RWQCB lead site

Versar INC.

DRAFT - NOT FOR RELEASE

September 10, 1998

Mr. Scott Seery
Alameda County Health Agency
1137 Harbor Bay Parkway, Room 250
Alameda, California 94502

SEP 15 '98 AM 9:26

Subject: Letter Workplan for Investigation of Volatile Organic Compounds Source(s)
Santa Rita Property - Parcel 15, Dublin, California.
Versar Project No. 4128-003

Dear Mr. Seery:

Versar, Inc. (Versar) is pleased to submit this letter workplan for investigation of volatile organic compounds (VOCs) source(s) at the Santa Rita Property - Parcel 15 in Dublin, California (Site). Versar is submitting the workplan on behalf of the County of Alameda General Services Agency (GSA). Included as Attachment I is a Site-specific Health and Safety Plan which will be present, on Site, during all field activities conducted for this investigation.

BACKGROUND

During a recent Phase II investigation conducted by People Soft in preparation for purchase of Parcel 16, perchloroethylene (PCE) and trichloroethylene (TCE) were detected along the southern boundary of Parcel 15. Alameda County GSA retained Versar in March 1998 to perform a preliminary assessment of the extent of PCE and TCE contamination of shallow groundwater within Parcel 15. Versar's findings were presented in our *Subsurface Investigation Report*, dated April 30, 1998. Versar identified PCE, TCE, carbon tetrachloride (CTET), and chloroform in the southern and western portions of Parcel 15. Versar also found that elevated levels of these VOCs may be related to structures and operations formerly associated with the Site, such as the alignment of a sewer line, and the locations of former laundry, service station, transportation shop, and paint shop facilities.

SCOPE OF WORK

Versar's scope of work to investigate potential sources of the VOCs in the shallow subsurface is presented in the following work task descriptions.

• SACRAMENTO OFFICE •
7844 MADISON AVENUE, SUITE 167 • FAIR OAKS, CALIFORNIA 95628 • TELEPHONE: (916) 962-1612 FAX: (916) 962-2678

Versar INC.

September 10, 1998

SEP 15 '98 AM 9:26

Mr. Scott Seery
Alameda County Department of Environmental Health
Hazardous Materials Program
1131 Harbor Bay Parkway
Alameda, CA 94502

Subject: Alameda County General Services Agency Investigation of VOCs at Parcel 15, Dublin, California (Site).
Versar Project No. 4128-003

Dear Scott:

Enclosed is the draft work plan for the investigation of potential sources for the VOC contamination of shallow groundwater at the subject site. Rod Freitag asked me to forward the draft work plan to you for your review. Rod is on vacation now until early October, and I will be similarly disposed from September 18th to October 5th. Rod would like you and I to discuss any suggestions you have to the work plan when I return, or before September 18th. He can then receive the final work plan when he returns.

If you have any questions, please call me at (916) 863-9323.

Sincerely,

Tim Berger
Senor Geologist
Environmental Management Division

Attachment: *Draft Letter Workplan for Investigation of Volatile Organic Compounds Source(s) Santa Rita Property - Parcel 15, Dublin, California.*

1407-99/4128-003/SEP10'98

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Task 1 - Permitting

Versar will obtain permits from Alameda County Flood Control - Zone 7 (Zone 7) for drilling at Parcel 15. It is our understanding that no other permits are required.

Task 2 - Source Area Assessment

Versar proposes to use a 16-point, passive soil gas array to qualitatively characterize VOC distribution across areas of Parcel 15 previously identified by Versar as having elevated concentrations of the target compounds. The locations for the 16-points are shown on Figure 1 in Attachment II. Versar will use the EMFLUX® passive soil gas system. Soil gas samples will be analyzed for the target VOCs (TCE, PCE, CTET, and chloroform) by Environmental Protection Agency (EPA) Method 8021. Information describing the EMFLUX® system is presented in Attachment III.

Once the survey has been performed, Versar will prepare an isoconcentration map of the collected data points to characterize the distribution of TCE, PCE, CTET, and chloroform in the study area. The contour map will be used by Versar to identify potential source areas to focus the Task 3 investigation of Parcel 15.

Task 3 - Source Area Evaluation

Task 3 will comprise the quantitative investigation of subsurface soil and groundwater conditions in areas of interest identified from the Task 2 soil vapor investigation. The goal of the investigation is to quantify the highest representative concentrations of VOCs at the Site. Prior to commencing with intrusive work, Versar will contact Underground Services Alert (USA) to notify the local utilities of impending drilling activities. Once utility companies have had an opportunity to mark utility lines in the vicinity of Parcel 15, Versar will proceed with the subsurface investigations at the Site.

Characterization of the soil and groundwater at potential source areas will be performed using a Geoprobe®-type, hydraulic-push, sampling technology (Geoprobe). Investigation of plume extent will comprise the collection of one grab groundwater sample and one soil sample from eight boreholes, and subsequent chemical analysis of each collected sample for volatile organic compounds by EPA Method 8260. If obviously contaminated soil is encountered during the investigation, the sample will be collected from the area of greatest observed contamination.

All subsurface samples will be collected under the direction of a California-registered Geologist. Groundwater and soil samples will be immediately sealed, properly labeled, placed in an ice-filled cooler at 4° Celsius, and transported under chain-of-custody protocol to McCampbell Analytical Laboratory, a California-certified hazardous waste analytical laboratory, for analysis. Samples will be analyzed for the following compounds:

- VOCs by EPA Method 8260 for soil and water.

Upon completion of sampling activities, boreholes will be backfilled with grout to the ground surface. Soil cuttings and equipment decontamination water associated with drilling and sampling activities will be stored on-site in sealed, labeled 55-gallon drums pending receipt of the soil and groundwater analytical data from the investigation.

Task 4 - Risk and Impact Characterization

Based on use of assumed worst-case soil and groundwater VOC concentrations collected during the Task 3 investigation, Versar will perform an American Society of Testing Materials (ASTM) Standard E 1739-compliant risk-based correction action (RBCA) analysis for risk-based cleanup screening levels applicable for use of the Site for residential housing. In addition, Versar will assess potential impacts to groundwater resource beneficial uses in the study area. Based on the results of the RBCA and groundwater beneficial use assessments, Versar will identify areas for cleanup, if any.

Task 5 - Reporting

Versar will prepare and submit to Alameda County Health Agency a report documenting project activities, analytical data, boring logs, risk and beneficial use data, and recommendations for additional work, if any. Scale figures will be included in the report, and data will be summarized in tables. Permits, analytical data and project chain-of-custody records will be included as appendices.

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Currently, installation of the passive soil vapor sample collectors is scheduled to occur on October 12, 1998. Mr. Tim Berger, R.G., will serve as the project manager for the investigation. If you have any questions or require additional information regarding this letter workplan, please call me at (916) 863-9323.

Sincerely,

Tim Berger, R.G., H.G.
Supervising Geoscientist
Environmental Management Division

cc.: Mr. Rod Freitag - County of Alameda GSA

Attachments:
Attachment I - Health and Safety Plan
Attachment II - Figure 1, Passive Soil Gas Sample Location Map
Attachment III - EMFLUX® System Information

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ATTACHMENT I

Health and Safety Plan

Versar INC.

HEALTH AND SAFETY PLAN

FOR

SANTA RITA PROPERTY
PARCEL 15
DUBLIN, CALIFORNIA

Prepared for:

Alameda County
General Services Agency
1400 Lakeshore Blvd.
Oakland, California

Prepared by:

Versar INC.
7844 Madison Avenue, Suite 167
Fair Oaks, California 95628

Versar Project No. 4128-003

Versar INC.

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Versar INC.

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Versar INC.

1.0 INTRODUCTION

1.1 Background

Alameda County General Services Agency has retained Versar, Inc. to conduct a soil vapor, soil, and groundwater investigation at the Santa Rita Property-Parcel 15 in Dublin, California.

1.2 Site Characterization

Client Name: Alameda County General Services Agency

Location of Site: Santa Rita Property
Parcel 15
Dublin, California

Client Contact Person(s): Name: Mr. Rod Freitag

Topography of the area surrounding the site:

Hilly ___ Flat _X__ Hummocky ____ Marshy ____
Mountainous ____ Other ____

Area affected:

Urban ____ Rural __X__ Residential ____ Industrial____ Commercial ___
Other ___

Types of bodies of water bordering the site, if any:

Stream ____ River ____ Pond ____ Lake ____ Bay ___Ocean ____ Other
____ None _X__

Are the services being provided as a consequence of orders from local, state, or federal officials?

Yes ___ No __X__

1.3 Purpose

The primary purpose of the site safety plan is to provide Versar field personnel and subcontractors with an understanding of the potential chemical and physical hazards that exist or may arise while the tasks of this project are being performed. The site safety plan follows the guidelines set forth in the Corporate Health and Safety Manual; the Injury Illness and Prevention Program (IIPP); and the Medical Monitoring Program. Additionally, the information contained herein will define the safety precautions necessary to respond to such hazards should they occur.

