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Final

Technical Memorandum for Soil Gas Sampling at Installation Restoration Site 12

Naval Station Treasure Island San Francisco, California

June 10, 2009

Prepared for:
Base Realignment and Closure
Program Management Office West
San Diego, California

Prepared by:
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Prepared under:
Naval Facilities Engineering Command
Contract Number N68711-03-D-5104
Contract Task Order 0117

SULT-5104-0117-0016

Final

Technical Memorandum for Soil Gas Sampling at Installation Restoration Site 12 Naval Station Treasure Island San Francisco, California

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Prepared for:

DEPARTMENT OF THE NAVY

REVIEW AND APPROVAL

Project Manager: _____ Date: June 10, 2009
Kevin Hoch, SulTech

SulTech

A Joint Venture of Sullivan Consulting Group and Tetra Tech EM Inc.

TRANSMITTAL/DELIVERABLE RECEIPT

Contract No. N68711-03-D-5104 Document Control No. SULT.5104.0117.0016

TO: Contracting Officer
Leanora Sili, Code 02RE.LS
Naval Facilities Engineering Command
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1220 Pacific Highway, Bldg 127
San Diego, CA 92132-5190

DATE: 06/15/2009
CTO: 0117
LOCATION:
NAVSTA Treasure Island, San Francisco, Cali

FROM:

Steven Bradley, Contract Manager

DOCUMENT TITLE AND DATE:

Technical Memorandum for Soil Gas Sampling at Installation Restoration Site 12

June 2009

TYPE: ☐ Contractual Deliverable ☒ Technical Deliverable (DS) ☐ Other (TC)

VERSION: Final (e.g., Draft, Draft Final, Final) REVISION #: NA

ADMIN RECORD: Yes ☒ No ☐ CATEGORY: Confidential ☐

SCHEDULED DELIVERY DATE: 06/15/2009 ACTUAL DELIVERY DATE: 06/19/2009

NUMBER OF COPIES SUBMITTED TO NAVY: O/8C/6E/3D

O = original transmittal form
C = copy of transmittal form
E = enclosure
D = CD

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rev 10/01/03

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ACRONYMS AND ABBREVIATIONS

µg/L	Micrograms per liter
µg/m^3	Microgram per cubic meter
µm	Microns
bgs	Below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CHHSL	California Human Health Screening Level
DTSC	Department of Toxic Substance Control
EPA	U.S. Environmental Protection Agency
EU	Exposure Unit
HHRA	Human health risk assessment
IR	Installation Restoration
LARWQCB	Los Angeles Regional Water Quality Control Board
mg/kg	Milligram per kilogram
ml	Milliliter
ml/minute	Milliliter per minute
NAVSTA TI	Naval Station Treasure Island
ng/m^3	Nanogram per cubic meter
PRC	PRC Environmental Management, Inc.
QC	Quality control
RI	Remedial investigation
SAP	Sampling and analysis plan
Tetra Tech	Tetra Tech EM Inc.
TI	Treasure Island
VOC	Volatile organic compound
Water Board	San Francisco Bay Regional Water Quality Control Board

EXECUTIVE SUMMARY

Volatile organic compounds (VOC) have been detected in soil throughout the former Naval Station Treasure Island in San Francisco, California (NAVSTA TI); however, only a few sites have known source areas of VOCs. With the exception of petroleum contamination in the Mariner Drive and Building 1313 areas, no known sources of VOCs were identified at IR Site 12; however, VOCs were identified as risk drivers when bulk soil data were modeled to indoor air vapor concentrations using default parameters in the Johnson and Ettinger vapor intrusion model (DTSC 2003b). In 2006, the California Environmental Protection Agency's Department of Toxic Substances Control (DTSC) noted that modeling from bulk soil data is no longer acceptable to them and asked that direct measurements of concentrations of VOCs in soil gas be collected to more accurately represent possible indoor air impacts in the human health risk assessment (HHRA). To satisfy this request, the Department of the Navy (Navy) conducted a targeted soil gas investigation. A secondary goal of the investigation was to identify any existing soil gas plumes within IR Site 12 that have not been discovered or investigated. This Technical Memorandum describes the field and sampling activities performed, and presents the results of this investigation.

SITE BACKGROUND

IR Site 12 is located on northwestern end of NAVSTA TI which is located in San Francisco Bay, midway between San Francisco and Oakland, California. IR Site 12, Old Bunker Area, is a CERCLA site that comprises approximately 94 acres. IR Site 12 was previously used for storage and disposal of solid waste. IR Site 12 is currently a housing area, which is a flat and consists of grassy lawns, paved roads, and residential housing units with backyards.

GEOLOGY AND HYDROGEOLOGY

Soils within IR Site 12 consist primarily of tan to grayish-brown, fine- to coarse-grained, loose sands, with some shell fragments and gravel (SulTech 2006). Solid waste has been found in previous soil borings; glass was the most frequently encountered type of solid waste.

The estimated depth to groundwater at IR Site 12 ranges between 2.5 to 7.5 feet bgs. The water table is unconfined and groundwater generally flows in a radial pattern from the center of TI to the shoreline. Perched groundwater conditions above the shallow water table exist locally because of the presence of relatively impermeable silt and clay lenses.

PREVIOUS INVESTIGATIONS

Between June 2, 2000 and May 2, 2003, a series of shallow soil gas surveys were conducted to investigate VOCs and methane within SWDA A&B and to evaluate the nature and extent of VOCs and methane suspected during previous investigations in the area of Northpoint Drive and Gateview Avenue. It was concluded VOCs were present at concentrations exceeding screening criteria in only one location, near Building 1323 (within SWDA A&B) and that the majority of the methane detections in the SWDA's and all of the methane detections in the Northpoint Drive and Gateview Avenue area were the result of leaks in natural gas pipeline.

From September to October 2003, the Navy excavated 581 exploratory trenches, seven step-out trenches, and seven step-out hand auger locations to evaluate risks to human health and make decisions about further remedial efforts at Site 12. The investigation was limited to the common areas outside of the SWDAs, specifically excluding areas previously remediated, areas scheduled for future remediation, and streets, sidewalks, and parking areas. Based on this investigation, it was determined that no widespread release of VOCs had occurred and the data were used to model potential vapor intrusion using the Johnson and Ettinger vapor intrusion model (DTSC 2003b).

A subsequent review of the soil and soil gas results during development of the Sampling and Analysis Plan (SulTech 2008) identified other areas within Exposure Units (EU) 8, 15, and 17 and the Mariner Drive Area (which includes portions of EUs 4, 5, and 9), where VOC concentrations exceed more recently promulgated screening criteria.

SAMPLING PROCESS DESIGN

The primary goal of this investigation was to characterize the vapor intrusion pathway at Installation Restoration (IR) Site 12, with a secondary goal of delineating any unbound locations where soil gas concentrations exceeded criteria.

Four areas within the following EUs were identified for inclusion in this soil gas investigation: EU8; EU15; EU17; and Mariner Drive Area. These areas were targeted based on results of previously collected soil and soil gas samples. The samples were analyzed for the subset of VOCs previously detected at IR Site 12 in soil, soil gas, or groundwater. The concentrations detected in the soil gas samples were compared to the California Human Health Screening Levels (CHHSL) presented in guidance from the DTSC (DTSC 2005). No CHHSL exists for several of the VOCs previously detected at the site; therefore, a project screening level (PSL) was derived using the same methodology employed in the CHHSL guidance.

SAMPLE COLLECTION

Temporary soil gas sampling wells were installed, using a GeoProbe® direct-push hydraulic device, by WDC Well Installation and Exploration (WDC) in accordance with the DTSC Soil Gas Advisory (DTSC/LARWQCB 2003b) and the SAP (SulTech 2008). When VOCs were detected at concentrations exceeding CHHSLs step-out samples were conducted. When VOCs were not detected, no step-out samples were collected. Additionally, when a chemical was detected at a concentration below CHHSLs, no step-out samples were collected.

To assist with the assessment of health risk via vapor intrusion modeling, soil samples were collected at a depth between 2.5 and 4.5 feet using a Geoprobe. One soil sample was collected from the following EUs: EU4, EU8, and EU15. The soil samples were analyzed for specific soil parameters in accordance with the DTSC Advisory (DTSC/LARWQCB 2003b).

There were a few field variations on the SAP that were implemented during the fieldwork of the soil gas investigation. The variations from the SAP did not diminish the quality of the work performed. Decisions were made in the field to ensure quality work and worker safety.

VAPOR INTRUSION INVESTIGATION RESULTS

In total, soil gas samples were collected from 95 distinct locations and analyzed for VOCs. Because step-out samples were required at only one location during the investigation of the four areas identified in the SAP, the Navy was able to collect 40 additional samples in other EU's to augment the HHRA dataset in EU's where samples for VOCs had not been collected in soil gas or groundwater during previous investigations. The cumulative CHHSL was exceeded in four of 95 locations; in three of these an individual CHHSL was also exceeded. Benzene was the only compound that exceeded its individual CHHSL and was the largest contributor to the risk at the location where only the cumulative CHHSL was exceeded. A breakdown of the findings by exposure unit is presented below:

- **Exposure Unit 15 -** No individual or cumulative CHHSLs were exceeded within EU15. No methane was detected within EU15.
- **Exposure Unit 8 -** No individual or cumulative CHHSLs were exceeded within EU8. No methane was detected within EU8.
- **Exposure Unit 17 -** No individual or cumulative CHHSLs were exceeded within EU17. No methane was detected within EU17.
- **Mariner Drive Area -** No individual CHHSLs were exceeded; however the cumulative CHHSL was exceeded at location 12SG243. Because this location was bounded by other data points, no step-outs were conducted.

  Methane was detected in 10 samples in the Mariner Drive Area, nine of which were located near Building 1228. The highest concentrations of methane were present near a junction in a subsurface natural gas pipeline. Cyclohexane (a compound found in natural gas) was reported at relatively higher concentrations in samples collected from the locations with high methane readings. The mobile laboratory also noted the presence of isobutane, another chemical often found in natural gas, in one sample (12SG230) in this area. Based on these findings, the Navy is confident the methane detections are related to the existing natural gas pipeline.

  The San Francisco Public Utilities Commission was notified of this possible leak and has visited the site on numerous occasions to monitor for a hazardous condition. PUC investigated the area with a hand-held surface methane monitor, and searched the area for signs of distressed vegetation that would indicate the presence of a major leak. To date, methane has not been detected and no distressed vegetation was identified in the area. Based on the results it is PUC's opinion that no hazard exists. As part of their routine monitoring of pipelines on the island, PUC will continue to monitor this area for leaks.

- **Additional Exposure Units -** The individual CHHSL for benzene was exceeded in three samples (12SG335, 12SG341, and 12SG353). Two samples (12SG335 and 12SG341) were located within EU16 while 12SG353 was located within EU10. Resources were exhausted; therefore, no step-out samples were conducted as part of this additional work.

  Methane was detected at locations 12SG335 and 12SG341. The highest concentrations of methane were present near a junction a subsurface natural gas pipeline. Cyclohexane (a compound found in natural gas) was reported at relatively higher concentrations in samples collected from the locations with high methane readings. Based on these findings, the Navy is confident the methane detections are related to the existing natural gas pipeline.

  The San Francisco Public Utilities Commission was notified of this possible leak and has visited the site on numerous occasions to monitor for a hazardous condition. PUC investigated the area with a hand-held surface methane monitor, and searched the area for signs of distressed vegetation that would indicate the presence of a major leak. To date, methane has not been detected and no distressed vegetation was identified in the area. Based on the results it is PUC's opinion that no hazard exists. As part of their routine monitoring of pipelines on the island, PUC will continue to monitor this area for leaks.

SUMMARY AND CONCLUSIONS

Soil vapor from 95 distinct locations was sampled and analyzed by EPA Method TO-15 in a mobile laboratory. Of these, the CHHSL for an individual compound (in this case benzene) was exceeded at only three locations. At one other location the cumulative CHHSL was exceed.

The primary goal of this investigation was to characterize the vapor intrusion pathway at IR Site 12. The successful collection and analysis of samples from 95 distinct soil gas locations has achieved this goal. Sufficient data now exists at the site to allow for analysis of the vapor intrusion pathway in the HHRA section of the RI report. Because no soil gas plumes were identified, the secondary goal of delineating any potential remaining soil gas plumes that may exist was also achieved.

1.0 INTRODUCTION

This technical memorandum presents the results of the targeted investigation of volatile organic compounds (VOC) in soil gas at IR Site 12.

This technical memorandum is organized as follows:

- **Section 1.0, Introduction** – Briefly presents the scope of the investigation and organization of the document.
- **Section 2.0, Site Background** – Presents background information including site location and history, the geology and hydrogeology of Site 12, and previous relevant investigations at the site.
- **Section 3.0, Sampling Process Design** – Presents the site conceptual model and the design of the soil gas sampling program.
- **Section 4.0, Sample Collection –** Summarizes data collection procedures and analytical methodology used during the vapor intrusion investigation.
- **Section 5.0, Sampling Results and Quality Assurance** – Presents an evaluation of analytical data for soil gas and soil sampling.
- **Section 6.0, Summary and Conclusions** – Presents a summary of the investigation and the conclusions of the data evaluation.
- **Section 7.0, References** – Lists the documents used to prepare this technical memorandum.
- Figures and tables are presented after Section 7.0. Appendix A presents Worksheet #15 - Reference Limits and Evaluation Table from the Sampling and Analysis Plan (SulTech 2008) and Appendix B includes the complete analytical results for the investigation.

2.0 SITE BACKGROUND

This section describes the site location, history, site geology and hydrogeology and the previous investigations that have been conducted at IR Site 12.

2.1 SITE LOCATION AND HISTORY

IR Site 12 is located on Naval Station Treasure Island (NAVSTA TI) which is located in San Francisco Bay, midway between San Francisco and Oakland, California. The facility consists of two islands joined by a causeway: Treasure Island (TI), which is approximately 403 acres, and Yerba Buena Island (YBI), which is approximately 147 acres. IR Site 12 is located within TI. TI is a manmade island constructed of materials dredged from San Francisco Bay. In 1993, NAVSTA TI was designated for closure under the Base Closure and Realignment Act of 1990.

The facility was closed on September 30, 1997, and is in the process of being transferred to the City and County of San Francisco for reuse.

IR Site 12, Old Bunker Area, is a CERCLA site located at the northwestern end of TI that comprises about 94 acres. IR Site 12 is currently the TI housing area, which is a flat area consisting of grassy common areas, paved roads, and residential housing units with backyards.

Throughout the 1940s, 1950s, and 1960s, ammunition was stored in bunkers which were located in the northern half of IR Site 12. The areas between and around the bunkers were used for disposal of solid waste. Trench-type disposal units and general solid waste disposal areas (SWDA) were constructed and used for the disposal of materials such as loose rubbish, bottles, wire rope, paper, and steel drums. These areas have been combined into four identified SWDAs known as A&B, 1207/1209, 1231/1233, and Bigelow Court. Aerial photos identified various disposal areas and stained areas within IR Site 12. A 1958 aerial photo identified a waste incinerator around SWDA 1231/1233 and aerial photos showed that as housing construction began, the ammunition bunkers were simultaneously removed and the area eventually was graded (SulTech 2006).

2.2 GEOLOGY AND HYDROGEOLOGY OF SITE 12

Soils encountered in borings advanced to depths up to 15 feet bgs consist primarily of tan to grayish-brown, fine- to coarse-grained, loose sands, with some shell fragments and gravel (SulTech 2006). Solid waste—such as glass, ceramics, brick fragments, unspecified metal objects, shoe soles, film canisters, a paint bucket, a metal ladder, and a metal drum—was encountered in borings and trenches during previous investigations. Solid waste was encountered most commonly from 2 to 5 feet bgs in borings located near the northern and northwestern shorelines, in the vicinity of the SWDAs. Glass was by far the most frequently encountered type of solid waste. In addition to the SWDAs, lesser amounts of solid waste have been found in other areas of IR Site 12, including near Buildings 1254 and 1219.

According to field logs describing the installation of monitoring wells and soil borings during the Phase IIB RI (PRC Environmental Management, Inc. [PRC] 1997), the estimated depth to groundwater during drilling at IR Site 12 ranged from about 2.5 to 7.5 feet bgs. The water table is unconfined. Groundwater generally flows in a radial pattern from the center of TI to the shoreline. Perched groundwater conditions above the shallow water table exist locally because of the presence of relatively impermeable silt and clay lenses. Groundwater recharge occurs primarily from precipitation infiltration, with some minor contributions from irrigation and leaking subsurface storm drains (PRC 1993). Previous investigations at TI have revealed tidally induced water table fluctuations of as much as 4.5 feet immediately adjacent to the TI seawall and as much as 2.25 feet at a distance of about 50 feet from the seawall (Harding Lawson Associates 1985).

2.3 PREVIOUS SOIL AND SOIL GAS INVESTIGATIONS

Between June 2, 2000 and May 2, 2003, a series of investigations were conducted at IR Site 12. A summary of these investigations are provided in the subsections below.

2.3.1 Previous Soil Gas Investigations

In June 2000, the Navy conducted a shallow soil gas survey to investigate the potential of VOCs and methane generation and migration within SWDA A&B and to evaluate the nature and extent of VOCs and methane suspected during previous investigations of IR Site 12; soil gas samples were collected from 70 locations within IR Site 12. Based on the survey results, it was concluded VOCs were present at concentrations exceeding screening criteria in only one location, near Building 1323. However, methane was detected at numerous locations in SWDA A&B, as well as the Northpoint Drive and Gateview Avenue area.

In 2001, additional VOC and methane samples were collected to delineate VOC and methane detections in SWDA A&B, as well as the Northpoint Drive and Gateview Avenue area. The results of the step-out sampling delineated the extent of VOC contamination to a small area between Building 1323 and the rip-rap. The area of known methane contamination in the SWDA A&B and the Northpoint Drive and Gateview Avenue areas correlated closely with natural gas pipelines in both areas.

