PES Environmental, Inc.
Engineering & Environmental Services

March 27, 2015 **DRAFT**

1409.002.02.004

Ms. Carmen Santos
U.S. Environmental Protection Agency, Region 9
Mail Code WST-5
75 Hawthorne Street
San Francisco, California 94105

**TSCA PCB Notification, Certification
And Self-Implementing Cleanup Plan
837 Industrial Road
San Carlos, California**

Dear Ms. Santos:

This Toxic Substances Control Act (TSCA) Notification, Certification, and Self-Implementing Cleanup Plan (SICP) has been prepared by PES Environmental, Inc. (PES) on behalf of Windy Hill Property Ventures (WHPV) to provide the U.S. Environmental Protection Agency (USEPA) the required notification for implementation of a remedial action plan for soil containing polychlorinated biphenyls (PCBs) at 837 Industrial Road, San Carlos, California (site). A site vicinity map and site plan are presented as Plates 1 and 2, respectively. Regulatory oversight of the site is provided by the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC).

BACKGROUND

Site investigation and remediation activities were previously conducted in accordance with the terms of a Voluntary Cleanup Agreement (VCA) entered into by and between the prior ownership entity (Tanklage Family Partnership I) and DTSC in October 2009. A Removal Action Workplan (RAW), provided in Appendix A, was approved for implementation on October 29, 2014 by DTSC. Ownership of the former property was transferred to WHPV in February 2015, and WHPV has assumed responsibility for implementing the RAW at the site. Additionally, a draft O&M Plan, provided in Appendix B, was submitted to DTSC for review on February 13, 2015. The final O&M Plan will be incorporated into the signed land use controls (i.e., Land Use Covenant [LUC]), and the LUC will be filed at the San Mateo County Recorder's Office.

In accordance with 40 Code of Federal Regulations (CFR) 761.61(a), this SICP presents: (1) a summary of pertinent portions of the DTSC-approved RAW that relate to PCBs; and (2) addresses USEPA requests for additional information regarding PCB issues under the

TSCA regulations [1,2]. The methods and procedures presented in the RAW and this SICP are considered fully protective of human health and the environment.

SITE INFORMATION

This section provides summary information about the nature and extent of the contamination and analytical procedures, as provided in 40 CFR 761.61(a)(3)(i)(A) through 40 CFR 761.61(a)(3)(i)(C). Where applicable, the February 24, 2014 information request from USEPA staff ("EPA Request") is reproduced, and followed by corresponding additional information and/or discussion.

The site is located on a single 1.265-acre parcel (San Mateo County Assessor Parcel Number 046-140-100) within the industrial park known as Tanklage Square. The site has been improved with an approximately 21,657 square-foot building with an address of 837 Industrial Road. The site building, constructed in 1979 with concrete tilt-up panels erected over a concrete slab floor, is divided into eight (8) suites (A-H), which are leased to commercial businesses. The site is bounded on the northwest by 821 Industrial Road, on the northeast by 853 Industrial Road, on the southeast by 887 Industrial Road, and on the southwest by Industrial Road (Plate 2). As of the preparation date of this SICP, there are no plans for significant renovations at the site, and land use is anticipated to remain commercial.

Initial Assessment and Remediation

In early 2008, a black, viscous, tar-like material was observed emanating from beneath a concrete floor slab within Suite D of the site. Samples of the material were submitted to an analytical laboratory. The analytical results included detections of the following constituents:

- Acetone at up to 170 micrograms per kilogram (μg/kg);
- Polyaromatic hydrocarbons (PAHs) including phenanthrene (up to 22,000 μg/kg), chrysene (up to 13,000 μg/kg), benzo [g,h,i] perylene (up to 15,000 μg/kg), fluoranthene (up to 13,000 μg/kg), and pyrene (up to 9,500 μg/kg);
- Diesel-range organics (DROs) at up to 90,000 milligrams per kilogram (mg/kg);
- Motor oil-range organics (MRO) at up to 220,000 mg/kg; and
- Polychlorinated biphenyls (PCBs) at up to 13,000 μg/kg.

[1] Email correspondence from Carmen Santos (USEPA) to George Chow (DTSC) dated February 24, 2014.
[2] Personal communication, Carl Michelsen (PES) and Carmen Santos (USEPA), February 2, 2015.

Chromium, nickel, zinc and lead were also detected. The material was also found to have low pH. Based on analytical characteristics, the tar-like substance was inferred to be an acid tar, a byproduct of an acid-clay oil recycling/refining process which was conducted for a number of years at nearby properties (e.g., former oil recycling facilities at 977 Bransten Road)[3].

To manage ongoing subsurface intrusion concerns, an intercept trench and recovery sump system was installed by the previous ownership (Tanklage Family Partnership) in 2008. Plates 3 and 4 show the location and diagram of the trench and sump system; respectively. Photographs of the sump and access plates are provided in Appendix B.

Site Characterization Results Summary

Based on agency concerns related to the relatively high concentrations of PCBs detected in soil samples and the oily/tar material, Tanklage Family Partnership entered into a Voluntary Cleanup Agreement (VCA) with DTSC in 2009. Subsequent soil and groundwater investigations were conducted under the oversight of DTSC by WSP Environment & Energy (WSP) between 2009 and 2011. Green Environment, Inc. (GEI) also implemented investigation activities described in a July 2010 Work Plan[4] and conducted additional soil and groundwater investigation at the site in 2011[5].

EPA Request:

- *Regarding the site characterization please indicate in the Application what type (discrete and/or composite) of samples were collected for that purpose and if those were collected in situ (before soil disturbance or excavation); and*

- *Characterization samples must be representative of as-found PCB concentrations in situ;*

Soil sampling for PCB analysis consisted of the collection of discrete, in situ soil samples, before any soil disturbance or excavation. The historical PCB results of the soil and groundwater investigations are provided in the attached RAW (Figure 6; Tables 1 and 2).

EPA Request:

- *PCB extraction and analytical methods used during site characterization;*

---

[3] Green Environment Inc. (GEI), 2014. *Final Removal Action Workplan, 837 Industrial Road, Tanklage Square, San Carlos, California*. October 24.

[4] WSP Environment & Energy, 2010. *Soil And Groundwater Investigation Workplan, Tanklage Construction Co., Inc. 837 Industrial Road, San Carlos, California.* May 21.

[5] Green Environment Incorporated, 2011. *Expanded Site Investigation 837 Industrial Road, San Carlos, CA.* March 2.

- *40 CFR 761.292 establishes that either the Soxhlet (Method 3540C is latest revision) or Ultrasonic (Method 3550C is latest revision) method be used for sample extraction before analysis via USEPA Method 8082 (Method 8082A is latest revision). However, USEPA R9's preference is that Soxhlet extraction be used for sample extraction; and*

- *PCB Extraction methods different from those required in the TSCA PCB regulations may be proposed consistent with the requirements in 40 CFR 761 Subpart Q. Site-specific samples must be used for the Subpart Q laboratory validation study for non-TSCA extraction and/or analysis methods.*

Laboratory analyses of the soil and groundwater samples (including duplicate samples) for PCBs were conducted using USEPA Test Method 8082. Soil samples were extracted via EPA Test Method 3546 and groundwater samples by EPA Test Method 3510C. In addition, moisture content was measured in the soil samples to allow the soil analytical results to be corrected for dry weight. The Soxhlet extraction method will be used in the future for waste characterization samples (e.g., samples of accumulated materials that are removed from the trench/sump system).