1.4 Objective

The primary objective of the site safety plan is to ensure the well-being of field personnel and the community surrounding the Site. In order to accomplish this, project staff and approved subcontractors shall acknowledge and adhere to the policies and procedures established herein. Accordingly, personnel assigned to this project shall read this site safety plan and sign the Agreement Statement in Section 8.1 to certify that they have read, understood, and agreed to abide by its provisions. Versar personnel shall perform work in compliance with standards set forth in the Corporate Health and Safety Manual and the IIPP.

1.5 Hazard Determination

Serious ____ Moderate ____ Low __X_ Unknown ____

1.6 Level of Protection

__X_ Modified level D

The minimum acceptable level of protection at this Site is a Modified Level D, as described in Section 5.0 entitled "Health and Safety Requirements."

1.7 Amendments

Any change in the scope of this project and/or Site conditions must be amended in writing in Section 8.2 entitled "Site Safety Plan Amendment Sheet" and approved by the Regional Health and Safety Officer.

2.0 PROJECT PERSONNEL

Versar will oversee and act accordingly during all phases of the project. The following management structure will be instituted for the purpose of successfully and safely completing this project.

2.1 Project Manager: Mr. Tim Berger, Supervising Geologist

The Project Manager will be responsible for implementing the project, the site safety plan, and the IIPP, and obtaining any necessary personnel or resources for the completion of the project. Specific duties will include:

- providing authority and resources to ensure that the Site Safety Officer is able to implement and manage safety procedures;
- preparing reports and recommendations about the project to clients and affected Versar personnel;
- ensuring that all persons allowed to enter the Site (i.e., EPA, contractors, state officials, visitors) are made aware of the potential hazards associated with the substances known or suspected to be on Site and are knowledgeable as to the location of the on-site copy of the specific site safety plan;
- ensuring that the Site Safety Officer is aware of all of the provisions of this site safety plan and is instructing all personnel on Site about the Site practices and emergency procedures defined in the plan; and
- ensuring that the Site Safety Officer is making an effort to monitor the Site safety and has designated a Field Team Leader to assist with the responsibility when necessary.

2.2 Regional Health and Safety Officer: Mr. Chris Brown

The Regional Health and Safety Officer shall be responsible for the overall coordination and oversight of the site safety plan. Specific duties will include:

- approving the selection of the types of personal protective equipment (PPE) to be used on Site for specific tasks;

- monitoring the compliance activities and the documentation processes undertaken by the Site Safety Officer as required in the Corporate Health and Safety Manual, the IIPP, and the Medical Monitoring Program;

- evaluating weather and chemical hazard information and making recommendations to the Project Manager about any modifications to work plans or personal protection levels in order to maintain personal safety;

- coordinating upgrading or downgrading of PPE with the Site Safety Officer, as necessary, due to changes in exposure levels, monitoring results, weather, or other site conditions;

- approving all field personnel working on Site, taking into consideration their level of safety training, their physical capacity, and their eligibility to wear the protective equipment necessary for their assigned tasks (i.e., respirator fit testing results and Medical Monitoring Program requirements); and

- overseeing the air-monitoring procedures as they are carried out by site personnel for compliance with all company health and safety policies.

2.3 Site Safety Officer: Mr. Philip Cox, Senior Associate Geologist

The Site Safety Officer shall be responsible for the implementation of the site safety plan and IIPP on Site. Specific duties will include:

- monitoring the compliance of field personnel for the routing and proper use of the PPE that has been designated for each task;

- routinely inspecting PPE and clothing to ensure that they are in good condition and are being stored and maintained properly;

- stopping work on the Site or changing work assignments or procedures if any operation threatens the health and safety of workers or the public;

- monitoring personnel who enter and exit the Site and all controlled access points;

- reporting any signs of fatigue, work-related stress, or chemical exposures to the Project Manager and the Regional Health and Safety Officer within 24 hours, as directed in the Corporate Health and Safety Manual and the IIPP;

- dismissing field personnel from the site if their actions or negligence endangers themselves, co-workers, or the public and reporting the same to the Project Manager and the Regional Health and Safety Officer within 24 hours, as directed in the Corporate Health and Safety Manual and IIPP;

- reporting accidents or violations of the site safety plan to the Project Manager and/or Regional Health and Safety Manager within 24 hours, as directed by the Corporate Health and Safety Manual and the IIPP;

- knowing emergency procedures, evacuation routes, and the telephone numbers of the ambulance, local hospital, poison control center, fire and police departments, per the site safety plan;

- ensuring that all project-related personnel have signed the personnel agreement and acknowledgments form contained in this site safety plan;

- coordinating, upgrading, and downgrading of PPE with the Regional Health and Safety Officer, as necessary, due to changes in exposure levels, monitoring results, weather, and other Site conditions; and

- performing air monitoring with approved instruments in accordance with requirements stated in this site safety plan.

2.4 Field Team Leader: Mr. Philip Cox, Senior Associate Geologist

In the event that the Project Manager and the Site Safety Officer are not on the Site, the Field Team Leader will assume responsibility for enforcing the safety procedures described in this site safety plan, the Corporate Health and Safety Manual, and the IIPP.

2.5 Field Personnel

All field personnel shall be responsible for acting in compliance with safety procedures outlined in this site safety plan, the Corporate Health and Safety Manual, and the IIPP. Any hazardous work situations or procedures should be reported to the Site Safety officer so that corrective steps can be taken. The Regional Health and Safety Officer and/or Site Safety Officer has the authority to halt any operation that does not follow the provisions of this site safety plan.

Versar INC.

3.0 EMERGENCIES

In the event of an accident or emergency situation, immediate action must be taken by the first person to recognize the event. First aid equipment is located on Site inside the Versar vehicle. Immediately after emergency procedures are implemented, notify (1) the Site Safety Officer and (2) the Project Manager and the Regional Health and Safety Officer about the situation.

3.1 Emergency Telephone Numbers

Immediate Emergencies:

Local Police:	911
Fire:	911
Ambulance:	911
Medical:	911

Medical Emergency:

ValleyCare Medical Center
5555 W. Las Positas Boulevard
Pleasanton, California
(510) 847-3000

Directions to ValleyCare Medical Center:

From the site, go east to Hacienda Drive, turn right (south) onto Hacienda Drive to Owens Drive. Turn left (east) onto West Las Positas Boulevard and immediately left into the Medical Center Complex. Stay to the right and follow the signs to the urgent care unit.

Environmental Emergency:

Versar, Inc.	(916) 962-1612
OSHA	(800) 648-1003
Poison Control Center	(800) 532-2222
National Response Center	(800) 424-8802

3.2 Encountering Hazardous Situations (requiring evacuation)

Personnel encountering a hazardous situation shall **instruct others on site to evacuate the vicinity IMMEDIATELY** and call the (1) Site Safety Officer, (2) the Project Manager, and (3) the Regional Health and Safety Officer for instructions.

The Site must not be re-entered until the situation has been corrected (i.e., appropriate back-up help, monitoring equipment, and PPE are at the Site).

Usual Procedures for Injury

A. Call for ambulance/medical assistance if necessary. Notify the receiving hospital of the nature of the physical injury or chemical overexposure. If a telephone is not available, transport the person to the nearest hospital and have another person inform the hospital, at the nearest phone, of the route taken to the hospital and the description of the transporting vehicle.

B. Send/take this site safety plan, with the attached Material Safety Data Sheet (MSDS) if available, to the medical facility with the injured person. Complete the required forms.

C. If the injury is minor, proceed to administer first aid, and notify the Site Safety Officer, the Project Manager, and the Regional Health and Safety Officer. Complete the required forms.

D. Notify the Site Safety Officer, Project Manager, and Regional Health and Safety Officer of accidents, incidents, or near miss situations. Ensure that required procedures in the Corporate Health and Safety Manual and IIPP are followed.

3.3 Emergency Treatment

When transporting an injured person to a hospital, bring this site safety plan to assist medical personnel with injury diagnosis and treatment. In cases of chemical overexposure, follow standard procedures as outlined below for poison management, first aid, and if applicable, cardiopulmonary resuscitation. Four different routes of exposure and their respective first aid/poison management procedures are outlined below:

A. Ingestion:

IMMEDIATELY transport the person to the nearest medical facility, or call **911**

B. Inhalation/Confined Space:

DO NOT ENTER A CONFINED SPACE TO RESCUE A PERSON WHO HAS BEEN OVERCOME UNLESS PROPERLY EQUIPPED AND A STANDBY PERSON IS PRESENT.

C. Inhalation/Other:

Move the person from the containment environment. Initiate CPR, if necessary. Call, or have someone call, for medical assistance. Refer to Material Safety Data Sheet for additional specific information. If necessary, transport the victim to the nearest hospital as soon as possible and have someone contact the hospital with the description of the transporting vehicle and the route taken to the hospital.

D. Skin Contact:

IMMEDIATELY wash off skin with a large amount of water. Remove any contaminated clothing and rewash the affected skin. Transport the person to a medical facility, if necessary.

E. Eyes:

Hold eyelids open and rinse the eyes IMMEDIATELY with copious amounts of water for 15 minutes. If possible, have the person remove his/her contact lenses (if worn). Never permit the eyes to be rubbed. Transport the person to a hospital as soon as possible and notify the hospital of the route taken to their facility and the description of the transport vehicle.