In January 2002, the Navy capped the natural gas pipeline, allowing any remaining gas in the pipeline to dissipate, and then resampled locations along the pipeline. Sample results indicated methane was not present at concentrations exceeding screening criteria in most of the locations. The exceptions included samples collected near Buildings 1319 and 1321.

2.3.2 Previous Soil Investigation

From September to October 2003, based on results from previous trenching and sampling investigations, the Navy excavated 581 exploration trenches, seven step-out trenches, and seven step-out hand auger locations to evaluate risks to human health and make decisions about further remedial efforts at Site 12. The investigation was limited to the common areas outside of the SWDAs, specifically excluding areas previously remediated or scheduled for future remediation; streets, sidewalks, and parking areas; and backyards.

In 2007, non-time-critical removal actions were initiated in SWDAs A&B and 1231/1233. These removal actions were initially motivated by the detection of elevated levels of chemicals in soil and soil gas within the SWDAs. Soil is being removed to a depth of 4 feet and replaced with clean fill. This will result in the elimination of many locations where VOCs had previously been detected in soil or soil gas, some of which had exceeded 2002 EPA soil gas screening guidance.

3.0 SAMPLING PROCESS DESIGN

This section describes the sampling process and rationale in terms of the media that were sampled, the analytical groups that were analyzed, the number of samples that were collected, and any field variances to the SAP (SulTech 2008).

3.1 PROBLEM DEFINITION

The primary goal of this investigation was to characterize the vapor intrusion pathway at Installation Restoration (IR) Site 12, with a secondary goal of delineating unbound locations where soil gas concentrations exceeded criteria.

Volatile organic compounds (VOC) have been detected in soil throughout the former Naval Station Treasure Island in San Francisco, California (NAVSTA TI); however, only a few sites have known source areas of VOCs. With the exception of petroleum contamination in the Mariner Drive and Building 1313 areas, no known sources of VOCs were identified at IR Site 12; however, VOCs were identified as risk drivers when conservative parameters were inserted in the Johnson and Ettinger vapor intrusion model (DTSC 2003b). The specific parameters used were the default soil gas flow rate into the building (Q-soil) and infinite source term. During the July 2006 Base Realignment and Closure (BRAC) Clean-up Team (BCT) meeting, the Navy presented its opinion that it was more appropriate to evaluate the vapor intrusion pathway using a finite source term and a site-specific Q-soil, instead of using an infinite source and default Q-soil value. During a meeting with EPA and the California Environmental Protection Agency's Department of Toxic Substances Control (DTSC) on August 8, 2006, DTSC responded that the use of bulk soil data was less than optimal because of inherent inaccuracies with data and the additional modeling required. The agencies (EPA and DTSC) stated the only accurate means to evaluate the vapor intrusion pathway was through the collection and evaluation of soil gas data.

Based on these discussions the Navy agreed to perform a targeted soil gas investigation at Site 12. Four areas within the following exposure units were identified for inclusion in this soil gas investigation: EU8; EU15; EU17; and Mariner Drive Area (including portions of EUs 4, 5, and 9). These areas were targeted based on results of previously collected soil and soil gas samples. Although VOCs were detected at slightly elevated concentrations in the debris disposal areas, these EUs were excluded because a removal action is ongoing. The Navy proposed collection of a minimum of five soil gas samples within each of the four target areas identified on Figure 4 of the final SAP (SulTech 2008) at a sample depth between 2.5 and 4.5 feet below ground surface (bgs). If moisture was detected in a soil gas sample due to interference of the water table or capillary fringe, a second sample was collected within a 1-foot radius and at a shallower depth. One soil gas sample was collocated with each of the previous soil samples where there was an exceedance of the screening criteria (SulTech 2008). Eight of the original sample locations were placed beneath hardscape (streets) or immediately adjacent to buildings or streets.

The samples were analyzed for VOCs that were previously detected at IR Site 12 in soil, soil gas, or groundwater. The concentrations detected in the soil gas samples were compared to the soil

gas CHHSLs presented in guidance from the San Francisco Bay Regional Water Quality Control Board (Water Board 2007). No CHHSL exists for several of the VOCs previously detected at the site; therefore, a screening criterion was derived from the Johnson and Ettinger vapor intrusion model (DTSC 2003a) using default assumptions. Worksheet #15 of the final SAP presents the compound list and screening criteria and is included as Appendix A.

Based on preliminary results, step-outs were required at only one location (12SG230). Because the mobile laboratory and Geoprobe operators were on site, the Navy decided to collect soil gas data from other EU's within IR Site 12 where soil gas or groundwater data were available. These are shown on Figure 1 as sample locations outside of the original investigation areas.

3.2 DECISION RULES

The following decision rules, presented originally in Worksheet #11 of the final SAP (SulTech 2008) were used throughout the soil gas investigation:

If no VOCs are detected in soil gas at any of the EUs in this study, then no step-out samples will be collected. This data will be used to evaluate whether the vapor intrusion pathway is complete and will be applied to the human health risk assessment portion of the forthcoming RI.

If chemicals are detected in soil gas at concentrations below individual or cumulative CHHSLs (Appendix B), no step-out samples will be collected. The data will be used to evaluate whether the vapor intrusion pathway is complete and will be applied to the HHRA of the forthcoming RI to determine if the concentrations pose an unacceptable risk to human health.

If chemicals are detected in soil gas at concentrations exceeding individual or cumulative CHHSLs, step-out samples will be collected in accordance with the decision rules presented in Figure 11 of the SAP (SulTech 2008). The data will be used to evaluate whether the vapor intrusion pathway is complete and will be applied to the HHRA portion of the RI to determine if the concentrations pose an unacceptable risk to human health.

If any step-out samples are collected, then up to three soil samples may be collected for physical analysis to provide site-specific input values for the Johnson and Ettinger vapor intrusion model.

If chemicals are detected in soil gas at concentrations exceeding individual or cumulative CHHSLs, at any location in Site 12, then the stakeholders may consider whether soil gas samples should be collected at specific locations at other IR sites while the mobile laboratory is on site.

To assist with the assessment of health risk via vapor intrusion modeling, three soil samples were collected using a direct push hydraulic device (GeoProbe®), one sample each from EUs 4, 8, and 15. The soil samples were analyzed for soil parameters that include (1) density; (2) organic carbon content of the soil (Walkley Black method); (3) soil moisture; (4) effective permeability; (5) porosity; (6) grain size distribution analysis (curve) and evaluation of fine-grained soil content to determine the percent clay, silt, and sand; and (7) soil description, performed and presented in accordance with the Unified Soil Classification System. The results are presented in Appendix B.

4.0 SAMPLE COLLECTION

This section describes the techniques used to collect soil and soil gas samples during this investigation.

4.1 SOIL GAS SAMPLING

Proposed soil gas sample locations identified in the SAP were marked using a Trimble® GPS unit. Underground Services Alert was notified of the locations and applicable utilities visited the site on November 9 to mark utilities. Cruz Brothers utility locators visited the site between November 9 and 11 and further cleared all locations. Where underground utilities were present or where proposed location were inaccessible, the proposed locations were abandoned and moved to the nearest acceptable area. Figure 1 presents the final sample locations.

The majority of the soil gas sampling wells were installed using a GeoProbe® by WDC Well Installation and Exploration (WDC). As indicated in the SAP, the soil gas monitoring wells were constructed of 1/8-inch outside diameter Teflon™ tubing with a ceramic tip, emplaced in a minimum of 1 ft of 20/40-grade sand, with at least 1-foot of dry granular bentonite emplaced upon the sand pack; the boreholes were then grouted to the surface with hydrated bentonite. As requested by DTSC, some of the soil gas sampling wells were installed through hardscape. A minimum of 30 minutes elapsed between installation and sampling.

The 1/8-inch outside diameter Teflon™ tubing terminated in a 3-way valve to allow for connection to an aluminum foil encased glass sampling syringe or SUMMA canister as appropriate. After the glass syringe was connected to the Teflon™ tubing a rag saturated in 1,1-difluoroethane, was used to test for leaks around the probe barrel at the ground surface and in the sampling system. The tracer was placed around the base of the sample tubing and near any connections during sample collection. No tracer was detected during this investigation. A 50 milliliter sample was withdrawn from the tubing at a rate of approximately 100 milliliters per minute (ml/minute). The 3-way valve was closed to seal the tubing, and the field chemist walked the sample to the mobile laboratory for analysis.

Actual sample depths were determined in the field. At each EU, the initial depth was set to 4.5-feet bgs. If the rod was wet, the location was abandoned and an additional soil gas sampling well was installed nearby at a shallower depth.

Prior to the collection of soil gas samples, a site-specific purge volume test was conducted to determine the optimum volume required to purge ambient air from the sampling system. Three samples were collected at location 12SG224; using 1-, 3-, and 7-purge volumes and analyzed in the mobile laboratory. The results of the purge volume test are presented below.

Results of Purge Volume Test				
Purge Volumes	Carbon Disulfide (µg/m^3)	Cyclohexane (µg/m^3)	M,P-Xylenes (µg/m^3)	Toluene (µg/m^3)
1	12	41	12	130
3	12	23	13	130
7	<10	19	13	130

Note:
µg/m^3 Microgram per cubic meter

Based on the results, 1-purge volume was used for collection of the samples.

The following quality control activities were conducted as part of the soil gas data collection:

- Five split samples were collected and analyzed by an off-site laboratory. An attempt was made to collocate split samples where: (1) VOC concentrations exceeded CHHSLs, (2) VOC concentrations were detected below CHHSLs, and (3) VOCs were not detected.
- 1,1-difluoroethane was used to test for leaks around the probe barrel at the ground surface and near the fittings for every sample collected.
- Seven field duplicate samples were collected and analyzed by the mobile laboratory.
- In areas where tidal influence was expected (EU8), replicate samples were collected; one between 30 and 90 minutes after higher high tide or the lower high tide and the second between 120 and 180 minutes after either the higher low tide or the lower low tide.
- Samples were not collected within 24 hours of rainfall.

4.2 SOIL SAMPLING

One soil sample was collected from each of the following EUs: EU4, EU8, and EU15. The soil samples were analyzed in accordance with the DTSC Advisory (DTSC/LARWQCB 2003b) and included: 1) density; (2) organic carbon content of the soil (Walkley Black method); (3) soil moisture; (4) effective permeability; (5) porosity; (6) grain size distribution analysis (curve) and evaluation of fine-grained soil content to determine the percent clay, silt, and sand; and (7) soil description, performed and presented in accordance with the Unified Soil Classification System. Soil samples were collected at a depth between 2.5 and 4.5 feet using a Geoprobe. A continuous core was collected using an acetate sleeve, capped, and sent to PTS Laboratories for analysis.

The soil samples were collected to assist with the assessment of health risk via vapor intrusion modeling. The results are included in Appendix B.

4.3 FIELD VARIATIONS

The following variations of the SAP were implemented during the fieldwork:

- To allow for collection of a continuous core, soil samples were collected using Geoprobe® technology instead of using a hand auger.
- Because the Geoprobe® could not fit between fencelines in EU15, soil gas wells for samples 12SG220, 12SG225, and 12SG226 were installed using a hand auger. These wells were allowed to equilibrate for a minimum of 24 hours prior to collection of samples.
- Several soil gas sample locations presented in the SAP were moved because of underground utilities or because they were located within the fenceline of the radiological-impacted area in SWDA A&B.
- The syringe used to collect the soil gas samples was covered in aluminum foil to mitigate degradation from exposure to sunlight.
- The soil vapor was manually withdrawn from the probe at a rate of approximately 100 ml/minute by monitoring the amount of time needed to collect approximately 5 milliliters (ml) of vapor. The sample was collected over a 30-second duration.
- Because few step-out samples were required, the Navy added 40 samples from other EUs within IR Site 12 where no soil gas or groundwater samples were collected previously to enhance the risk assessment data set for these EU's.
- The variations from the SAP did not diminish the quality of the work performed. Decisions were made in the field to ensure quality and worker safety.

5.0 SAMPLING RESULTS AND QUALITY ASSURANCE

The following sections present the analytical results for each EU and summarize the quality control sample results. A summary of the results is presented in Table 1.

5.1 SOIL GAS SAMPLING RESULTS

5.1.1 Exposure Unit 15

Figure 6 of the SAP presented locations for 20 proposed soil gas samples within EU15. SulTech personnel were not permitted to enter the fenced area behind Buildings 1315 and 1317 (SWDA A&B), therefore the locations were moved (Figure 1). Locations were also moved slightly in the area of Building 1313 due to the presence of underground utilities. One new location was also added underneath Westside Drive for a total of 21.

SulTech was unable to collect a soil gas sample from location 12SG210 due to the presence of groundwater. Because results were available for the adjacent location 12SG207, no additional attempts were made to re-install and sample 12SG207. No individual or cumulative CHHSLs were exceeded within EU15. No methane was detected within EU15.

5.1.2 Exposure Unit 8

Figure 7 of the SAP presented locations for five proposed soil gas samples within EU8. Locations were moved slightly in the area due to the presence of underground utilities (Figure 1). Because two locations were within 100-feet of the shoreline, two samples were collected from each of these to capture any differences in concentration due to tidal influence. The results indicated no tidal influence on the results.

No individual or cumulative CHHSLs were exceeded within EU8. No methane was detected within EU8.

5.1.3 Exposure Unit 17

Figure 5 of the SAP presented locations for 5 proposed soil gas samples within EU17. The samples were collected at the locations proposed in the SAP (Figure 1). No individual or cumulative CHHSLs were exceeded within EU17. No methane was detected within EU17.

5.1.4 Mariner Drive Area

Figure 8 of the SAP presented locations for 18 proposed soil gas samples within the Mariner Drive Area. A few locations were moved slightly due to the presence of underground utilities. One new location was also added (12SG318) at the request of DTSC during the field work.

No individual CHHSLs were exceeded; however the cumulative CHHSL was exceeded at location 12SG243. Because this location was surrounded by other points, no step-outs were conducted. Benzene was the largest contributor to the exceedance. In addition, carbon disulfide, cyclohexane, ethylbenzene, methyl isobutyl ketone, toluene, and xylene were detected in this sample (Table 1). 12SG243 was collected from beneath the asphalt road.

During the field investigation, a concentration of chloromethane exceeding its CHHSL was reported by the mobile laboratory at location 12SG230. In addition methane readings taken directly from the sampling port exceeded 90 percent methane. Because of this, step-out samples were collected. One point (12SG230A) was installed immediately adjacent to Building 1228 (between 12SG230 and Building 1228), and locations 12SG351 and 12SG352 were installed to bound the original detection. Because of the high concentration the field team collected a duplicate and split sample in this area. Chloromethane was not found in the duplicate or step-out samples. The mobile laboratory chemist reviewed the original results and in conjunction with the laboratory QA manager, decided that the original chloromethane result was an artifact of the natural gas in the area. The split sample result confirmed this conclusion.

Methane was detected in 10 samples in the Mariner Drive Area (Figure 2), nine of which were near Building 1228 (Table 1). Figure 2 presents the locations where methane was detected and any natural gas or sewer lines in the area. The highest concentrations of methane were present near a junction in the pipeline. In addition, cyclohexane (a compound found in natural gas) was reported at relatively higher concentrations in samples collected from the locations with high methane readings. The mobile laboratory also noted the presence of isobutene in one sample (12SG230) in this area. Isobutane is not a target analyte, but appeared as an anomalous peak. When trying to determine if the original chloromethane peak was identified correctly, the chemist found the isobutane as a tentatively identified compound. Isobutane was not identified in other samples, but it also was not directly investigated. Based on these findings, it appears methane detections are related to the existing natural gas pipeline. The San Francisco Public Utilities Commission (PUC) was notified of this possible leak and has visited the site on numerous occasions to monitor for a hazardous condition. PUC investigated the area with a hand-held surface methane monitor, and searched the area for signs of distressed vegetation that would indicate the presence of a major leak. To date, methane has not been detected and no distressed vegetation was identified in the area. Based on the results it is PUC's opinion that no hazard exists. As part of their routine monitoring of pipelines on the island, PUC will continue to monitor this area for leaks.

In total, 24 samples were collected in the Mariner Drive Area.

5.1.5 Additional Exposure Units

Because only one location required step-out sampling, the Navy decided to take advantage of the mobile laboratory and collected 40 additional samples. These samples targeted EU's where neither groundwater nor soil gas had been investigated previously. The results of these samples will be used in the HHRA evaluation of the RI. Due to time and budget constraints, no step-out samples were planned as part of this additional work.

Cumulative CHHSLs were exceeded in three samples (12SG335, 12SG341, and 12SG353). The individual CHHSL for benzene was also exceeded in these samples. No other individual CHHSLs were exceeded. 12SG335 and 12SG341 were located within EU16 while 12SG353 was located within EU10 (Figure 1).

Methane was detected at locations 12SG335 and 12SG341 (Figure 3). Figure 3 presents the locations where methane was detected and any natural gas or sewer lines in the area. The highest concentrations of methane were present near a junction in the pipeline. In addition, cyclohexane (a compound found in natural gas) was reported at relatively higher concentrations in samples collected from the locations with high methane readings. The PUC was notified of this possible leak and has visited the site on numerous occasions to monitor for a hazardous condition. The PUC investigated the area with a hand-held surface methane monitor, and searched the area for signs of distressed vegetation that would indicate the presence of a major leak. To date, methane has not been detected and no distressed vegetation was identified in the area. Based on the results it is PUC's opinion that no hazard exists. As part of their routine monitoring of pipelines on the island, PUC will continue to monitor this area for leaks.

5.2 QUALITY CONTROL

During this investigation a number of samples were collected to monitor the quality of the results. These included field blanks, duplicate samples, and split samples. The following sections describe these quality control samples.

5.2.1 Field Blanks

Two types of field blanks were collected during this investigation and are described below.