Nature and Extent of Contamination

Based on investigations conducted at the site, GEI concluded the following:

- **Nature of contamination:** Soils in the area of the tar-like substance were identified by GEI as impacted primarily with diesel- to motor oil-range organic compounds, with the highest concentrations generally observed from 7 to 13 feet deep. Other detected compounds included PCBs, PAHs (primarily chrysene and pyrene) and several heavy metals. Two volatile organic compounds (VOCs) were primarily detected in soil, specifically acetone and methyl ethyl ketone; less frequently detected VOCs in soil included carbon disulfide, naphthalene, toluene, tetrachloroethylene (PCE), trichloroethylene (TCE), trimethylbenzenes (TMB) and xylenes. PCE and TCE were detected at low concentrations and mainly in saturated zone soils;

- **Horizontal and vertical extent of PCBs in soil:** Based on the investigation results, GEI concluded that the tar-like substance (which contains PCBs) appeared to be horizontally limited to the immediate vicinity of the trenched area in the northeast portion of the site building and was observed to a maximum vertical-limit depth of 14 feet bgs; and

- **Nature and extent of groundwater contamination:** Grab groundwater samples collected at 837 Industrial Road indicate that groundwater is impacted with halogenated volatile organic compounds (HVOCs), primarily chloroform, 1,2-dichloroethane (1,2-DCA), PCE and TCE. Based on the horizontal extent of VOCs detected in

groundwater at 837 Industrial Road, GEI concluded that the source of HVOCs identified in groundwater was an off-site, upgradient site. PCBs (analyzed by USEPA Test Method 8082) were not detected at or above the laboratory reporting limit in any of the 14 grab groundwater samples or in monitoring well samples.

GEI further concluded: (1) the tar-like substance was of limited horizontal and vertical extent and did not significantly impact groundwater; (2) the trench/sump system was effective, and periodic emptying and proper disposal of the accumulated material was recommended; and (3) HVOC concentrations in groundwater beneath the site appeared to be from an offsite, unknown upgradient source(s).

PCB Co-Solvency Assessment

EPA Request:

- *Regarding site characterization, please describe if co-solvency of PCBs and solvents present in soils was considered when determining the vertical and horizontal extent of PCB contamination at the site.*

While it does not appear that co-solvency of PCBs was considered when GEI established the vertical and horizontal extent of PCB contamination, the following considerations indicate that co-solvency is not likely a concern at the site: (1) The detected concentrations of VOCs in soil and groundwater are orders of magnitude below anticipated PCB co-solvency concentrations[6]; (2) PCBs have not been detected at or above the laboratory reporting limits in groundwater samples collected beneath the site in either grab groundwater samples, or during four quarters of groundwater monitoring of well MW-1[7]; and (3) PCBs have low water solubility, high K_{ow}, exhibit tight adsorption to soil, and generally do not leach significantly in aqueous soil systems[8].

As such, PCB mobilization/transport through co-solvent processes does not appear to be a significant process of concern at the site.

---

[6] AMEC, 2007. *Summary Findings Regarding Cosolvency at MW-05S – Centredale manor Restoration Project, North Providence, Rhode Island*. August 15.
AMEC's literature review of PCB cosolvency studies indicate that concentrations of partially miscible solvents (e.g., PCE and/or TCE) must exceed 1% (10,000 milligrams per liter) or greater before cosolvency of a hydrophobic organic compound (e.g., PCBs) is observed.

[7] Laboratory reporting limits for PCBs in groundwater ranged from 47 to 52 mircograms per liter [μg/L].

[8] USEPA. Technical Factsheet on: POLYCHLORINATED BIPHENYLS (PCBs). www.epa.gov/ogwdw/pdfs/factsheets/soc/tech/pcbs.pdf Accessed March 25, 2015.

Periodic Groundwater Monitoring Results

At the request of DTSC, one groundwater monitoring well (MW-1) was installed in the inferred downgradient direction of the 837 Industrial Road building to assess potential impacts to groundwater from the tar-like substance. Quarterly groundwater monitoring of MW-1 was conducted between June 2012 and March 2013. GEI reported that based on the four consecutive quarters of monitoring, groundwater sample results indicated that PCBs were not detected at or above the laboratory reporting limits (ranging from 47 to 52 mircograms per liter [μg/L]) in any of the groundwater samples. As described below, groundwater monitoring will continue via implementation of the RAW, on a semi-annual basis (second and fourth quarter).

Assessment of Potential for Off-Site Transport of PCBs

A study of PCB concentrations in storm drain conveyance drains for the Pulgas Creek drainage area was conducted by the San Mateo Countywide Stormwater Pollution Prevention Program (SMCSPPP)[9]. The Pulgas Creek drainage area includes the 837 Industrial Road site. The study included investigation into potentially ongoing inputs of PCBs from urban runoff at several nearby sites, and included collecting sediment samples from storm drain lines along Bransten Road and Industrial Road (i.e., including the storm water drainage area of 837 Industrial Road) during 2001 and 2002. Sediment samples collected from storm drains directly downstream of the 977 Bransten Road site (*upstream* of the 837 Industrial Road facility with respect to local storm drain lines) had total PCB concentrations ranging from 306 to 311 μg/kg at sample locations SMC042 and SMC043, respectively. One storm drain sediment sample (SMC044) was collected downstream of 837 Industrial Road; the detected total PCB concentration was 30 μg/kg. As such, SMCSPPP identified 977 Bransten Road (hydraulically upgradient from 837 Industrial Road), where high levels of PCBs were previously detected in near-surface soils (up to 67,000 μg/kg) as a potential source of PCBs found in storm drain sediments.

Additionally, based on the depth of on-site PCBs detections in soil (generally greater than 7.5 feet bgs), and the relatively shallower depth of the bottom of the on-site storm drain conduits, the on-site storm water drainage system is not anticipated to have significant potential for off-site transport of PCBs.

[9] San Mateo Countywide Stormwater Pollution Prevention Program, 2003. *Case Study Investigating Elevated Levels of PCBs in Storm Drain Sediments in the Pulgas Creek Pump Station Drainage, San Carlos, California.* June.

CLEANUP PLAN

The following section provides pertinent information regarding the DTSC-approved cleanup plan, as provided in 40 CFR 761.61(a)(3)(i)(D). The approved RAW is also considered substantively responsive to USEPA requirements for a risk-based cleanup plan, as provided in 40 CFR 761.61(c), and 40 CFR 761.61(a)(3) and (a)(5). Brief summary information pertinent to the site cleanup and cap management (per CFR 761.61(a)(7)) specified in the RAW are also provided below.

Remedial Action Workplan

The RAW was submitted to DTSC on October 24, 2014 and approved on October 29, 2014[10]. The applicable remedial action components (presented in Section 5.0 of the RAW) include: (1) maintenance and inspection activities associated with management of impacted soils as capped in place with the current site development; (2) periodic monitoring of groundwater quality at well MW-1; (3) conducting O&M (including periodically removing contents of the recovery/collection sump); and (4) institutional land use controls.