4.0 CHEMICALS OF CONCERN

4.1 Chemical Hazards

The potential effect of any exposure is dependent upon several factors: toxicity of substance, length of time of exposure, concentration of substance producing the exposure, general health of person exposed, and individual use of hazardous reduction methods.

4.1.1 PCE

Tetrachloroethylene is a manufactured chemical that is widely used for dry cleaning of fabrics and for metal-degreasing. It is also used to make other chemicals and is used in some consumer products.

Other names for tetrachloroethylene include perchloroethylene, PCE, and tetrachloroethene. It is a nonflammable liquid at room temperature. It evaporates easily into the air and has a sharp, sweet odor. Most people can smell tetrachloroethylene when it is present in the air at a level of 1 part tetrachloroethylene per million parts of air (1 ppm) or more, although some can smell it at even lower levels.

High concentrations of tetrachloroethylene (particularly in closed, poorly ventilated areas) can cause dizziness, headache, sleepiness, confusion, nausea, difficulty in speaking and walking, unconsciousness, and death. Irritation may result from repeated or extended skin contact with it.

4.1.2 TCE

Trichloroethylene is a nonflammable, colorless liquid with a somewhat sweet odor and a sweet, burning taste. It is used mainly as a solvent to remove grease from metal parts, but it is also an ingredient in adhesives, paint removers, typewriter correction fluids, and spot removers

Breathing large amounts of trichloroethylene may cause impaired heart function, coma, and death. Breathing it for long periods may cause nerve, lung, kidney, and liver damage. Breathing small amounts for short periods of time may cause headaches, lung irritation, dizziness, poor coordination, and difficulty concentrating. Drinking large amounts of trichloroethylene may cause nausea, liver and kidney damage, convulsions, impaired heart function, coma, or death. Drinking small amounts of trichloroethylene for long periods may cause liver and kidney damage, nervous system effects, impaired immune system function, and impaired fetal development in pregnant women, although the extent of some of these effects is not yet clear. Skin contact with trichloroethylene for short periods may cause skin rashes.

4.1.3 Carbon Tetrachloride

Carbon tetrachloride is a manufactured compound that does not occur naturally. It's a clear liquid with a sweet smell that can be detected at low levels. It's also called carbon chloride, methane tetrachloride, perchloromethane, tetrachloroethane, or benziform. Trade names include Benzinoform, Freon 10, Halon 104, Tetraform, or Tetrasol.

Carbon tetrachloride is most often found as a colorless gas. It's not flammable and doesn't dissolve in water very easily. It was used in the production of refrigeration fluid and propellants for aerosol cans, as a pesticide, as a cleaning fluid and degreasing agent, in fire extinguishers, and in spot removers. Because of its harmful effects, these uses are now banned and it is only used in some industrial applications.

High exposure to carbon tetrachloride can cause liver, kidney, and central nervous system damage. These effects result from either eating, drinking, or breathing it, and possibly from exposure to the skin. The liver is especially sensitive to carbon tetrachloride because it swells and cells are damaged or destroyed. Kidneys are also damaged, causing a buildup of wastes in the blood. If exposure is low and then stops, the liver and kidneys can repair the damaged cells and function normally again.

If exposure is very high, the nervous system, including the brain, is affected. People may feel intoxicated and experience headaches, dizziness, sleepiness, and nausea and vomiting. These effects may subside if exposure is stopped, but in severe cases, coma and even death can occur.

4.1.4 Chloroform

Chloroform is a colorless liquid with a pleasant, nonirritating odor and a slightly sweet taste. It will burn only when it reaches very high temperatures.

Breathing about 900 parts of chloroform per million parts air (900 ppm) for a short time can cause dizziness, fatigue, and headache. Breathing air, eating food, or drinking water containing high levels of chloroform for long periods of time may damage your liver and kidneys. Large amounts of chloroform can cause sores when chloroform touches your skin.

4.2 Physical Hazard

Physical hazards are those typically associated with general construction. Slips, trips, and falls are of primary concern in accident prevention. The contractor will exercise care to maintain good housekeeping practices within the excavation area. The excavation will be closed off with caution tape and barricades when work is not in progress. The excavation is not expected to exceed 5 feet in depth. The excavation will be sloped as needed.

4.2.1 Heavy Equipment

The more severe accidents will be related to the use of heavy equipment. During activities, trucks, excavation, and steam cleaning equipment will be used. All heavy equipment used on this project will be in good working order and operated in accordance with recognized industry standard and Cal-OSHA Title 8, Subchapter 4, Construction Safety Orders. Safety maintenance checks of all equipment shall be conducted just prior to the start of each work day. Employers and workers at the site shall comply with all Cal OSHA requirements including personal protection, safety, training, and safety planning rules. Removal activities that pose imminent hazard to site personnel will not be permitted. All cables, slings, and locks will be inspected daily by the contractor to insure that they are in safe working order.

5.0 HEALTH AND SAFETY REQUIREMENTS

5.1 Work Zone Access

If significant contamination is encountered within a 30-foot radius of any on-site operation, access is prohibited to all but Versar field personnel and subcontractors. PPE, indicated in Section 5.4, will be worn by all on site field personnel, including the subcontractor's personnel.

Exclusion Zones

Formal exclusion zones will be setup at the Site to prevent tourists from entering the work area. Caution tape and barricades will be used to mark the exclusion zone. Unauthorized personnel will not be permitted near the work zone area.

Decontamination Zone

If a formal decontamination zone is required, it will be sited upwind from the work zone area. (Decontamination procedures are covered in Section 5.5.) Site personnel will be required to follow the procedures as reported in the corporate Health and Safety Manual.

Support Zones

No formal requirements will be necessary for the support zone area, although the general practice of locating the zone in the upwind direction will be followed. Heavy equipment will be located such as not to interfere with tourist activities. Public notification signed warning of heavy equipment will be displayed throughout the area.

5.2 Air/Gas/Vapor Monitoring Procedures

The greatest potential hazards to safety and health at this Site include:

1) Exposure to petroleum vapors

2) Exposure to chemical contamination through skin contact and ingestion.

In the event that soil and/or groundwater petroleum hydrocarbon contamination is encountered, ongoing air monitoring during project tasks will provide data to ensure that vapor concentrations are within acceptable ranges and that adequate selection criteria for respiratory and dermal protection are provided.

- If PID/FID readings exceed 100 ppm, air purifying respirators with organic cartridges must be worn by all Site workers within any area where monitoring results exceed 100 units.

- If PID/FID readings exceed 150 ppm, Level B protection will be required. Personnel must leave the Site immediately and contact the Site Safety Officer or the Regional Health and Safety Manager for further instructions.

- Respirator cartridges will be changed a minimum of once per day. This can be accomplished at the end of the work day during respirator decontamination. If odor breakthrough is detected while wearing the respirator or breathing becomes difficult, the cartridge will be changed immediately.

5.3 Action Levels/Level of Personal Protection Equipment (PPE)

Air Monitoring Instrument Reading	LEVEL D <100 units	LEVEL C 100-150 units	LEVEL B >150 units

5.4 PPE

Modified Level D is the minimum acceptable level for this Site. Modified Level D provides minimal dermal protection. Respiratory protection is optional unless air monitoring data indicates otherwise.

Modified Level D includes:

- coveralls/work uniform
- Tyvek (optional)
- Nitrile, butyl-rubber or Viton gloves with disposable nitrile liner (optional)
- boots/shoes, leather or chemical resistant, with steel shank and approved toe protection
- approved safety glasses or chemical splash goggles if the potential for splash exists
- hard hat

- reflective traffic vest (if traffic, construction, or other related activities are present)
- hearing protection (as appropriate)
- respiratory protection (as necessary)

B. Additional equipment upgrade:

1. Protocols for upgrading

Once air monitoring data are complete and results are tabulated on the initial Site entry, the Site Safety Officer and/or Regional Health and Safety Officer will determine whether changes in PPE are needed.

2. Upgraded equipment

a. Respirators

Respirators with organic vapor cartridges shall be worn by all personnel if PID readings exceed 50 units.

b. Other

Tyvek suits and appropriate gloves shall be worn if potential for dermal exposure exists while performing job tasks.

C. First Aid Equipment

First aid equipment for this Site is the responsibility of the Site Safety Officer.

Vehicles used for Site work will be equipped with a first aid kit and safety equipment including:

- cones and flags
- barricades
- fire extinguisher
- water, suitable for drinking
- portable eye wash
- complete first aid kit
- cell phone

5.5 Decontamination Procedures

All operations conducted at this Site have the potential to contaminate field equipment and PPE. To prevent the transfer of any contamination to vehicles, administrative areas, and other personnel, the following procedures must be followed:

1. Whenever possible, field equipment should be decontaminated with a solution of Alconox or Green Soap and thoroughly rinsed with water prior to leaving the Site. This must be done outside a 10-foot radius of any work area or the hot zone.

