002	Water	(-11)	--	<500	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-2	Enrest	4/26/2002	Water	(-11)	--	<500	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-3	Enrest	4/26/2002	Water	(-11)	--	<500	--	--	--	--	--	--	--	--	--	--	--	--	--
SB-4	Enrest	4/26/2002	Water	(-11)	--	<500	--	--	--	<1.0	<1.0	<1.0	<2.0	<1.0	<2.0	--	--	--	--
SB-5	Enrest	4/26/2002	Water	(-11)	--	<500	--	--	--	<1.0	21	<1.0	2	<1.0	<2.0	--	--	--	--
SB-6	Enrest	4/26/2002	Water	(-11)	--	<500	--	--	--	--	--	--	--	--	--	--	--	--	--
SP1	Enrest	5/21/2002	Water	(-11)	--	**77,000**	--	--	--	<1.0	<1.0	<1.0	<2.0	<1.0	<2.0	--	--	--	--
SP2	Enrest	5/21/2002	Water	(-11)	--	**74,000**	--	--	--	<1.0	<1.0	<1.0	3.0	<1.0	<2.0	--	--	--	--
SP3	Enrest	5/21/2002	Water	(-11)	--	**5,780,000**	--	--	--	**87**	94	<1.0	82	<1.0	2.0	--	--	--	--
Source Pt	Enrest	5/21/2002	Water	(-11)	--	--	--	--	--	<1.0	<1.0	<1.0	<2.0	<5.0	<10	--	--	--	--
PZ-1	ERAS	4/1/2003	Water	(8.8)	--	<250	<50	<250	<50	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	--	--	--	--
PZ-2	ERAS	4/3/2003	Water		--	<556	<50	<556	<50	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	--	--	--	--
E-5	ERAS	4/2/2003	Water	(~10)	--	<10	<570	5,300	<50	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	--	--	--	--
E-6	ERAS	4/1/2003	Water	(~10)	--	<338	130	<338	<50	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	--	--	--	--
E-7	ERAS	4/1/2003	Water	(14.5)	--	<250	<50	<250	<50	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	--	--	--	--
E-8	ERAS	4/1/2003	Water	(6.7)	--	<385	<77	<385	<50	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	--	--	--	--
E-9	ERAS	4/2/2003	Water	(~10)	--	<291	<50	**890**	<50	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	--	--	--	--
E-10	ERAS	4/1/2003	Water	(~10)	--	<313	<63	**670**	<50	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	--	--	--	--
E-11	ERAS	4/2/2003	Water	(~10)	--	<588	<118	**890**	<0.050	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	--	--	--	--
E-12	ERAS	4/2/2003	Water	(12.0)	--	<250	<50	<250	<0.050	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	--	--	--	--
E-13	ERAS	4/2/2003	Water	(14.0)	--	<333	<67	<333	<0.050	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	--	--	--	--
B4-GW	Enrest	4/21/2005	Water	(~10)	<10,000	--	--	--	<50	????	????	????	????	????	????	--	--	--	--
B9-GW	Enrest	4/21/2005	Water	(~10)	<10,000	--	--	--	<50	--	--	--	--	--	--	--	--	--	--
B12-GW	Enrest	4/21/2005	Water	(~10)	--	--	--	--	<50	--	--	--	--	--	--	--	--	--	--
B10-GW	Enrest	4/21/2005	Water	(~10)	<10,000	--	--	--	<50	????	????	????	????	????	????	--	--	--	--
B13-GW	Enrest	4/21/2005	Water	(~10)	<10,000	--	--	--	<50	--	--	--	--	--	--	--	--	--	--
B11-GW	Enrest	4/21/2005	Water	(~10)	--	--	--	--	<50	--	--	--	--	--	--	--	--	--	--
B5-GW	Enrest	4/21/2005	Water	(~10)	<10,000	--	--	--	<50	????	????	????	????	????	????	--	--	--	--
B8-GW	Enrest	4/21/2005	Water	(~10)	--	--	--	--	<50	--	--	--	--	--	--	--	--	--	--
B6-GW	Enrest	4/21/2005	Water	(~10)	<10,000	--	--	--	<50	--	--	--	--	--	--	--	--	--	--
B2-GW	Enrest	4/21/2005	Water	(~10)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B1-GW	Enrest	4/21/2005	Water	(~10)	--	--	--	--	<50	--	--	--	--	--	--	--	--	--	--
B8-GW	Enrest	4/22/2005	Water	(~10)	???	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B12-GW	Enrest	4/22/2005	Water	(~10)	???	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B2-GW	Enrest	4/22/2005	Water	(~10)	<10,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 2. Historical Analytical Data for Groundwater
2868 Hannah Street, Oakland, California

Sample ID	Consultant	Sample Date	Media	Sample Depth (feet)	TEPH 100/640	TPH-MO 100/640	TPH-D 100/640	TPH-HO 100/640	TPH-G 100/500	Benzene .74/27	Toluene 9.3/130	EB 4.7/43	Xylenes 11/100	PCE .55/63	TCE 1.7/130	VC	Acetone	cis-1,2-Dichloroethylene (cis-1,2-DCE)	Xylene (total)
ESL Table E-1 - GW Screening Levels for Evaluation of Potential Vapor					--	--	--	--	--	2.7E+01	9.5E+04	3.1E+02	3.7E+04	6.3E+01	1.3E+02	1.8E+00	--	--	--
B11-GW	Enrest	4/22/2005	Water	(~10)	<10,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--
B8-GW@25'	Enrest	4/22/2005	Water	(25)	<17,000	--	--	--	62	--	--	--	--	--	--	--	--	--	--
B5-GW@25'	Enrest	4/22/2005	Water	(25)	<10,000	--	--	--	<50	--	--	--	--	--	--	--	--	--	--
B10-GW@25'	Enrest	4/22/2005	Water	(25)	<10,000	--	--	--	<50	--	--	--	--	--	--	--	--	--	--
B11-GW@25'	Enrest	4/22/2005	Water	(25)	<10,000	--	--	--	<50	--	--	--	--	--	--	--	--	--	--
B9-GW@25'	Enrest	4/22/2005	Water	(25)	<10,000	--	--	--	<50	--	--	--	--	--	--	--	--	--	--
B13-GW@25'	Enrest	4/22/2005	Water	(25)	<10,000	--	--	--	<50	--	--	--	--	--	--	--	--	--	--
B6-GW@25'	Enrest	4/22/2005	Water	(25)	<10,000	--	--	--	<50	--	--	--	--	--	--	--	--	--	--
B4-GW@25'	Enrest	4/22/2005	Water	(25)	<10,000	--	--	--	**853**	--	--	--	--	--	--	--	--	--	--
B18-GW	Enrest	4/22/2005	Water	(~10)	<10,000	--	--	--	**1,640**	--	--	--	--	--	--	--	--	--	--
B7-GW	Enrest	4/22/2005	Water	(~10)	<20,000	--	--	--	<50	--	--	--	--	--	--	--	--	--	--
B18-GW@25'	Enrest	4/22/2005	Water	(25)	<10,000	--	--	--	285	--	--	--	--	--	--	--	--	--	--
B7-GW@25'	Enrest	4/22/2005	Water	(25)	<19,000	--	--	--	<50	--	--	--	--	--	--	--	--	--	--
B3-GW@25'	Enrest	4/22/2005	Water	(25)	<10,000	--	--	--	<50	--	--	--	--	--	--	--	--	--	--
B1-GW	Enrest	4/22/2005	Water	(~10)	<10,000	--	--	--	<50	--	--	--	--	--	--	--	--	--	--
B1-GW@25'	Enrest	4/22/2005	Water	(25)	<10,000	--	--	--	<50	--	--	--	--	--	--	--	--	--	--
B14-GW	Enrest	4/22/2005	Water	(~10)	???	--	--	--	<50	--	--	--	--	--	--	--	--	--	--
B14-GW@25'	Enrest	4/22/2005	Water	(25)	<10,000	--	--	--	<50	--	--	--	--	--	--	--	--	--	--
B2-GW@25'	Enrest	4/22/2005	Water	(25)	<10,000	--	--	--	<50	--	--	--	--	--	--	--	--	--	--
EB3-W-18.5	ERSC	9/18/2008	Water	(18.5)	--	610	**730**	--	--	--	--	--	--	<0.5	<0.5	--	--	--	--
EB4-W-21.0	ERSC	9/18/2008	Water	(21.0)	--	<300	69	--	--	--	--	--	--	<0.5	<0.5	--	--	--	--
EB5-W-21.0	ERSC	9/18/2008	Water	(21.0)	--	<300	150	--	--	--	--	--	--	1.6	<0.5	--	--	--	--
EB6-W-21.0	ERSC	9/18/2008	Water	(21.0)	--	<300	73	--	**15000***	<83	<83	<83	<83	**11,000**	<83	--	--	--	--
EB7-W-15.5	ERSC	9/18/2008	Water	(15.5)	--	**1,600**	**1,400**	--	<50	<0.5	<0.5	<0.5	<0.5	7.1	4.3	--	--	--	--
EB8-W-8.5	ERSC	9/18/2008	Water	(8.5)	--	**650**	**3,100**	--	460	<0.5	<0.5	5.0	1.3	<0.5	<0.5	--	--	--	--
EB9-W-15.5	ERSC	9/18/2008	Water	(15.5)	--	<300	51	--	--	--	--	--	--	2.1	<0.5	--	--	--	--
RB-1		3/27/2015	Water	--	--	273	294	--	7200[d]	--	--	--	<46	4220.0	121	<20	<400	163	<46
RB-2		3/27/2015	Water	--	--	234	264	--	<25	--	--	--	<0.46	<0.30	<0.20	<0.20	<4.0	<0.20	<0.46
RB-3		3/27/2015	Water	--	--	187 J	320	--	19500[d]	--	--	--	<120	11500.0	252	56.4 J	<1000	396	<120
RB-4		3/27/2015	Water	--	--	80.8 J	79.8 J	--	<25	--	--	--	0.86 J	<0.30	<0.20	<0.20	6.0 J	<0.20	0.86 J
RB-5		3/27/2015	Water	--	--	110 J	164	--	924[d]	--	--	--	<4.6	499.0	35.1	4.6 J	<40	48.6	<4.6

Notes:

(--): Results were not analyzed or unavailable

???: Laboratory analytical results could not be interpreted

TEPH 100/640: ESL (2013)- 1st No. is ESL-Residential Scenario soil in mg/kg / 2nd No. is ESL-Groundwater Scenario, water is not a source of drinking water in ug/l

* Result flagged by the laboratory as primarily due to single spike and not resembling TPHg

Residential Land Use Soil Gas 42 ug/m3/Indoor Air 0.084 ug/m3 (Benzene)

! Residential Land Use Soil Gas 1.6E+05 ug/m3/Indoor Air 310 ug/m3 (Toluene)

^ Residential Land Use Soil Gas 490 ug/m3/Indoor Air 0.97 ug/m3 (Ethylbenzene)

& Residential Land Use Soil Gas 490 ug/m3/Indoor Air 0.97 ug/m3 (Xylene)

> Residential Land Use Soil Gas 0.41 ug/m3/Indoor Air 210 ug/m3 (Perchloroethylene)

" Residential Land Use Soil Gas 0.59 ug/m3/Indoor Air 300 ug/m3 (Trichloroethylene)

TPH-HO: Total Petroleum Hydrocarbons as Hydaulic Oil, EB: Ethylbenzene, TCE: Trichloroethylene

j = Estimated value

d = Atypical pattern; value primarily due to a single peak(s).