Operations & Maintenance Plan

In accordance with Section 5.2 of the RAW, a draft O&M Plan was submitted to DTSC for review on February 13, 2015. The O&M Plan includes procedures and methodologies for: (1) quarterly visual inspections of the cap (page 4 of the draft O&M Plan); (2) periodic maintenance and periodic cleaning of the oil collection sump (pages 5 and 6); (3) contingency notification and cleanup procedures for the asphalt parking lot and interior concrete slab (page 6); (4) periodic groundwater monitoring (page 7); and (5) proper management, disposal, and recordkeeping for hazardous materials collected from the sump (pages 6 and 7). The final O&M Plan will be incorporated into the signed land use controls (i.e., Land Use Covenant [LUC]), and the LUC will be filed at the San Mateo County Recorder's Office.

Land Use Covenant

EPA Request:

- *Brief preliminary description of matters to be addressed in the restrictive covenant for the property concerning PCBs.*

---

[10] California Environmental Protection Agency, Department of Toxic Substances Control (DTSC), 2014. *Approval Letter for Final Removal Action Workplan, 837 Industrial Road, San Carlos, California.* October 29.

As provided in Section 5.1 of the RAW, DTSC will prepare a draft Land Use Restriction specific to the subject property. Upon approval of the final O&M Plan, a signed Land Use Restriction referring to and appending the O&M Plan will be recorded by the property owner with the San Mateo County Recorder.

At a minimum, it is anticipated that the land use covenant will impose the following requirements:

- The subject property will not be used for a residence, hospital, school for persons under 21 years of age, or a day care center for children;
- Activities that may disturb the Cap (e.g., excavation, grading, removal, trenching, filling, earth movement, or mining) shall not be permitted on the Capped subject property without a Soil Management Plan and prior written approval by DTSC;
- All uses and development of the Capped subject property shall preserve the integrity or effectiveness of the Cap;
- All uses shall preserve the physical accessibility to and integrity of the groundwater monitoring system;
- The Cap shall not be altered without prior written approval by DTSC; and
- Drilling for any water, oil or gas will not be permitted without prior written approval by DTSC.

<u>Cap Specifications</u>

EPA Request:

- *If proposing a new and/or seeking approval for an existing cap, provide cap design, describe consistency of existing and/or proposed cap with the cap requirements in 40 CFR 761.61(a)(7), provide in-perpetuity maintenance, repair, and inspection plan for the cap, provide vertical and horizontal extent of PCB contaminated soils beneath proposed and/or existing cap (figures and maps must be included), provide residual PCB concentrations beneath the cap including tables, maps, and figures depicting sample identification codes, location and associated PCB concentration, as well as, survey coordinates for all samples representing PCB residual concentrations beneath the cap.*

The limits of the cap are shown as the building, parking areas, and landscaped areas depicted on Plates 2 and 3. As noted in Section 2.8.2 of the RAW, direct contact of the tar-like material is mitigated based on the presence of a cap, consisting of the 6-inch thick concrete

floor slab at the 837 Industrial Road building. At exterior locations (where PCB detections were identified in soil at depths of 7.5 feet bgs or greater), the 6-inch thick asphalt-paved parking area and overlying soil is maintained as a cap[11]. As such, the entire 837 Industrial Road site is capped by the existing concrete slab of the building, asphalt parking lot, and overlying soil. The cap functions to minimize human exposure, infiltration of water, and erosion.

Tables and figures of the lateral and vertical extent of PCB detections are presented in the RAW and O&M Plan appendices (Appendixes A and B, respectively). Please note that survey coordinates for all samples representing PCB residual concentrations beneath the cap are not available.

The O&M plan, attached, is an in-perpetuity maintenance, repair, and inspection plan for the cap. As also noted in Section 5.1 of the RAW, activities that might disturb the cap (e.g., excavation, trenching, etc.) shall not be permitted without notification and adherence to planning documents (e.g., a Soil Management Plan (SMP) or Intrusive Earthwork Guidance Plan [IEGP]) and prior written approval from DTSC. Adherence to the IEGP, included as Appendix D in the O&M Plan, is required when the cap is breached and subsurface soils are encountered during maintenance or minor construction activities. A SMP will be required if waste soils are generated.

Seasonal Considerations

EPA Request:

- *In reference to operation and maintenance of the proposed remedy, do those activities consider changes in viscosity of the tar material due to temperature (cool vs. hot weather) and season (winter vs. summer) changes and if the proposed remedy will be effective regardless of those physical changes.*

Consideration for potential variations in tar material consistency and recovery (volumes) is substantially provided by implementation of the O&M Plan, and includes periodic routine inspection of the sump and access ports on a quarterly basis. The collection sump is operational under all seasons and weather; temperatures in the subsurface are not expected to vary significantly. As such, the remedy is designed to be effective regardless of the limited seasonal temperature variations.

[11] Site investigation boring logs indicate concrete and asphalt thicknesses of 6-inches, respectively. GEI, Inc., 2011. *Expanded Site Investigation, 837 industrial Road, San Carlos, California*. March 2.

Characterization, Storage, Disposal and Transportation of PCB Remedial Waste

EPA Request:

- *PCB remediation waste transportation and disposal including manifesting of the waste and whether any PCB waste would be store onsite before transportation to an offsite disposal facility permitted to accept the waste;*

- *Disposal of PCB decontamination fluids and residues consistent with 40 CFR 761.79(g);*

- *Recordkeeping for decontamination (refer to 40 CFR 761.79(f));*

- *Recordkeeping for PCB cleanup. [USEPA R9 requires a PCB cleanup completion report be submitted and the details of that report can be further discussed during the approval of CBS' PCB cleanup application.]; and*

- *The transporter of PCB waste generated at Tanklage with a PCB concentration equal to or above 50 mg/kg must submit to USEPA Headquarters a "Notification of PCB Activity" (USEPA Form 7710-53) consistent with 40 CFR 761.205 (a section in Subpart K). Manifesting of PCB remediation waste and / or other PCB containing wastes generated at Tanklage and any recordkeeping associated with waste disposal must comply with all other applicable requirements in 40 CFR 761 Subpart K. In addition, the cleanup plan must describe if PCB remediation wastes or other PCB wastes generated at the site will be stored at the site, concentration of PCBs in the waste to be stored, method of storage, and length of onsite PCB waste storage prior to disposal. PCB remediation wastes containing less than 50 mg/kg must be disposed of consistent with 40 CFR 761.61(a)(5)(i)(B), (B)(1), (B)(2)(ii), (B)(2)(iv) (15-day notification to landfill), and 761.61 (a)(5)(v)(A).*

Procedures for management of PCB remedial waste (including sampling, characterization, storage, disposal, and transportation) are described in the O&M Plan, and as indicated below:

- Recovered material will be placed in 55-gallon steel DOT-approved drums, labeled appropriately, and stored onsite in a secure, locked location, prior to transportation and disposal;

- In accordance with 761.61(a)(5)(i)(B), bulk PCB remediation waste characterized with total PCB concentrations greater than 1 mg/kg but less than 50 mg/kg will be transported to a Class II landfill, or an equivalent disposal facility[12]. If PCB-containing waste with a concentration greater than 1 mg/kg and less than 50 mg/kg are present, a

[12] PCB concentrations in soil and the tar-like material have been below 50 mg/kg.