2. Disposable PPE (for example, Tyvek suits, respirator cartridges) must be bagged and disposed of appropriately.

Personal Decontamination

Level D: Segregated Equipment Drop
- wash/rinse outer boot (as appropriate)
- wash/rinse chemical resistant outer glove, then remove as appropriate
- remove and throw out inner disposable nitrile liner gloves in designated, lined receptacles

Level C: Segregated Equipment Drop
- wash/rinse outer boots
- wash/rinse chemical resistant outer gloves, then remove tape and gloves
- remove chemical resistant suit (remove by rolling down suit from the inside)
- remove outer boots
- remove first pair(s) of disposable gloves
- remove respirator, hard hat/faceshield and properly dispose of cartridges; wash respirator
- remove last pair of disposable nitrile liner gloves

Level B: Segregated Equipment Drop
- wash/rinse outer boots
- wash/rinse chemical resistant outer gloves
- cross hotline (into clean area) and change air tanks, then redress or
- cross hotline (into clean area)
- remove boots and gloves
- remove SCBA, if worn over chemical resistant suit
- if SCBA is worn under the suit, remove the chemical resistant suit, then the SCBA

- remove hard hat
- remove disposable nitrile liner gloves

5.6 Excavation Procedures

A digsafe number must be obtained from the appropriate agency prior to drilling, excavation or trenching. To determine presence of subsurface metal utility lines, tanks and/or drums (if suspected), a metal detector should be used before excavating on a Site.

During the operation, two persons (one designated as "operator" and the other as the "helper") must be present at all times. The helper (whether Versar personnel or subcontractors) must be instructed as to the whereabouts of the emergency shut-off switch. Every attempt must be made to keep unauthorized personnel from entering the work area. If this is not possible, the operation should be shut down until the area is cleared. The Site Safety Officer or the Field Team Leader has the authority and responsibility to shut down the excavating operations whenever a hazardous situation is deemed present.

The arm of any equipment should maintain a preferred clearance of 20 feet from any overhead electrical cables, with 10 feet being the minimum. All operations will immediately cease during any hazardous weather conditions. Hard hats and safety boots shall be worn at all times. Caution tape will be used to mark off the excavation.

5.7 Electrical Equipment and Ground Fault Circuit Interrupters

All electrical equipment and power cables used in and around wells or structures containing chemical contamination must be explosion-proof and/or intrinsically safe and equipped with a three-wire ground lead that has been rated as explosion-proof for hazardous atmospheres (Class 1 Div 1&2). In accordance with OSHA 29 CFR 1926.404, approved ground fault circuit interrupters (GFCI) must be utilized for all 120 vault, single-phase, 15-and 20-amp receptacle outlets on the Site that are in use by employees and that are not part of the permanent wiring as defined by the NEC 1987. Receptacles on the ends of the extension cords are not part of the permanent wiring and therefore, must be protected by GFCI's whether or not the extension cord is plugged into permanent wiring.

The GFCI is a fast-acting circuit breaker that senses small imbalances in the circuit caused by current leakage to ground, and in a fraction of a second, shuts off the electricity. However, the GFCI will not protect the employee from line-to-line contact hazards such as a person holding two "hot" wires or a hot and neutral wire in each hand. The GFCI does provide protection against the most common form of electrical hazard, the ground fault. It also provides protection against fires, overheating, and destruction of wire insulation.

GFCI's can be used successfully to reduce electrical hazards on construction sites. Tripping of GFCI's interruption of current flow, is sometimes caused by wet connectors and tools. It is good practice to limit exposure of connectors and tools to excessive moisture by using watertight or sealable connectors. Providing more GFCI's on shorter circuits can prevent tripping caused by the cumulative leakage from several tools or by leakages from extremely long circuits. (Adapted from OSHA 3007; Ground-Faulting Protection on Construction Sites - 1987.)

5.8 Fire Protection

Only approved metal cans will be used to transport and store flammable liquids. All gasoline and diesel-driven engines requiring refueling must be shut down and allowed to cool before filling. No open flame or spark is allowed in any area containing petroleum products or other flammable liquids.

Smoking is not allowed during any operations within the work area in which petroleum products or solvents in free-floating, dissolved or vapor forms, or other flammable liquids may be present.

5.9 General Health

Medicine and alcohol can increase the effects of exposure to toxic chemicals. Unless specifically approved by a qualified physician, prescription drugs should not be taken by personnel assigned to operations where the potential for absorption, inhalation, or ingestion of toxic substances exists.

Drinking and driving is prohibited at any time. Driving at excessive speeds is always prohibited. Skin abrasions must be thoroughly protected to prevent chemicals from penetrating the abrasion. It is recommended that contact lenses not be worn by persons working on the Site.

The elevation of the Site exceeds 6000 feet above mean sea level. Signs of elevation sickness will be monitored. If personnel appear short of breath they will not work immediately.

6.0 EMPLOYEE TRAINING

All Versar employees who may be exposed to hazards such as those mentioned in this Site safety plan are required to participate in an initial minimum of 40 hours of training to recognize, evaluate, and control Site hazards. Three days of supervised field-training is also included within the initial training program. Project manager level and above must also participate in an additional eight-hour supervisory training course. Once employees have received the above training, they receive a certificate of completion and are scheduled for an eight-hour refresher training session within one year of their initial training. Versar training includes specific details on the following:

- regulatory requirements
- confined space entry
- respiratory protection
- hazard communication
- decontamination procedures
- incident command system
- first aid/CPR
- air monitoring
- toxicology
- Prop. 65 (California)
- fire technology
- PPE
- IIPP

7.0 MEDICAL MONITORING PROGRAM

All Versar, Inc. field personnel are required to have annual medical evaluations in accordance with the company's Health and Safety Program policy. Additional re-evaluation will be considered in the event of chemical over-exposure while working on this Site.

The chemicals typical of this Site can affect specific organ systems producing characteristic health effects. The medical evaluation will, therefore, focus on the liver, kidney, nervous system, blood systems, and skin and lung function. Laboratory testing will include complete blood count, and applicable kidney and liver function tests. Other tests include skin examination.

Versar INC.

8.0 DOCUMENTATION

8.1 Site Safety Plan Agreement

In the situation that contamination is encountered which affect Site development personnel, all details of this site safety plan will be implemented. Versar personnel have the authority to stop work performed by our subcontractors at this Site if any work is not performed in accordance with the requirements of this site safety plan.

All Versar project personnel and subcontractor personnel are required to sign the following agreement prior to conducting work at the Site.

A. I have read and fully understand the site safety plan and my individual responsibilities.

B. I agree to abide by the provisions of the site safety plan.

Name	Company	Date	Signature

Versar INC.

8.2 Site Safety Plan Amendment Sheet

Project Name: _____

Project Number: _____

Location: _____

Changes in field activities or hazards:

Proposed Amendment:

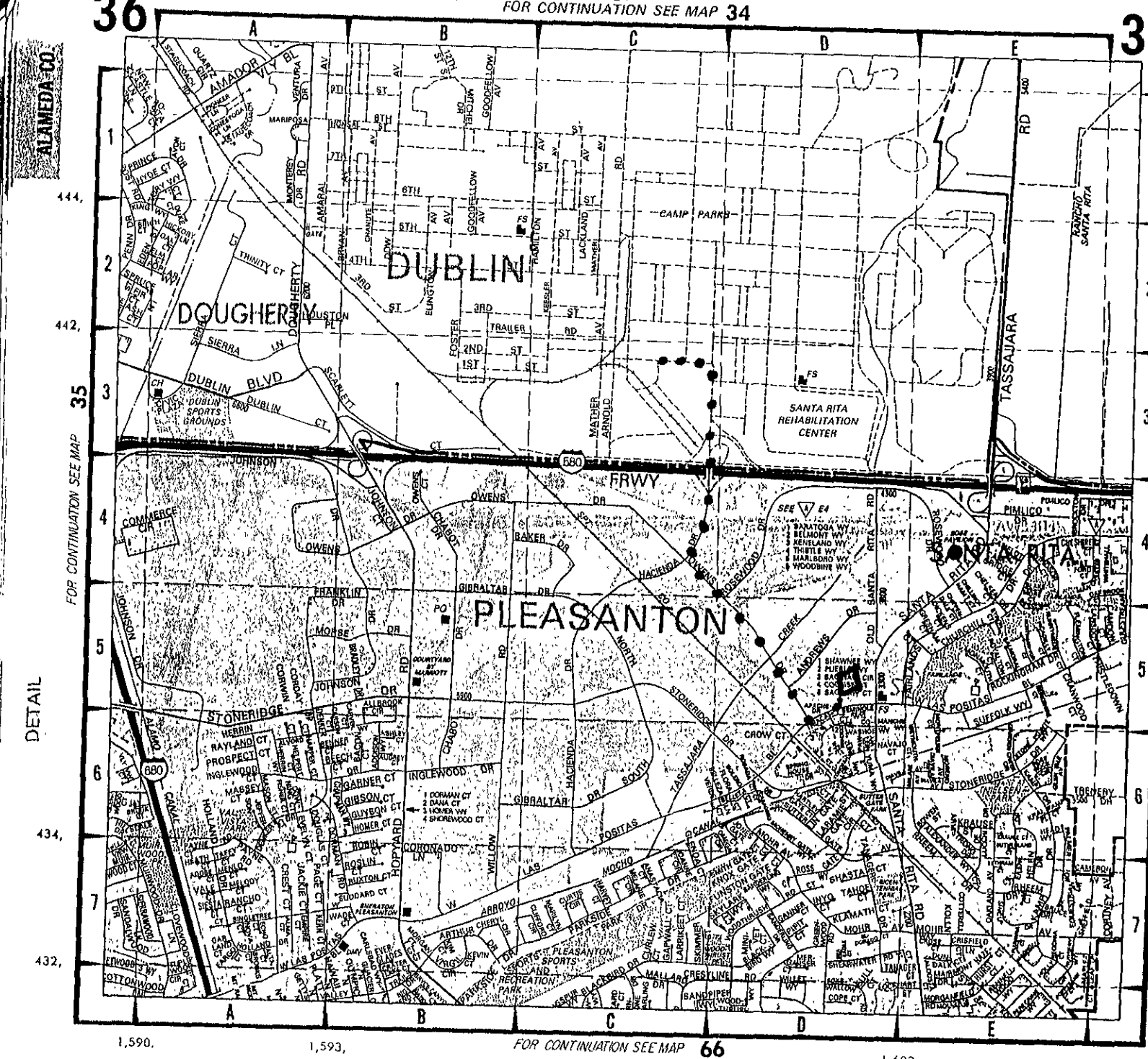
Proposed By:_____ Date _____

Approved By:_____ Date _____
Project Manager

_____ Date _____
Regional Health & Safety Officer

Declined By:_____ Date _____

Amendment Effective Date _____


36
FOR CONTINUATION SEE MAP 34
36
ALAMEDA CO.
DETAIL
FOR CONTINUATION SEE MAP 35
FOR CONTINUATION SEE MAP 39
FOR CONTINUATION SEE MAP 66
DUBLIN
DOUGHERTY
PLEASANTON
SANTA RITA
CAMP PARKS
SANTA RITA REHABILITATION CENTER
DUBLIN SPORTS GROUNDS
STONERIDGE
580 FRWY
680
444,
442,
434,
432,
1,590,
1,593,
1,602,
1,605,
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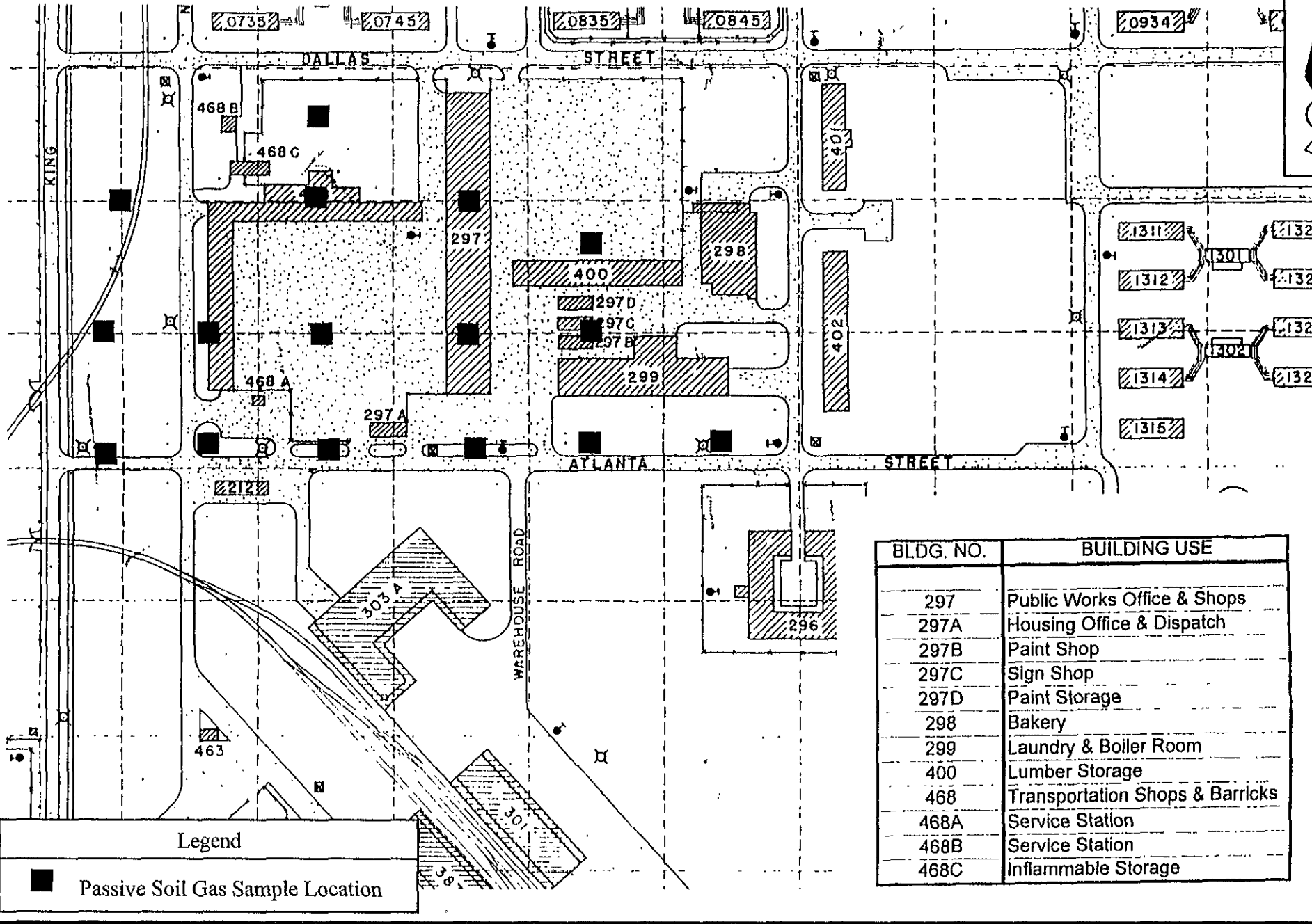
Versar INC.

DRAFT - NOT FOR RELEASE

ATTACHMENT II

Figure 1
Passive Soil Gas Sample Location Map



BLDG. NO.	BUILDING USE
297	Public Works Office & Shops
297A	Housing Office & Dispatch
297B	Paint Shop
297C	Sign Shop
297D	Paint Storage
298	Bakery
299	Laundry & Boiler Room
400	Lumber Storage
468	Transportation Shops & Barricks
468A	Service Station
468B	Service Station
468C	Inflammable Storage

Legend

■ Passive Soil Gas Sample Location

Prepared by: Phil Cox

Date: 9/9/98

Project No.: 4128-003

Versar Inc.
7844 Madison Ave.
Suite 167
Fair Oaks, CA 95628
(916) 962-1612

Passive Soil Gas Sample Location Map

Santa Rita Property - Parcel 15

Dublin, California

FIG 1

Versar INC.

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ATTACHMENT III

EMFLUX® System Information

Quadrel Services, Inc. 1896 Urbana Pike, Suite 20, Clarksburg, MD 20871

Tel: (301) 874-5510 • Fax: (301) 874-5567 • e-mail: quadrel@erols.com

Subject: THE EMFLUX® SOIL-GAS DETECTION SYSTEM

****Having the opportunity to bid on projects****

Good Morning:

We would appreciate the opportunity to provide you with **cost and procedural information** regarding use of the passive EMFLUX® Soil-Gas Detection System to detect soil and groundwater contamination.

As you may know, EMFLUX® has been used on commercial and federal projects throughout the United States and internationally longer than any other available passive soil-gas system. We have successfully completed numerous private-sector projects under both state and federal regulatory review, and many federal-facility projects, including Air Force Bases such as Edwards, Nellis, Hickam, Kirtland, Shaw, Griffiss, Maxwell, Hill, Bergstom, Eielson, Davis-Monthan, Cannon, Roswell, Wright-Patterson, Hanscom, Otis, Eglin, Hamilton; Army facilities such as Anniston, Edgewood, Ft. Benjamin Harrison, Ft. Sheridan, Detroit Arsenal, Sunflower, Pueblo; Naval facilities such as Former Naval Air Station Agana (Guam), Naval Surface Weapons Station (NJ), Marine Corps Logistic Center (GA); DOE facilities such as the Hanford Reservation and the Los Alamos, Sandia, Idaho, and Oak Ridge National Laboratories; and on many Superfund and Brownfield sites.

Currently EMFLUX® is listed in EPA's VendorFACTS Database of Innovative Site Characterization Technologies and on the Interstate Technology & Regulatory Cooperation (ITRC) Workgroup website. The System has a demonstrated and field-tested ability to detect VOCs and SVOCs with unusually high degrees of accuracy. In its formal evaluation at an EPA Las Vegas test site in 1989, EMFLUX® obtained a correlation coefficient of 0.91: and has since then maintained this exceptional standard of sensitivity and reliability.

EMFLUX® is simple to use. Collectors are placed in the ground to a minimum depth of three inches (see enclosure). Deployment and retrieval each typically require less than two minutes (exclusive of time required to drill and repatch holes in artificial caps), and are left there for just three days.

To protect the levels of sensitivity and accuracy attained in the field. EMFLUX® samples are thermally desorbed or solvent-extracted and analyzed with one of several standard or modified EPA Methods, including 8015B, 8020, 8021, 8260, 8270, and 8330 -- all of them incorporating extensive laboratory QA/QC procedures.