5.2.1.1 Ambient Air Blanks

Each day, prior to the analysis of field samples, the mobile laboratory chemist collected and analyzed an ambient air blank. The sampling syringe was used to collect a sample of the ambient air in the vicinity of the planned sampling locations. No target analytes were detected in any of the ambient air blanks.

5.2.1.2 Equipment Blank

One equipment blank was collected at the beginning of the investigation prior to collection of field samples. The purpose of this sample was to ensure that no contamination was being introduced to the samples via the sampling equipment. A mock-up of the sampling probe was prepared using the same tubing, fittings, and ceramic tip as were used for the field samples. Five ml of ambient air was purged from probe, and then 5 ml was drawn directly into the syringe and analyzed. The only target analyte detected was toluene at a concentration of 21 micrograms/per cubic meter ($\mu g/m^3$) (reporting limit of 10 $\mu g/m^3$). This result was considered during the third-party validation and results for toluene were flagged appropriately.

5.2.2 Duplicate Samples

Seven duplicate samples were collected during this investigation. Because the holding time for samples collected via syringe is 5 minutes, duplicates were collected by returning to a sample location to collect a separate aliquot. Overall there was good correlation (<50% relative percent difference) between the original sample and the duplicate. The results are presented in Table 2.

5.2.3 Split Samples

Five split samples were collected during this investigation. Split samples were collected via a 1-liter SUMMA canister. Following purging of the probe, a sample was collected with the glass syringe for analysis at the mobile laboratory. Immediately, a SUMMA canister was attached via a flow control and allowed to sample the soil gas at a 100 ml/minute flow rate. When the vacuum gauge measured minus 5 inches of mercury, the valve was closed and the canister was sipped to Air Toxics, Ltd. for analysis. In general there was good correlation (<50% relative percent difference) between the mobile laboratory and the split samples analyzed at the offsite laboratory. The results are presented in Table 3.

6.0 SUMMARY AND CONCLUSIONS

Soil vapor from 95 distinct locations was sampled and analyzed by EPA Method TO-15 in a mobile laboratory. Of these, the CHHSL for an individual compound (in this case benzene) was exceeded at only three locations. At one other location the cumulative CHHSL was exceed. Duplicate and split samples verified the accuracy of the mobile laboratory results.

The primary goal of this investigation was to characterize the vapor intrusion pathway at IR Site 12. The successful collection and analysis of samples from 95 distinct soil gas locations has achieved this goal. Sufficient data now exists at the site to allow for analysis of the vapor intrusion pathway in the HHRA section of the RI report. Because no soil gas plumes were identified, the secondary goal of delineating unbound locations where soil gas concentrations exceeded criteria was also achieved.

7.0 REFERENCES

Department of Toxic Substances Control (DTSC). 2003a. "Johnson and Ettinger (1991) Model for Vapor Intrusion into Buildings. Version 2.0." April.

DTSC. 2003b. "Advisory – Active Soil Gas Investigations." January 28. Available Online at: <http://www.dtsc.ca.gov/LawsRegsPolicies/Policies/SiteCleanup/upload/SMBR_ADV_activesoilgasinvst.pdf>.

DTSC. 2005. Use of California Human Health Screening Levels (CHHSLs) in Evaluations of Contaminated Properties. January. Available online at: <http://www.calepa.ca.gov/brownfields/documents/2005/CHHSLsGuide.pdf>

Harding Lawson Associates. 1985. "Dewatering Recommendations, Repair of Steam Distribution System, Treasure Island, California." Prepared for the Department of the Navy, Naval Facilities Engineering Command, Western Division (WESTDIV). August 24.

PRC Environmental Management, Inc. (PRC). 1993. "Storm Water Pollution Prevention Plan, Naval Station Treasure Island, San Francisco, California." Prepared for WESTDIV. June 14.

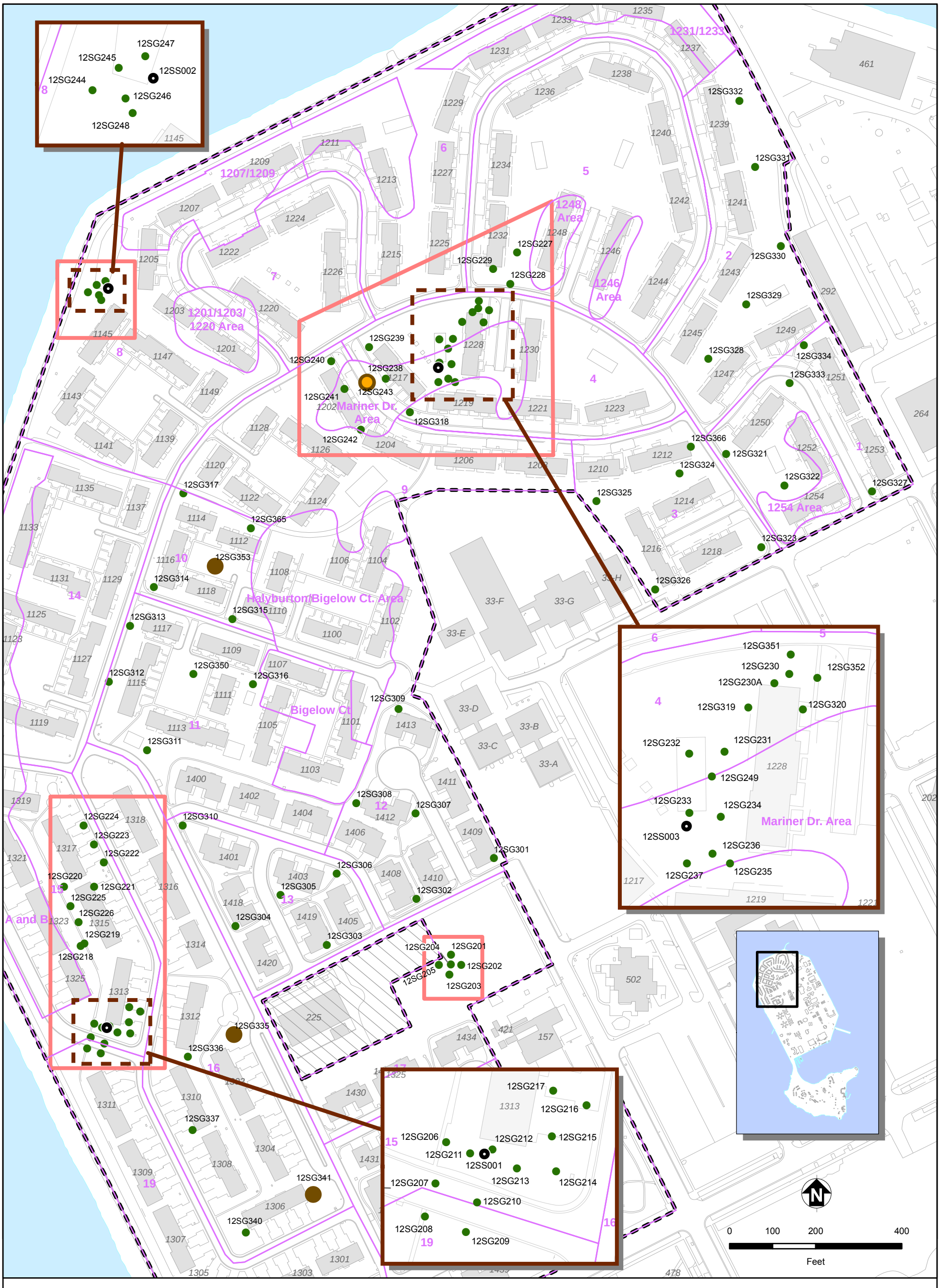
PRC. 1997. "Draft Final Remedial Investigation Report, Naval Station Treasure Island, San Francisco, California." Prepared for Department of the Navy, Naval Facilities Engineering Command, Engineering Field Activity West (EFA WEST). September.

San Francisco Bay Regional Water Quality Control Board. 2007. "Screening for Environmental Concerns at Sites with Contaminated Soil and Groundwater." Interim Final. November. Available Online at: <http://www.waterboards.ca.gov/rwqcb2/esl.htm>.

SulTech. 2006. "Final Remedial Investigation Report Work Plan, Installation Restoration Site 12, Old Bunker Area, Naval Station Treasure Island, San Francisco, California." Prepared for BRAC PMO West. April.

SulTech. 2008. "Final Sampling and Analysis Plan (Field Sampling Plan/Quality Assurance Project Plan) Targeted Soil Gas Investigation, Naval Station Treasure Island, San Francisco, California. November.

FIGURES



Soil Gas Sample Exceeds Individual CHSSL (Benzene) and Cumulative CHSSL

Soil Gas Sample Exceeds Cumulative CHHSL

Soil Gas Sample (Below CHSSLs)

Soil Sample

Site 12

Site 20

Original Investigation Area

Exposure Unit Boundary

Building

Road, Curb, Parking, Pavement

TETRA TECH EM INC.

Naval Station Treasure Island

U.S. Department of the Navy, BRAC PMO West, San Diego, CA

FIGURE 1

VOCs IN SOIL GAS

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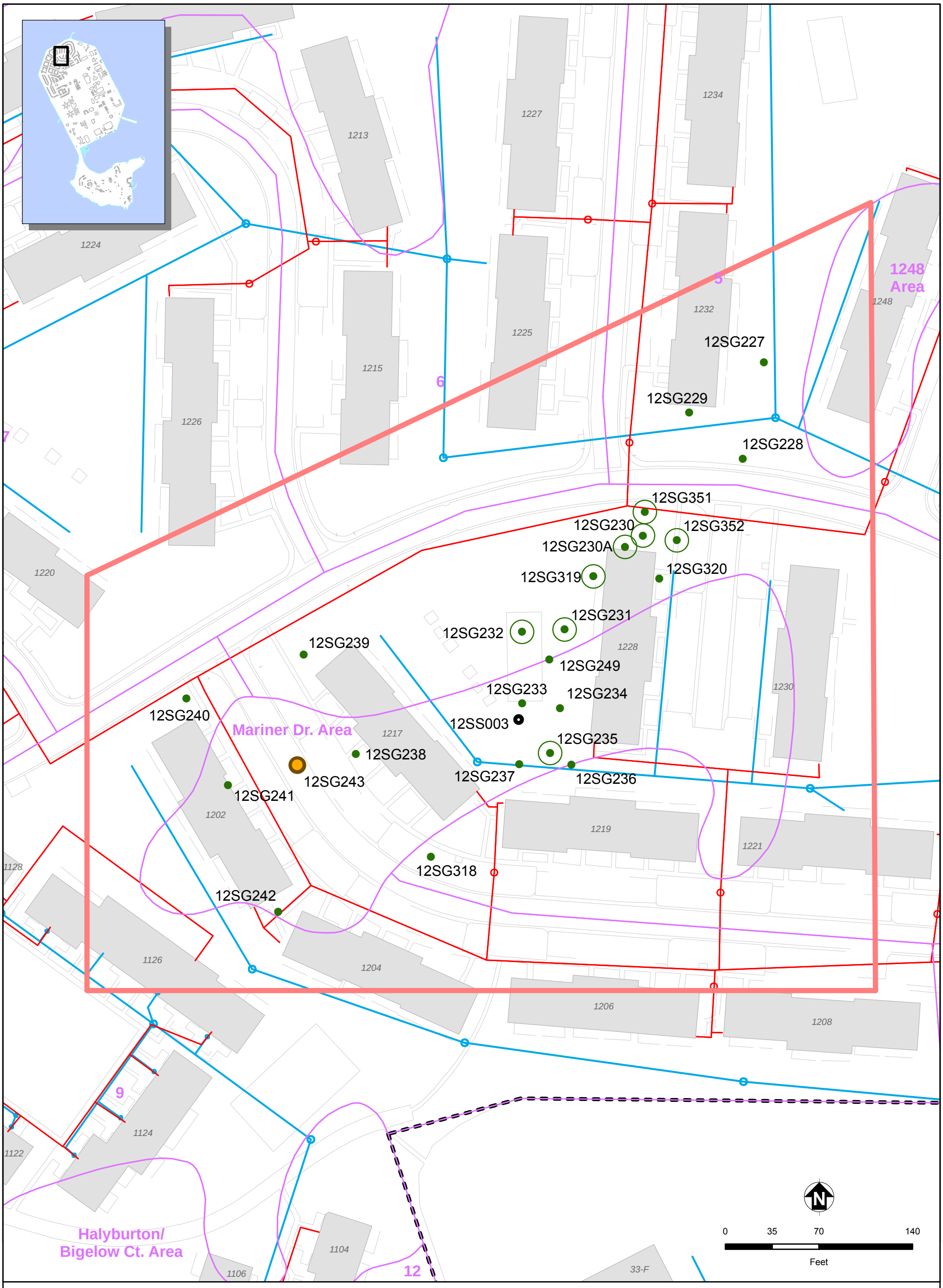

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12SG335
12SG336
12SG337
12SG340
12SG341
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Soil Gas Sample Exceeds Individual CHSSL (Benzene) and Cumulative CHSSL
Soil Gas Sample Exceeds Cumulative CHHSL
Soil Gas Sample (Below CHSSLs)
Methane Detected (in Soil Sample)
Original Investigation Area
Site 12
Site 20
Exposure Unit Boundary
Gas Line
Gas Vault
Sanitary Sewer Pipeline
Sanitary Sewer Manhole
Building
Road, Curb, Parking, Pavement

TETRA TECH EM INC.

Naval Station Treasure Island
U.S. Department of the Navy, BRAC PMO West, San Diego, CA

FIGURE 3
METHANE IN SOIL GAS
EXPOSURE UNIT 16

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TABLES

TABLE 1: SUMMARY OF SOIL GAS INVESTIGATION

Technical Memorandum, Soil Gas Sampling, Installation Restoration Site 12, Naval Station Treasure Island, San Francisco, California

Sample ID	Date Collected	Exceed Individual CHHSL (Y/N)	Compound Exceeding Individual CHHSL (Concentration)	Exceed Cumulative CHHSL (Y/N)	If Cumulative CHHSL Exceeded; Compounds Detected	Methane (%)	Depth (ft. bgs)	Comments
Original Locations								
12SG201	14-Nov-08	N	--	N	--	ND	4.0	
12SG202	14-Nov-08	N	--	N	--	ND	4.0	
12SG203	14-Nov-08	N	--	N	--	ND	4.0	
12SG204	14-Nov-08	N	--	N	--	ND	4.0	
12SG205	14-Nov-08	N	--	N	--	ND	4.0	
12SG206	12-Nov-08	N	--	N	--	ND	4.0	
12SG207	11-Nov-08	N	--	N	--	ND	2.5	Beneath asphalt
12SG208	12-Nov-08	N	--	N	--	ND	4.0	
12SG209	12-Nov-08	N	--	N	--	ND	4.0	
12SG210	NA[1]	--	--	--	--	--	4.0	Beneath asphalt, unable to collect due to groundwater
12SG211	12-Nov-08	N	--	N	--	ND	4.0	
12SG212	12-Nov-08	N	--	N	--	ND	4.0	
12SG213	12-Nov-08	N	--	N	--	ND	4.0	
12SG214	12-Nov-08	N	--	N	--	ND	3.5	
12SG215	12-Nov-08	N	--	N	--	ND	4.0	
12SG216	12-Nov-08	N	--	N	--	ND	4.0	
12SG217	12-Nov-08	N	--	N	--	ND	4.0	
12SG218	12-Nov-08	N	--	N	--	ND	4.0	
12SG219	12-Nov-08	N	--	N	--	ND	4.0	
12SG220	11-Nov-08	N	--	N	--	ND	4.0	Hand auger
12SG221	11-Nov-08	N	--	N	--	ND	4.0	
12SG222	11-Nov-08	N	--	N	--	ND	2.5	Within 2' of road
12SG223	11-Nov-08	N	--	N	--	ND	4.0	Within 2' of road
12SG224	11-Nov-08	N	--	N	--	ND	4.0	Within 2' of road
12SG225	11-Nov-08	N	--	N	--	ND	4.0	Hand auger
12SG226	11-Nov-08	N	--	N	--	ND	4.0	Hand auger
12SG227	14-Nov-08	N	--	N	--	ND	4.0	
12SG228	14-Nov-08	N	--	N	--	ND	4.0	Within 2' of road

TABLE 1: SUMMARY OF SOIL GAS INVESTIGATION (CONTINUED)
Technical Memorandum, Soil Gas Sampling, Installation Restoration Site 12, Naval Station Treasure Island, San Francisco, California

Sample ID	Date Collected	Exceed Individual CHHSL (Y/N)	Compound Exceeding Individual CHHSL (Concentration)	Exceed Cumulative CHHSL (Y/N)	If Cumulative CHHSL Exceeded; Compounds Detected	Methane (%)	Depth (ft. bgs)	Comments
12SG229	14-Nov-08	N	--	N	--	ND	4.0	
12SG230	14-Nov-08	N	--	N	--	**>90**	4.0	
12SG230A	18-Nov-08	N	--	N	--	**43**	4.0	Within 2' of Building 1228 foundation.
12SG231	14-Nov-08	N	--	N	--	**1.7**	4.0	
12SG232	13-Nov-08	N	--	N	--	**22**	4.0	
12SG233	14-Nov-08	N	--	N	--	ND	4.0	
12SG234	14-Nov-08	N	--	N	--	ND	4.0	
12SG235	13-Nov-08	N	--	N	--	**4.5**	2.5	
12SG236	13-Nov-08	N	--	N	--	ND	4.0	
12SG237	13-Nov-08	N	--	N	--	ND	4.0	
12SG238	13-Nov-08	N	--	N	--	**2.9**	4.0	
12SG239	13-Nov-08	N	--	N	--	ND	4.0	
12SG240	13-Nov-08	N	--	N	--	ND	4.0	
12SG241	NA[2]	--	--	--	--	--	--	Beneath asphalt, unable to collect due to groundwater
12SG242	13-Nov-08	N	--	N	--	ND	4.0	
12SG243	11-Nov-08	N	--	Y	4-methyl-2-pentenone, benzene, carbon disulfide, cyclohexane, xylenes, toluene	ND	4.0	Beneath asphalt
12SG244 High Tide	13-Nov-08	N	--	N	--	ND	4.0	
12SG244 Low Tide	14-Nov-08	N	--	N	--	ND	4.0	
12SG245 High Tide	13-Nov-08	N	--	N	--	ND	4.0	
12SG245 Low Tide	14-Nov-08	N	--	N	--	ND	4.0	
12SG246	13-Nov-08	N	--	N	--	ND	4.0	
12SG247	13-Nov-08	N	--	N	--	ND	4.0	
12SG248	13-Nov-08	N	--	N	--	ND	4.0	
12SG249	14-Nov-08	N	--	N	--	ND	4.0	