<x.xx = Concentration not detected above x.xx reporting limit

Concentration exceeds environmental screening level (ESL)

Volatile Organic Compounds (VOCs) and TPHg by EPA Method 8260

TPHd and TPHmo by EPA Method 8015

Table 3. Historical Analytical Data for Soil Vapor
2868 Hannah Street, Oakland, California

Sample ID	Consultant	Sample Date	Media	Sample Depth (feet)	TEPH 100/640	TPH-MO 100/640	TPH-D 100/640	TPH-HO 100/640	TPH-G 100/500	Benzene .74/27	Toluene 9.3/130	EB 4.7/43	Xylenes 11/100	PCE .55/63	TCE 1.7/130	VC
B-5SV	Enrest	5/25/2005	Vapor	3.5	--	--	--	--	--	5	33	9.1	52	<7.3	<5.8	<4.4
B-1SV	Enrest	5/25/2005	Vapor	3.5	--	--	--	--	--	<3.6	30	6.9	36	<7.8	<6.2	6.2
ESL - Table E-2 Soil Vapor Screening Levels for Evaluation of Potential Vapor Intrusion Concerns - Residential (ug/m3)										**4.2E+01**	**1.6E+05**	**4.9E+02**	**5.2E+04**	**2.1E+02**	**3.0E+02**	**1.6E+01**

Notes:
(--): Results were not analyzed or unavailable

Yellow highlight indicates > Indoor Air ESL (or the Lab reporting limit is > Indoor Air ESL

Table 4. ERD Injection Calculations
2868 Hannah Street, Oakland, California

Thickness of Amendment Zone (ft)	h	10
Total Soil Porosity	Φ	0.30
Effective Porosity (75% of total)		0.23
Oil Saturation in Soil[a]	S_{oil}	0.005
Safety Factor[b]		1.25
Number of Injection Points[c]		15
Fraction of Interval that Accepts Flow		0.85
Oil Content in Emulsion (Newman Zone; %v/v)		0.48

Injection Flow Rate (gpm)	3.00
Total Injection Volume for Site (gal)	1798
Total Injection Volume for Site (L)	6807
Radius of Influence (ft)	5.7
Oil Volume (L)[d]	27.3
Emulsion Volume (L)	56.9

Total Injection Volume of NZ for Site (L)	1067
Total Injection Volume of NZ for Site (gal)	282
Total Injection Mass of NZ for Site (kg)	1045
Total Injection Mass of NZ for Site (lbs)	2305

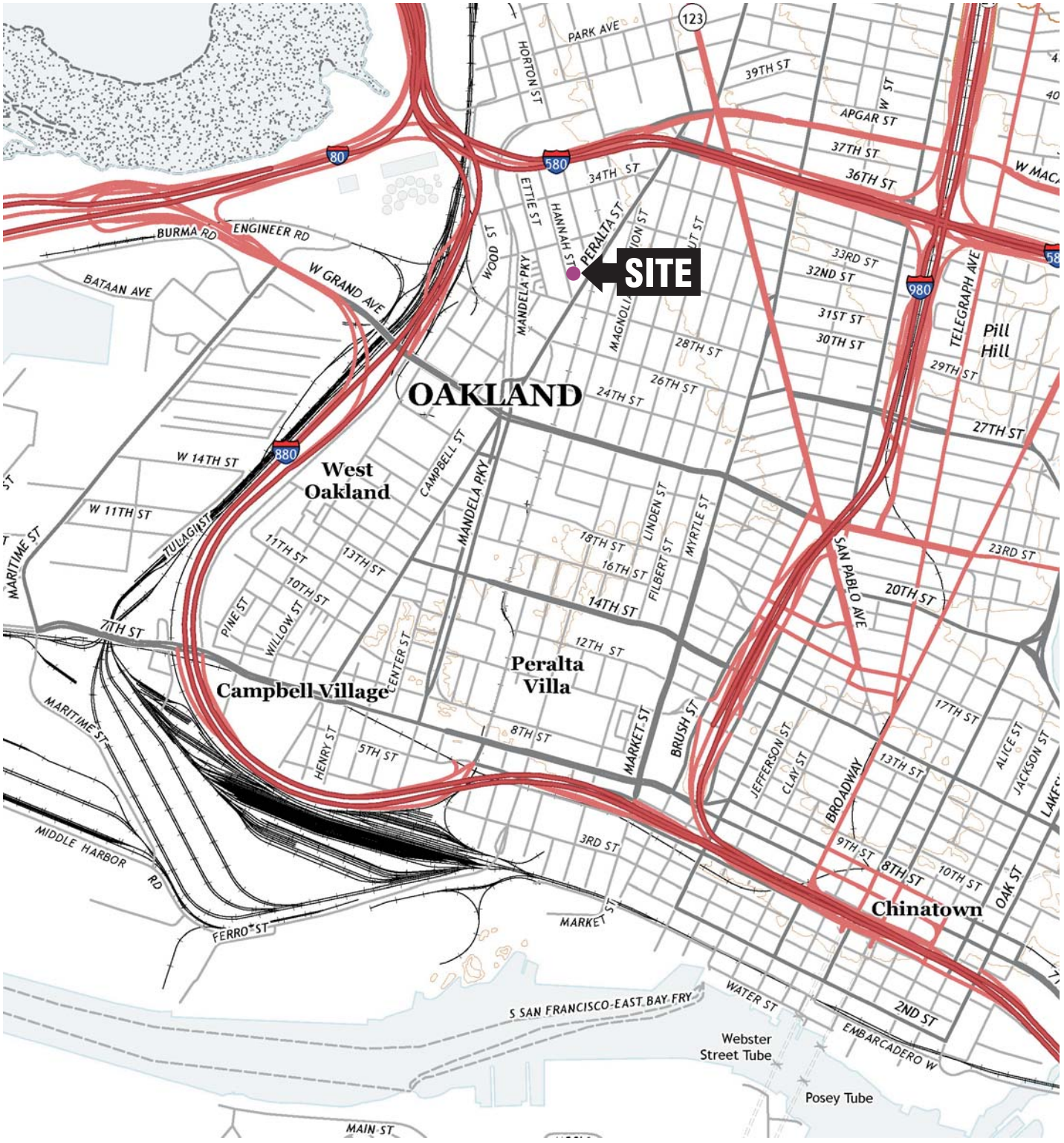
Total Injection Mass of Lactate for Site (kg)	1777
Total Injection Mass of Lactate for Site (lbs)	3910
Total Injection Volume of Lactate for Site (L)	1357
Number of Lactate Drums Required	8

Assumptions:
8 hours of injection.
Newman Zone is 45% w/w soybean oil, or 48% v/v.

Notes:
[a]Target oil saturation, volume percent of injection fluid.
[b]Safety factor of +25% chosen to determine the Not-to-Exceed volumes. +5% used to cost oil.
[c]Number of injection points proposed in implementation plan.
[d]Oil Volume (per point) calculated from injection volume and target saturation.
Radius of influence is for the injection fluid, i.e. ROI of water.

FIGURES

1. Site Location Map
2. Site Map
3. Previous Remedial Activities
4. Conceptual Site Model
5. Phase II Investigation Distribution of PCE and TCE in Groundwater
6. Phase II Investigation Distribution of PCE and TCE in Soil
7. Groundwater Monitoring Wells and Supplemental Soil Borings
8. Proposed ERD Injection Site Plan
9. Preliminary Schedule



QUADRANGLE LOCATION

SOURCE:
USGS; 2015, Oakland West, CA
7.5 Minute Topographic Quadrangle

N

0 2000’

Title:

VICINITY MAP

2868 HANNAH STREET
OAKLAND, CALIFORNIA

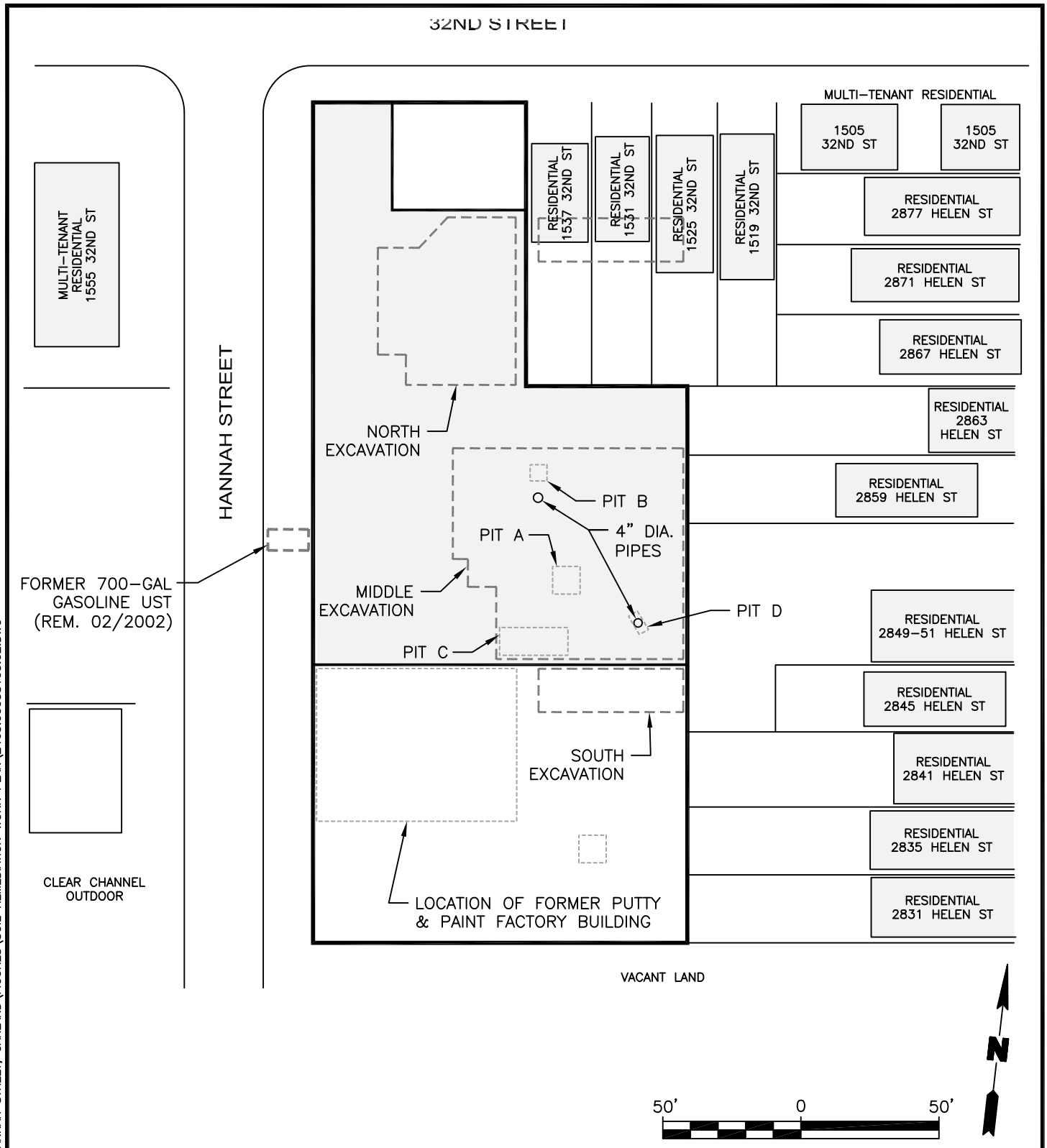
Prepared for:

MADISON PARK FINANCIAL

ROUX
ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: U.P.	Date: 17APR15	FIGURE
Prepared by: B.H.C.	Scale: AS SHOWN	1
Project Mgr.: A.C	Project No.: X-7748	
File: X7748.01.CDR		

\PROPOSALS\X-7748\7748.01.CDR



Title:

SITE MAP

2868 HANNAH STREET
OAKLAND CALIFORNIA

Prepared For:

2868 HANNAH STREET, LLC

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: D.F.	Date: 14AUG15	FIGURE
Prepared by: N.R.	Scale: AS SHOWN	2
Project Mgr: A.C.	Project: 2463.0003S000	
File: 2463.0003S103.02.DWG		