The EMFLUX® Edge

Equipment and Method Overview 1997

The EMFLUX® System

The EMFLUX® Soil-Gas Detection System is a reliable and accurate screening technology used for expedited site investigations of VOCs and SVOCs.

EMFLUX® is useful for simultaneously tracking the three primary contaminant pathways: soil, groundwater, and the resulting vapor emissions.

The EMFLUX® Kit

EMFLUX® Kits are small and lightweight. There are no pumps or cumbersome equipment, and no capital investment is required. The Kits and Collectors are returned to our laboratories after use.

Each Kit contains all that is needed to conduct a successful survey, except for a hammer and any drilling equipment needed to penetrate concrete or asphalt caps.

The System is exceptionally easy-to-use and requires no training prior to use. One person can emplace over 100 Collectors per day. Each Collector requires around two minutes to emplace or retrieve (exclusive of the time required to drill through concrete or asphalt).

Collector Emplacement

Sample Points on Open Ground:

- Make a hole by hammering the metal rod about three inches into the soil.
- Remove the shipping cap from the Collector vial containing the adsorbent trap and replace it with a sampling cap.
- Extend the retrieval wire, which comes wrapped around the Collector.
- Place the Collector into the hole, sampling cap down.
- Cover with available soils

Sample Points under Surfacing:

- Drill a 1-1/2" diameter hole through the surfacing to the soils.
- Cut a sanitized metal sleeve (provided by Quadrel) to appropriate length and insert in hole.
- To deploy Collector, follow steps for Sample Points on Open Ground; plug the hole with aluminum foil and quick-set patching compound rather than available soil.

Collector Retrieval

All Collectors are retrieved three days later. The shipping caps are replaced and the samples are returned to the Kit, which is then shipped to the laboratory for sample analysis.

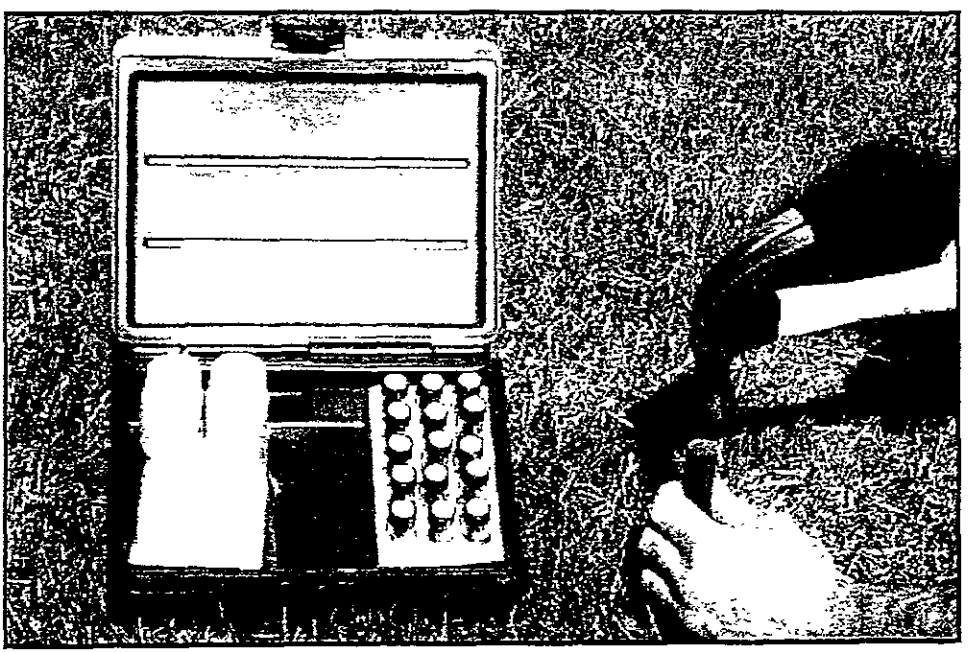


Figure 1: Standard EMFLUX® Equipment and Kit

Web Site: www.emflux.com

The EMFLUX® Collector

Collector Emplacement

Sample Points In Open Soils:

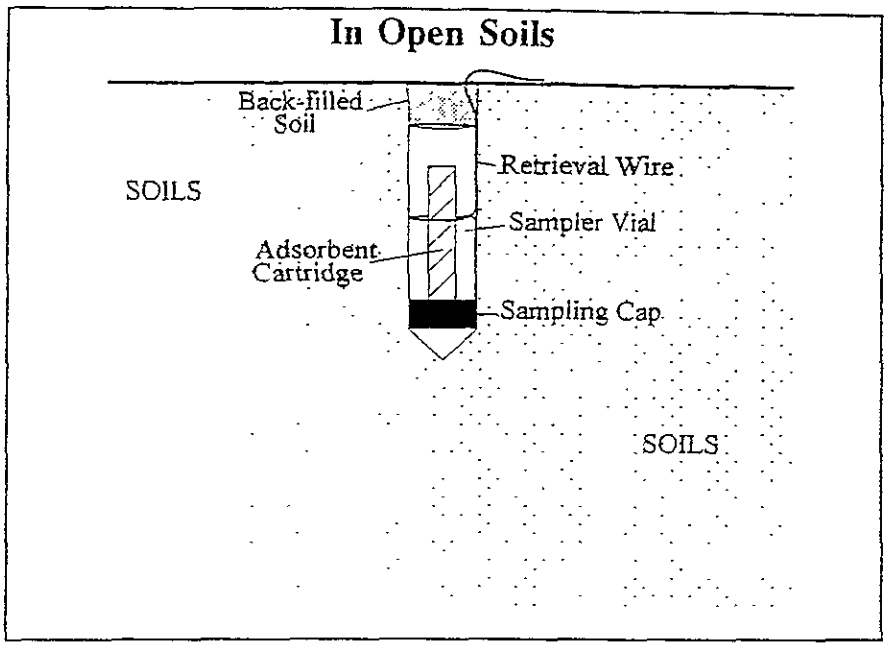
- Make a hole by hammering the metal rod about three inches into the soil.
- Remove the shipping cap from the Collector vial containing the adsorbent trap and replace it with a sampling cap.
- Extend the retrieval wire, which comes wrapped around the Collector.
- Place the Collector into the hole, sampling cap down.
- Cover Collector with soil.

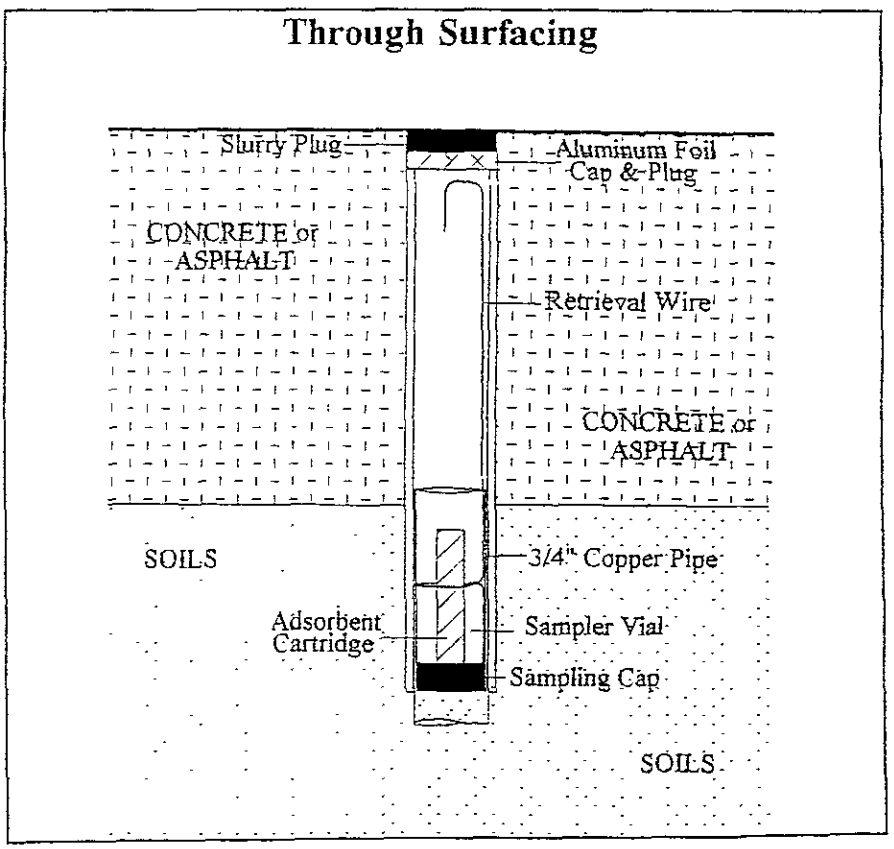
Sample Points Through Surfacing:

- Drill a 1-1/2" diameter hole through the surfacing to the soils.
- Cut a sanitized metal sleeve (provided by Quadrel) to appropriate length and insert in hole.
- To deploy Collector, follow steps for Sample Points In Open Soils; plug the hole with aluminum foil and patching compound.

Collector Retrieval

All Collectors are retrieved three days after deployment. Shipping caps are replaced and samples are returned to the Kit and shipped to the laboratory for analysis.