TABLE 1: SUMMARY OF SOIL GAS INVESTIGATION (CONTINUED)

Technical Memorandum, Soil Gas Sampling, Installation Restoration Site 12, Naval Station Treasure Island, San Francisco, California

Sample ID	Date Collected	Exceed Individual CHHSL (Y/N)	Compound Exceeding Individual CHHSL (Concentration)	Exceed Cumulative CHHSL (Y/N)	If Cumulative CHHSL Exceeded; Compounds Detected	Methane (%)	Depth (ft. bgs)	Comments
Step-out Samples and Additional Locations								
12SG301	21-Nov-08	N	--	N	--	ND	4.0	
12SG302	20-Nov-08	N	--	N	--	ND	4.0	
12SG303	20-Nov-08	N	--	N	--	ND	4.0	
12SG304	20-Nov-08	N	--	N	--	ND	4.0	
12SG305	20-Nov-08	N	--	N	--	ND	4.0	
12SG306	20-Nov-08	N	--	N	--	ND	4.0	
12SG307	20-Nov-08	N	--	N	--	ND	4.0	
12SG308	20-Nov-08	N	--	N	--	ND	4.0	
12SG309	20-Nov-08	N	--	N	--	ND	4.0	
12SG310	20-Nov-08	N	--	N	--	ND	4.0	
12SG311	20-Nov-08	N	--	N	--	ND	4.0	
12SG312	21-Nov-08	N	--	N	--	ND	4.0	
12SG313	20-Nov-08	N	--	N	--	ND	4.0	
12SG314	19-Nov-08	N	--	N	--	ND	4.0	
12SG315	19-Nov-08	N	--	N	--	ND	4.0	
12SG316	20-Nov-08	N	--	N	--	ND	4.0	
12SG317	20-Nov-08	N	--	N	--	ND	4.0	
12SG318	18-Nov-08	N	--	N	--	**3.9**	4.0	
12SG319	18-Nov-08	N	--	N	--	**68**	4.0	
12SG320	18-Nov-08	N	--	N	--	ND	4.0	
12SG321	18-Nov-08	N	--	N	--	ND	4.0	
12SG322	18-Nov-08	N	--	N	--	ND	4.0	
12SG323	NA[3]	--	--	--	--	--	--	
12SG324	18-Nov-08	N	--	N	--	ND	4.0	
12SG325	19-Nov-08	N	--	N	--	ND	4.0	
12SG326	21-Nov-08	N	--	N	--	ND	4.0	
12SG327	NA[3]	--	--	--	--	--	--	
12SG328	19-Nov-08	N	--	N	--	ND	4.0	
12SG329	19-Nov-08	N	--	N	--	ND	4.0	

TABLE 1: SUMMARY OF SOIL GAS INVESTIGATION (CONTINUED)
Technical Memorandum, Soil Gas Sampling, Installation Restoration Site 12, Naval Station Treasure Island, San Francisco, California

Sample ID	Date Collected	Exceed Individual CHHSL (Y/N)	Compound Exceeding Individual CHHSL (Concentration)	Exceed Cumulative CHHSL (Y/N)	If Cumulative CHHSL Exceeded; Compounds Detected	Methane (%)	Depth (ft. bgs)	Comments
12SG330	19-Nov-08	N	--	N	--	ND	4.0	
12SG331	19-Nov-08	N	--	N	--	ND	4.0	
12SG332	19-Nov-08	N	--	N	--	ND	4.0	
12SG333	19-Nov-08	N	--	N	--	ND	4.0	
12SG334	NA[3]	--	--	--	--	--	--	
12SG335	21-Nov-08	Y	Benzene (160 µg/m^3; CHHSL = 36 µg/m3)	Y	Benzene,cyclohexane, ethylbenzene, xylenes	ND	4.0	
12SG336	21-Nov-08	N	--	N	--	ND	4.0	
12SG337	21-Nov-08	N	--	N	--	ND	4.0	
12SG338	NA[3]	--	--	--	--	--	--	
12SG339	NA[3]	--	--	--	--	--	--	
12SG340	21-Nov-08	N	--	N	--	ND	4.0	
12SG341	21-Nov-08	Y	Benzene (370 µg/m^3; CHHSL = 36 µg/m^3)	Y	Benzene, cyclohexane, ethylbenzene, xylenes, toluene	ND	4.0	
12SG342	NA[3]	--	--	--	--	--	--	
12SG343	NA[3]	--	--	--	--	--	--	
12SG344	NA[3]	--	--	--	--	--	--	
12SG345	NA[3]	--	--	--	--	--	--	
12SG346	NA[3]	--	--	--	--	--	--	
12SG347	NA[3]	--	--	--	--	--	--	
12SG348	NA[3]	--	--	--	--	--	--	
12SG349	NA[3]	--	--	--	--	--	--	
12SG350	20-Nov-08	N	--	N	--	ND	4.0	Beneath asphalt
12SG351	18-Nov-08	N	--	N	--	**>90**	4.0	

TABLE 1: SUMMARY OF SOIL GAS INVESTIGATION (CONTINUED)

Technical Memorandum, Soil Gas Sampling, Installation Restoration Site 12, Naval Station Treasure Island, San Francisco, California

Sample ID	Date Collected	Exceed Individual CHHSL (Y/N)	Compound Exceeding Individual CHHSL (Concentration)	Exceed Cumulative CHHSL (Y/N)	If Cumulative CHHSL Exceeded; Compounds Detected	Methane (%)	Depth (ft. bgs)	Comments
12SG352	18-Nov-08	N	--	N	--	**2.6**	4.0	
12SG353	19-Nov-08	Y	Benzene (50 µg/m^3; CHHSL = 36 µg/m^3)	Y	Benzene, carbon disulfide, chloroform, cyclohexane, ethylbenzene, xylenes, toluene	ND	4.0	
12SG354	NA[3]	--	--	--	--	--	4.0	
12SG355	NA[3]	--	--	--	--	--	4.0	
12SG356	NA[3]	--	--	--	--	--	4.0	
12SG357	NA[3]	--	--	--	--	--	4.0	
12SG358	NA[3]	--	--	--	--	--	4.0	
12SG359	NA[3]	--	--	--	--	--	4.0	
12SG360	NA[3]	--	--	--	--	--	4.0	
12SG361	NA[3]	--	--	--	--	--	4.0	
12SG362	NA[3]	--	--	--	--	--	4.0	
12SG363	NA[3]	--	--	--	--	--	4.0	
12SG364	NA[3]	--	--	--	--	--	4.0	
12SG365	21-Nov-08	N	--	N	--	ND	4.0	
12SG366	21-Nov-08	N	--	N	--	ND	4.0	

Notes:

1 Unable to collect sample due to presence of groundwater.
2 Unable to access original location due to ongoing radiological investigation.
3 Because Phase I required few step-outs, additional locations within EU's not originally proposed for this investigation were identified for possible sampling. These locations were given identification numbers, however, due to time and budget constraints, samples were not collected.

CHHSL California Human Health Screening Level (DTSC 2005)
EU Exposure unit
NA Not applicable
ND Not detected

TABLE 2: DUPLICATE SAMPLE RESULTS

Technical Memorandum, Soil Gas Sampling, Installation Restoration Site 12,
Naval Station Treasure Island, San Francisco, California

Location ID	Compound	Original Location	Duplicate Result	Relative Percent Difference
12SG204	Cyclohexane	62	33	61.1
	m,p-xylene	13	<10J	NA
	Toluene	<26	170	NA
12SG206	Cyclohexane	20	15	28.6
	m,p-xylene	21	17	21.1
	Toluene	980	650	40.5
12SG207	Cyclohexane	<10	24	NA
	Ethylbenzene	<10	15	NA
	m,p-xylene	<10	40	NA
	o-xylene	<10	16	NA
	Toluene	200	1,300	**-146.7**
12SG232	Benzene	16	12	28.6
	Carbon Disulfide	230	170	30.0
	Cyclohexane	290	280	3.5
	Ethylbenzene	11	<10J	NA
	Freon 12	350	360	-2.8
	m,p-xylene	24	<10J	NA
12SG350	Carbon Disulfide	16	17	-6.1
	Cyclohexane	370	370	0.0
	Ethylbenzene	16	22	-31.6
	m,p-xylene	53	60	-12.4
	o-xylene	<10	31	NA
12SG352	Cyclohexane	400	390	2.5
	Freon 12	37	38	-2.7
12SG353	Benzene	50	50	0.0
	Carbon Disulfide	13	13	0.0
	Chloroform	29	42	-36.6
	Cyclohexane	940	660	35.0
	Ethylbenzene	55	73	-28.1
	m,p-xylene	130	190	-37.5
	o-xylene	53	47	12.0
	Toluene	11,000	12,000	-8.7

Notes:

Results in **bold** exceed 50% RPD criteria.

NA Unable to calculate RPD for this compound.

TABLE 3: SPLIT SAMPLE RESULTS

Technical Memorandum, Soil Gas Sampling, Installation Restoration Site 12,
Naval Station Treasure Island, San Francisco, California

Location ID	Compound	Original Location	Split Sample Result	Relative Percent Difference
12SG230	Cyclohexane	9,600	6,870	33.2
	m,p-xylene	110	<178	NA
	Toluene	<26	170	NA
12SG326	Chloroform	23	20.4	12.0
	Cyclohexane	<10J	7.6	NA
	m,p-xylene	12	11.7	2.5
	Toluene	27	23.7J	NA
12SG340	Cyclohexane	<10	7.9	NA
	m,p-xylene	13	12.6	3.1
	Toluene	<44	24.1	NA
12SG341	Cyclohexane	39,000	41,200	-5.5
12SG350	Benzene	<10	5.1	NA
	Carbon Disulfide	16	7.5	**72.3**
	Cyclohexane	370	155	**81.9**
	Ethylbenzene	16	9.1	**55.0**
	m,p-xylene	53	29	**58.5**
	o-xylene	<10	8.2	NA

Notes:

Results in **bold** exceed 50% RPD criteria.

NA Unable to calculate RPD for this compound.

APPENDIX A
SAP WORKSHEET 15 – REFERENCE LIMITS AND EVALUATION TABLE

SAP WORKSHEET #15 — REFERENCE LIMITS AND EVALUATION TABLE

(15a) EPA Method TO-15
Analytical Group: VOCs
Matrix: Soil Gas

Chemical CAS	Number	Project Action Limit (µg/m^3)	Project Action Limit Reference[1,2]	Project Quantitation Limit Goal (µg/m^3)	Laboratory-Specific (µg/m^3)	
					Quantitation Limit (QL)	Method Detection Limit (MDL)
TO-15 using Mobile Laboratory for Soil Gas						
1,1,1-Trichloroethane	**71-55-6**	991,000	**CHHSL**	496,000	**10**	**4.2**
1,1,2,2-Tetrachlorethane	**79-34-5**	17.9	**PSL**	9.0	**15**	**3.6**
1,1,2-Trichloroethane	**79-00-5**	65	**PSL**	32.5	**10**	**9.9**
1,1-Dichloroethane	**75-34-31**	650	**PSL**	325	**10**	**6.3**
1,1-Dichloroethene	**75-35-4**	89,100	**PSL**	44,600	**10**	**2.8**
1,1-Difluoroethane	**75-37-6**	N.A.	**TRACER**	N.A.	**10,000**	**10**
1,2,4-Trimethylbenzene	**95-63-6**	**2670**	**PSL**	**1340**	**15**	**2.4**
1,3,5-Trimethylbenzene	**108-67-8**	**2670**	**PSL**	**1340**	**10**	**4.2**
1,2-Dichlorobenzene	**95-50-1**	**89,100**	**PSL**	**44,600**	**15**	**3.4**
1,4-Dichlorobenzene	**106-46-7**	**94.5**	**PSL**	**47.3**	**15**	**3.7**
2-Butanone	**78-93-3**	**2,230,000**	**PSL**	**1,120,000**	**10**	**7.5**
Benzene	**71-43-2**	**36.2**	**CHHSL**	**18.1**	**10**	**2.6**
Bromodichloromethane	**75-27-4**	**--**	**None**	**--**	**10**	**10**
Bromomethane	**74-83-9**	**2230**	**PSL**	**1120**	**20**	**4.9**
Carbon Disulfide	**75-15-0**	**312,000**	**PSL**	**156,000**	**10**	**3.2**
Chlorobenzene	**108-90-7**	**22,300**	**PSL**	**11,200**	**10**	**1.9**
Chloroethane	**75-00-3**	**1260**	**PSL**	**630**	**15**	**5.3**
Chloroform	**67-66-3**	**196**	**PSL**	**98**	**10**	**5.7**
Chloromethane	**74-87-3**	**578**	**PSL**	**289**	**10**	**2.5**
***cis*-1,2-Dichloroethene**	**156-59-2**	**15,900**	**CHHSL**	**8000**	**10**	**2.3**

SAP WORKSHEET #15 — REFERENCE LIMITS AND EVALUATION TABLES (UFP-QAPP MANUAL SECTION 2.8.1) (CONTINUED)

Matrix: Soil Gas

Cyclohexane	**110-82-7**	**2,650,000**	**PSL**	**1,330,000**	**10**	**6.9**
Dibromochloromethane	**124-48-1**	**38.5**	**PSL**	**19.3**	**10**	**7.1**
Ethylbenzene	**100-41-4**	**416**	**PSL**	**208**	**10**	**2.3**
Freon 11	**75-69-4**	**312,000**	**PSL**	**160,000**	**10**	**5.8**
Freon 113	**76-13-1**	**13,400,000**	**PSL**	**6,700,000**	**15**	**7.4**
Freon 12	**75-71-8**	**89,100**	**PSL**	**44,600**	**15**	**5.8**
Isopropylbenzene	**98-82-8**	**178,000**	**PSL**	**89,000**	**TIC[3]**	**TIC**
Methyl Isobutyl Ketone	**108-10-1**	**13,400,000**	**PSL**	**6,700,000**	**10**	**11.3**
Methyl *tert*-butyl Ether	**1634-04-4**	**4000**	**CHHSL**	**2000**	**10**	**2.67**
Methylene Chloride	**75-09-2**	**1040**	**PSL**	**520**	**10**	**7.6**
Naphthalene	**91-20-3**	**31.9**	**CHHSL**	**16.0**	**20**	**4.85**
N-Propylbenzene	**103-65-1**	**62,400**	**PSL**	**31,200**	**TIC**	**TIC**
***para*-Isopropyl Toluene**	**99-87-6**	**2,230,000**	**PSL**	**1,120,000**	**TIC**	**TIC**
***sec*-Butylbenzene**	**135-98-8**	**62,400**	**PSL**	**31,200**	**TIC**	**TIC**
Styrene	**100-42-5**	**452,000**	**PSL**	**236,000**	**10**	**1.7**
Tetrachloroethene	**127-18-4**	**180**	**CHHSL**	**90**	**10**	**4.6**
Toluene	**108-88-3**	**135,000**	**CHHSL**	**68,000**	**10**	**2.3**
***trans*-1,2-Dichloroethene**	**156-60-5**	**31,900**	**CHHSL**	**16,000**	**10**	**8.2**
Trichloroethene	**79-01-6**	**528**	**CHHSL**	**264**	**10**	**4.1**
Vinyl chloride	**75-01-4**	**13.3**	**CHHSL**	**6.7**	**5**	**2.7**
Xylene	**1330-20-7**	**45,200**	**PSL**	**27,600**	**10**	**6.1**
TO-15 using Off-Site Laboratory for Soil Gas						
1,1,1-Trichloroethane	**71-55-6**	991,000	**CHHSL**	496,000	**10**	**4.2**
1,1,2,2-Tetrachlorethane	**79-34-5**	17.9	**PSL**	9.0	**15**	**3.6**
1,1,2-Trichloroethane	**79-00-5**	65	**PSL**	32.5	**10**	**9.9**
1,1-Dichloroethane	**75-34-31**	650	**PSL**	325	**10**	**6.3**

SAP WORKSHEET #15 — REFERENCE LIMITS AND EVALUATION TABLES (UFP-QAPP MANUAL SECTION 2.8.1) (CONTINUED)