15-day notification must be provided to a proposed, properly permitted facility (i.e., a facility licensed or registered by the State of California to manage municipal solid waste, or non-municipal, non-hazardous waste; a hazardous waste landfill permitted under Subtitle C of RCRA; or an approved PCB disposal facility);

- In accordance with 761.61(a)(5)(i)(B), it is anticipated that material with total PCBs at concentrations greater than or equal to 50 mg/kg will be transported as bulk PCB remediation waste to a Class I landfill, or an equivalent disposal facility. For PCB-containing waste with a concentration greater than 50 mg/kg, prior to commencing off-site transportation and disposal, the site owner or designee will submit U.S. EPA Form 7710-53 as notification of PCB activity; and

- Following acceptance approval of the material at an appropriate disposal facility, drums containing recovered material will be loaded and transported off the site following appropriate California and Federal waste manifesting procedures.

Additionally, as noted in the O&M Plan and provided by 40 CFR 761.292, characterization samples will be analyzed for PCBs using the Soxhlet sample extraction Method 3540C prior to using U.S. EPA Test Method 8082A.

Recordkeeping

In accordance with 40 CFR Part 761.79(f) and (g), annual records consisting of: (1) signed manifests for PCB waste generated, stored, or disposed of at the facility; (2) Certificates of Disposal generated during a calendar year; and (3) records of inspections and cleanups performed in accordance with temporary storage (40 CFR Part 761.65(c)(5)) will be compiled into an annual document log and made available for EPA inspection by July 1 of the following calendar year. Additionally, as required by USEPA Region IX, a written annual report, summarizing the information in the annual document log and annual records for the preceding calendar year, will be submitted to EPA by July 15 of the following year.

Schedule

EPA Request:

- *Schedule to implement and complete all PCB cleanup activities.*

Upon approval, the anticipated implementation schedule for the tasks associated with the O&M Plan include:

Task	Task Implementation Schedule
Cap Inspection	Quarterly Basis
Sump Inspection/Cleaning	Second Quarter (Annual Basis)
Groundwater Monitoring	Second and Fourth Quarter (Semiannual Basis)

CERTIFICATION

EPA Request:

- *The written certification required in 40 CFR 761.61 (a)(3)(i)(E) as well as the language under "Certification" in 40 CFR 761.3 must be submitted together with the Application. The certification must be signed by the owner of the property and the cleanup party.*

A draft SICP Certification statement is provided in Appendix C.

CLOSING

We trust this is the information you require at this time. Please contact the undersigned with questions or comments.

Yours very truly,

PES ENVIRONMENTAL, INC.

D R A F T

Christopher J. Baldassari, P.G.
Senior Geologist

D R A F T

Carl J. Michelsen, C.HG.
Principal Geochemist

cc: George Chow, DTSC

Attachments: Illustrations

Plate 1 - Site Location
Plate 2 - Site Plan and Vicinity
Plate 3 – Detailed Site Plan
Plate 4 – Diagram of Trench and Sump for Tar-Like Substance Collection

Appendices

A – Final Removal Action Workplan
B – Draft Operations & Maintenance Plan
C – Certification

ILLUSTRATIONS

Aerial Photo: February 23, 2014 (Google 2014)

PES Environmental, Inc.
Engineering & Environmental Services

Site Location
837 Industrial Road
San Carlos, California

PLATE
1

JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE
1409.002.02.002	140900202002_TSCA_1-4	DRAFT	3/15

Explanation

Approximate Subject Property Boundary

821 Street Address on Industrial Road

831* Street Address on Bransten Road

N

0 100

SCALE IN FEET

Aerial Photo: February 23, 2014 (Google 2014)

PES Environmental, Inc.
Engineering & Environmental Services

Site Plan and Vicinity
837 Industrial Road
San Carlos, California

PLATE 2

JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE
1409.002.02.002	140900202002_TSCA_1-4	DRAFT	3/15

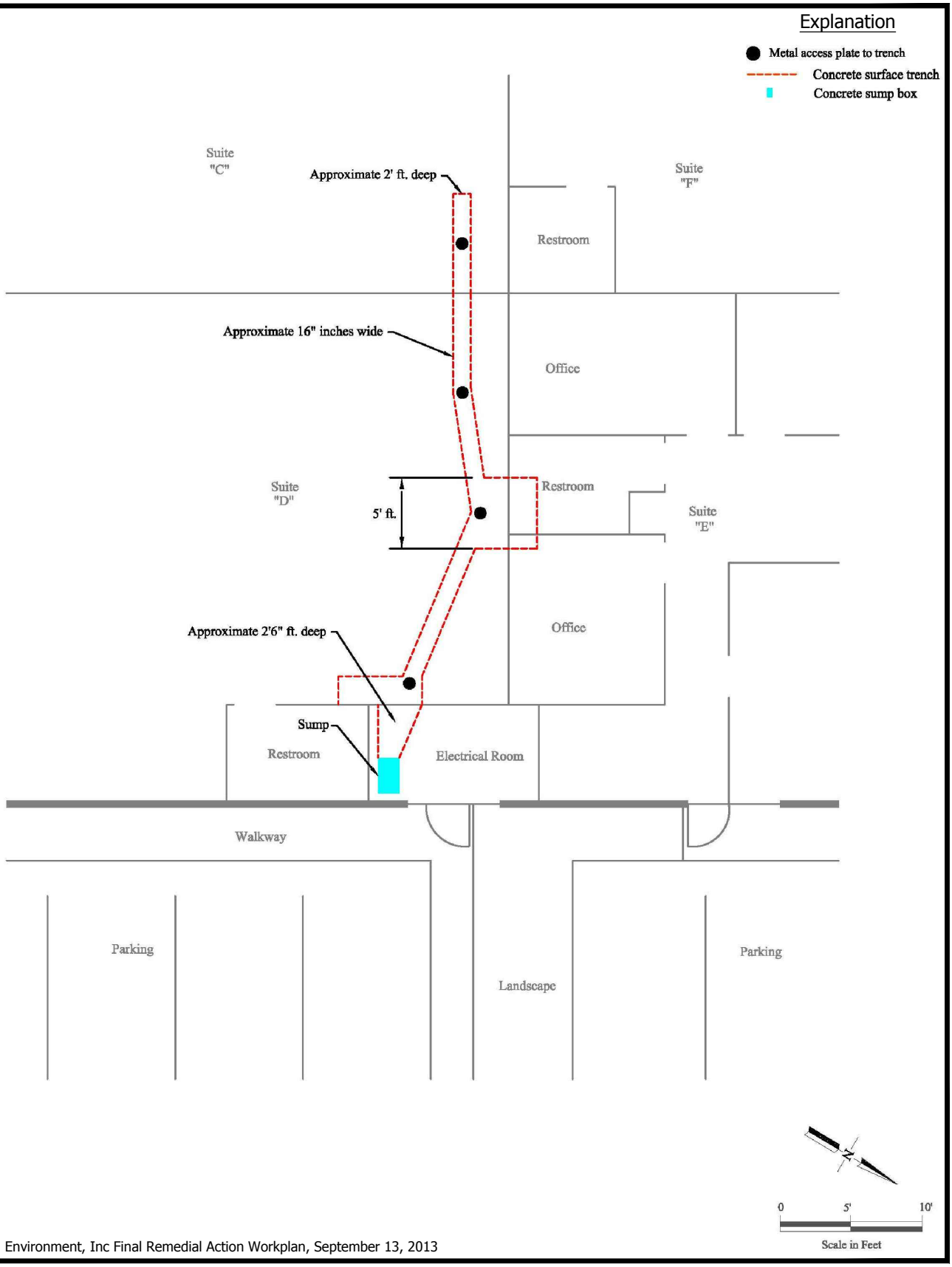
Reference: Green Environment, Inc Final Remedial Action Workplan, September 13, 2013