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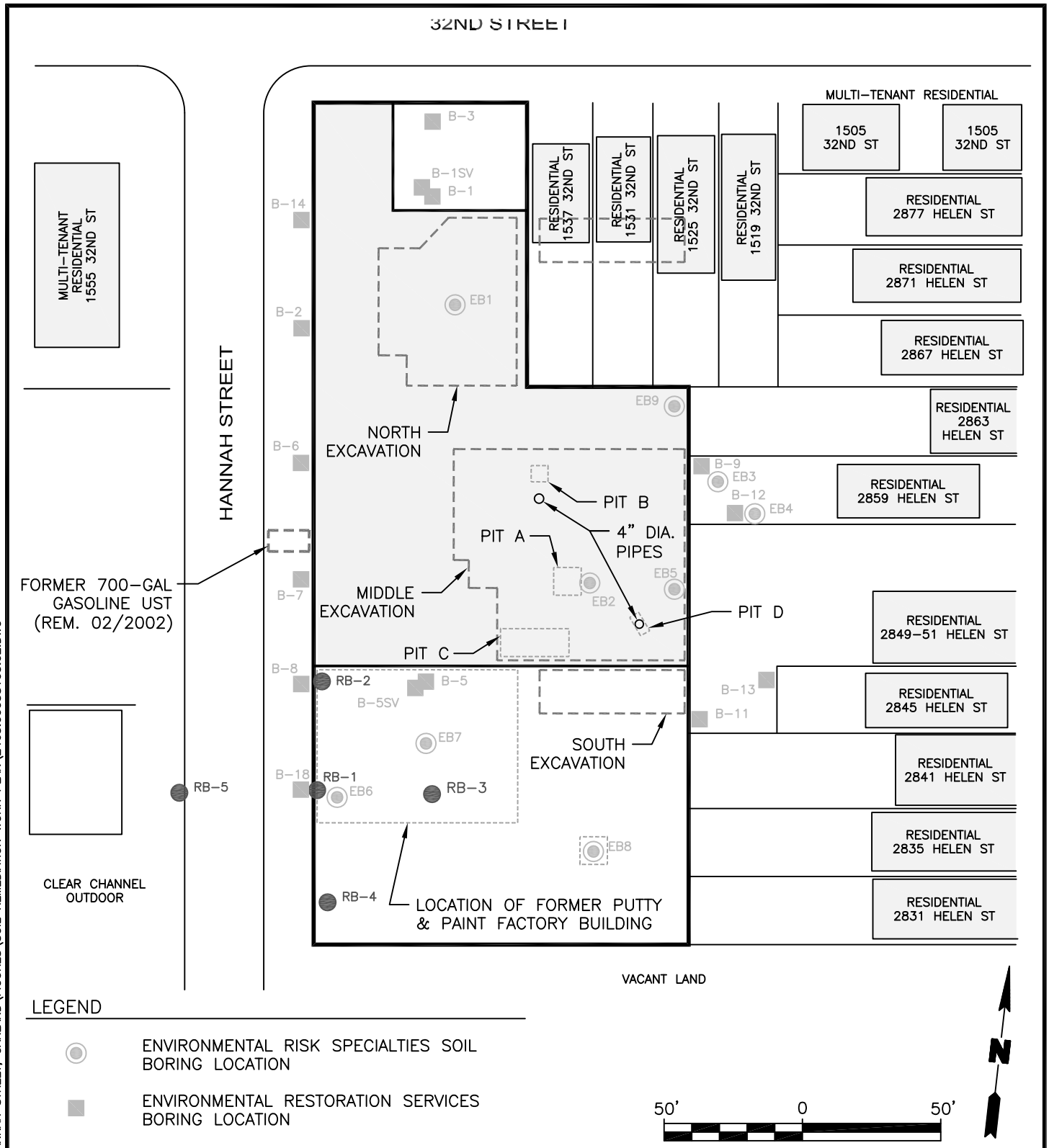

Title:

PREVIOUS REMEDIAL ACTIVITIES

2868 HANNAH STREET
OAKLAND CALIFORNIA

Prepared For:

2868 HANNAH STREET, LLC

ROUX ASSOCIATES, INC. *Environmental Consulting & Management*	Compiled by: D.F.	Date: 14AUG15	FIGURE 3
	Prepared by: N.R.	Scale: AS SHOWN	
	Project Mgr: A.C.	Project: 2463.0003S000	
	File: 2463.0003S103.02.DWG		

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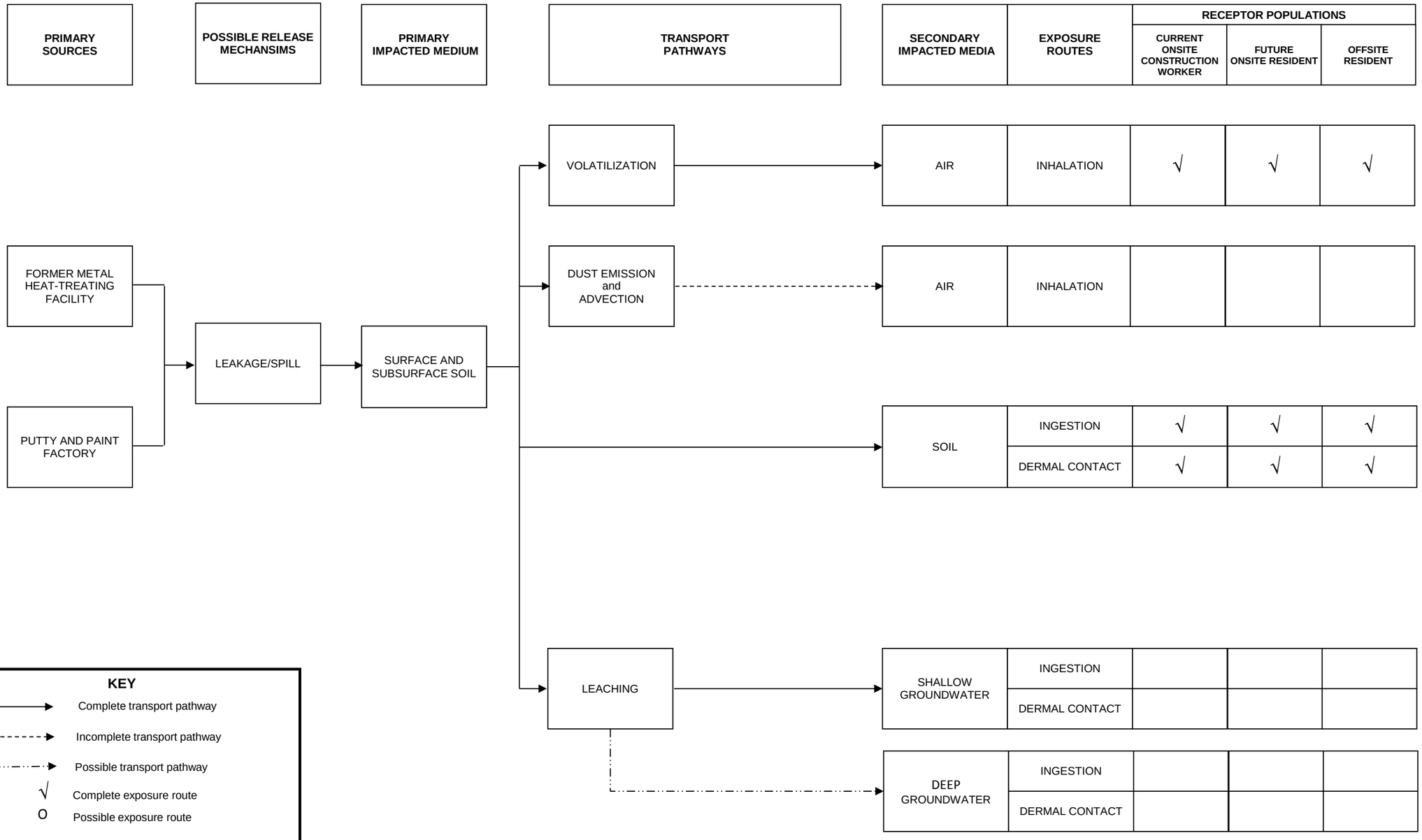


KEY

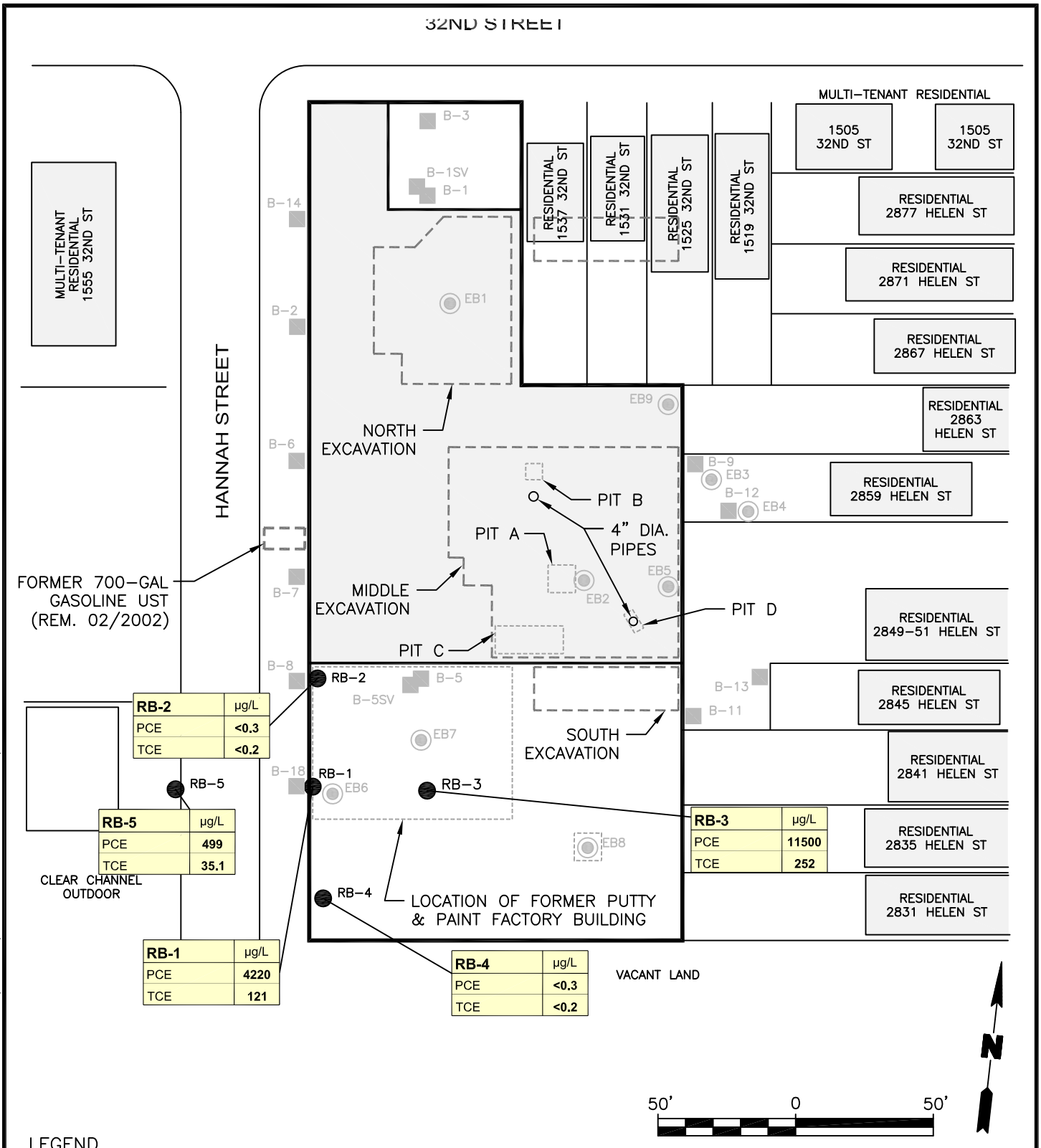
- Complete transport pathway
- Incomplete transport pathway
- Possible transport pathway
- √ Complete exposure route
- o Possible exposure route

ROUX ASSOCIATES, INC.
Environmental Consulting & Management
555 12th Street, Suite 1725
Oakland, California 94607

Conceptual Site Model

2868 Hannah Street
Oakland, California

Figure
4



LEGEND

- ENVIRONMENTAL RISK SPECIALTIES SOIL BORING LOCATION
- ENVIRONMENTAL RESTORATION SERVICES BORING LOCATION
- ROUX PHASE II SOIL BORING LOCATION

Title:

PHASE II INVESTIGATION DISTRIBUTION OF PCE AND TCE IN GROUNDWATER

2868 HANNAH STREET
OAKLAND CALIFORNIA

Prepared For:

2868 HANNAH STREET, LLC

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: D.F.	Date: 07AUG15	FIGURE
Prepared by: N.R.	Scale: AS SHOWN	5
Project Mgr: A.C.	Project: 2463.0003S000	
File: 2463.0003S103.05.DWG		

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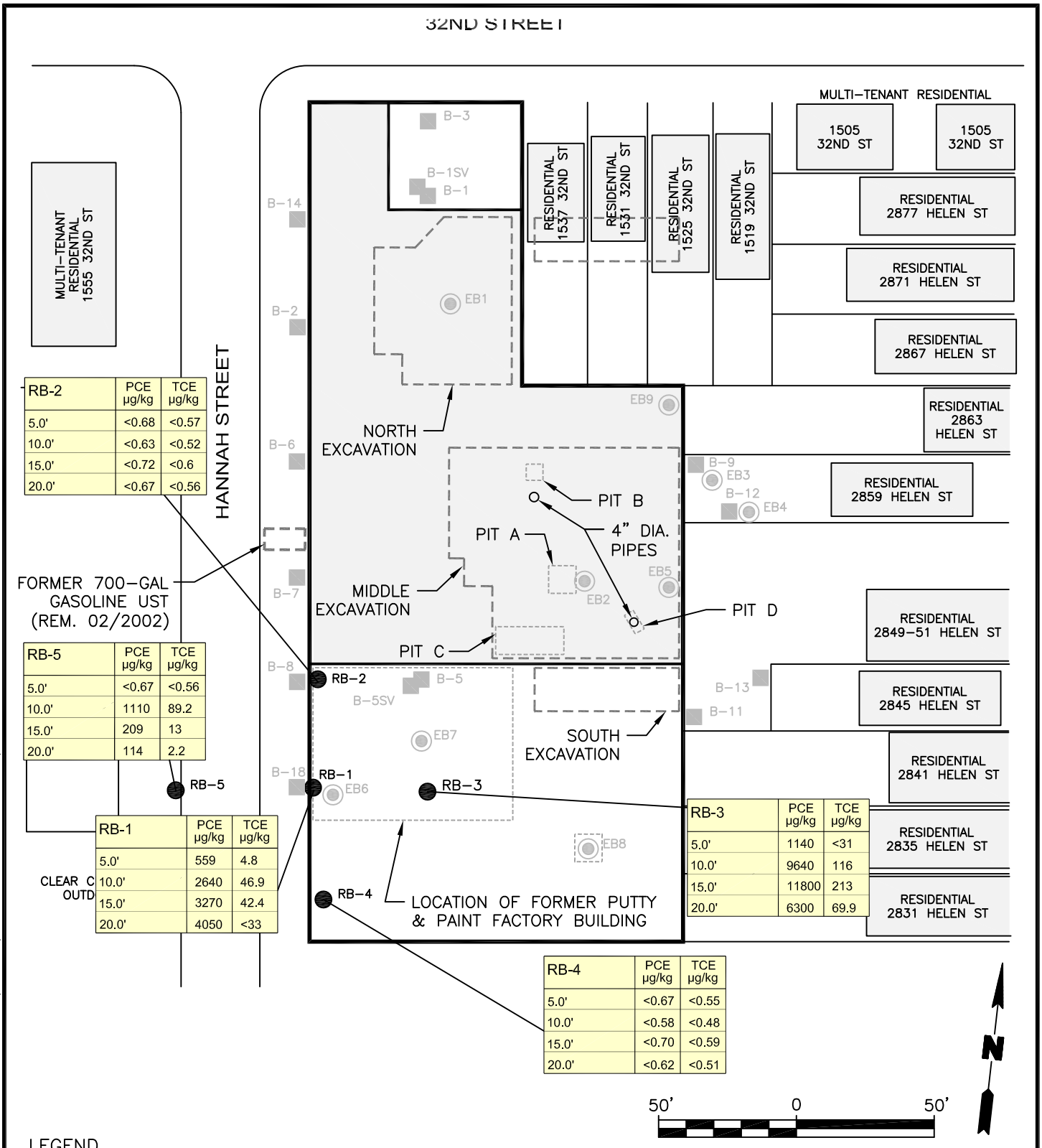

RB-2	PCE µg/kg	TCE µg/kg
5.0'	<0.68	<0.57
10.0'	<0.63	<0.52
15.0'	<0.72	<0.6
20.0'	<0.67	<0.56

RB-5	PCE µg/kg	TCE µg/kg
5.0'	<0.67	<0.56
10.0'	1110	89.2
15.0'	209	13
20.0'	114	2.2

RB-1	PCE µg/kg	TCE µg/kg
5.0'	559	4.8
10.0'	2640	46.9
15.0'	3270	42.4
20.0'	4050	<33

RB-3	PCE µg/kg	TCE µg/kg
5.0'	1140	<31
10.0'	9640	116
15.0'	11800	213
20.0'	6300	69.9

RB-4	PCE µg/kg	TCE µg/kg
5.0'	<0.67	<0.55
10.0'	<0.58	<0.48
15.0'	<0.70	<0.59
20.0'	<0.62	<0.51

LEGEND

- ENVIRONMENTAL RISK SPECIALTIES SOIL BORING LOCATION
- ENVIRONMENTAL RESTORATION SERVICES BORING LOCATION
- ROUX PHASE II SOIL BORING LOCATION

Title:

PHASE II INVESTIGATION DISTRIBUTION OF PCE AND TCE IN SOIL

2868 HANNAH STREET
OAKLAND CALIFORNIA

Prepared For:

2868 HANNAH STREET, LLC

ROUX ASSOCIATES, INC.
Environmental Consulting & Management

Compiled by: D.F.	Date: 07AUG15	FIGURE
Prepared by: N.R.	Scale: AS SHOWN	6
Project Mgr: A.C.	Project: 2463.0003S000	
File: 2463.0003S103.05.DWG		

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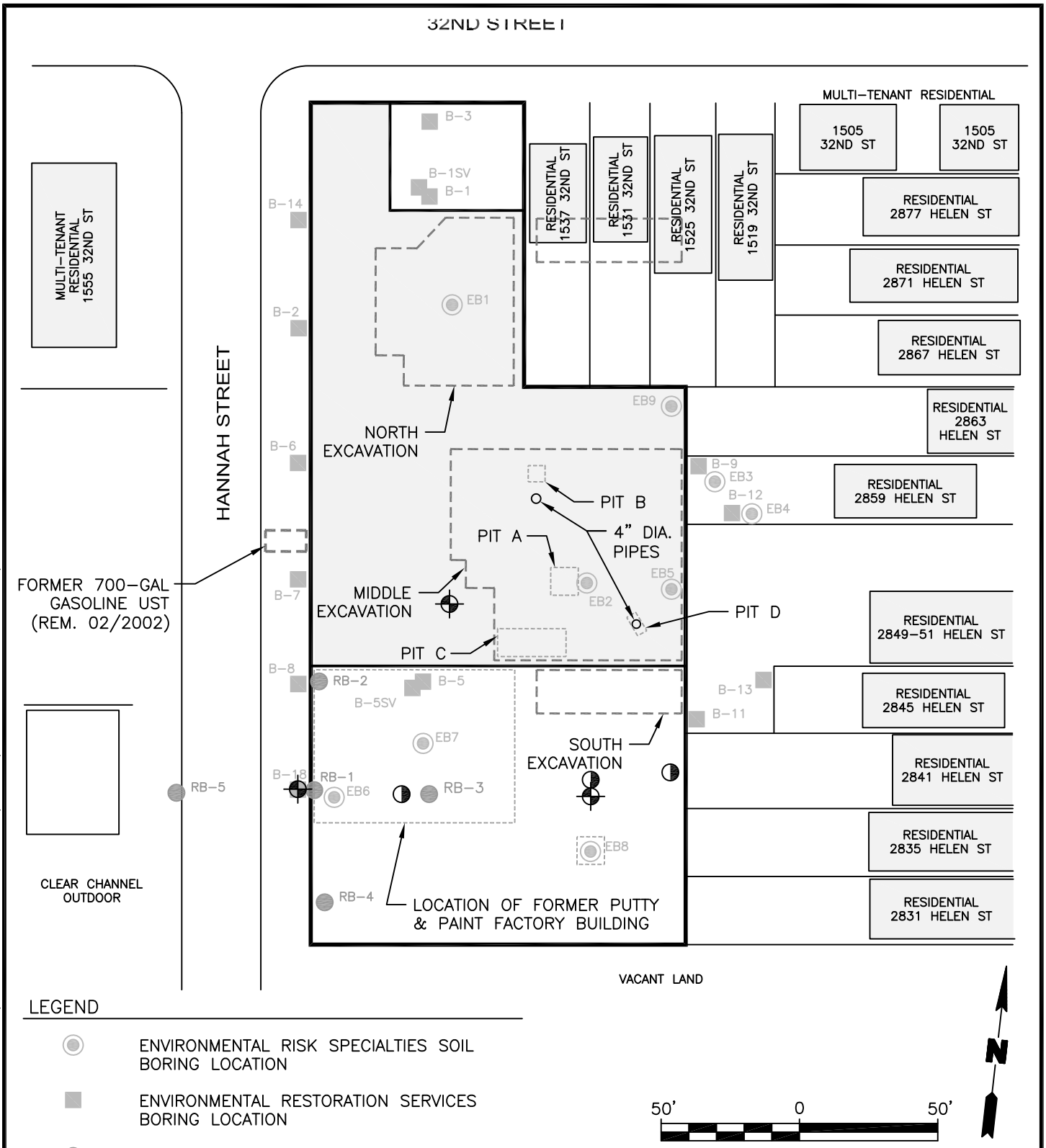


Title:

GROUNDWATER MONITORING WELLS AND SUPPLEMENTAL SOIL BORINGS

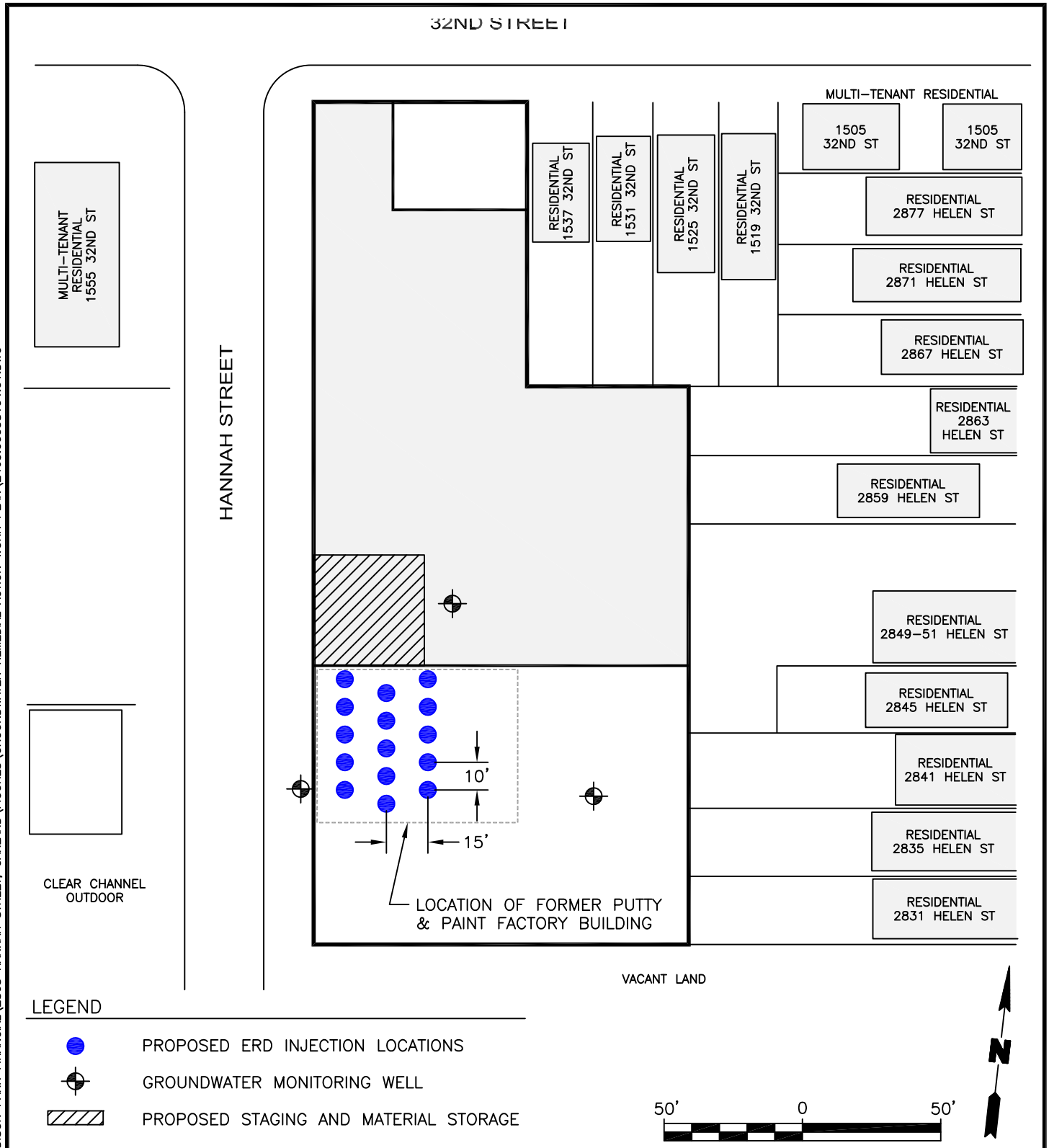
2868 HANNAH STREET
OAKLAND CALIFORNIA

Prepared For:

2868 HANNAH STREET, LLC

ROUX ASSOCIATES, INC. *Environmental Consulting & Management*	Compiled by: D.F.	Date: 18AUG15	FIGURE 7
	Prepared by: N.R.	Scale: AS SHOWN	
	Project Mgr: A.C.	Project: 2463.0003S000	
	File: 2463.0003S103.02.DWG		

\\ROUXNYFP01\OAKLAND SHARED\CLIENTS\MADISON PARK FINANCIAL\2868 HANNAH STREET, OAKLAND\FIGURES\SOIL REMEDIATION WORK PLAN\2463.0003S103.02.DWG



Title:

PROPOSED ERD INJECTION SITE PLAN

2868 HANNAH STREET
OAKLAND CALIFORNIA

Prepared For:

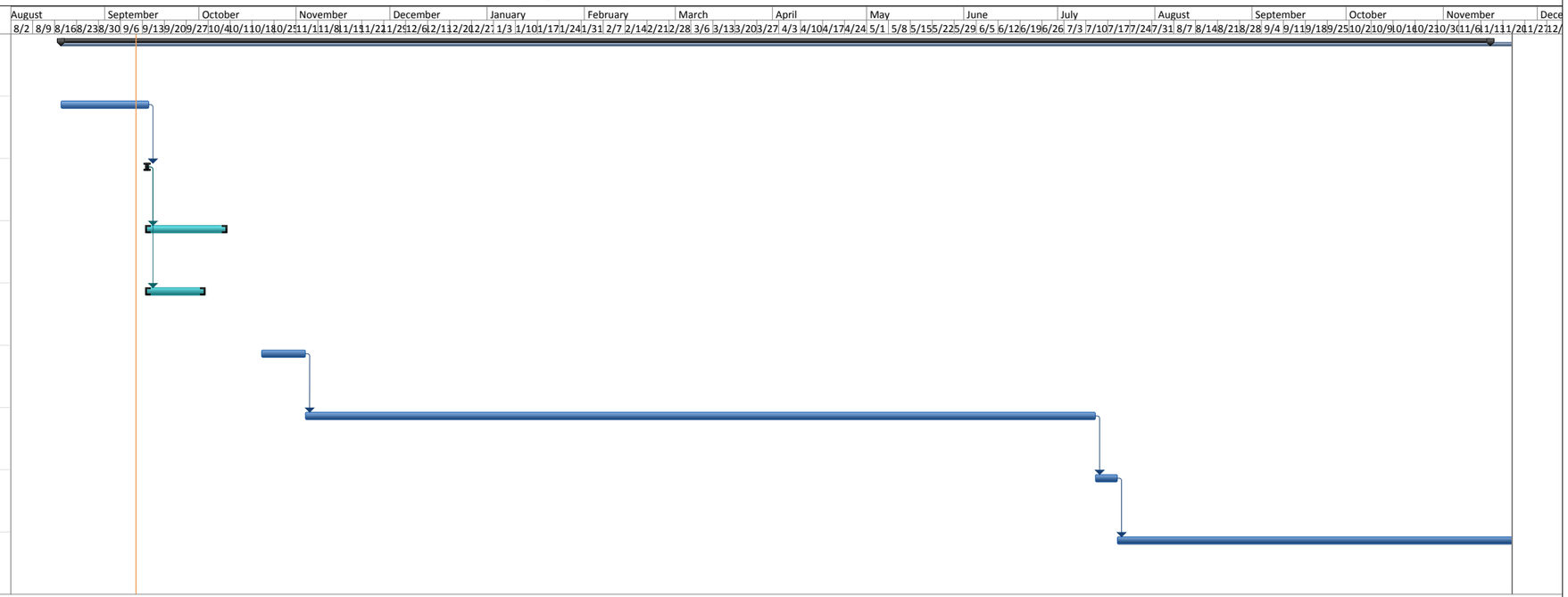
2868 HANNAH STREET, LLC

ROUX ASSOCIATES, INC. *Environmental Consulting & Management*	Compiled by: D.F.	Date: 02SEP15	FIGURE 8
	Prepared by: N.R.	Scale: AS SHOWN	
	Project Mgr: A.C.	Project: 2463.0003S000	
	File: 2463.0003S104.01.DWG		

\\ROUXNYFP01\OAKLAND SHARED\CLIENTS\MADISON PARK FINANCIAL\2868 HANNAH STREET, OAKLAND\FIGURES\GROUNDWATER REMEDIAL ACTION WORK PLAN\2463.0003S104.01.DWG

Draft Remediation Schedule (Augst 10, 2015)

ID		% Complete	Task Mode	Task Name	Duration	Start	Finish
1		**0%**		**Groundwater Remediation**	**326 days**	**Tue 8/18/15**	**Tue 11/15/16**
2		0%		ERD Injection Work Plan	20 days	Tue 8/18/15	Mon 9/14/15
3		0%		Submit ERD Injection WP to ACEH	1 day	Mon 9/14/15	Mon 9/14/15
4		0%		ERD Injection Permit from Water Board	4 wks	Mon 9/14/15	Fri 10/9/15
5		0%		ACEH Review and Appoval of ERD Injection Work Plan	3 wks	Mon 9/14/15	Fri 10/2/15
6		0%		ERD Injection	10 days	Wed 10/21/15	Tue 11/3/15
7		0%		Performance Monitoring	180 days	Wed 11/4/15	Tue 7/12/16
8		0%		Second ERD Injection	5 days	Wed 7/13/16	Tue 7/19/16
9		0%		Performance Monitoring	90 days	Wed 7/20/16	Tue 11/22/16



Project: 2868 Hannah Street Remediation Schedule
Date: 5/1/15

Task | Milestone | Project Summary | External Milestone | Inactive Milestone | Manual Task | Manual Summary Rollup | Start-only | Deadline
Split | Summary | External Tasks | Inactive Task | Inactive Summary | Duration-only | Manual Summary | Finish-only | Progress

APPENDICES

APPENDIX A

Summary of Previous Investigations and Remediation Activities

Previous Investigations

In 1988, Property Contamination Control, Inc. (PCC) conducted a soil investigation consisting of four exploratory soil borings. PCC reported relatively minor concentrations of ethanol, methanol, 1,1-dichloroethene (1,1-DCE), and metals in soil. Soil sample locations and depths are unknown (ERS, 2009).

In 2002, two environmental consulting firms were retained to perform investigations at the Site: ERAS Environmental, Inc. (ERAS) and Environmental Restoration Services (Enrest).

In March 2002, ERAS advanced four soil borings with a hand auger and reported "elevated" concentrations of total recoverable petroleum hydrocarbons (TRPH) and relatively minor concentrations of benzene, toluene, ethylbenzene and total xylenes (BTEX) in soil at approximately 3 feet below ground surface (bgs) in three of the four soil borings. In November 2002, ERAS analyzed a sample of oil from an excavation pit located near the southeast corner of the building and reported the oil resembled mineral oil, foundry quenching oil, or similar material (ERS, 2009).

In April 2002, Enrest advanced seven Geoprobe soil borings and free-floating oil in one soil boring (SB-6) was reported. In addition, Enrest determined that a pipe identified by ERAS was potentially a waste percolation well. The suspected percolation well was 7 feet deep, the casing was perforated from 5.5 to 7 feet, and drain rock surrounded the well from approximately 5 to 10 feet bgs. On April 26, 2002, Enrest demolished the concrete lining of Pit B and excavated soil to 12 feet bgs. Enrest also excavated casting sand backfill from Pit A and Pit C, and identified another suspect percolation well near the southeast corner of the building (ERS, 2009).

In May 2002, Enrest excavated soil in the vicinity of soil boring SB-6 and in the vicinity of the southeast corner suspect percolation well. Enrest also advanced three soil borings to collect grab groundwater samples north, west, and south of soil boring SB-6, designated as borings SP-1, SP-2, and SP-3. Grab groundwater sample analytical results reported elevated concentrations of

motor oil range petroleum hydrocarbons, relatively minor concentrations of BTEX, 1,2-dichlorobenzene, and naphthalene (ERS, 2009).

In May 2003, ERAS advanced eleven continuously-cored, Geoprobe soil borings to depths of approximately 16 to 20 feet bgs, collected soil and grab groundwater samples, and converted three of the soil borings to temporary piezometers. Soil samples were analyzed for volatile organic compounds (VOCs), total petroleum hydrocarbons as gasoline (TPH-g), total extractable petroleum hydrocarbons (TEPH or TPH), and chromium, copper, and nickel metals. Grab groundwater samples were analyzed for VOCs, TPH-g, TPH, and chromium, copper, and nickel metals. The piezometers were surveyed and the calculated groundwater flow direction and gradient were west to northwest at 0.03 ft/ft. Soil sample analysis generally reported minor to elevated TPH concentrations, varying minor VOC concentrations, and concentrations of chromium, copper, and nickel at typical of background naturally-occurring concentrations. Grab groundwater sample analysis reported relatively low TPH concentrations in soil borings E-6, E-9, and E-10, no VOCs above laboratory reporting limits, and minor to low concentrations of dissolved metals (ERS, 2009).

Concurrently, ERAS sampled the contents of six subsurface concrete vaults. Vault contents were described as poorly-graded sand. These soil samples were analyzed for VOCs, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and TPH. Laboratory analysis reported that the sandy contents of the concrete vaults contained TPH concentrations only (ERS, 2009).

In April 2005, Enrest advanced 15 exploratory soil borings primarily around the perimeter of the building. The purpose was to collect representative verification soil and groundwater samples at the perimeter of the property to evaluate the effectiveness of remedial soil excavation performed in September 2003 to January 2004. Soil samples were generally collected at 4 and 9 feet bgs and grab groundwater samples were collected in each soil boring at approximately 15 and 25 feet bgs. In addition, Enrest collected representative soil samples from imported material to be used to backfill the remedial soil excavations and analyzed the samples for constituents of concern. Imported soil samples are designated with “IMP” in the sample identification (ERS, 2009).

Enrest also collected two soil vapor samples and analyzed for VOCs by EPA Method TO-15. Sample B-1SV was collected at the north end of the Site adjacent to the "north" excavation and sample B-5SV was collected at the south end of the Site adjacent to the "south" excavation. Soil vapor sample analytical results indicated minor VOC constituent concentrations just above their respective laboratory reporting limits, as shown in Table 3. The VOC concentrations reported in the two soil vapor samples did not indicate a significant source of residual VOCs or BTEX exist in the subsurface (ERS, 2005).