Matrix: Soil Gas

1,1-Dichloroethene	**75-35-4**	**89,100**	**PSL**	**44,600**	**10**	**2.8**
1,1-Difluoroethane	**75-37-6**	N.A.	**TRACER**	N.A.	**10,000**	**10**
1,2,4-Trimethylbenzene	**95-63-6**	**2670**	**PSL**	**1340**	**15**	**2.4**
1,3,5-Trimethylbenzene	**108-67-8**	**2670**	**PSL**	**1340**	**10**	**4.2**
1,2-Dichlorobenzene	**95-50-1**	**89,100**	**PSL**	**44,600**	**15**	**3.4**
1,4-Dichlorobenzene	**106-46-7**	**94.5**	**PSL**	**47.3**	**15**	**3.7**
2-Butanone	**78-93-3**	**2,230,000**	**PSL**	**1,120,000**	**10**	**7.5**
Benzene	**71-43-2**	**36.2**	**CHHSL**	**18.1**	**10**	**2.6**
Bromodichloromethane	**75-27-4**	**--**	**None**	**--**	**10**	**10**
Bromomethane	**74-83-9**	**2230**	**PSL**	**1120**	**20**	**4.9**
Carbon Disulfide	**75-15-0**	**312,000**	**PSL**	**156,000**	**10**	**3.2**
Chlorobenzene	**108-90-7**	**22,300**	**PSL**	**11,200**	**10**	**1.9**
Chloroethane	**75-00-3**	**1260**	**PSL**	**630**	**15**	**5.3**
Chloroform	**67-66-3**	**196**	**PSL**	**98**	**10**	**5.7**
Chloromethane	**74-87-3**	**578**	**PSL**	**289**	**10**	**2.5**
***cis*-1,2-Dichloroethene**	**156-59-2**	**15,900**	**CHHSL**	**8000**	**10**	**2.3**
Cyclohexane	**110-82-7**	**2,650,000**	**PSL**	**1,330,000**	**10**	**6.9**
Dibromochloromethane	**124-48-1**	**38.5**	**PSL**	**19.3**	**10**	**7.1**
Ethylbenzene	**100-41-4**	**416**	**PSL**	**208**	**10**	**2.3**
Freon 11	**75-69-4**	**312,000**	**PSL**	**160,000**	**10**	**5.8**
Freon 113	**76-13-1**	**13,400,000**	**PSL**	**6,700,000**	**15**	**7.4**
Freon 12	**75-71-8**	**89,100**	**PSL**	**44,600**	**15**	**5.8**
Isopropylbenzene	**98-82-8**	**178,000**	**PSL**	**89,000**	**TIC**	**TIC**
Methyl Isobutyl Ketone	**108-10-1**	**1,340,000**	**PSL**	**670,000**	**10**	**11.3**
Methyl *tert*-butyl Ether	**1634-04-4**	**4000**	**CHHSL**	**2000**	**10**	**2.67**
Methylene Chloride	**75-09-2**	**1040**	**PSL**	**520**	**10**	**7.6**

SAP WORKSHEET #15 — REFERENCE LIMITS AND EVALUATION TABLES (UFP-QAPP MANUAL SECTION 2.8.1) (CONTINUED)

Matrix: Soil Gas

Naphthalene	**91-20-3**	**31.9**	**CHHSL**	**16.0**	**20**	**4.85**
N-Propylbenzene	**103-65-1**	**62,400**	**PSL**	**31,200**	**TIC**	**TIC**
***para*-Isopropyl Toluene**	**99-87-6**	**2,230,000**	**PSL**	**1,120,000**	**TIC**	**TIC**
***sec*-Butylbenzene**	**135-98-8**	**62,400**	**PSL**	**31,200**	**TIC**	**TIC**
Styrene	**100-42-5**	**452,000**	**PSL**	**236,000**	**10**	**1.7**
Tetrachloroethene	**127-18-4**	**180**	**CHHSL**	**90**	**10**	**4.6**
Toluene	**108-88-3**	**135,000**	**CHHSL**	**68,000**	**10**	**2.3**
***trans*-1,2-Dichloroethene**	**156-60-5**	**31,900**	**CHHSL**	**16,000**	**10**	**8.2**
Trichloroethene	**79-01-6**	**528**	**CHHSL**	**264**	**10**	**4.1**
Vinyl chloride	**75-01-4**	**13.3**	**CHHSL**	**6.7**	**5**	**2.7**
Xylene	**1330-20-7**	**45,200**	**PSL**	**27,600**	**10**	**6.1**

Notes:

1 **CHHSL values are shallow soil gas human health screening levels for residential exposures (From Table 2 of Cal/EPA, 2005)**

2 **PSL – Project screening levels (PSLs) calculated with methodology used by Cal/EPA to calculate CHHSLs (Cal/EPA, 2005).**

3 **TIC –These chemicals are not part of EPA Method TO-15 and will be evaluated as tentatively identified compounds (TICs).**

µg/m^3 **Microgram per cubic meter**
CHHSL **2005 California Human Health Screening Levels**
HQ **Hazard quotient**
J&E **Johnson and Ettinger Model for Vapor Intrusion (DTSC 2003b)**
PSL **Project Screening Level**

APPENDIX B
ANALYTICAL RESULTS

APPENDIX B: ANALYTICAL RESULTS FOR SOIL GAS IN SITE 12

Technical Memorandum for Soil Gas Sampling at Installation Restoration Site 12, Naval Station Treasure Island, San Francisco, California

Sample Location ID	12SG201	12SG202	12SG203	12SG204	12SG204 (dup)	12SG205	12SG206
Sample ID	12SG201	12SG202	12SG203	12SG204	12SG204DUP	12SG205	12SG206
Sample Date	11/14/2008	11/14/2008	11/14/2008	11/14/2008	11/14/2008	11/14/2008	11/12/2008
EPA TO-15 VOA (UG/M3)							
1,1,1-TRICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 UJ i	10.0 U	10.0 U	10.0 U
1,1,2,2-TETRACHLOROETHANE	15.0 U	15.0 U	15.0 U	15.0 UJ i	15.0 U	15.0 U	15.0 U
1,1,2-TRICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,1-DICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 UJ i	10.0 U	10.0 U	10.0 U
1,1-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 UJ i	10.0 U	10.0 U	10.0 U
1,2,4-TRIMETHYLBENZENE	15.0 U	15.0 U	15.0 U	15.0 UJ i	15.0 U	15.0 U	15.0 UJ e
1,2-DICHLOROBENZENE	15.0 U	15.0 U	15.0 U	15.0 UJ i	15.0 U	15.0 U	15.0 U
1,3,5-TRIMETHYLBENZENE	10.0 U	10.0 U	10.0 U	10.0 UJ i	10.0 U	10.0 U	10.0 UJ e
1,4-DICHLOROBENZENE	15.0 U	15.0 U	15.0 U	15.0 UJ i	15.0 U	15.0 U	15.0 U
2-BUTANONE	10.0 U	10.0 U	10.0 U	10.0 UJ i	10.0 U	10.0 U	10.0 U
4-METHYL-2-PENTANONE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
ACETONE	NA	NA	NA	NA	NA	NA	NA
BENZENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
BROMODICHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
BROMOMETHANE	20.0 U	20.0 U	20.0 U	20.0 UJ i	20.0 U	20.0 U	20.0 U
CARBON DISULFIDE	11.0	11.0	15.0	10.0 UJ i	10.0 U	10.0 U	10.0 U
CHLOROBENZENE	10.0 U	10.0 U	10.0 U	10.0 UJ i	10.0 U	10.0 U	10.0 U
CHLOROETHANE	15.0 U	15.0 U	15.0 U	15.0 UJ i	15.0 U	15.0 U	15.0 U
CHLOROFORM	10.0 U	10.0 U	10.0 U	10.0 UJ i	10.0 U	68.0	10.0 U
CHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 UJ i	10.0 U	10.0 U	10.0 U
CIS-1,2-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 UJ i	10.0 U	10.0 U	10.0 U
CYCLOHEXANE	10.0 U	10.0 U	10.0 U	62.0	33.0	41.0	20.0
DIBROMOCHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
ETHANOL	NA	NA	NA	NA	NA	NA	NA
ETHYLBENZENE	15.0	10.0 U	10.0 U	10.0 UJ i	10.0 U	23.0	10.0 U
FREON 11	10.0 U	10.0 U	10.0 U	10.0 UJ i	10.0 U	10.0 U	10.0 U
FREON 113	15.0 U	15.0 U	15.0 U	15.0 UJ i	15.0 U	15.0 U	15.0 U
FREON 12	15.0 U	15.0 U	15.0 U	15.0 UJ i	15.0 U	15.0 U	15.0 U
ISOPROPYLBENZENE	NA	NA	NA	NA	NA	NA	NA
M,P-XYLENES	40.0	11.0	13.0	10.0 UJ i	13.0	59.0	21.0
METHYL-TERT-BUTYL ETHER	10.0 U	10.0 U	10.0 U	10.0 UJ i	10.0 U	10.0 U	10.0 U
METHYLENE CHLORIDE	10.0 U	10.0 U	10.0 U	10.0 UJ i	10.0 U	10.0 U	10.0 U
N-PROPYLBENZENE	NA	NA	NA	NA	NA	NA	NA
NAPHTHALENE	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec	20.0 UJ eci	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec
O-XYLENE	15.0	10.0 U	10.0 U	10.0 UJ i	10.0 U	10.0 U	10.0 ~~U~~

Sample Location ID	12SG201	12SG202	12SG203	12SG204	12SG204 (dup)	12SG205	12SG206
Sample ID	12SG201	12SG202	12SG203	12SG204	12SG204DUP	12SG205	12SG206
Sample Date	11/14/2008	11/14/2008	11/14/2008	11/14/2008	11/14/2008	11/14/2008	11/12/2008
EPA TO-15 VOA (UG/M3)							
PARA-ISOPROPYL TOLUENE	NA	NA	NA	NA	NA	NA	NA
SEC-BUTYLBENZENE	NA	NA	NA	NA	NA	NA	NA
STYRENE	10.0 U	10.0 U	10.0 U	10.0 UJ i	10.0 U	10.0 U	10.0 U
TETRACHLOROETHENE	10.0 U	10.0 U	22.0	10.0 U	10.0 U	10.0 U	10.0 U
TOLUENE	840	65.0 UJ f	120	26.0 UJ f	170	1,500	980
TRANS-1,2-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 UJ i	10.0 U	10.0 U	10.0 U
TRICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
VINYL CHLORIDE	5.0 U	5.0 U	5.0 U	5.0 UJ i	5.0 U	5.0 U	5.0 U

Sample Location ID	12SG206 (dup)	12SG207	12SG207 (dup)	12SG208	12SG209	12SG211	12SG212
Sample ID	12SG206DUP	12SG207	12SG207DUP	12SG208	12SG209	12SG211	12SG212
Sample Date	11/12/2008	11/11/2008	11/11/2008	11/12/2008	11/12/2008	11/12/2008	11/12/2008
EPA TO-15 VOA (UG/M3)							
1,1,1-TRICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,1,2,2-TETRACHLOROETHANE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 UJ i	15.0 U
1,1,2-TRICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,1-DICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,1-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,2,4-TRIMETHYLBENZENE	15.0 UJ e	15.0 U	15.0 U	15.0 UJ e	15.0 UJ e	15.0 UJ ei	15.0 UJ e
1,2-DICHLOROBENZENE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 UJ i	15.0 U
1,3,5-TRIMETHYLBENZENE	10.0 UJ e	10.0 U	10.0 U	10.0 UJ e	10.0 UJ e	10.0 UJ ei	10.0 UJ e
1,4-DICHLOROBENZENE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 UJ i	15.0 U
2-BUTANONE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
4-METHYL-2-PENTANONE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
ACETONE	NA	NA	NA	NA	NA	NA	NA
BENZENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
BROMODICHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
BROMOMETHANE	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U
CARBON DISULFIDE	10.0 U	10.0 U	10.0 U	25.0	10.0 U	10.0 U	10.0 U
CHLOROBENZENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 UJ i	10.0 U
CHLOROETHANE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
CHLOROFORM	10.0 U	10.0 U	10.0 U	10.0 U	19.0	10.0 U	10.0 U
CHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
CIS-1,2-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
CYCLOHEXANE	25.0	10.0 U	24.0	45.0	10.0 U	180	15.0
DIBROMOCHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
ETHANOL	NA	NA	NA	NA	NA	NA	NA
ETHYLBENZENE	10.0 U	10.0 U	15.0	10.0 U	10.0 U	10.0 UJ i	10.0 U
FREON 11	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
FREON 113	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
FREON 12	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
ISOPROPYLBENZENE	NA	NA	NA	NA	NA	NA	NA
M,P-XYLENES	17.0	10.0 U	40.0	10.0 U	17.0	10.0 UJ i	10.0 U
METHYL-TERT-BUTYL ETHER	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
METHYLENE CHLORIDE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
N-PROPYLBENZENE	NA	NA	NA	NA	NA	NA	NA
NAPHTHALENE	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec	20.0 UJ eci	20.0 UJ ec
O-XYLENE	10.0 U	10.0 U	16.0	10.0 U	10.0 U	10.0 UJ i	10.0 U

Sample Location ID	12SG206 (dup)	12SG207	12SG207 (dup)	12SG208	12SG209	12SG211	12SG212
Sample ID	12SG206DUP	12SG207	12SG207DUP	12SG208	12SG209	12SG211	12SG212
Sample Date	11/12/2008	11/11/2008	11/11/2008	11/12/2008	11/12/2008	11/12/2008	11/12/2008
EPA TO-15 VOA (UG/M3)							
PARA-ISOPROPYL TOLUENE	NA	NA	NA	NA	NA	NA	NA
SEC-BUTYLBENZENE	NA	NA	NA	NA	NA	NA	NA
STYRENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 UJ i	10.0 U
TETRACHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
TOLUENE	650	200	1,300	130	110	32.0 UJ f	18.0 UJ f
TRANS-1,2-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
TRICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
VINYL CHLORIDE	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U

APPENDIX B: ANALYTICAL RESULTS FOR SOIL GAS IN SITE 12 (Continued)

Technical Memorandum for Soil Gas Sampling at Installation Restoration Site 12, Naval Station Treasure Island, San Francisco, California

Sample Location ID	12SG213	12SG214	12SG215	12SG216	12SG217	12SG218	12SG219
Sample ID	12SG213	12SG214	12SG215	12SG216	12SG217	12SG218	12SG219
Sample Date	11/12/2008	11/12/2008	11/12/2008	11/12/2008	11/12/2008	11/12/2008	11/12/2008
EPA TO-15 VOA (UG/M3)							
1,1,1-TRICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,1,2,2-TETRACHLOROETHANE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
1,1,2-TRICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,1-DICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,1-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,2,4-TRIMETHYLBENZENE	15.0 UJ e	15.0 UJ e	15.0 UJ e	15.0 UJ e	15.0 UJ e	15.0 UJ e	15.0 UJ e
1,2-DICHLOROBENZENE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
1,3,5-TRIMETHYLBENZENE	10.0 UJ e	10.0 UJ e	10.0 UJ e	10.0 UJ e	10.0 UJ e	10.0 UJ e	10.0 UJ e
1,4-DICHLOROBENZENE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
2-BUTANONE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
4-METHYL-2-PENTANONE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
ACETONE	NA	NA	NA	NA	NA	NA	NA
BENZENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
BROMODICHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
BROMOMETHANE	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U
CARBON DISULFIDE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	11.0
CHLOROBENZENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
CHLOROETHANE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
CHLOROFORM	10.0 U	10.0 U	12.0	10.0 U	12.0	14.0	10.0 U
CHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
CIS-1,2-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
CYCLOHEXANE	33.0	19.0	17.0	10.0	26.0	24.0	56.0
DIBROMOCHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
ETHANOL	NA	NA	NA	NA	NA	NA	NA
ETHYLBENZENE	10.0 U	10.0 U	10.0 U	10.0	10.0 U	10.0 U	10.0 U
FREON 11	10.0 U	25.0	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
FREON 113	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
FREON 12	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
ISOPROPYLBENZENE	NA	NA	NA	NA	NA	NA	NA
M,P-XYLENES	10.0 U	10.0 U	10.0	32.0	10.0 U	10.0 U	10.0 U
METHYL-TERT-BUTYL ETHER	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
METHYLENE CHLORIDE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
N-PROPYLBENZENE	NA	NA	NA	NA	NA	NA	NA
NAPHTHALENE	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec
O-XYLENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U

Sample Location ID	12SG213	12SG214	12SG215	12SG216	12SG217	12SG218	12SG219
Sample ID	12SG213	12SG214	12SG215	12SG216	12SG217	12SG218	12SG219
Sample Date	11/12/2008	11/12/2008	11/12/2008	11/12/2008	11/12/2008	11/12/2008	11/12/2008
EPA TO-15 VOA (UG/M3)							
PARA-ISOPROPYL TOLUENE	NA	NA	NA	NA	NA	NA	NA
SEC-BUTYLBENZENE	NA	NA	NA	NA	NA	NA	NA
STYRENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
TETRACHLOROETHENE	18.0	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
TOLUENE	29.0 UJ f	42.0 UJ f	35.0 UJ f	420	20.0 UJ f	31.0 UJ f	35.0 UJ f
TRANS-1,2-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
TRICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
VINYL CHLORIDE	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U

Sample Location ID	12SG220	12SG221	12SG222	12SG223	12SG224, 1PV	12SG224, 3PV	12SG224, 7PV
Sample ID	12SG220	12SG221	12SG222	12SG223	12SG224, 1PV	12SG224, 3PV	12SG224, 7PV
Sample Date	11/11/2008	11/11/2008	11/11/2008	11/11/2008	11/11/2008	11/11/2008	11/11/2008
EPA TO-15 VOA (UG/M3)							
1,1,1-TRICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,1,2,2-TETRACHLOROETHANE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
1,1,2-TRICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,1-DICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,1-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,2,4-TRIMETHYLBENZENE	15.0 U	34.0	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
1,2-DICHLOROBENZENE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
1,3,5-TRIMETHYLBENZENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,4-DICHLOROBENZENE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
2-BUTANONE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
4-METHYL-2-PENTANONE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
ACETONE	NA	NA	NA	NA	NA	NA	NA
BENZENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
BROMODICHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
BROMOMETHANE	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U
CARBON DISULFIDE	10.0 U	34.0	10.0 U	10.0 U	12.0	14.0	10.0 U
CHLOROBENZENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
CHLOROETHANE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
CHLOROFORM	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
CHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
CIS-1,2-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
CYCLOHEXANE	44.0	22.0	10.0 U	29.0	41.0	23.0	19.0
DIBROMOCHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
ETHANOL	NA	NA	NA	NA	NA	NA	NA
ETHYLBENZENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
FREON 11	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
FREON 113	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
FREON 12	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
ISOPROPYLBENZENE	NA	NA	NA	NA	NA	NA	NA
M,P-XYLENES	10.0 U	10.0 U	10.0	10.0 U	12.0	13.0	13.0
METHYL-TERT-BUTYL ETHER	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
METHYLENE CHLORIDE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
N-PROPYLBENZENE	NA	NA	NA	NA	NA	NA	NA
NAPHTHALENE	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec
O-XYLENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U