PES Environmental, Inc.
Engineering & Environmental Services

Detailed Site Plan
837 Industrial Road
San Carlos, California

PLATE
3

1409.002.02.002	140900202002_TSCA_1-4	DRAFT	3/15
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE



Reference: Green Environment, Inc Final Remedial Action Workplan, September 13, 2013

PES Environmental, Inc.
Engineering & Environmental Services

Diagram of Trench and Sump for Tar-Like Substance Collection
837 Industrial Road
San Carlos, California

PLATE
4

JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE
1409.002.02.002	140900202002_TSCA_1-4	DRAFT	3/15

APPENDIX A

FINAL REMOVAL ACTION WORKPLAN

Green Environment inc
www.greenenvironment.com

1347 Laurel Street
San Carlos, CA 94070
T 650.508.8018
F 650.508.8005

October 24, 2014

Mr. George Chow
Hazardous Substances Scientist
Brownfields and Environmental Restoration Program
Department of Toxic Substances Control
700 Heinz Avenue
Berkeley, CA 94710-2721

Re: Final Removal Action Workplan, 837 Industrial Road, Tanklage Square, San Carlos, California

Dear Mr. Chow:

Green Environment inc. respectfully submits the enclosed *Final Removal Action Workplan, 837 Industrial Road, Tanklage Square, San Carlos, California*, dated October 24, 2014.

Please call me at 650-508-8018 if you have questions.

Respectfully:

Mark Green
President, Green Environment inc.

Cc: Mr. Dennis Wagstaffe, 1025 Tanklage Road, #A, San Carlos, CA 94070

Green Environment inc
www.greenenvironment.com

1347 Laurel Street
San Carlos, CA 94070
T 650.508.8018
F 650.508.8005

FINAL REMOVAL ACTION WORKPLAN

837 INDUSTRIAL ROAD
TANKLAGE SQUARE
SAN CARLOS, CALIFORNIA

GEI PROJECT: B10655

OCTOBER 24, 2014

Mark Green
President, Green Environment inc.

Ross Tinline
Professional Geologist #5860

PROFESSIONAL GEOLOGIST
ROSS W.N. TINLINE
No. 5860
STATE OF CALIFORNIA

Table of Contents

EXECUTIVE SUMMARY 1

1.0 INTRODUCTION 3
1.1 Objectives of the RAW 3
1.2 Site Description 4

2.0 SITE CHARACTERIZATION 5
2.1 Previous Site Investigations 5
2.2 Results of Site Subsurface Investigations 8
2.3 Potential Off-Site Sources of VOCs in Groundwater 9
2.4 Regional Geology and Hydrogeology 11
2.5 Site Geology and Hydrogeology 12
2.6 Background Metal Concentrations 12
2.7 Nature and Extent of Contamination 14
2.7.1 Tar-like Substance 14
2.7.2 Soil 14
2.7.3 Groundwater 16
2.8 Risk Evaluation 18
2.8.1 Screening Levels 18
2.8.2 Exposure Pathways 21

3.0 REMOVAL ACTION OBJECTIVES AND GOALS 22
3.1 Removal Action Objectives 23
3.2 Applicable or Relevant and Appropriate Requirements (ARARs) 23
3.3 Removal Action Goals 24

4.0 EVALUATION OF REMOVAL ACTION ALTERNATIVES 24
4.1 Identification of Removal Action Alternatives 25
4.1.1 Alternative 1 – No Further Action (NFA) 25
4.1.2 Alternative 2 – Soil Excavation and Off-Site Disposal 25
4.1.3 Alternative 3 – Institutional Controls, Operation and Maintenance 26
4.2 Evaluation Criteria 26
4.3 Analysis of Removal Action Alternatives 27

4.3.1 Alternative 1 – No Further Action (NFA) 27
4.3.2 Alternative 2 – Soil Excavation and Offsite Disposal 28
4.3.3 Alternative 3 – Institutional Controls, Operation and Maintenance 30
4.4 Recommended Removal Action Alternative 31

5.0 REMOVAL ACTION IMPLEMENTATION 31
5.1 Institutional Controls 31
5.2 Operation and Maintenance 32
5.3 Reporting 33

6.0 PUBLIC PARTICIPATION 33

7.0 CEQA DOCUMENTATION 33

8.0 REFERENCES 34

FIGURES

Figure 1 – Vicinity Map
Figure 2 – Site Plan
Figure 3 – Diagram of Trench and Sump for Tar-Like Substance Collection
Figure 4 – Site Plan with Sample and Core Locations
Figure 5 – Soil and Groundwater Analytical Results: Extractable Petroleum Hydrocarbons
Figure 6 – Soil Analytical Results: PAHs and PCBs
Figure 7 – Groundwater Analytical Results: PAHs and PCBs
Figure 8 – Soil Analytical Results: VOCs
Figure 9 – Groundwater Analytical Results: VOCs
Figure 10 – Soil Analytical Results: Metals
Figure 11 – Groundwater Analytical Results: Metals
Figure 12 – Potential Off-Site Sources of VOCs in Groundwater
Figure 13 –Excavation Area for Alternative 2

TABLES

Table 1 – Soil Organic Analytical Results
Table 2 – Groundwater Organic Analytical Results
Table 3 – Soil Metals Analytical Results
Table 4 – Groundwater Metals Analytical Results
Table 5 – Summary of ARARs/TBCs

APPENDICES

Appendix A – Photos
Appendix B – 95% UCL Calculation for Lead
Appendix C – Cost Analyses for Removal Action Alternatives 2 and 3
Appendix D – DTSC's Responsiveness Summary (October 2014)
Appendix E – CEQA Notice of Exemption (October 2014)

EXECUTIVE SUMMARY

This Draft Removal Action Workplan (*RAW*) has been prepared on behalf of the Tanklage Family Partnership I (Tanklage), owner of the commercial/industrial property located at 837 Industrial Road in San Carlos, California (*subject property*). The purpose of the *RAW* is to present existing site conditions, establish appropriate removal action objectives (RAOs), and evaluate alternatives to identify a final recommendation for a removal action at the *subject property* that is protective of human health and the environment. The *RAW* has been prepared in accordance with Task 3 and Task 5 of the Voluntary Cleanup Agreement (VCA) between Tanklage and DTSC, dated October 2009.

The *subject property* is part of an industrial park known as Tanklage Square, located in a commercial/industrial area of eastern San Carlos bounded by Industrial Road to the southwest and Highway 101 to the northeast. Tanklage Square includes six (6) commercial/industrial buildings developed by Tanklage between 1978 and 1980 on approximately eight (8) acres. The *subject property* at 837 Industrial Road, San Carlos consists of the central of the three single story commercial buildings that have frontage on Industrial Road. The building on the *subject property* is approximately 22,000 square feet, and is divided into eight (8) suites (A-H), leased by Tanklage to several commercial businesses.