In September 2008, ERS advanced nine exploratory soil borings EB1 through EB9 at selected locations across the Site and at one neighboring residential property located at 2859 Helen Street to further characterize the vertical and lateral extent of constituents of concern (COCs) in soil and groundwater. Soil borings EB1 and EB2 were advanced within two restored excavations and sampled to confirm the general soil quality of backfill. The analytical results were consistent with the soil profiling results at the time it was generated in Berkeley by Affordable Housing Associates. Soil borings EB5 and EB9 were advanced at an approximate angle of 20 degrees from vertical to further assess soil and groundwater at adjacent neighboring properties 2851 Helen Street and 2863 Helen Street. With the exception of soil borings EB3 and EB4, the continuously cored borings were advanced using a four-foot long, hydraulically driven, truck-mounted Geoprobe® sampling tool equipped with 2-inch inside-diameter clear acetate liners. Soil borings EB3 and EB4 were continuously cored using limited access Geoprobe® equipment. Sample locations are shown on Figure 3. Grab groundwater samples were collected in soil borings EB3 through EB9 (ERS, 2009).

Select soil samples were analyzed for TPH as diesel (TPH-d) and TPH as motor oil (TPH-mo) and halogenated VOCs. TPH soil sample analytical results are summarized in Table 1. Figure 2 shows an aerial view of the Site and the surrounding residential properties (ERS, 2009).

Previous Remediation

In April 2002, Enrest demolished the concrete lining of Pit B and excavated soil to 12 feet bgs. An oil sheen was noted on groundwater that entered the excavation pit. Enrest also excavated sand backfill from Pit A and Pit C. The volume of removed soil is unknown. In or before May 2002, Enrest excavated soil in the vicinity of soil boring SB-6 and around the second 4-inch diameter pipe identified as a waste percolation well (ERS, 2009).

In September 2003 to January 2004, ERAS oversaw remedial soil excavation designed to remove soil containing TPH as hydraulic oil (TPH-ho) above 500 miligrams per kilogram (mg/kg). The limits of soil excavation are shown on Figure 3. Soil was removed in three locations: 1) inside the northeast corner of the building (designated "north"); 2) inside the southeast portion of the building to the building perimeter (designated "middle"); and 3) outside the building on the south side (designated "south").

Approximately 845, 1,950, and 407 cubic yards (CY) of soil were removed from the "north", "middle", and "south" excavations, respectively, for a total of approximately 3,202 cubic yards (4,800 tons). Following remedial soil excavation, confirmation sidewall and bottom soil samples were collected and analyzed for TPH-ho and select confirmation soil samples were analyzed for VOCs.

Soil remediation was performed to the satisfaction of Barney Chan, caseworker with the Alameda County Environmental Health (ACEH), and verification soil and grab groundwater testing was requested following remedial soil removal (ERS, 2009). Excavated soil was properly profiled and disposed of at Forward Landfill, Manteca, California. Verification sampling was performed as described above by Enrest in April 2005.

APPENDIX B

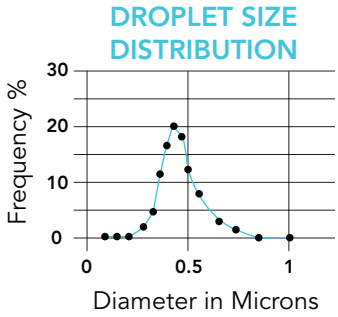
Newman Zone® Data Sheets

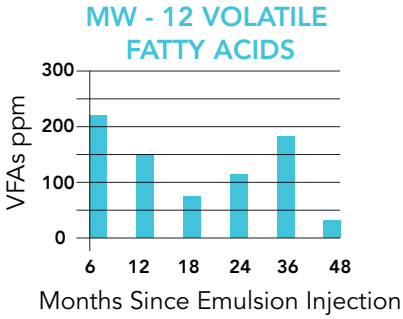
RNAS REMEDIATION PRODUCTS
6712 West River Road, Brooklyn Center, MN 55430
(763) 585.6191 www.RNASinc.com

Newman Zone

A Balance Of Fast And Slow Release Electron Donors

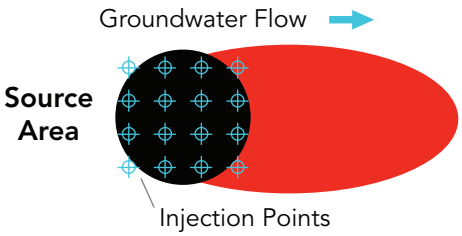
Newman Zone® is an electron donor for enhancing the in situ anaerobic bioremediation of chlorinated solvents, nitrated explosives (RDX, HMX, TNT), selected toxic metals (chrome VI), perchlorate and nitrate. Newman Zone® has both fast and slow-release electron donors. Lactate stimulates microbial growth within hours of injection and rapidly produces anaerobic conditions in the subsurface. Vegetable oil droplets are retained on soil particles and slowly ferment to hydrogen and volatile fatty acids which support anaerobic biodegradation for as long as five years after injection.

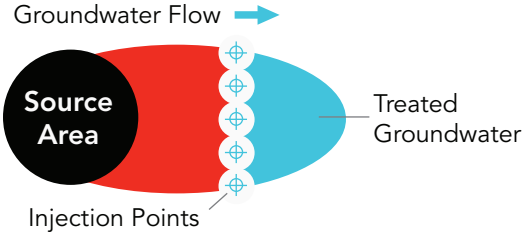




Application

Newman Zone® emulsions contain a minimum of 50 percent vegetable oil by volume in concentrated form. The emulsion is usually diluted to 5 percent or less oil by volume prior to injection. After dilution the emulsion has a low viscosity similar to water allowing it to be applied by direct push injections, injection wells, water circulation systems and even direct application to source area excavations prior to backfilling. Common treatment configurations include an injection grid used to treat contaminant source areas and bio-barriers to treat dissolved plumes.





Benefits – The Smallest Emulsion Droplet Size in the Industry

Newman Zone® is an oil-in-water emulsion consisting of oil droplets between 0.15 and 0.60 microns in size with a median size of 0.30 microns. Our uniquely small oil droplet size maximizes mobility in silt and clay soils and allows for excellent stability when blended with oxygen scavengers, buffers and other amendments prior to injection. The large droplet emulsions provided by other companies can result in oil/water separation, limited distribution or reduced soil permeability.

Experience – Over a Decade of Results From Millions of Pounds Delivered!

Newman Zone® was the first factory produced small droplet emulsified oil product on the market. Since the first production run in 2002 we have delivered millions of pounds of emulsion to thousands of sites around the world.

RNAS REMEDIATION PRODUCTS
6712 West River Road, Brooklyn Center, MN 55430
(763) 585.6191 www.RNASinc.com

Newman Zone

A Balance Of Fast And Slow Release Electron Donors

Product Content

Chemical Name	CAS Number	Composition
Soybean Oil (food grade)	8001-22-7	>46%
Sodium-L-Lactate	867-56-1	4%
Sodium Bicarbonate (buffered formulations only)	144-55-8	1%
Food Additives / Emulsifiers / Preservatives	Proprietary	<10%
Water		45%

Product Characteristics

Parameter	Unit	Specification
Density	g/cm³	0.99
Particle Size	um	0.15 - 0.60
Flash Point	°F/	>540 (closed cup)
Appearance		White opaque liquid

Packaging

Newman Zone® is available in 5-gallon pails (40 pounds net) and 275-gallon totes (2,100 pounds net). For large projects bulk emulsion can be delivered in either Agmark iso-tanks (47,500 pounds net typical) or food grade tanker truck loads (48,000 pounds net typical).

Storage

The small droplet Newman Zone® emulsion is kinetically stable and pasteurization prevents microbial spoilage. We keep inventory in chilled storage where the shelf-life can exceed five years. Newman Zone® can be stored on-site for 2-4 months without refrigeration. Avoid freezing conditions. Temperatures that average below 25 degrees Fahrenheit may result in frozen emulsion.

Safety

No protective equipment is necessary under normal use conditions. All ingredients consist of food or food grade additives.

SAFETY DATA SHEET

Newman Zone – Buffered Non-ionic Formulation 190-6730

Prepared to U.S. OSHA, CMA, ANSI, Canadian WHMIS Standards, Australian WorkSafe, Japanese Industrial Standard JIS Z 7250:2000, and European Directives

1. PRODUCT IDENTIFICATION

TRADE NAME (AS LABELED):	***Newman Zone – Buffered Non-ionic Formulation 190-6730***
SYNONYMS:	None known
CAS#:	Mixture
PRODUCT USE:	This product is used for soil and ground water remediation. It is formulated and processed using food grade additives, following packaging, sanitation and storage as required by Best Practices used for Food products.
CHEMICAL SHIPPING NAME/CLASS:	Non-Regulated Material
U.N. NUMBER:	None
MANUFACTURER'S NAME:	**RNAS Remediation Products**
ADDRESS:	6712 West River Road, Brooklyn Center, MN 55430
BUSINESS PHONE:	1-763-585-6191
EMERGENCY PHONE:	1-800-424-9300 (Chemtrec 24 Hr Service – Emergency Only)
DATE OF CURRENT REVISION:	June 25, 2014
DATE OF LAST REVISION:	May 20, 2013

2. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This product is a white liquid with a vegetable oil odor.
Health Hazards: Not expected to cause adverse health effects when used as intended. Prolonged or repeated exposure may cause irritation to skin. May cause irritation to eyes upon contact. Inhalation of vapors/sprays or mist may cause respiratory irritation. Ingestion of large amounts of this product may cause gastrointestinal irritation.
Flammability Hazards: This product is a Non-Flammable liquid with a flash point of >540°F (>282°C)
Reactivity Hazards: None known
Environmental Hazards: The Environmental effects of this product have not been investigated. Release of this product is not anticipated to have significant adverse effects in the aquatic environment.

US DOT SYMBOLS	CANADA (WHMIS) SYMBOLS	EUROPEAN and (GHS) Hazard Symbols
		None
Non-Regulated Material	"Not Controlled"	Signal Word: **None**

EU LABELING AND CLASSIFICATION:
This product does not meet the definition of a hazardous substance or preparation as defined by the European Union Council Directives 67/548/EEC, 1999/45/EC, 1272/2008/EC and subsequent Directives.

EU HAZARD CLASSIFICATION OF INGREDIENTS PER DIRECTIVE 1272/2008/EC:
None of the ingredients are listed in Annex I
Substances not listed either individually or in group entries must be self classified.

OSHA HAZARD CLASSIFICATION:
These chemicals are not considered hazardous by OSHA

Component(s) Contributing to Classification(s)
All Ingredients

GHS Hazard Classification(s):
None known

Hazard Statement(s):
None known

Precautionary Statement(s):
None known

HEALTH HAZARDS OR RISKS FROM EXPOSURE:
SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE: The most significant routes of overexposure for this product are by contact with skin or eyes, inhalation of vapors and ingestion. The symptoms of overexposure are described below.
ACUTE:
INHALATION: Not expected to cause adverse health effects when used as intended. Inhalation of vapors/mist/spray may cause respiratory irritation.
CONTACT WITH SKIN: Not expected to cause adverse health effects when used as intended. Prolonged and

repeated contact may cause irritation to skin.
EYE CONTACT: Direct eye contact can cause irritation with redness, tearing and blurred vision.
INGESTION: Under normal conditions of intended use, this material is not expected to be an ingestion hazard. Ingestion of large quantities may cause gastrointestinal irritation, nausea and vomiting.
CHRONIC: None known

TARGET ORGANS: Acute: Skin, Respiratory System and Eyes **Chronic:** None known

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Hazardous Ingredients:	WT%	CAS#	EINECS #	Hazard Classification	Risk Phrases
Food Grade Soybean Oil	45 - 50%	8001-22-7	232-274-4	None	None Known
Water	30 – 40%	7732-18-5	231-791-2	None	None Known
Food Grade Sodium-L-lactate	3 – 7%	867-56-1	212-762-3	None	None Known
Proprietary Food Grade Surfactant Blend	3 – 7%	Proprietary	Not Listed in ESIS	None	None Known
Sodium Bicarbonate	1 - 2%	144-55-8	205-633-8	None	None Known
Balance of other ingredients is less than 1% in concentration (or 0.1% for carcinogens, reproductive toxins, or respiratory sensitizers).					