Sample Location ID	12SG220	12SG221	12SG222	12SG223	12SG224, 1PV	12SG224, 3PV	12SG224, 7PV
Sample ID	12SG220	12SG221	12SG222	12SG223	12SG224, 1PV	12SG224, 3PV	12SG224, 7PV
Sample Date	11/11/2008	11/11/2008	11/11/2008	11/11/2008	11/11/2008	11/11/2008	11/11/2008
EPA TO-15 VOA (UG/M3)							
PARA-ISOPROPYL TOLUENE	NA	NA	NA	NA	NA	NA	NA
SEC-BUTYLBENZENE	NA	NA	NA	NA	NA	NA	NA
STYRENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
TETRACHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
TOLUENE	16.0 UJ f	36.0 UJ f	46.0 UJ f	30.0 UJ f	130	130	130
TRANS-1,2-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
TRICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
VINYL CHLORIDE	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U

Sample Location ID	12SG225	12SG226	12SG227	12SG228	12SG229	12SG230	12SG230
Sample ID	12SG225	12SG226	12SG227	12SG228	12SG229	12SG230	12SG230RSPLIT
Sample Date	11/11/2008	11/11/2008	11/14/2008	11/14/2008	11/14/2008	11/14/2008	11/18/2008
EPA TO-15 VOA (UG/M3)							
1,1,1-TRICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	196 U
1,1,2,2-TETRACHLOROETHANE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	247 U
1,1,2-TRICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	196 U
1,1-DICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	146 U
1,1-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	143 U
1,2,4-TRIMETHYLBENZENE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	177 U
1,2-DICHLOROBENZENE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	NA
1,3,5-TRIMETHYLBENZENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	177 U
1,4-DICHLOROBENZENE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	216 U
2-BUTANONE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	106 U
4-METHYL-2-PENTANONE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	147 U
ACETONE	NA	NA	NA	NA	NA	NA	332 U
BENZENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	115 U
BROMODICHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	NA
BROMOMETHANE	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U	140 U
CARBON DISULFIDE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	112 U
CHLOROBENZENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	NA
CHLOROETHANE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	95.7 UJ c
CHLOROFORM	27.0 J a	10.0 U	10.0 U	10.0 U	21.0	10.0 U	175 U
CHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	292 U
CIS-1,2-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	143 U
CYCLOHEXANE	31.0 J a	10.0 U	14.0	39.0	10.0 U	9,600	6,870
DIBROMOCHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	306 U
ETHANOL	NA	NA	NA	NA	NA	NA	263 U
ETHYLBENZENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	156 U
FREON 11	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	202 U
FREON 113	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	275 U
FREON 12	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	110	178 U
ISOPROPYLBENZENE	NA	NA	NA	NA	NA	NA	241 U
M,P-XYLENES	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	156 U
METHYL-TERT-BUTYL ETHER	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	NA
METHYLENE CHLORIDE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	125 U
N-PROPYLBENZENE	NA	NA	NA	NA	NA	NA	177 U
NAPHTHALENE	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec	733 U
O-XYLENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	156 U

Sample Location ID	12SG225	12SG226	12SG227	12SG228	12SG229	12SG230	12SG230
Sample ID	12SG225	12SG226	12SG227	12SG228	12SG229	12SG230	12SG230RSPLIT
Sample Date	11/11/2008	11/11/2008	11/14/2008	11/14/2008	11/14/2008	11/14/2008	11/18/2008
EPA TO-15 VOA (UG/M3)							
PARA-ISOPROPYL TOLUENE	NA	NA	NA	NA	NA	NA	527 U
SEC-BUTYLBENZENE	NA	NA	NA	NA	NA	NA	767 U
STYRENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	153 U
TETRACHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	244 U
TOLUENE	37.0 UJ af	10.0 U	21.0 UJ f	26.0 UJ f	24.0 UJ f	27.0 UJ f	135 U
TRANS-1,2-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	143 U
TRICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	193 U
VINYL CHLORIDE	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	92.8 U

APPENDIX B: ANALYTICAL RESULTS FOR SOIL GAS IN SITE 12 (Continued)

Technical Memorandum for Soil Gas Sampling at Installation Restoration Site 12, Naval Station Treasure Island, San Francisco, California

Sample Location ID	12SG230A	12SG230R	12SG231	12SG232	12SG232 (dup)	12SG233	12SG234
Sample ID	12SG230A	12SG230R	12SG231	12SG232	12SG232DUP	12SG233	12SG234
Sample Date	11/18/2008	11/18/2008	11/14/2008	11/13/2008	11/13/2008	11/14/2008	11/14/2008
EPA TO-15 VOA (UG/M3)							
1,1,1-TRICHLOROETHANE	100 U	100 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,1,2,2-TETRACHLOROETHANE	150 U	150 U	15.0 U	15.0 UJ i	15.0 UJ i	15.0 U	15.0 U
1,1,2-TRICHLOROETHANE	100 U	100 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,1-DICHLOROETHANE	100 U	100 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,1-DICHLOROETHENE	100 U	100 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,2,4-TRIMETHYLBENZENE	150 UJ e	150 UJ e	15.0 U	15.0 UJ ei	15.0 UJ ei	15.0 U	15.0 U
1,2-DICHLOROBENZENE	150 U	150 U	15.0 U	15.0 UJ i	15.0 UJ i	15.0 U	15.0 U
1,3,5-TRIMETHYLBENZENE	100 UJ e	100 UJ e	10.0 U	10.0 UJ i	10.0 UJ i	10.0 U	10.0 U
1,4-DICHLOROBENZENE	150 U	150 U	15.0 U	15.0 UJ i	15.0 UJ i	15.0 U	15.0 U
2-BUTANONE	100 U	100 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
4-METHYL-2-PENTANONE	100 U	100 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
ACETONE	NA	NA	NA	NA	NA	NA	NA
BENZENE	100 U	100 U	10.0 U	16.0	12.0	11.0	10.0 U
BROMODICHLOROMETHANE	100 U	100 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
BROMOMETHANE	200 U	200 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U
CARBON DISULFIDE	100 U	100 U	10.0 U	230	170	14.0	10.0 U
CHLOROBENZENE	100 U	100 U	10.0 U	10.0 UJ i	10.0 UJ i	10.0 U	10.0 U
CHLOROETHANE	150 U	150 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
CHLOROFORM	100 U	100 U	10.0 U	10.0 U	10.0 U	18.0	10.0 U
CHLOROMETHANE	100 U	100 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
CIS-1,2-DICHLOROETHENE	100 U	100 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
CYCLOHEXANE	6,600	10,000	39.0	290	280	56.0	10.0 U
DIBROMOCHLOROMETHANE	100 U	100 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
ETHANOL	NA	NA	NA	NA	NA	NA	NA
ETHYLBENZENE	100 U	100 U	10.0 U	11.0 J i	10.0 UJ i	10.0 U	10.0 U
FREON 11	100 U	100 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
FREON 113	150 U	150 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
FREON 12	150 U	150 U	15.0 U	350	360	15.0 U	15.0 U
ISOPROPYLBENZENE	NA	NA	NA	NA	NA	NA	NA
M,P-XYLENES	100 U	100 U	10.0 U	24.0 J i	10.0 UJ i	10.0 U	10.0 U
METHYL-TERT-BUTYL ETHER	100 U	100 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
METHYLENE CHLORIDE	100 U	100 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
N-PROPYLBENZENE	NA	NA	NA	NA	NA	NA	NA
NAPHTHALENE	200 UJ ec	200 UJ ec	20.0 UJ ec	20.0 UJ eci	20.0 UJ eci	20.0 UJ ec	20.0 UJ ec
O-XYLENE	100 U	100 U	10.0 U	10.0 UJ i	10.0 UJ i	10.0 U	10.0 U

Sample Location ID	12SG230A	12SG230R	12SG231	12SG232	12SG232 (dup)	12SG233	12SG234
Sample ID	12SG230A	12SG230R	12SG231	12SG232	12SG232DUP	12SG233	12SG234
Sample Date	11/18/2008	11/18/2008	11/14/2008	11/13/2008	11/13/2008	11/14/2008	11/14/2008
EPA TO-15 VOA (UG/M3)							
PARA-ISOPROPYL TOLUENE	NA	NA	NA	NA	NA	NA	NA
SEC-BUTYLBENZENE	NA	NA	NA	NA	NA	NA	NA
STYRENE	100 U	100 U	10.0 U	10.0 UJ i	10.0 UJ i	10.0 U	10.0 U
TETRACHLOROETHENE	100 U	100 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
TOLUENE	100 U	100 U	29.0 UJ f	77.0 UJ f	62.0 UJ f	37.0 UJ f	37.0 UJ f
TRANS-1,2-DICHLOROETHENE	100 U	100 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
TRICHLOROETHENE	100 U	100 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
VINYL CHLORIDE	50.0 U	50.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U

APPENDIX B: ANALYTICAL RESULTS FOR SOIL GAS IN SITE 12 (Continued)

Technical Memorandum for Soil Gas Sampling at Installation Restoration Site 12, Naval Station Treasure Island, San Francisco, California

Sample Location ID	12SG235	12SG236	12SG237	12SG238	12SG239	12SG240	12SG242
Sample ID	12SG235	12SG236	12SG237	12SG238	12SG239	12SG240	12SG242
Sample Date	11/13/2008	11/13/2008	11/13/2008	11/13/2008	11/13/2008	11/13/2008	11/13/2008
EPA TO-15 VOA (UG/M3)							
1,1,1-TRICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,1,2,2-TETRACHLOROETHANE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
1,1,2-TRICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,1-DICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,1-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,2,4-TRIMETHYLBENZENE	15.0 UJ e	15.0 UJ e	15.0 UJ e	15.0 UJ e	15.0 UJ e	15.0 UJ e	15.0 UJ e
1,2-DICHLOROBENZENE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
1,3,5-TRIMETHYLBENZENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,4-DICHLOROBENZENE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
2-BUTANONE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
4-METHYL-2-PENTANONE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
ACETONE	NA	NA	NA	NA	NA	NA	NA
BENZENE	14.0	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	14.0
BROMODICHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
BROMOMETHANE	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U
CARBON DISULFIDE	89.0	10.0 U	13.0	20.0	10.0 U	18.0	56.0
CHLOROBENZENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
CHLOROETHANE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
CHLOROFORM	10.0 U	35.0	16.0	10.0 U	42.0	10.0 U	10.0 U
CHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
CIS-1,2-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
CYCLOHEXANE	160	51.0	38.0	110	10.0 U	13.0	67.0
DIBROMOCHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
ETHANOL	NA	NA	NA	NA	NA	NA	NA
ETHYLBENZENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
FREON 11	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
FREON 113	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
FREON 12	900	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
ISOPROPYLBENZENE	NA	NA	NA	NA	NA	NA	NA
M,P-XYLENES	15.0	10.0 U	10.0 U	13.0	10.0 U	10.0 U	11.0
METHYL-TERT-BUTYL ETHER	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
METHYLENE CHLORIDE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
N-PROPYLBENZENE	NA	NA	NA	NA	NA	NA	NA
NAPHTHALENE	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec
O-XYLENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U

Sample Location ID	12SG235	12SG236	12SG237	12SG238	12SG239	12SG240	12SG242
Sample ID	12SG235	12SG236	12SG237	12SG238	12SG239	12SG240	12SG242
Sample Date	11/13/2008	11/13/2008	11/13/2008	11/13/2008	11/13/2008	11/13/2008	11/13/2008
EPA TO-15 VOA (UG/M3)							
PARA-ISOPROPYL TOLUENE	NA	NA	NA	NA	NA	NA	NA
SEC-BUTYLBENZENE	NA	NA	NA	NA	NA	NA	NA
STYRENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
TETRACHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
TOLUENE	45.0 UJ f	27.0 UJ f	30.0 UJ f	41.0 UJ f	24.0 UJ f	12.0 UJ f	44.0 UJ f
TRANS-1,2-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
TRICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
VINYL CHLORIDE	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U

APPENDIX B: ANALYTICAL RESULTS FOR SOIL GAS IN SITE 12 (Continued)

Technical Memorandum for Soil Gas Sampling at Installation Restoration Site 12, Naval Station Treasure Island, San Francisco, California

Sample Location ID	12SG243	12SG244 HIGH TIDE	12SG244 LOW TIDE	12SG245 HIGH TIDE	12SG245 LOW TIDE	12SG246	12SG247
Sample ID	12SG243	12SG244 HIGH TIDE	12SG244 LOW TIDE	12SG245 HIGH TIDE	12SG245 LOW TIDE	12SG246	12SG247
Sample Date	11/11/2008	11/13/2008	11/14/2008	11/13/2008	11/14/2008	11/13/2008	11/13/2008
EPA TO-15 VOA (UG/M3)							
1,1,1-TRICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,1,2,2-TETRACHLOROETHANE	15.0 UJ i	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
1,1,2-TRICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,1-DICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,1-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,2,4-TRIMETHYLBENZENE	15.0 UJ i	15.0 UJ e	15.0 U	15.0 UJ e	15.0 U	15.0 UJ e	15.0 UJ e
1,2-DICHLOROBENZENE	15.0 UJ i	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
1,3,5-TRIMETHYLBENZENE	10.0 UJ i	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,4-DICHLOROBENZENE	15.0 UJ i	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
2-BUTANONE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
4-METHYL-2-PENTANONE	50.0	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
ACETONE	NA	NA	NA	NA	NA	NA	NA
BENZENE	33.0	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
BROMODICHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
BROMOMETHANE	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U
CARBON DISULFIDE	66.0	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
CHLOROBENZENE	10.0 UJ i	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
CHLOROETHANE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
CHLOROFORM	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
CHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
CIS-1,2-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
CYCLOHEXANE	140	42.0	10.0 U	27.0	10.0 U	12.0	29.0
DIBROMOCHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
ETHANOL	NA	NA	NA	NA	NA	NA	NA
ETHYLBENZENE	61.0 UJ i	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
FREON 11	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
FREON 113	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
FREON 12	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
ISOPROPYLBENZENE	NA	NA	NA	NA	NA	NA	NA
M,P-XYLENES	140 J i	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
METHYL-TERT-BUTYL ETHER	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
METHYLENE CHLORIDE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
N-PROPYLBENZENE	NA	NA	NA	NA	NA	NA	NA
NAPHTHALENE	20.0 UJ eci	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec
O-XYLENE	37.0 J i	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U

APPENDIX B: ANALYTICAL RESULTS FOR SOIL GAS IN SITE 12 (Continued)

Technical Memorandum for Soil Gas Sampling at Installation Restoration Site 12, Naval Station Treasure Island, San Francisco, California

Sample Location ID	12SG243	12SG244 HIGH TIDE	12SG244 LOW TIDE	12SG245 HIGH TIDE	12SG245 LOW TIDE	12SG246	12SG247
Sample ID	12SG243	12SG244 HIGH TIDE	12SG244 LOW TIDE	12SG245 HIGH TIDE	12SG245 LOW TIDE	12SG246	12SG247
Sample Date	11/11/2008	11/13/2008	11/14/2008	11/13/2008	11/14/2008	11/13/2008	11/13/2008
EPA TO-15 VOA (UG/M3)							
PARA-ISOPROPYL TOLUENE	NA	NA	NA	NA	NA	NA	NA
SEC-BUTYLBENZENE	NA	NA	NA	NA	NA	NA	NA
STYRENE	10.0 UJ i	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
TETRACHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
TOLUENE	15,000 J j	22.0 UJ f	14.0 UJ f	21.0 UJ f	17.0 UJ f	27.0 UJ f	21.0 UJ f
TRANS-1,2-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
TRICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
VINYL CHLORIDE	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U

Sample Location ID	12SG248	12SG249	12SG301	12SG302	12SG303	12SG304	12SG305
Sample ID	12SG248	12SG249	12SG301	12SG302	12SG303	12SG304	12SG305
Sample Date	11/13/2008	11/14/2008	11/21/2008	11/20/2008	11/20/2008	11/20/2008	11/20/2008
EPA TO-15 VOA (UG/M3)							
1,1,1-TRICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,1,2,2-TETRACHLOROETHANE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
1,1,2-TRICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,1-DICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,1-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,2,4-TRIMETHYLBENZENE	15.0 UJ e	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
1,2-DICHLOROBENZENE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
1,3,5-TRIMETHYLBENZENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,4-DICHLOROBENZENE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
2-BUTANONE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
4-METHYL-2-PENTANONE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
ACETONE	NA	NA	NA	NA	NA	NA	NA
BENZENE	10.0 U	14.0	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
BROMODICHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
BROMOMETHANE	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U
CARBON DISULFIDE	17.0	49.0	10.0 U	10.0 U	10.0 U	10.0 U	74.0
CHLOROBENZENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
CHLOROETHANE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
CHLOROFORM	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	12.0	26.0
CHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
CIS-1,2-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
CYCLOHEXANE	56.0	35.0	40.0	42.0	26.0	20.0	19.0
DIBROMOCHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
ETHANOL	NA	NA	NA	NA	NA	NA	NA
ETHYLBENZENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
FREON 11	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
FREON 113	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
FREON 12	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	28.0	15.0 U
ISOPROPYLBENZENE	NA	NA	NA	NA	NA	NA	NA
M,P-XYLENES	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
METHYL-TERT-BUTYL ETHER	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
METHYLENE CHLORIDE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
N-PROPYLBENZENE	NA	NA	NA	NA	NA	NA	NA
NAPHTHALENE	20.0 UJ ec	20.0 UJ ec	20.0 UJ c	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec
O-XYLENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U