In 2008, a black tar-like substance was observed seeping out of the floor of a restroom located in one of the suites in the northeast portion of the building on the *subject property*. Tanklage investigated the source and extent of the tar-like substance by manually digging a trench, and sloping the trench to a deeper sump to allow for collection and removal of the tar-like substance over time. The tar-like substance was found to contain acetone, polyaromatic hydrocarbons (PAHs) including phenanthrene, chrysene, benzo[g,h,i]perylene, fluoranthene, pyrene, diesel and motor oil range organic compounds, and polychlorinated biphenyls (PCBs). Chromium, nickel, zinc and lead were also detected in the tar-like substance. The pH of the tar-like substance was 1.7. Subsequent subsurface investigations conducted on the *subject property* indicated that the tar-like substance appears to be limited to the immediate vicinity of the trenched area in the northeast portion of the building on the *subject property* and has been observed to a maximum depth of 14 feet. Based upon GEI's understanding of the history of the *subject property* and the surrounding area, and the nature of the tar-like substance, GEI believes it is possible that the tar-like substance is an acid tar, a byproduct of an acid-clay oil recycling/refining process which was employed for a number of years at a nearby property.

Soils in the area of the tar-like substance are impacted primarily with diesel to motor oil range organic compounds with the highest concentrations generally observed from 7 to 13 feet deep. Other lesser soil impacts include PCBs, PAHs (primarily chrysene and pyrene) and several heavy metals. Two volatile organic compounds (VOCs) were primarily detected in soil but at low

concentrations, specifically acetone and methyl ethyl ketone. Other lesser soil impacts with VOCs include carbon disulfide, naphthalene, toluene, tetrachloroethylene (PCE), trichloroethylene (TCE), trimethylbenzenes (TMB) and xylenes. The few detections of PCE and TCE were at low concentrations mainly in saturated zone soils.

Groundwater is primarily impacted with halogenated volatile organic compounds (HVOCs), primarily chloroform, 1,2-dichloroethane (1,2-DCA), PCE and TCE. The highest concentration of PCE in groundwater was located in boring B-15 located in the inferred upgradient (south) portion of the site. The HVOCs in groundwater appear to be migrating onto the *subject property* from an undetermined offsite source or sources. Groundwater is not significantly impacted with diesel to motor oil range organic compounds, PAHs, PCBs or metals.

Chemicals of concern (COCs) for the *subject property* have been determined to be diesel to motor oil range organics and PCBs in soil, and PCE in groundwater, though the PCE appears to be from an offsite release. PCE in groundwater poses a potential vapor intrusion risk, but indoor air sampling conducted in 2009 did not indicate an indoor air risk in the area of the tar-like substance. Direct contact with the tar-like substance poses a health and safety risk.

Three (3) removal action alternatives are evaluated in this draft *RAW*:
(1) No Further Action (NFA);
(2) Soil Excavation and Off-Site Disposal; and
(3) Institutional Controls, and Operation and Maintenance.

Although potential risks to human health and the environment are low, Alternative (1) does not meet the Removal Action Objectives (RAOs). Alternative (2) meets the RAOs, but implementation of a large soil excavation beneath an occupied building is challenging and the cost is high compared to the other alternatives.

The proposed alternative is Alternative (3), which involves leaving impacted soils in place, while implementing institutional controls and an Operation and Maintenance Plan to monitor groundwater quality and maintain the trench and sump in good working condition with the periodic removal and disposal of accumulated tar-like substance. Land use restrictions would be applied to the *subject property*, and a regular reporting schedule would be implemented. Alternative (3) meets the RAOs with reasonable cost and implementability.

1.0 INTRODUCTION

Green Environment inc. (GEI) has prepared this *Draft Removal Action Work Plan* (*RAW*) on behalf of the Tanklage Family Partnership I (Tanklage), owner of the commercial/industrial property located at 837 Industrial Road in San Carlos, California (*subject property*). The draft *RAW* was prepared in response to a letter received from the California Department of Toxic Substances Control (DTSC), dated November 5, 2012, and in accordance with Task 3 and Task 5 of the Voluntary Cleanup Agreement (VCA) between Tanklage and DTSC, dated October 2009. This draft *RAW* incorporates comments prepared and submitted via email by DTSC dated July 24, 2013, upon DTSC review of a draft *RAW* prepared by GEI, dated May 1, 2013, and submitted via email by DTSC dated March 12, 2014, upon DTSC review of a second draft *RAW* prepared by GEI, dated September 13, 2013.

A *RAW* is one of two remedy selection documents that may be prepared for a hazardous substance release site pursuant to California Health and Safety Code (HSC) Section 25356.1, and is appropriate for removal actions that are projected to cost less than $1,000,000. In California HSC 25323.1, a *RAW* is defined as "a work plan prepared or approved by the Department (DTSC) or a California Regional Water Quality Control Board (RWQCB) which is developed to carry out a removal action, in an effective manner, that is protective of the public health and safety and the environment."

Based on the information obtained from *subject property* characterization activities (described in **Section 2**), DTSC has determined that further action may be required for the *subject property* due to elevated concentrations of polynuclear aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), metals, and petroleum hydrocarbons detected in soil and groundwater samples collected at the *subject property*. Following review of the draft *RAW* by DTSC and a public comment period, the draft *RAW* will be revised as necessary by GEI, and a final *RAW* will be submitted to DTSC for DTSC approval, and subsequent implementation. Upon completion of the remedy, a removal action report will be prepared by GEI and submitted to DTSC for review and certification.

1.1 Objectives of the RAW

The objectives of this *RAW* are to:

- Present and evaluate existing site conditions;
- Establish appropriate removal action objectives (RAOs) for protection of human health and the environment; and
- Evaluate alternatives and identify a final recommendation for a removal action at the

subject property that is protective of human health and the environment.

1.2 Site Description

Tanklage Square is located in a commercial/industrial area of eastern San Carlos bounded by Industrial Road to the southwest and Highway 101 to the northeast. A site vicinity map is provided in **Figure 1**. Tanklage Square includes six (6) commercial/industrial buildings developed by Tanklage between 1978 and 1980 on approximate eight (8) acres. The *subject property* at 837 Industrial Road, San Carlos consists of the central of the three single story commercial buildings that have frontage on Industrial Road. The building on the *subject property* at 837 Industrial Road (Assessor's Parcel Number 046-140-100, lot 2) is approximately 22,000 square feet, and is divided into eight (8) suites (A-H), leased by Tanklage to several commercial businesses (**Figure 2**).

The following site history has been excerpted from the WSP Environment & Energy (WSP) *Soil and Groundwater Investigation Work Plan* dated July 21, 2010:

The land for Tanklage Square was filled originally by contractor Charles Harney when they excavated for Candlestick Park in the late 1950's. When Tanklage purchased the property in 1976 an additional 3 to 5 feet of fill was brought in by the previous owner Pimbo/Western Gear. According to a report prepared by Purcell, Rhoades & Associates in 1977, the fill material was brought in from a nearby excavation project.