Quadrel's GC Analyte Lists

EPA Method 8021 Commonly Selected Analytes

Benzene
Bromoform
Carbon Tetrachloride
Chlorobenzene
Chloroform
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethene
cis-1,2-Dichloroethene
trans-1,2-Dichloroethene
cis-1,3-Dichloropropene
trans-1,3-Dichloropropene
Ethylbenzene
MTBE
Methylene Chloride
1,1,2,2-Tetrachloroethane
Tetrachloroethene (PCE)
Toluene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethene (TCE)
Xylene(s)

Total Halogenated Hydrocarbons (THH)*

EPA Method 8015B Commonly Selected Analytes

Benzene
Toluene
Ethylbenzene
Xylene(s)
MTBE
1,2,4-Trimethylbenzene
1,3,5-Trimethylbenzene
Naphthalene

Total Petroleum Hydrocarbons (TPH)**

Please Note:

Other compounds are available on request, as are other GC Methods (*e.g.*, 8020) and GC/MS Methods (*e.g.*, modified 8260 and/or 8270).

* The THH value reflects Halogenated Hydrocarbon VOCs.

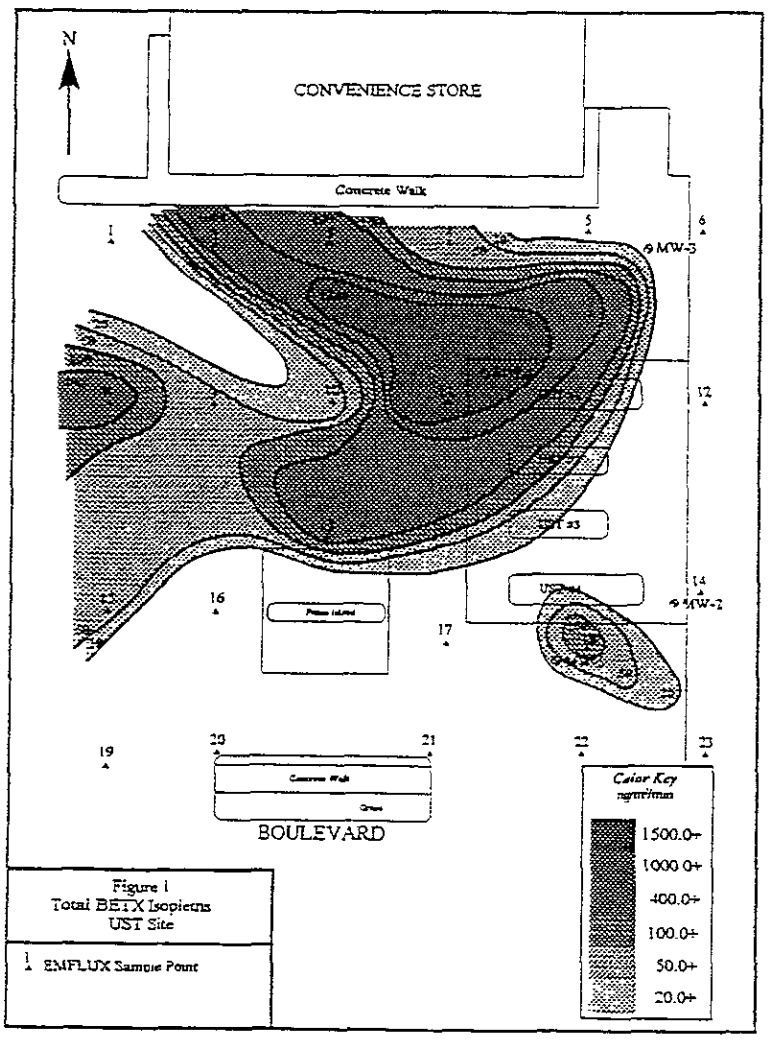
** The TPH value reflects Aromatic Hydrocarbons from Benzene through Naphthalene and Aliphatic Hydrocarbons from C_2 through C_{16} (plus ketones, alcohols, ethers).

Tracking BETX Contamination at a UST Site Using the EMFLUX® Soil-Gas Detection System

Background

An environmental engineering firm required an accurate characterization of fuel-related contamination in soils and ground water at an East Coast underground storage tank (UST) site near the ocean. The site consisted of the area surrounding four USTs and several gasoline pumps at an urban convenience store. Hydrologic flow in the area had been determined to be variable, flowing northwestward at certain times and southwestward at others. Depth to ground water in the area was also variable, being that the surficial aquifer was unconfined and thus free to rise and fall in response to seasonal variations in discharge and recharge.

The firm chose to use the highly rated EMFLUX® Soil-Gas Detection System, a noninvasive, passive soil-gas system, which has a demonstrated ability to detect VOCs and SVOCs with a high degree of accuracy. Field personnel deployed 23 low-profile, easy-to-use EMFLUX® Collectors in a modified grid pattern and retrieved them after a three day exposure period. Operations at the convenience store were not disturbed at any time during the survey. The samples were analyzed with GC/MS equipment following EPA Method 8240 (Modified), which allows the most sensitive, compound-specific identification of contaminants while virtually eliminating false negatives and compound masking.



Results

EMFLUX® data revealed considerable fuel-related contamination in the soil or ground water beneath the site. As **Figure 1** shows, a plume of BETX contamination was found originating near UST #1 and migrating northwestward toward the convenience store; Aliphatic Hydrocarbon contamination was found in a congruent pattern. Subsequent follow-on drilling at the site confirmed the EMFLUX® data, showing that the fuel-plume had in fact migrated both off-site and beneath the convenience store.

CASE STUDY:
Characterizing Methane Generation at a 20-Year-Old Landfill with the EMFLUX® Soil-Gas Detection System

Summary

As input to the remedial design phase of a midwest Superfund project, the government agency in charge of the work needed an estimate of annual methane generation at a 45-acre former landfill. And, although document searches and previous work at the landfill had indicated that methane production was not a concern, site investigators elected to confirm that conclusion by hiring Quadrel Services to perform an EMFLUX® Methane Survey of the landfill and surrounding areas within 50 feet of its boundaries. Survey results showed that more than 70 percent of the landfill was actively generating methane and that significant production was occurring in areas outside the assumed southern boundary of the landfill.

Background

The landfill, constructed without liner or leachate- or gas-recovery system, operated between 1960 and 1976, accepting primarily chemical and other industrial waste, including demolition and construction debris. However, the facility was also rumored to have received limited amounts of household waste. Thus, while investigators did not expect to find high levels of methane at the site, they decided to do a methane-production-rate assessment prior to approving a final design for the landfill cap. Because the planned 77-point survey constituted only a small part of the remedial-design/remedial-action activities, the investigating agency sought a subcontractor capable of performing the whole job — field work, analysis, and computations — and ultimately selected Quadrel Services to conduct an EMFLUX® Survey.

The EMFLUX® System

The EMFLUX® System combines a highly accurate passive field technology with a sophisticated computer model which predicts ideal periods for soil-gas surveys. The System's timing model is based on a scientific understanding of relationships between fluctuations in vertical soil-gas velocity and the effects of geophysical forces known as earth tides (see **Figure 1** and text below). Using this model, Quadrel Services can select favorable periods for EMFLUX® Surveys.

The remediation plan designers at the Superfund site in question recognized that a methane-production-rate assessment based on data collected during a period of low emissions would underestimate the amount of gas being generated and would therefore be of little use in designing an effective landfill cap. On the other hand, sampling in a period of high soil-gas emissions would avoid this pitfall and provide a reliable and conservative basis for estimating the maximum methane-production rate of the landfill.

Earth Tides and Vertical Soil-Gas Migration

The term "earth tides" refers to powerful gravitational forces, first recorded by NASA and USGS, which cause elastic distortions of the earth's crust (tension, expansion and contraction). In the 1970s early attempts to use soil-gas emissions as a tool for uranium exploration led to the discovery (by George H. Milly, Sc.D.) of a relationship between earth tides and soil-gas emissions. Previously, researchers had observed repetitive, crudely cyclical variations in vertical soil-gas velocity which could not be attributed to those factors commonly believed critical in soil-gas emissions (*e.g.*, barometric pressure, temperature, and moisture changes). Dr. Milly found, however, that these variations did show a high correlation with NASA-USGS earth-tide data, and his research established earth tides as the most significant influence on vertical soil-gas migration, often causing changes of three-to-five orders of magnitude in vertical soil-gas velocity. Subsequent developments led to the creation of the EMFLUX® computer timing model, a program which can predict for any location on the surface of the earth maximum periods of soil-gas emission. **Figure 1** shows methane emissions recorded on a landfill during a favorable period.