Sample Location ID	12SG248	12SG249	12SG301	12SG302	12SG303	12SG304	12SG305
Sample ID	12SG248	12SG249	12SG301	12SG302	12SG303	12SG304	12SG305
Sample Date	11/13/2008	11/14/2008	11/21/2008	11/20/2008	11/20/2008	11/20/2008	11/20/2008
EPA TO-15 VOA (UG/M3)							
PARA-ISOPROPYL TOLUENE	NA	NA	NA	NA	NA	NA	NA
SEC-BUTYLBENZENE	NA	NA	NA	NA	NA	NA	NA
STYRENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
TETRACHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
TOLUENE	24.0 UJ f	39.0 UJ f	23.0 UJ f	31.0 UJ f	41.0 UJ f	23.0 UJ f	36.0 UJ f
TRANS-1,2-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
TRICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
VINYL CHLORIDE	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U

Sample Location ID	12SG306	12SG307	12SG308	12SG309	12SG310	12SG311	12SG312
Sample ID	12SG306	12SG307	12SG308	12SG309	12SG310	12SG311	12SG312
Sample Date	11/20/2008	11/20/2008	11/20/2008	11/20/2008	11/20/2008	11/20/2008	11/21/2008
EPA TO-15 VOA (UG/M3)							
1,1,1-TRICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,1,2,2-TETRACHLOROETHANE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
1,1,2-TRICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,1-DICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,1-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,2,4-TRIMETHYLBENZENE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
1,2-DICHLOROBENZENE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
1,3,5-TRIMETHYLBENZENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,4-DICHLOROBENZENE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
2-BUTANONE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
4-METHYL-2-PENTANONE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
ACETONE	NA	NA	NA	NA	NA	NA	NA
BENZENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
BROMODICHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
BROMOMETHANE	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U
CARBON DISULFIDE	59.0	10.0 U	17.0	10.0 U	10.0 U	10.0 U	10.0 U
CHLOROBENZENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
CHLOROETHANE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
CHLOROFORM	18.0	26.0	180	10.0 U	10.0 U	10.0 U	10.0 U
CHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
CIS-1,2-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
CYCLOHEXANE	35.0	19.0	11.0	10.0 U	10.0 U	10.0 U	13.0
DIBROMOCHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
ETHANOL	NA	NA	NA	NA	NA	NA	NA
ETHYLBENZENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
FREON 11	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
FREON 113	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
FREON 12	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
ISOPROPYLBENZENE	NA	NA	NA	NA	NA	NA	NA
M,P-XYLENES	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
METHYL-TERT-BUTYL ETHER	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
METHYLENE CHLORIDE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
N-PROPYLBENZENE	NA	NA	NA	NA	NA	NA	NA
NAPHTHALENE	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec	20.0 UJ c
O-XYLENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U

Sample Location ID	12SG306	12SG307	12SG308	12SG309	12SG310	12SG311	12SG312
Sample ID	12SG306	12SG307	12SG308	12SG309	12SG310	12SG311	12SG312
Sample Date	11/20/2008	11/20/2008	11/20/2008	11/20/2008	11/20/2008	11/20/2008	11/21/2008
EPA TO-15 VOA (UG/M3)							
PARA-ISOPROPYL TOLUENE	NA	NA	NA	NA	NA	NA	NA
SEC-BUTYLBENZENE	NA	NA	NA	NA	NA	NA	NA
STYRENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
TETRACHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
TOLUENE	38.0 UJ f	21.0 UJ f	34.0 UJ f	22.0 UJ f	20.0 UJ f	19.0 UJ f	20.0 UJ f
TRANS-1,2-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
TRICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
VINYL CHLORIDE	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U

APPENDIX B: ANALYTICAL RESULTS FOR SOIL GAS IN SITE 12 (Continued)

Technical Memorandum for Soil Gas Sampling at Installation Restoration Site 12, Naval Station Treasure Island, San Francisco, California

Sample Location ID	12SG313	12SG314	12SG315	12SG316	12SG317	12SG318	12SG319
Sample ID	12SG313	12SG314	12SG315	12SG316	12SG317	12SG318	12SG319
Sample Date	11/20/2008	11/19/2008	11/19/2008	11/20/2008	11/20/2008	11/18/2008	11/18/2008
EPA TO-15 VOA (UG/M3)							
1,1,1-TRICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	100 U
1,1,2,2-TETRACHLOROETHANE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	150 U
1,1,2-TRICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	100 U
1,1-DICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	100 U
1,1-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	100 U
1,2,4-TRIMETHYLBENZENE	15.0 U	15.0 UJ e	15.0 UJ e	15.0 U	15.0 U	15.0 UJ e	150 UJ e
1,2-DICHLOROBENZENE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	150 U
1,3,5-TRIMETHYLBENZENE	10.0 U	10.0 UJ e	10.0 UJ e	10.0 U	10.0 U	10.0 UJ e	100 UJ e
1,4-DICHLOROBENZENE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	150 U
2-BUTANONE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	100 U
4-METHYL-2-PENTANONE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	100 U
ACETONE	NA	NA	NA	NA	NA	NA	NA
BENZENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	19.0	100 U
BROMODICHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	100 U
BROMOMETHANE	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U	200 U
CARBON DISULFIDE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	18.0	100 U
CHLOROBENZENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	100 U
CHLOROETHANE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	150 U
CHLOROFORM	10.0 U	12.0	25.0	10.0 U	10.0 U	10.0 U	100 U
CHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	100 U
CIS-1,2-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	100 U
CYCLOHEXANE	34.0	38.0	30.0	10.0 U	10.0 U	170	3,900
DIBROMOCHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	100 U
ETHANOL	NA	NA	NA	NA	NA	NA	NA
ETHYLBENZENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	100 U
FREON 11	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	100 U
FREON 113	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	150 U
FREON 12	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	150 U
ISOPROPYLBENZENE	NA	NA	NA	NA	NA	NA	NA
M,P-XYLENES	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	100 U
METHYL-TERT-BUTYL ETHER	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	100 U
METHYLENE CHLORIDE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	100 U
N-PROPYLBENZENE	NA	NA	NA	NA	NA	NA	NA
NAPHTHALENE	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec	200 UJ ec
O-XYLENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	100 U

Sample Location ID	12SG313	12SG314	12SG315	12SG316	12SG317	12SG318	12SG319
Sample ID	12SG313	12SG314	12SG315	12SG316	12SG317	12SG318	12SG319
Sample Date	11/20/2008	11/19/2008	11/19/2008	11/20/2008	11/20/2008	11/18/2008	11/18/2008
EPA TO-15 VOA (UG/M3)							
PARA-ISOPROPYL TOLUENE	NA	NA	NA	NA	NA	NA	NA
SEC-BUTYLBENZENE	NA	NA	NA	NA	NA	NA	NA
STYRENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	100 U
TETRACHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	100 U
TOLUENE	35.0 UJ f	18.0 UJ f	18.0 UJ f	14.0 UJ f	19.0 UJ f	38.0 UJ f	100 U
TRANS-1,2-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	100 U
TRICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	100 U
VINYL CHLORIDE	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	50.0 U

APPENDIX B: ANALYTICAL RESULTS FOR SOIL GAS IN SITE 12 (Continued)

Technical Memorandum for Soil Gas Sampling at Installation Restoration Site 12, Naval Station Treasure Island, San Francisco, California

Sample Location ID	12SG320	12SG321	12SG322	12SG323	12SG324	12SG325	12SG326
Sample ID	12SG320	12SG321	12SG322	12SG323	12SG324	12SG325	12SG326
Sample Date	11/18/2008	11/19/2008	11/19/2008	11/19/2008	11/19/2008	11/19/2008	11/21/2008
EPA TO-15 VOA (UG/M3)							
1,1,1-TRICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
1,1,2,2-TETRACHLOROETHANE	15.0 U	15.0 U	15.0 U	15.0 UJ a	15.0 U	15.0 U	15.0 U
1,1,2-TRICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
1,1-DICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
1,1-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
1,2,4-TRIMETHYLBENZENE	15.0 UJ e	15.0 UJ e	15.0 UJ e	15.0 UJ ae	15.0 UJ e	15.0 UJ e	15.0 U
1,2-DICHLOROBENZENE	15.0 U	15.0 U	15.0 U	15.0 UJ a	15.0 U	15.0 U	15.0 U
1,3,5-TRIMETHYLBENZENE	10.0 UJ e	10.0 UJ e	10.0 UJ e	10.0 UJ ae	10.0 UJ e	10.0 UJ e	10.0 U
1,4-DICHLOROBENZENE	15.0 U	15.0 U	15.0 U	15.0 UJ a	15.0 U	15.0 U	15.0 U
2-BUTANONE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
4-METHYL-2-PENTANONE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
ACETONE	NA	NA	NA	NA	NA	NA	NA
BENZENE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
BROMODICHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
BROMOMETHANE	20.0 U	20.0 U	20.0 U	20.0 UJ a	20.0 U	20.0 U	20.0 U
CARBON DISULFIDE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
CHLOROBENZENE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
CHLOROETHANE	15.0 U	15.0 U	15.0 U	15.0 UJ a	15.0 U	15.0 U	15.0 U
CHLOROFORM	28.0	10.0 U	10.0 U	10.0 J a	10.0 U	10.0 U	23.0
CHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
CIS-1,2-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
CYCLOHEXANE	78.0	10.0 U	10.0 U	10.0 UJ a	23.0	16.0	10.0 U
DIBROMOCHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
ETHANOL	NA	NA	NA	NA	NA	NA	NA
ETHYLBENZENE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
FREON 11	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
FREON 113	15.0 U	15.0 U	15.0 U	15.0 UJ a	15.0 U	15.0 U	15.0 U
FREON 12	15.0 U	15.0 U	15.0 U	15.0 UJ a	15.0 U	15.0 U	15.0 U
ISOPROPYLBENZENE	NA	NA	NA	NA	NA	NA	NA
M,P-XYLENES	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	12.0
METHYL-TERT-BUTYL ETHER	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
METHYLENE CHLORIDE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
N-PROPYLBENZENE	NA	NA	NA	NA	NA	NA	NA
NAPHTHALENE	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec	20.0 UJ ace	20.0 UJ ec	20.0 UJ ec	20.0 UJ c
O-XYLENE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U

Sample Location ID	12SG320	12SG321	12SG322	12SG323	12SG324	12SG325	12SG326
Sample ID	12SG320	12SG321	12SG322	12SG323	12SG324	12SG325	12SG326
Sample Date	11/18/2008	11/19/2008	11/19/2008	11/19/2008	11/19/2008	11/19/2008	11/21/2008
EPA TO-15 VOA (UG/M3)							
PARA-ISOPROPYL TOLUENE	NA	NA	NA	NA	NA	NA	NA
SEC-BUTYLBENZENE	NA	NA	NA	NA	NA	NA	NA
STYRENE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
TETRACHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
TOLUENE	20.0 UJ f	22.0 UJ f	16.0 UJ f	26.0 UJ af	12.0 UJ f	19.0 UJ f	27.0 UJ f
TRANS-1,2-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
TRICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
VINYL CHLORIDE	5.0 U	5.0 U	5.0 U	5.0 UJ a	5.0 U	5.0 U	5.0 U

Sample Location ID	12SG326	12SG327	12SG328	12SG329	12SG330	12SG331	12SG332
Sample ID	12SG326SPLIT	12SG327	12SG328	12SG329	12SG330	12SG331	12SG332
Sample Date	11/21/2008	11/19/2008	11/19/2008	11/19/2008	11/19/2008	11/19/2008	11/19/2008
EPA TO-15 VOA (UG/M3)							
1,1,1-TRICHLOROETHANE	6.5 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,1,2,2-TETRACHLOROETHANE	8.2 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
1,1,2-TRICHLOROETHANE	6.5 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,1-DICHLOROETHANE	4.9 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,1-DICHLOROETHENE	4.8 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,2,4-TRIMETHYLBENZENE	5.9 U	15.0 UJ e	15.0 UJ e	15.0 UJ e	15.0 UJ e	15.0 UJ e	15.0 UJ e
1,2-DICHLOROBENZENE	NA	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
1,3,5-TRIMETHYLBENZENE	5.9 U	10.0 UJ e	10.0 UJ e	10.0 UJ e	10.0 UJ e	10.0 UJ e	10.0 UJ e
1,4-DICHLOROBENZENE	7.2 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
2-BUTANONE	12.1 UJ b	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
4-METHYL-2-PENTANONE	4.9 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
ACETONE	35.6 UJ b	NA	NA	NA	NA	NA	NA
BENZENE	3.8 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
BROMODICHLOROMETHANE	NA	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
BROMOMETHANE	4.7 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U
CARBON DISULFIDE	3.7 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
CHLOROBENZENE	NA	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
CHLOROETHANE	3.2 UJ c	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
CHLOROFORM	20.4	16.0	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
CHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
CIS-1,2-DICHLOROETHENE	4.8 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
CYCLOHEXANE	7.6	10.0 U	25.0	21.0	47.0	37.0	21.0
DIBROMOCHLOROMETHANE	10.2 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
ETHANOL	9.0 U	NA	NA	NA	NA	NA	NA
ETHYLBENZENE	5.2 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
FREON 11	6.7 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
FREON 113	9.2 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
FREON 12	5.9 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
ISOPROPYLBENZENE	22.1	NA	NA	NA	NA	NA	NA
M,P-XYLENES	11.7	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
METHYL-TERT-BUTYL ETHER	NA	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
METHYLENE CHLORIDE	4.2 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
N-PROPYLBENZENE	5.9 U	NA	NA	NA	NA	NA	NA
NAPHTHALENE	25.1 U	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec
O-XYLENE	5.2 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U

Sample Location ID	12SG326	12SG327	12SG328	12SG329	12SG330	12SG331	12SG332
Sample ID	12SG326SPLIT	12SG327	12SG328	12SG329	12SG330	12SG331	12SG332
Sample Date	11/21/2008	11/19/2008	11/19/2008	11/19/2008	11/19/2008	11/19/2008	11/19/2008
EPA TO-15 VOA (UG/M3)							
PARA-ISOPROPYL TOLUENE	18.1 U	NA	NA	NA	NA	NA	NA
SEC-BUTYLBENZENE	26.3 U	NA	NA	NA	NA	NA	NA
STYRENE	5.1 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
TETRACHLOROETHENE	8.1 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
TOLUENE	23.7	17.0 UJ f	13.0 UJ f	14.0 UJ f	15.0 UJ f	14.0 UJ f	29.0 UJ f
TRANS-1,2-DICHLOROETHENE	4.8 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
TRICHLOROETHENE	6.4 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
VINYL CHLORIDE	3.1 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U

Sample Location ID	12SG333	12SG334	12SG335	12SG336	12SG337	12SG340	12SG340
Sample ID	12SG333	12SG334	12SG335	12SG336	12SG337	12SG340	12SG340SPLIT
Sample Date	11/19/2008	11/19/2008	11/21/2008	11/21/2008	11/21/2008	11/21/2008	11/21/2008
EPA TO-15 VOA (UG/M3)							
1,1,1-TRICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	6.5 U
1,1,2,2-TETRACHLOROETHANE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	8.2 U
1,1,2-TRICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	6.5 U
1,1-DICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	4.9 U
1,1-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	4.8 U
1,2,4-TRIMETHYLBENZENE	15.0 UJ e	15.0 UJ e	15.0 U	15.0 U	15.0 U	15.0 U	5.9 U
1,2-DICHLOROBENZENE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	NA
1,3,5-TRIMETHYLBENZENE	10.0 UJ e	10.0 UJ e	10.0 U	10.0 U	10.0 U	10.0 U	5.9 U
1,4-DICHLOROBENZENE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	7.2 U
2-BUTANONE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	6.2 UJ b
4-METHYL-2-PENTANONE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	4.9 U
ACETONE	NA	NA	NA	NA	NA	NA	17.6 UJ b
BENZENE	10.0 U	10.0 U	160	10.0 U	10.0 U	10.0 U	3.8 U
BROMODICHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	NA
BROMOMETHANE	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U	4.7 U
CARBON DISULFIDE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	3.7 U
CHLOROBENZENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	NA
CHLOROETHANE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	3.2 UJ c
CHLOROFORM	10.0 U	10.0 U	10.0 U	10.0 U	14.0	10.0 U	5.8 U
CHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	9.8 U
CIS-1,2-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	4.8 U
CYCLOHEXANE	21.0	10.0 U	12,000	10.0 U	58.0	10.0 U	7.9
DIBROMOCHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.2 U
ETHANOL	NA	NA	NA	NA	NA	NA	8.8 U
ETHYLBENZENE	10.0 U	10.0 U	15.0	10.0 U	10.0 U	10.0 U	5.2 U
FREON 11	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	6.7 U
FREON 113	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	9.2 U
FREON 12	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	5.9 U
ISOPROPYLBENZENE	NA	NA	NA	NA	NA	NA	19.5
M,P-XYLENES	10.0 U	10.0 U	34.0	11.0	11.0	13.0	12.6
METHYL-TERT-BUTYL ETHER	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	NA
METHYLENE CHLORIDE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	4.2 U
N-PROPYLBENZENE	NA	NA	NA	NA	NA	NA	5.9 U
NAPHTHALENE	20.0 UJ ec	20.0 UJ ec	20.0 UJ c	20.0 UJ c	20.0 UJ c	20.0 UJ c	24.6 U
O-XYLENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	5.2 U

Sample Location ID	12SG333	12SG334	12SG335	12SG336	12SG337	12SG340	12SG340
Sample ID	12SG333	12SG334	12SG335	12SG336	12SG337	12SG340	12SG340SPLIT
Sample Date	11/19/2008	11/19/2008	11/21/2008	11/21/2008	11/21/2008	11/21/2008	11/21/2008
EPA TO-15 VOA (UG/M3)							
PARA-ISOPROPYL TOLUENE	NA	NA	NA	NA	NA	NA	17.7 U
SEC-BUTYLBENZENE	NA	NA	NA	NA	NA	NA	25.8 U
STYRENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	5.1 U
TETRACHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	8.1 U
TOLUENE	24.0 UJ f	19.0 UJ f	29.0 UJ f	20.0 UJ f	30.0 UJ f	44.0 UJ f	24.1
TRANS-1,2-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	4.8 U
TRICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	6.4 U
VINYL CHLORIDE	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	3.1 U