*According to Tanklage, some time ago, a black tar-like substance was observed seeping out of the floor in a bathroom, located in the northwestern corner of Unit D of Building 837 (**Figure 2**). To address the issue, a sloped trench was dug from the point of surfacing to a below-grade sump in the electrical room, located at the eastern edge of the building. The sump was installed as a catch basin for the purpose of collecting the substance. This sump is cleaned out periodically, and the collected material is appropriately disposed of.*

Further historical details provided to GEI by Tanklage indicate the black tar-like substance was first observed by Tanklage in early 2008 in the bathroom of Suite D of Building 837. In response, in 2008 Tanklage investigated the extent of the tar-like substance by manually digging a shallow (approximately 16 to 24 inches below slab surface), narrow (approximately 10 inches wide on average) trench inside the building to intersect the tar-like substance where it was observed in soil, resulting in a trench that extended across the width of Suite D, and ending a few feet into the adjacent Suites C and E. The trench was dug to slope gently towards a small sump, 2.5 feet long by 1.5 feet wide by 2.7 feet deep, dug in the building electrical room to facilitate collection of the tar-like substance. Upon completion of trenching activities in 2008, the trench was covered with plywood and an approximate 4-inch thick layer of concrete to match the surrounding floor surface. The

walls and floor of the trench are soil (predominantly clay). Three (3) small (4-inch diameter) metal access plates were installed along the trench to provide limited access to the trench, if needed. A concrete lidded box (without a bottom) was placed into the sump to protect against direct exposure to the tar-like substance, and allow for safe sampling and/or periodic removal of the tar-like substance. Details of the trench are presented in **Figure 3.**

The source of the tar-like substance has not been confirmed. However, the WSP *Work Plan* states that a 2007 investigation at a nearby site, 977 Bransten Road, "prompted Tanklage to consider further investigation as to the possible source of the tar-like substance beneath Building 837." According to the reported history of 977 Bransten Road, as provided by Conor-Pacific/EFW (July 14, 2000), the 977 Bransten Road site had been used to re-refine or recycle oil as early as the 1930s. Reportedly, the site was first operated using an acid-clay process to recycle/re-refine oil. A reported by-product of the acid-clay oil refining process is acid tars. Information on acid tars is provided in a 2005 paper titled *Acid tar lagoons: risks and sustainable remediation in an urban context* (Catney et. al., March 1, 2005). Acid tars are described as "acidic (pH often <2) and viscous with black color and oily smell, and of greater density than water." The Catney paper also states that common disposal routes have historically included dumping the tars in clay or gravel pits. Based on analysis of the tar-like substance found on the *subject property* (see **Section 2.0**), the proximity of the 977 Bransten Road site to the *subject property*, and the fact that the *subject property* was undeveloped land for much of the operational history of the oil recycling/re-refining facility at 977 Bransten Road, GEI believes it is possible that the tar-like substance discovered on the *subject property* is acid tar, a by-product of the oil recycling process once employed at 977 Bransten Road.

2.0 SITE CHARACTERIZATION

Characterization of the *subject property* was conducted from 2008 through 2012. A summary of the activities and results are discussed in the sections below.

2.1 Previous Site Investigations

On December 23, 2008, on behalf of Tanklage, GEI collected a sample of a "semi-solid, black tar-like" substance and a sample of the overlying water that was observed within a sump inside the electrical room at the *subject property* (GEI, January 8, 2009). Laboratory analysis indicated that the tar-like substance contained acetone, polyaromatic hydrocarbons (PAHs) including phenanthrene, chrysene, benzo[g,h,i]perylene, fluoranthene, pyrene, diesel range organic compounds, motor oil range organic compounds, and polychlorinated biphenyls (PCBs). Chromium, nickel, zinc and lead were also detected in the tar-like substance. The pH of the tar-like substance was 1.7. The overlying water sample did not contain detectable concentrations of volatile organic compounds (VOCs) or gasoline range

organic compounds (GRO). Low concentrations of metals were detected in the water sample, which had a pH of 2.4.

An initial soil and groundwater investigation was performed at the *subject property* by WSP on September 28, 2009, to delineate the lateral and vertical extent of the "tar-like" substance inside the *subject property* building. A total of four (4) borings, WSP-1 through WSP-4, were installed using DPT to a depth of sixteen (16) feet below top surface (bts) (see **Figure 4**). Grab groundwater samples were collected from borings WSP-2 through WSP-4. Soil samples were collected from each boring at depths as follows: WSP-1 at 6.5, 12.5, and 15 feet bts; WSP-2 at 12.5 feet bts; WSP-3 at 8.5, 12.5, and 15 feet bts, and WSP-4 at 9, 12.5, and 15 feet bts. In October 2009, Tanklage entered into a Voluntary Cleanup Agreement with the Department of Toxic Substances Control (DTSC). DTSC requested an additional investigation be performed at the *subject property* to expand the soil and groundwater investigation and delineate the lateral and vertical extent of the "tar-like" substance encountered in the initial investigation. In response, WSP prepared a *Soil and Groundwater Investigation Work Plan* on May 21, 2010, which was revised on July 21, 2010 to incorporate comments received from DTSC. The proposed work was completed by GEI in general accordance with the WSP July 21, 2010 *Work Plan* from November, 2010 through January, 2011, and GEI prepared an *Expanded Site Investigation Report* (GEI, March 2, 2011) presenting the investigation results. The GEI investigation included installation of an additional thirteen (13) borings, B-5 through B-17, to a depth of eighteen (18) feet bts. Grab groundwater samples were collected from each boring location, and soil samples were collected from borings B-5 through B-15 (**Figure 3**). Soil sample depths ranged from 3.5 to 16.5 feet bts, and are listed in **Table 1**. A total of thirteen (13) groundwater samples with two (2) duplicates, and 35 soil samples with three (3) duplicate samples were collected during the November 2010 – January 2011 investigation. As indicated on **Tables 1 through 4**, soil and groundwater samples collected in November were analyzed for TPHd and TPHmo by EPA Method 8015B with a silica gel cleanup, VOCs (EPA 8260B), PAHs (EPA 8270SIM), PCBs (EPA 8082), select metals (cadmium, chromium, nickel, lead, zinc, by EPA 6010B), and pH (ASTM 9045C). In addition, soil samples were analyzed for moisture content to allow results to be corrected for dry weight.

Based on the findings of the site investigations, DTSC requested that one (1) groundwater monitoring well be installed on the *subject property* to monitor groundwater conditions downgradient of subsurface contaminants discovered at the eastern side of the *subject property* building. The monitoring well (MW-1) was installed on June 4, 2012, to a depth of 17 feet below bts. GEI prepared a *Well Installation and Sampling Report* (GEI, October 9, 2012) presenting the findings of the well installation and sampling activities performed. Four soil samples were collected during the drilling of MW-1, at depths of 6, 7.5, 8.5, and 20 feet bts. The results for the laboratory analyses of the four soil samples are presented in

Table 1.

During installation of well MW-1, Mr. Tom Lanphar and Ms. Michelle Dalrymple of DTSC visited the *subject property* to observe the well installation. In a memo prepared on June 6, 2012, Mr. Lanphar documented observations including a small amount of black oil seeping from a floor cover in the bathroom of Suite D, and dark staining along cracks in the concrete floor of the warehouse area in the same Suite (DTSC, June 6, 2012). It should be noted that Mr. Lanphar incorrectly noted the interior space inspected as Suite D, as the space inspected is actually Suite E. On September 10, 2012, Mr. Lanphar accompanied Mr. Mark Green of GEI on a re-inspection of Suite E, and an inspection of the interior of Suite D, which Mr. Lanphar had not inspected in June 2012. Mr. Lanphar documented his September 2012 observations in a memo dated October 10, 2012, where he incorrectly identified Suite D as Suite C, and Suite E as Suite D. Mr. Lanphar observed the same conditions in Suite E as observed in his June 2012 inspection. In response, GEI contracted with Environmental Restoration Services (ERS) of Menlo Park, California, to investigate the oil seepage observed in the restroom of Suite E. A site map is provided in **Figure 2**.