NOTE: ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-2010 format. This product has been classified in accordance with the hazard criteria of the CPR and the SDS contains all the information required by the CPR, EU Directives and the Japanese Industrial Standard *JIS Z 7250: 2000*.

4. FIRST-AID MEASURES

EYE CONTACT: If product enters the eyes, open eyes while under gentle running water for at least 15 minutes. Seek medical attention if irritation persists.
SKIN CONTACT: Wash skin thoroughly with soap and water after handling. Seek medical attention if irritation develops and persists.
INHALATION: If breathing becomes difficult, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Seek medical attention.
INGESTION: If product is swallowed, call physician or poison control center for most current information. If professional advice is not available, do not induce vomiting. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or who cannot swallow. Seek medical advice. Take a copy of the label and/or SDS with the victim to the health professional.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: None known
RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and eliminate overexposure.

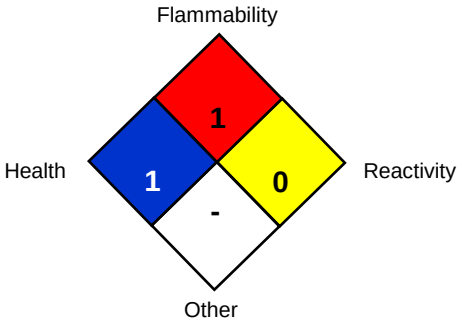
5. FIRE-FIGHTING MEASURES

FLASH POINT: Non-Flammable with flash point >540°F (>282°C)
AUTOIGNITION TEMPERATURE: Not Available
FLAMMABLE LIMITS (in air by volume, %): Lower NA Upper NA
FIRE EXTINGUISHING MATERIALS: Use fire extinguishing methods below:

Water Spray: Yes	Carbon Dioxide: Yes
Foam: Yes	Dry Chemical: Yes
Halon: Yes	Other: Any "C" Class

UNUSUAL FIRE AND EXPLOSION HAZARDS: Not considered a fire or explosion hazard.
Explosion Sensitivity to Mechanical Impact: No
Explosion Sensitivity to Static Discharge: No
SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Isolate materials not yet involved in the fire and protect personnel. Move containers from fire area if this can be done without risk; otherwise, cool with carefully applied water spray. If possible, prevent runoff water from entering storm drains, bodies of water, or other environmentally sensitive areas.

NFPA RATING SYSTEM



HMIS RATING SYSTEM

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH HAZARD (BLUE)	1
FLAMMABILITY HAZARD (RED)	1
PHYSICAL HAZARD (YELLOW)	0

PROTECTIVE EQUIPMENT			
EYES	RESPIRATORY	HANDS	BODY
	See Sect 8		See Sect 8

For Routine Industrial Use and Handling Applications

Hazard Scale: **0** = Minimal **1** = Slight **2** = Moderate **3** = Serious **4** = Severe * = Chronic hazard

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Stop the flow of material, if this can be done safety. Contain discharged material. Absorb spill using an absorbent, non-combustible material such as earth, sand, or vermiculite. Place in a proper container for disposal. Dispose of in accordance with U.S. Federal, State, and local hazardous waste disposal regulations and those of Canada and its Provinces, those of Australia, Japan and EU Member States (see Section 13, Disposal Considerations).

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Use good hygiene practices.

STORAGE AND HANDLING PRACTICES: Store in original container. Keep container closed when not in use. Store in a cool, dry location. Avoid freezing or extended storage in high temperatures and away from incompatible materials.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

Chemical Name	CAS#	ACGIH TLV	OSHA TWA
Blend of Food Grade Soybean Oil	8001-22-7	10 mg/m³ Oil Mists	15 mg/m³ Oil Mists
Food Grade Sodium-L-lactate	867-56-1	Not Listed	Not Listed
Proprietary Food Grade Surfactant Blend	Proprietary	Not Listed	Not Listed
Sodium Bicarbonate	144-55-8	Not Listed	Not Listed

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation to ensure exposure levels are maintained below the limits provided above.

The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132) or equivalent standard of Canada, or standards of EU member states (including EN 149 for respiratory PPE, and EN 166 for face/eye protection), and those of Japan. Please reference applicable regulations and standards for relevant details.

RESPIRATORY PROTECTION: Not required when using this product. Maintain airborne contaminant concentrations below guidelines listed above, if applicable. If necessary, use only respiratory protection authorized in the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), equivalent U.S. State standards, Canadian CSA Standard Z94.4-93, the European Standard EN149, or EU member states.

EYE PROTECTION: Safety glasses or goggles are recommended to avoid eye contact. If necessary, refer to U.S. OSHA 29 CFR 1910.133, Canadian Standards, and the European Standard EN166, Australian Standards, or relevant Japanese Standards.

SKIN PROTECTION: Wear impervious gloves for prolonged or repeated exposure as appropriate to task when using this product. If necessary, refer to U.S. OSHA 29 CFR 1910.138, the European Standard DIN EN 374, the appropriate Standards of Canada, Australian Standards, or relevant Japanese Standards.

BODY PROTECTION: Use body protection appropriate to task being performed. If necessary, refer to appropriate Standards of Canada, or appropriate Standards of the EU, Australian Standards, or relevant Japanese Standards.

9. PHYSICAL and CHEMICAL PROPERTIES

APPEARANCE (Physical State) and COLOR: This product is a white liquid with a vegetable oil odor.
ODOR: Slight
ODOR THRESHOLD: Not Applicable
pH: 7.0
MELTING/FREEZING POINT: Not Available
BOILING POINT: Not Available
FLASH POINT: >540°F (>282°C)(For pure soybean oil)
EVAPORATION RATE (n-BuAc=1): Not Available
FLAMMABILITY (SOLID, GAS): Not Applicable
UPPER/LOWER FLAMMABILITY OR EXPLOSION LIMITS: Not Available
VAPOR PRESSURE (mm Hg @ 20°C (68°F): Not Available
VAPOR DENSITY: Not Available
RELATIVE DENSITY: Not Available
SPECIFIC GRAVITY: 0.99
SOLUBILITY IN WATER: Dispersible in water
WEIGHT PER GALLON: Not Available
PARTITION COEFFICENT (n-octanol/water): Not Available
AUTO-IGNITION TEMPERATURE: Not Available
DECOMPOSITION TEMPERATURE: Not Available
VISCOSITY: 23.6 cPs @ 20°C

10. STABILITY and REACTIVITY

STABILITY: Stable under conditions of normal storage and use.
HAZARDOUS DECOMPOSITION PRODUCTS: Thermal decomposition products include oxides of carbon.
MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong oxidizing materials.
POSSIBILITY OF HAZARDOUS REACTIONS: Will not occur.
CONDITIONS TO AVOID: Incompatible materials

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA:
No LD50 Data available for this product.
SUSPECTED CANCER AGENT: Ingredients within this product are not found on the following lists: FEDERAL OSHA Z LIST, NTP, IARC, or CAL/OSHA and therefore are not considered to be, nor suspected to be, cancer-causing agents by these agencies.
IRRITANCY OF PRODUCT: No specific data available
SENSITIZATION TO THE PRODUCT: This product is not a skin and respiratory sensitizer
REPRODUCTIVE TOXICITY INFORMATION: No information concerning the effects of this product and its components on the human reproductive system.

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.
ENVIRONMENTAL STABILITY: No specific data available on this product.
CHEMICAL EFFECT ON PLANTS, ANIMALS AND AQUATIC LIFE: This product is not expected to cause significant harm to plants, animals or aquatic life.
WATER ENDANGERMENT CLASS: Water endangering in accordance with EU Guideline 91/155-EWG – Not Determined.
SPECIFIC AVAILABLE COMPONENT INFORMATION: No additional data available at this time.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate U.S. Federal, State, and local regulations, those of Canada, Australia, EU Member States and Japan.
EU Waste Code: Not determined

14. TRANSPORTATION INFORMATION

US DOT, IATA, IMO, ADR:

U.S. DEPARTMENT OF TRANSPORTATION (DOT) SHIPPING REGULATIONS: This product is classified (per 49 CFR 172.101) by the U.S. Department of Transportation, as follows.

PROPER SHIPPING NAME:	Non-Regulated Material
HAZARD CLASS NUMBER and DESCRIPTION:	None
UN IDENTIFICATION NUMBER:	None
PACKING GROUP:	NA
DOT LABEL(S) REQUIRED:	None

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER: None
RQ QUANTITY: None
MARINE POLLUTANT: The components of this product are not designated by the Department of Transportation to be Marine Pollutants (49 CFR 172.101, Appendix B).

INTERNATIONAL AIR TRANSPORT ASSOCIATION SHIPPING INFORMATION (IATA): This product is not considered as dangerous goods.

INTERNATIONAL MARITIME ORGANIZATION SHIPPING INFORMATION (IMO): This product is not considered as dangerous goods.

EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR): This product is not considered by the United Nations Economic Commission for Europe to be dangerous goods.

15. REGULATORY INFORMATION

UNITED STATES REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: The components of this product are subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act as follows: None
U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for the components of this product. The default Federal SDS submission and inventory requirement filing threshold of 10,000 lbs (4,540 kg) therefore applies, per 40 CFR 370.20.
U.S. CERCLA REPORTABLE QUANTITY (RQ): None
U.S. TSCA INVENTORY STATUS: The components of this product are listed on the TSCA Inventory or are exempted form listing.
OTHER U.S. FEDERAL REGULATIONS: None
CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): Ingredients within this product are not on the Proposition 65 Lists.

CANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY STATUS: The components of this product are on the DSL Inventory, or are exempted from listing.
OTHER CANADIAN REGULATIONS: Not applicable.
CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS:
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the SDS contains all of the information required by those regulations.
CANADIAN WHMIS CLASSIFICATION and SYMBOLS: This product is "Not Controlled:" per WHMIS Controlled Product Regulations

EUROPEAN ECONOMIC COMMUNITY INFORMATION:

This product does not meet the definition of a hazardous substance or preparation as defined by the European Union Council Directives 67/548/EEC, 1999/45/EC, 1272/2008/EC and subsequent Directives.
See Section 2 for Details

AUSTRALIAN INFORMATION FOR PRODUCT: The components of this product are listed on the International Chemical Inventory list.

JAPANESE INFORMATION FOR PRODUCT:
JAPANESE MINISTER OF INTERNATIONAL TRADE AND INDUSTRY (MITI) STATUS: The components of this product are not listed as Class I Specified Chemical Substances, Class II Specified Chemical Substances, or Designated Chemical Substances by the Japanese MITI.

JAPANESE ENCS INVENTORY: The components of this product are on the ENCS Inventory as indicated in the section on International Chemical Inventories, below.

POISONOUS AND DELETERIOUS SUBSTANCES CONTROL LAW: No component of this product is a listed Specified Poisonous Substance under the Poisonous and Deleterious Substances Control Law.

INTERNATIONAL CHEMICAL INVENTORIES:

Listing of the components on individual country Chemical Inventories is as follows:
Asia-Pac: Listed or Exempt from listing
Australian Inventory of Chemical Substances (AICS): Listed or Exempt from listing
Korean Existing Chemicals List (ECL): Listed or Exempt from listing
Japanese Existing National Inventory of Chemical Substances (ENCS): Listed or Exempt from listing
Philippines Inventory if Chemicals and Chemical Substances (PICCS): Listed or Exempt from listing
Swiss Giftliste List of Toxic Substances: Listed or Exempt from listing
U.S. TSCA: Listed

16. OTHER INFORMATION

ABBREVIATIONS AND ACRONYMS:

EPA: United States Environmental Protection Agency
ARD: European Agreement concerning the International Carriage of Dangerous Goods by Road
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
ACGIH: American Conference of Governmental Industrial Hygienists
NFPA: National Fire Protection Association (USA)
HMIS: Hazardous Materials Identification System (USA)

PREPARED BY: Paul Eigbrett – (**GHS MSDS Compliance PLUS)**
DATE OF PRINTING: June 25, 2014

The information contained herein is believed to be accurate but is not warranted to be so. Data and calculations are based on information furnished by the manufacturer of the product and manufacturers of the components of the product. Users are advised to confirm in advance of the need that information is current, applicable and suited to the circumstances of use. Remediation and Natural Attenuation Services Inc. assumes no responsibility for injury to vendee or third party person proximately caused by the material if reasonable safety procedures are no adhered to as stipulated in the data sheet. Furthermore, Remediation and Natural Attenuation Services Inc. assumes no responsibility for injury caused by abnormal use of this material even if reasonable safety procedures are followed.