APPENDIX B: ANALYTICAL RESULTS FOR SOIL GAS IN SITE 12 (Continued)

Technical Memorandum for Soil Gas Sampling at Installation Restoration Site 12, Naval Station Treasure Island, San Francisco, California

Sample Location ID	12SG341	12SG341	12SG350	12SG350 (dup)	12SG350	12SG351	12SG352
Sample ID	12SG341	12SG341SPLIT	12SG350	12SG350DUP	12SG350SPLIT	12SG351	12SG352
Sample Date	11/21/2008	11/21/2008	11/20/2008	11/20/2008	11/20/2008	11/18/2008	11/18/2008
EPA TO-15 VOA (UG/M3)							
1,1,1-TRICHLOROETHANE	10.0 U	2,560 U	10.0 U	10.0 U	6.0 U	10.0 U	10.0 U
1,1,2,2-TETRACHLOROETHANE	15.0 U	3,230 U	15.0 U	15.0 UJ i	7.6 U	15.0 U	15.0 U
1,1,2-TRICHLOROETHANE	10.0 U	2,560 U	10.0 U	10.0 U	6.0 U	10.0 U	10.0 U
1,1-DICHLOROETHANE	10.0 U	1,900 U	10.0 U	10.0 U	4.5 U	10.0 U	10.0 U
1,1-DICHLOROETHENE	10.0 U	1,860 U	10.0 U	10.0 U	4.4 U	10.0 U	10.0 U
1,2,4-TRIMETHYLBENZENE	15.0 U	2,310 U	15.0 U	15.0 UJ i	5.4 U	15.0 UJ e	15.0 UJ e
1,2-DICHLOROBENZENE	15.0 U	NA	15.0 U	15.0 UJ i	NA	15.0 U	15.0 U
1,3,5-TRIMETHYLBENZENE	10.0 U	2,310 U	10.0 U	10.0 UJ i	5.4 U	10.0 UJ e	10.0 UJ e
1,4-DICHLOROBENZENE	15.0 U	2,830 U	15.0 U	15.0 UJ i	6.6 U	15.0 U	15.0 U
2-BUTANONE	10.0 U	1,380 U	10.0 U	10.0 U	3.2 U	10.0 U	10.0 U
4-METHYL-2-PENTANONE	10.0 U	1,920 U	10.0 U	10.0 U	4.5 U	10.0 U	10.0 U
ACETONE	NA	4,510 U	NA	NA	11.9 UJ b	NA	NA
BENZENE	370	1,500 U	10.0 U	10.0 U	5.1	12.0	10.0 U
BROMODICHLOROMETHANE	10.0 U	NA	10.0 U	10.0 U	NA	10.0 U	10.0 U
BROMOMETHANE	20.0 U	1,830 U	20.0 U	20.0 U	4.3 U	20.0 U	20.0 U
CARBON DISULFIDE	10.0 U	1,460 U	16.0	17.0	7.5	10.0 U	10.0 U
CHLOROBENZENE	10.0 U	NA	10.0 UJ i	10.0 UJ i	NA	10.0 U	10.0 U
CHLOROETHANE	15.0 U	1,250 UJ c	15.0 U	15.0 U	2.9 UJ c	15.0 U	15.0 U
CHLOROFORM	10.0 U	2,290 U	10.0 U	10.0 U	5.4 U	10.0 U	10.0 U
CHLOROMETHANE	10.0 U	3,960 UJ c	10.0 U	10.0 U	9.2 U	10.0 U	10.0 U
CIS-1,2-DICHLOROETHENE	10.0 U	1,860 U	10.0 U	10.0 U	4.4 U	10.0 U	10.0 U
CYCLOHEXANE	39,000	41,200	370	370	155	11,000	400
DIBROMOCHLOROMETHANE	10.0 U	4,000 U	10.0 U	10.0 U	9.4 U	10.0 U	10.0 U
ETHANOL	NA	3,570 U	NA	NA	8.3 U	NA	NA
ETHYLBENZENE	12.0	2,040 U	16.0 J i	22.0 J i	9.1	10.0 U	10.0 U
FREON 11	10.0 U	2,630 U	10.0 U	10.0 U	6.2 U	10.0 U	10.0 U
FREON 113	15.0 U	3,590 U	15.0 U	15.0 U	8.4 U	15.0 U	15.0 U
FREON 12	15.0 U	2,330 U	15.0 U	15.0 U	5.4 U	15.0 U	37.0
ISOPROPYLBENZENE	NA	3,150 U	NA	NA	10.7	NA	NA
M,P-XYLENES	23.0	2,040 U	53.0	60.0 J i	29.0	10.0 U	10.0 U
METHYL-TERT-BUTYL ETHER	10.0 U	NA	10.0 U	10.0 U	NA	10.0 U	10.0 U
METHYLENE CHLORIDE	10.0 U	1,630 U	10.0 U	10.0 U	3.8 U	10.0 U	10.0 U
N-PROPYLBENZENE	NA	2,310 U	NA	NA	5.4 U	NA	NA
NAPHTHALENE	20.0 UJ c	9,950 U	20.0 UJ ec	20.0 UJ eci	23.0 U	20.0 UJ ec	20.0 UJ ec
O-XYLENE	19.0	2,040 U	10.0 U	31.0 J i	8.2	10.0 U	10.0 U

Sample Location ID	12SG341	12SG341	12SG350	12SG350 (dup)	12SG350	12SG351	12SG352
Sample ID	12SG341	12SG341SPLIT	12SG350	12SG350DUP	12SG350SPLIT	12SG351	12SG352
Sample Date	11/21/2008	11/21/2008	11/20/2008	11/20/2008	11/20/2008	11/18/2008	11/18/2008
EPA TO-15 VOA (UG/M3)							
PARA-ISOPROPYL TOLUENE	NA	7,150 U	NA	NA	16.6 U	NA	NA
SEC-BUTYLBENZENE	NA	10,400 U	NA	NA	24.1 U	NA	NA
STYRENE	10.0 U	2,000 U	10.0 U	10.0 UJ i	4.7 U	10.0 U	10.0 U
TETRACHLOROETHENE	10.0 U	3,190 U	10.0 U	10.0 U	7.5 U	10.0 U	10.0 U
TOLUENE	71.0 UJ f	1,770 U	49.0 UJ f	59.0 UJ f	29.0	40.0 UJ f	10.0 U
TRANS-1,2-DICHLOROETHENE	10.0 U	1,860 U	10.0 U	10.0 U	4.4 U	10.0 U	10.0 U
TRICHLOROETHENE	10.0 U	2,520 U	10.0 U	10.0 U	5.9 U	10.0 U	10.0 U
VINYL CHLORIDE	5.0 U	1,210 U	5.0 U	5.0 U	2.8 U	5.0 U	5.0 U

Sample Location ID	12SG352 (dup)	12SG353	12SG353 (dup)	12SG365	12SG366	QC SAMPLE	QC SAMPLE
Sample ID	12SG352DUP	12SG353	12SG353DUP	12SG365	12SG366	AMBIENT AIR	EQUIPMENT BLANK
Sample Date	11/18/2008	11/19/2008	11/19/2008	11/21/2008	11/21/2008	11/11/2008	11/11/2008
EPA TO-15 VOA (UG/M3)							
1,1,1-TRICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,1,2,2-TETRACHLOROETHANE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
1,1,2-TRICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,1-DICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,1-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
1,2,4-TRIMETHYLBENZENE	15.0 UJ e	15.0 UJ e	15.0 UJ e	15.0 U	15.0 U	15.0 U	15.0 U
1,2-DICHLOROBENZENE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
1,3,5-TRIMETHYLBENZENE	10.0 UJ e	10.0 UJ e	10.0 UJ e	10.0 U	10.0 U	10.0 U	10.0 U
1,4-DICHLOROBENZENE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
2-BUTANONE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
4-METHYL-2-PENTANONE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
ACETONE	NA	NA	NA	NA	NA	NA	NA
BENZENE	10.0 U	50.0	50.0	11.0	10.0 U	10.0 U	10.0 U
BROMODICHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
BROMOMETHANE	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U	20.0 U
CARBON DISULFIDE	10.0 U	13.0	13.0	10.0 U	10.0 U	10.0 U	10.0 U
CHLOROBENZENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
CHLOROETHANE	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
CHLOROFORM	10.0 U	29.0	42.0	10.0 U	11.0	10.0 U	10.0 U
CHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
CIS-1,2-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
CYCLOHEXANE	390 J a	940	660	57.0	10.0 U	10.0 U	10.0 U
DIBROMOCHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
ETHANOL	NA	NA	NA	NA	NA	NA	NA
ETHYLBENZENE	10.0 U	55.0	73.0	10.0 U	10.0 U	10.0 U	10.0 U
FREON 11	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
FREON 113	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
FREON 12	38.0 J a	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U	15.0 U
ISOPROPYLBENZENE	NA	NA	NA	NA	NA	NA	NA
M,P-XYLENES	10.0 U	130	190	10.0 U	10.0 U	10.0 U	10.0 U
METHYL-TERT-BUTYL ETHER	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
METHYLENE CHLORIDE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
N-PROPYLBENZENE	NA	NA	NA	NA	NA	NA	NA
NAPHTHALENE	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec	20.0 UJ c	20.0 UJ c	20.0 UJ ec	20.0 UJ ec
O-XYLENE	10.0 U	53.0	47.0	10.0 U	10.0 U	10.0 U	10.0 U

APPENDIX B: ANALYTICAL RESULTS FOR SOIL GAS IN SITE 12 (Continued)

Technical Memorandum for Soil Gas Sampling at Installation Restoration Site 12, Naval Station Treasure Island, San Francisco, California

Sample Location ID	12SG352 (dup)	12SG353	12SG353 (dup)	12SG365	12SG366	QC SAMPLE	QC SAMPLE
Sample ID	12SG352DUP	12SG353	12SG353DUP	12SG365	12SG366	AMBIENT AIR	EQUIPMENT BLANK
Sample Date	11/18/2008	11/19/2008	11/19/2008	11/21/2008	11/21/2008	11/11/2008	11/11/2008
EPA TO-15 VOA (UG/M3)							
PARA-ISOPROPYL TOLUENE	NA	NA	NA	NA	NA	NA	NA
SEC-BUTYLBENZENE	NA	NA	NA	NA	NA	NA	NA
STYRENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
TETRACHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
TOLUENE	58.0 UJ af	11,000	12,000 J j	25.0 UJ f	26.0 UJ f	10.0 U	21.0
TRANS-1,2-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
TRICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
VINYL CHLORIDE	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U

APPENDIX B: ANALYTICAL RESULTS FOR SOIL GAS IN SITE 12 (Continued)

Technical Memorandum for Soil Gas Sampling at Installation Restoration Site 12, Naval Station Treasure Island, San Francisco, California

Sample Location ID	QC SAMPLE	QC SAMPLE	QC SAMPLE	QC SAMPLE	QC SAMPLE	QC SAMPLE	QC SAMPLE
Sample ID	AMBIENT AIR	AMBIENT AIR	AMBIENT AIR	AMBIENT AIR	AMBIENT AIR	AMBIENT AIR	AMBIENT AIR
Sample Date	11/12/2008	11/12/2008	11/13/2008	11/14/2008	11/18/2008	11/19/2008	11/20/2008
EPA TO-15 VOA (UG/M3)							
1,1,1-TRICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
1,1,2,2-TETRACHLOROETHANE	15.0 U	15.0 U	15.0 U	15.0 UJ a	15.0 U	15.0 U	15.0 U
1,1,2-TRICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
1,1-DICHLOROETHANE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
1,1-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
1,2,4-TRIMETHYLBENZENE	15.0 UJ e	15.0 UJ e	15.0 UJ e	15.0 UJ a	15.0 UJ e	15.0 UJ e	15.0 U
1,2-DICHLOROBENZENE	15.0 U	15.0 U	15.0 U	15.0 UJ a	15.0 U	15.0 U	15.0 U
1,3,5-TRIMETHYLBENZENE	10.0 UJ e	10.0 UJ e	10.0 U	10.0 UJ a	10.0 UJ e	10.0 UJ e	10.0 U
1,4-DICHLOROBENZENE	15.0 U	15.0 U	15.0 U	15.0 UJ a	15.0 U	15.0 U	15.0 U
2-BUTANONE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
4-METHYL-2-PENTANONE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
ACETONE	NA	NA	NA	NA	NA	NA	NA
BENZENE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
BROMODICHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
BROMOMETHANE	20.0 U	20.0 U	20.0 U	20.0 UJ a	20.0 U	20.0 U	20.0 U
CARBON DISULFIDE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
CHLOROBENZENE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
CHLOROETHANE	15.0 U	15.0 U	15.0 U	15.0 UJ a	15.0 U	15.0 U	15.0 U
CHLOROFORM	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
CHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
CIS-1,2-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
CYCLOHEXANE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
DIBROMOCHLOROMETHANE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
ETHANOL	NA	NA	NA	NA	NA	NA	NA
ETHYLBENZENE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
FREON 11	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
FREON 113	15.0 U	15.0 U	15.0 U	15.0 UJ a	15.0 U	15.0 U	15.0 U
FREON 12	15.0 U	15.0 U	15.0 U	15.0 UJ a	15.0 U	15.0 U	15.0 U
ISOPROPYLBENZENE	NA	NA	NA	NA	NA	NA	NA
M,P-XYLENES	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
METHYL-TERT-BUTYL ETHER	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
METHYLENE CHLORIDE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
N-PROPYLBENZENE	NA	NA	NA	NA	NA	NA	NA
NAPHTHALENE	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec	20.0 UJ ace	20.0 UJ ec	20.0 UJ ec	20.0 UJ ec
O-XYLENE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U

APPENDIX B: ANALYTICAL RESULTS FOR SOIL GAS IN SITE 12 (Continued)

Technical Memorandum for Soil Gas Sampling at Installation Restoration Site 12, Naval Station Treasure Island, San Francisco, California

Sample Location ID	QC SAMPLE	QC SAMPLE	QC SAMPLE	QC SAMPLE	QC SAMPLE	QC SAMPLE	QC SAMPLE
Sample ID	AMBIENT AIR	AMBIENT AIR	AMBIENT AIR	AMBIENT AIR	AMBIENT AIR	AMBIENT AIR	AMBIENT AIR
Sample Date	11/12/2008	11/12/2008	11/13/2008	11/14/2008	11/18/2008	11/19/2008	11/20/2008
EPA TO-15 VOA (UG/M3)							
PARA-ISOPROPYL TOLUENE	NA	NA	NA	NA	NA	NA	NA
SEC-BUTYLBENZENE	NA	NA	NA	NA	NA	NA	NA
STYRENE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
TETRACHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
TOLUENE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
TRANS-1,2-DICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
TRICHLOROETHENE	10.0 U	10.0 U	10.0 U	10.0 UJ a	10.0 U	10.0 U	10.0 U
VINYL CHLORIDE	5.0 U	5.0 U	5.0 U	5.0 UJ a	5.0 U	5.0 U	5.0 U

Sample Location ID	QC SAMPLE
Sample ID	AMBIENT AIR
Sample Date	11/20/2008
EPA TO-15 VOA (UG/M3)	
1,1,1-TRICHLOROETHANE	10.0 U
1,1,2,2-TETRACHLOROETHANE	15.0 U
1,1,2-TRICHLOROETHANE	10.0 U
1,1-DICHLOROETHANE	10.0 U
1,1-DICHLOROETHENE	10.0 U
1,2,4-TRIMETHYLBENZENE	15.0 U
1,2-DICHLOROBENZENE	15.0 U
1,3,5-TRIMETHYLBENZENE	10.0 U
1,4-DICHLOROBENZENE	15.0 U
2-BUTANONE	10.0 U
4-METHYL-2-PENTANONE	10.0 U
ACETONE	NA
BENZENE	10.0 U
BROMODICHLOROMETHANE	10.0 U
BROMOMETHANE	20.0 U
CARBON DISULFIDE	10.0 U
CHLOROBENZENE	10.0 U
CHLOROETHANE	15.0 U
CHLOROFORM	10.0 U
CHLOROMETHANE	10.0 U
CIS-1,2-DICHLOROETHENE	10.0 U
CYCLOHEXANE	10.0 U
DIBROMOCHLOROMETHANE	10.0 U
ETHANOL	NA
ETHYLBENZENE	10.0 U
FREON 11	10.0 U
FREON 113	15.0 U
FREON 12	15.0 U
ISOPROPYLBENZENE	NA
M,P-XYLENES	10.0 U
METHYL-TERT-BUTYL ETHER	10.0 U
METHYLENE CHLORIDE	10.0 U
N-PROPYLBENZENE	NA
NAPHTHALENE	20.0 UJ ec
O-XYLENE	10.0 U

Sample Location ID	QC SAMPLE
Sample ID	AMBIENT AIR
Sample Date	11/20/2008
EPA TO-15 VOA (UG/M3)	
PARA-ISOPROPYL TOLUENE	NA
SEC-BUTYLBENZENE	NA
STYRENE	10.0 U
TETRACHLOROETHENE	10.0 U
TOLUENE	10.0 U
TRANS-1,2-DICHLOROETHENE	10.0 U
TRICHLOROETHENE	10.0 U
VINYL CHLORIDE	5.0 U

Notes:

a	Surrogate recovery problem
b	Laboratory blank and common contamination problem
c	Calibration criteria exceedance
dup	Duplicate sample
e	Matrix spike/laboratory control sample (LCS) recovery problem
f	Field blank contamination
i	Internal standard exceedance
ID	Identification.
J	Estimated value
j	Other qualification reasons
NA	Not analyzed
U	Nondetected