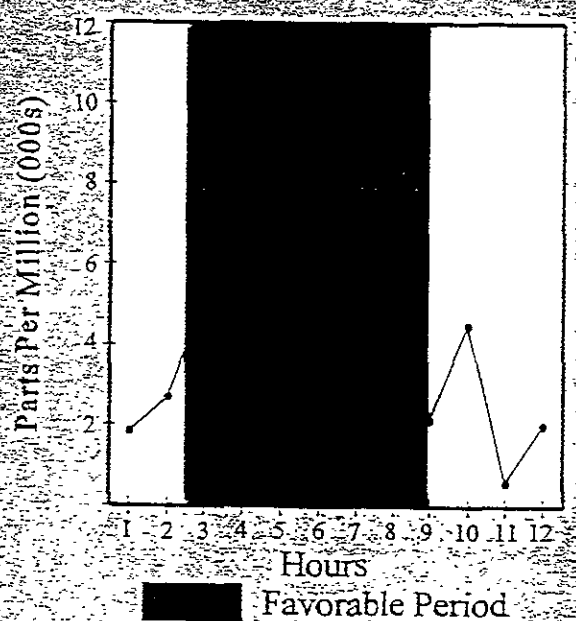


Figure 1. Methane concentrations on a landfill during an EMFLUX® favorable emission period.

CASE STUDY
Tracking Suspected Solvent Contaminant Plume with EMFLUX® Soil-Gas Sampling

SUMMARY

The objective of this survey was to delineate a suspected tetrachloroethene (PCE) plume downgradient from a former dry-cleaning establishment to facilitate emplacement of ground-water sampling wells. The EMFLUX® results correlated extremely well with subsequent ground-water samples, permitting design of a cost-effective remediation plan.

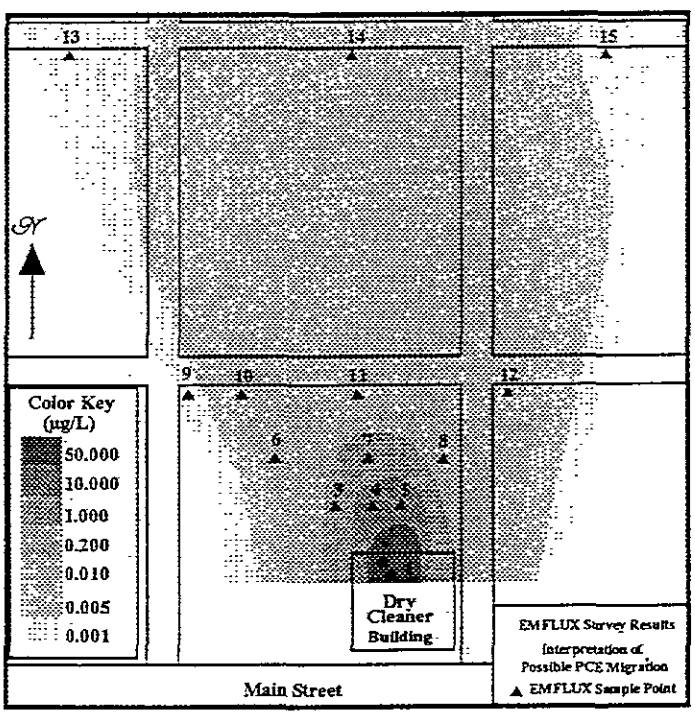
BACKGROUND

Initially, a five-hour EMFLUX® passive soil-gas survey indicated several PCE "hot spots." One of these, sample location 5 (shown below), was located outside the dry cleaning establishment, and this suggested the possibility of off-site migration of the contaminant. Given this data, and to minimize investigative drilling in the residential neighborhood surrounding the dry cleaner, a second -- and broader -- EMFLUX® soil-gas survey was conducted to determine the path and extent of the subsurface contamination.

SAMPLING PLAN

For the second survey, the environmental consulting firm responsible for the field investigation asked Quadrel to develop a soil-gas sampling plan, using 10 EMFLUX® collectors to transect likely down-gradient plume migration, and to provide an EMFLUX® Field Kit containing all necessary sampling components and appropriate instructions. A 72-hour soil-gas sampling period was used to achieve additional sensitivity at the low-concentration boundaries of the contaminant plume. The consulting firm deployed, recovered, and returned all samplers to Quadrel Services for analysis.

EMFLUX® Survey Results
PCE Soil-Gas Concentrations
(μg/L)



RESULTS

As the figure indicates, the EMFLUX® data showed a strong subsurface presence of PCE around the dry-cleaner's building and a clear down-gradient migration pattern. In addition, the survey detected trichloroethene (TCE) -- a solvent and a degradation product of PCE -- near the building. On the basis of the EMFLUX® data, wells were installed at EMFLUX® sample points 5 and 11 and ground-water samples were collected and analyzed.

Comparison of ground-water and EMFLUX® data revealed a high correlation, leading investigators to rely heavily on EMFLUX® information in planning remedial action.

Comparison of EMFLUX® Data to Ground Water Data

Location	PCE	TCE
EMFLUX® Pt. 5 (μg/L)	15.75	0.14
Monitoring Well No. 14 (ppb)	350	7
EMFLUX® Pt. 11 (μg/L)	0.02	ND
Monitoring Well No. 20 (ppb)	3	ND

Relative to ground-water concentrations, the soil-gas concentration for EMFLUX® point 11 was proportionally lower than that for EMFLUX® point 5. This is, however, consistent with the expected behavior of migrating PCE contamination, because PCE is a DNAPL (denser-than-water nonaqueous phase liquid) and tends to sink in ground water as it moves away from its source, reducing the amount of soil gas reaching ground surface. Follow-on intrusive sampling showed PCE present in both soil and ground water at EMFLUX® point 5, while at point 11 only ground-water was contaminated.

CONCLUSION

The EMFLUX® survey effectively delineated the contamination plume down to and below the local action level for PCE and thus helped avoid the expense of additional investigative drilling.

Quadrel Services, Inc.

ENVIRONMENTAL PRODUCT PROFILES

EMFLUX® Trace-Gas Detection System

System Procedures

- *Survey Planning*
- *3-Day Soil-Gas Collection*
- *GC/MS Analysis*
- *Data Interpretation*
- *Reporting*

The basic steps required to use the EMFLUX® Trace-Gas Detection System are listed in Table 2. Work begins with specific analysis of a particular site, after which an overall survey plan is developed. Field activities begin with equipment preparation and emplacement of collection devices at predetermined locations. Field work can be performed by Quadrel field teams or by client personnel with easy-to-use field kits. Collection devices are deployed directly on the ground and left in the field for approximately 72 hours. During emplacement, the perimeters of the collection devices are sealed with a collar of soil to prevent ambient air contamination. Gases entering collection devices are adsorbed on carbon-based sorbent cartridges, which are retrieved after the 72-hour period and analyzed, using an EPA-approved method, in an off-site laboratory with GC/MS equipment. The resulting data, reported in nanograms of contaminant per cartridge, are used to compute normalized contaminant flux rates that are evaluated with respect to site conditions. Results are presented in a survey report that includes conclusions, raw data, and graphics.

TABLE 2: REQUIRED ACTIVITIES

1. Site evaluation
2. Selection of sample locations and parameters
3. Determination of time period of maximum soil gas emissions
4. Location and placement of collection devices
5. Retrieval of devices and analysis of sorbent cartridges
6. Data evaluation and reporting of results

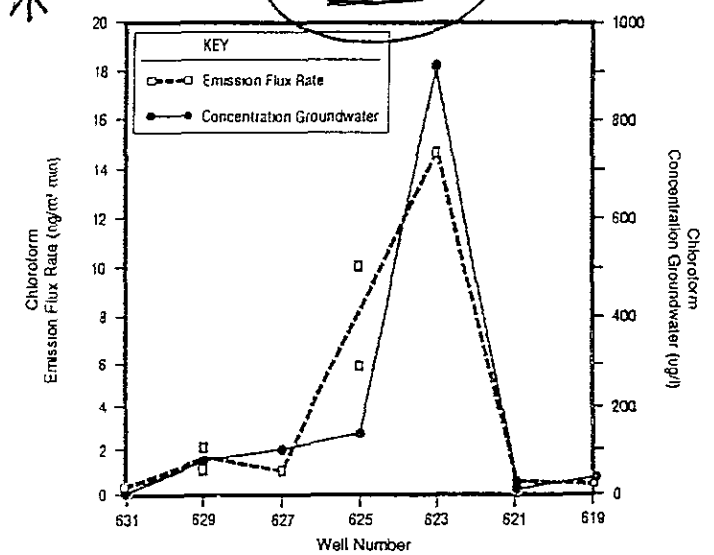
Vendor Services

- *Project Planning*
- *Full Field Services*
- *Easy-To-Use Kits*
- *Training*
- *GC/MS Analysis*
- *Report Preparation*

The EMFLUX® technology was developed and successfully used for uranium exploration in the 1970s and early 1980s. During the mid-1980s, the developers of the method devised field equipment that permitted the technology to be applied to the detection of buried volatile and semi-volatile organic compounds. Quadrel Services, Inc. was formed in 1988 to commercialize the EMFLUX® Trace-Gas Detection System for environmental applications. The firm has been operating since that time and has applied its technology to numerous projects across the U.S. In June 1989, EMFLUX® was independently evaluated by NETAC at the U.S. EPA testing facility near Las Vegas, Nevada (Figure 2). This evaluation is available from Quadrel Services, Inc.

FIGURE 2: INDEPENDENT ASSESSMENT FINDINGS

NETAC determined that EMFLUX® was able to define a plume profile similar to that observed in the groundwater with a correlation coefficient (r) of 0.91.*



ACCURACY

Profile based on vendor interview. Where noted, information provided has been independently verified by NETAC.