END OF SDS SHEET

KB-1® Data Sheets

KB-1®

Bioaugmentation Culture

For bioaugmentation of chlorinated ethene contaminated sites

Contact SiREM for a quotation or more information on our line of leading bioaugmentation cultures

toll free: 1-866-251-1747
phone: (519) 822-2265

KB-1® is a naturally occurring, non-pathogenic microbial culture that contains *Dehalococcoides* (*Dhc*), the only group of microorganisms documented to promote the complete dechlorination of chlorinated ethenes to non-toxic ethene. Although *Dhc* are found in the environment, research indicates these microorganisms are not ubiquitous and not all Dhc are capable of complete dechlorination of chlorinated ethenes. At sites where *Dehalococcoides* are absent, tetrachloroethene (PCE) and trichloroethene (TCE) dechlorination typically stalls at cis-1,2-dichloroethene (cDCE), despite ample electron donor availability. KB-1® is used to establish complete dechlorination at sites that do not contain *Dhc* (or the right *Dhc*), and to accelerate dechlorination rates to achieve treatment goals. Bioaugmentation of aquifer systems with KB-1® provides an active microbial community capable of complete reductive dechlorination, ensuring that PCE, TCE, cDCE and vinyl chloride (VC) are completely dechlorinated to ethene, without undue acclimation periods, and at rates that are suitable for achieving remedial goals.

KB-1® is the most field-demonstrated culture of its type, and its robustness has been demonstrated for both source area and plume remediation in both porous media and fractured bedrock environments.

Benefits of KB-1® Include:

- Low cost: single application
- Works with all commonly used electron donors
- Natural microbial culture (not genetically modified or engineered)
- Certified to be free of known human pathogens
- Rigorous quality control procedures ensure each shipment is of the highest quality, stable, safe, effective and free of chlorinated volatile organic compounds
- Shipped overnight in specially designed stainless steel vessels that prevent exposure to air and which are safe and easy to handle

All KB-1® purchases include:

- Technical support from an experienced SiREM field technician to support successful application to your site
- Complimentary Gene-Trac® *Dehalococcoides* tests to verify the successful delivery and persistence of KB-1® in site groundwater
- KB-1® guarantee - complete dechlorination to ethene*

**Some conditions apply*

KB-1® plus

Bioaugmentation Culture

Overcome Inhibition at Mixed Chlorinated Solvent Sites

KB-1® Plus are custom-blended microbial culture formulations for bioaugmentation of sites with inhibitory concentrations of chlorinated ethanes and chlorinated methanes, which are often comingled with chlorinated ethenes. KB-1® Plus has been demonstrated to dechlorinate in excess of 200 milligrams per liter (mg/L) of 1,1,1-trichloroethane (1,1,1-TCA) to chloroethane and carbon tetrachloride, chloroform to dichloromethane (DCM) to non-chlorinated end products. Chloroethane can be further degraded under aerobic conditions. These cultures have been developed by SiREM in collaboration with the University of Toronto[1,2] and the United States Geological Survey[3].

Benefits of KB-1® Plus include:

- Overcome inhibition of chloroethene dechlorination caused by 1,1,1-TCA and chloroform
- Only a single application required
- Works with all commonly used electron donors
- Natural microbial culture (not genetically modified)
- Pathogen free
- Rigorous quality control ensures each shipment is effective, stable and safe
- Shipped overnight in specially designed stainless-steel vessels that prevent exposure to air and are safe and easy to handle

All KB-1® Plus purchases include:

- KB-1® Plus Guarantee*
- Technical support to ensure a successful application to your site
- Complimentary Gene-Trac® *Dehalococcoides* and *Dehalobacter* tests to verify the successful delivery, growth and persistence of KB-1® Plus microbes in site groundwater

Contact SiREM for a quotation or more information on our line of leading bioaugmentation products.

toll free: 1-866-251-1747
phone: (519) 822-2265

References

[1]Grostern, A. and E. A. Edwards. 2006. Growth of *Dehalobacter* and *Dehalococcoides* spp. during Degradation of Chlorinated Ethanes. *Appl. Environ. Microbiol*. 72: 428–436.

[2]Grostern, A., M. Duhamel, S. Dworatzek and E. A. Edwards. 2010. Chloroform respiration to dichloromethane by a *Dehalobacter* population. *Environmental Microbiology*. 12: 1053–1060.

[3]Jones E. J. P., M. A. Voytek, M.M. Lorah, J. D. Kirshtein. 2006. Characterization of a Microbial Consortium Capable of Rapid and Simultaneous Dechlorination of 1,1,2,2-Tetrachloroethane and Chlorinated Ethane and Ethene Intermediates. *Bioremediation Journal,* Volume 10: 153-168.

**Some conditions apply*

130 Research Lane, Suite 2 Guelph◆Ontario ◆ N1G 5G3 ◆ Canada ◆ Tel: (519) 822-2265 ◆ Fax: (519) 822-3151

KB-1® Dechlorinator Material Safety Data Sheet

Section 1: Material Identification

Trade Name: KB-1® Dechlorinator
Chemical Family: bacterial mixture
Chemical name: No IUC name for mixture is known to exist
Manufacturer/Supplier: SiREM
130 Research Lane, Suite 2,
Guelph, Ontario,
Canada N1G 5G3

For Information call: 519-822-2265 / 1-866-251-1747
Emergency Number: 519-822-2265
Description: Microbial inoculum (non-pathogenic, non-hazardous)
Trade Name: KB-1® Dechlorinator
Product Use: Bioremediation of contaminated groundwater.
Date Prepared: 2 February 2005

Section 2: Composition, Information on Ingredients

KB-1® Dechlorinator is a microbial culture grown in an aqueous dilute mineral salt solution media containing no hazardous ingredients.

The microbial composition of KB-1® Dechlorinator (as determined by phylogenetic analysis) is listed in Table 1. Identification of organisms was obtained by matching 16S rRNA gene sequence of organisms in KB-1® Dechlorinator to other known organisms. The characteristics of related organisms can be used to identify potential or likely characteristics of organisms in KB-1® Dechlorinator.

Table 1. Genus' identified in KB-1® Dechlorinator Microbial Inoculum

Genus
Dehalococcoides sp.
Geobacter sp.
Methanomethylovorans sp.

Section 3: Hazards Identification:

A review of the available data does not indicate any known health effects related to normal use of this product.

Section 4: First Aid Measures:

Avoid direct contact with skin and eyes. In any case of any exposure which elicits a response, a physician should be consulted immediately.

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Eye Contact: Flush eyes with water for at least 15 minutes, occasionally lift upper and lower eyelids, if undue irritation or redness occurs seek medical attention.

Skin Contact: Remove contaminated clothing and wash skin thoroughly with water and antibacterial soap. Seek medical attention if irritation develops or open wounds are present.

Ingestion: Do not induce vomiting, drink several cups of water, seek medical attention.

Inhalation: Remove to fresh air. If not breathing give artificial respiration. In case of labored breathing give oxygen. Call a physician.

Section 5 - Fire Fighting Measures:

Non-flammable
Flash Point: not applicable
Upper flammable limit: not applicable
Lower flammable limit: not applicable

Section 6 – Accidental Release Procedures

Spilled KB-1® Dechlorinator should be soaked up with sorbant and saturated with a 10% bleach solution (prepared by making a one in ten dilution of diluted standard bleach [normally sold at a strength of 5.25% sodium hypochlorite] to disinfect affected surfaces. Sorbant should be double bagged and disposed of as indicated in section 12. After removal of sorbant, area should be washed with 10% bleach solution to disinfect. If liquid from the culture vessel is present on the fittings, non-designated tubing or exterior of the stainless steel pressure vessel liquid should be wiped off and the area washed with 10% bleach solution.

Section 7 - Handling and Storage

KB-1® Dechlorinator is shipped in stainless steel pressure vessels and connected to injection lines and inert gas is used to pressurize the vessel to displace the contents. KB-1® Dechlorinator should be handled with care to avoid any spillage. Vessels are shipped with 1 pound per square inch (psi) pressure; valves should not be opened until connections to appropriate lines for subsurface injection are in place.

Storage Requirements: Avoid exposing stainless steel pressure vessels to undue temperature extremes (i.e., temperatures less than 0°C or greater than 30°C may result in harm to the microbial cultures and damage to the vessels). All valves should be in the closed position when the vessel is not pressurized to prevent the escape of gases and to maintain anaerobic conditions in the vessel. Avoid exposure of the culture to air as the presence of oxygen will kill dechlorinating microorganisms.

Section 8 - Exposure Controls/Personal Protection

Personal protective equipment:

Skin: Protective gloves (latex, vinyl or nitrile) should be worn.
Eye Protection: Wear appropriate protective eyeglasses or goggles when opening pressure vessels valves or when pressurizing vessels to inject contents into the subsurface.
Respiratory: No respiratory protection is required.
Engineering Controls: Good general room ventilation is expected to be adequate.

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Section 9: Physical and Chemical Properties:

Physical State: liquid
Odour: skunky odour
Appearance: dark grey, slightly turbid liquid under anaerobic conditions, pink if exposed to air (oxygen).
Specific gravity: not determined
Vapor pressure: not applicable
Vapor density: not applicable
Evaporation rate: not determined
Boiling point: ~100° C
Freezing point/melting point: ~ 0°C
pH: 6.5-7.5
Solubility: fully soluble in water

Section 10 – Stability and Reactivity Data

Stable and non-reactive.
Maintain under anaerobic conditions to preserve product integrity.
Materials to avoid: none known

Section 11 - Toxicological Information

Potential for Pathogenicity:

KB-1® Dechlorinator has tested negative (i.e., the organisms are not present) for a variety of pathogenic organisms listed in Table 2. While there is no evidence that virulent pathogenic organisms are present in KB-1® Dechlorinator, there is potential that certain organisms in KB-1® Dechlorinator may have the potential to act as opportunistic (mild) pathogens, particularly in individuals with open wounds and/or compromised immune systems. For this reason standard hygienic procedures such as hand washing after use should be observed.

Table 2, Results of Human Pathogen Screening of KB-1® Dechlorinator

Organism	**Disease(s) Caused**	***Test result***
Salmonella sp.	Typhoid fever, gastroenteritis	Not Detected
Listeria monocytogenes	Listerioses	Not Detected
Vibrio sp.,	Cholera, gastroenteritis	Not Detected
Campylobacter sp.,	Bacterial diarrhea	Not Detected
Clostridia sp.,	Food poisoning, Botulism, tetanus, gas gangrene	Not Detected
Bacillus anthracis	Anthrax	Not Detected
Pseudomonas aeruginosa	Wound infection	Not Detected
Yersinia sp.,	Bubonic Plague, intestinal infection	Not Detected
Yeast and Mold	Candidiasis, Yeast infection etc.	Not Detected
Fecal coliforms	Indicator organisms for many human pathogens diarrhea, urinary tract infections	Not Detected
Enterococci	Various opportunistic infections	Not Detected

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Section 12. Disposal Considerations

Material must be disinfected or sterilized prior to disposal. Consult local regulations prior to disposal.

Section 13 – Transport Information

Non-hazardous, non-pathogenic microbial inoculum – Biosafety Risk Group 1.

Chemicals, Not Otherwise Indexed (NOI), Non-hazardous

Not subject to TDG or DOT guidelines.

Disclaimer:

The information provided on the MSDS sheet is based on current data and represents our opinion based on the current standard of practice as to the proper use and handling of this product under normal, reasonably foreseeable conditions.

Last revised: 24 June 2008