In November 2012, ERS removed several vinyl floor tiles and a section of adjacent drywall behind the toilet on the east side of the restroom in Suite E (**Figure 3**), and noted that a small amount of the black tar-like substance was present within and at the metal base of the wall cavity, adjacent to a vent pipe within the wall for the toilet. The tar-like substance had migrated to a limited degree beneath the adjacent floor tiles and could be seen at the surface of several tile joints. ERS removed the tar-like substance using scraping tools, a small amount of diesel fuel, and rags. Once clean, ERS filled the wall metal base with concrete, including the gap where the toilet vent pipe penetrates the floor. The restroom was then reconstructed. Photos including descriptions are provided in **Appendix A**. Wastes were placed into a labeled, sealed container, and is pending proper offsite disposal.

To investigate the source of dark surface staining along minor cracks in the concrete floor of the warehouse area of Suite E, in December 2012, GEI contracted with Superior Coring and Cutting, Inc. (Superior) of Daly City, California, to cut three (3) 4-inch diameter cores (CC-1 through CC-3) completely through the concrete slab at representative areas of floor staining. GEI then inspected the concrete cores and the surface of the underlying base material, and did not observe any visible evidence of the tar-like substance either in the concrete core (other than at the surface of the core) or on the surface of the underlying base material. Based upon these observations, GEI believes the black staining observed on the surface of concrete in some locations in the warehouse area of Suite E is due to minor past surface chemical spills or leaks, and not from the tar-like substance. The three described concrete core locations are shown in **Figure 4,** and photos are provided with descriptions in **Appendix A**.

2.2 Results of Site Subsurface Investigations

Soil and groundwater investigations performed by WSP in September 2009 (WSP, July 21, 2010), and GEI in November 2010 and January 2011 (GEI, March 2, 2011), have aided in evaluating the extent of the tar-like substance on the *subject property*. The tar-like substance has only been observed in boring WSP-1 between 12.5 and 14.2 feet bts, and within a trench constructed to route the substance that nears the surface to a collection sump (**Figure 3**).

Summary subsurface investigation findings indicate that diesel range organics (DRO) and motor oil range organics (MRO) have been detected in a majority of soil samples from 6.5 to 8.5 feet bts located proximal to the trench and previous borings WSP-1 and WSP-3 (**Table 1, Figure 5**). DRO and MRO have been detected in only one groundwater sample collected on the *subject property*, at boring WSP-3, which contained 21,000 μg/L DRO and 62,000 μg/L MRO in a grab groundwater sample (**Table 2, Figure 5**). PAHs and PCBs have been detected in soil samples generally consistent with elevated extractable petroleum hydrocarbons (**Table 1, Figures 5 and 6**). Consistent with the DRO and MRO findings, PAHs and PCBs have not significantly impacted groundwater on the *subject property* (**Table 2, Figure 7**).

GRO has been detected in *subject property* groundwater at relatively low concentrations (**Table 2, Figure 9**), but GRO was detected in only two (2) *subject property* soil samples at low concentrations (**Table 1**).

VOCs have not been detected in *subject property* soil at significant concentrations (**Table 1, Figure 9**). However, VOCs – primarily halogenated VOCs (HVOCs) – have been detected in groundwater beneath the *subject property*. The only non-halogenated VOC detected in groundwater has been methyl-tert-butyl ether (MTBE), detected in only a few groundwater samples at low concentrations (**Table 2**, **Figure 9**). HVOCs are present in groundwater across the *subject property* with the highest HVOC concentration detected in a grab groundwater sample collected in the southwest corner of the *subject property* (B-15), where 1,700 micrograms per liter (μg/L) of tetrachloroethylene (PCE) was detected.

Sampling of soil and groundwater for metals (**Table 3, Figure 10)** has included analyses for cadmium, chromium, lead, nickel and zinc per Unidocs UN-078-1/1, Recommended Minimum Verification Analyses for Underground Storage Tank Leaks for Waste, Used or Unknown Oil. Metals have been detected in *subject property* soils above reported background concentrations. However, groundwater is not significantly impacted with

dissolved concentrations of any of the five (5) metals (**Table 4, Figure 11**).

One (1) groundwater monitoring well (MW-1) was installed on the *subject property* in June 2012 at a location inferred to be downgradient (northeast) from the location where the tar-like substance has been discovered. The groundwater flow direction in the upper water-bearing zone in the immediate vicinity of the *subject property* has been determined to be to the north-northeast at a hydraulic gradient of approximately 0.005 foot per foot based upon historic monitoring of twenty-two groundwater monitoring wells installed (including one well at 821 Industrial Road approximately 200 feet northwest of *subject property*) by the parties responsible for the chemical release(s) at and from the 977 Bransten Road site (Watson Consulting/Georestoration Inc., March 6, 2013).

2.3 Potential Off-Site Sources of VOCs in Groundwater

VOCs which have been detected in groundwater on the *subject property* include carbon tetrachloride (CCl4), chloroform, 1,1-DCA, 1,2-DCA, 1,1-dichloroethene (1,1-DCE), cis-1,2-DCE, PCE, TCE, CFC-113, vinyl chloride, and MTBE. Of the VOCs detected in groundwater, PCE has been detected at the highest concentrations, with PCE detected; at 1,700 μg/L outside the *subject property* building at an inferred upgradient location (B-15); at 730 μg/L near the tar-like substance source area at an inferred mid gradient location (B-13); and at 180 μg/L at an inferred downgradient location (B-7) (GEI, March 2, 2011). The VOCs detected in groundwater were either not detected in soil samples on the *subject property*, or were detected at very low concentrations, indicating that there is not a significant source of VOCs on the *subject property*. Thus, GEI believes VOCs are migrating onto the *subject property* from an offsite source or sources. In the *Expanded Site Investigation Report* (GEI, March 2, 2011), research was conducted by GEI regarding potential off-site sources of VOC contamination. A map showing the relative locations of the identified potential off-site sources with the *subject property* is presented as **Figure 12**. The following sites were considered (refer to the March 2011 report for a full description):

- <u>960 Industrial Road (located approximately 300 feet south of *subject property*)</u>. The site was developed in the 1950s by Litton. Historical site operations consisted of the design, manufacture, and distribution of microwave components for use in weather radar equipment, medical devices, and communication equipment for military aircraft and ships. Since 2002, the site has been operated by L3 Electron devices. Environmental characterization activities have been performed at the site from 1986 to present by Stantec and others. The site includes sixteen (16) groundwater monitoring wells, with no wells offsite. The main contaminants of concern (COCs) are PCE, TCE, and 1,2-DCE (Stantec, August 16, 2010).

- 977 Bransten Road (located approximately 500 feet southwest *of subject property*). The site was originally developed as an oil recycling and refining facility in the 1930's, operated by Bayside Oil Company. Bayside Oil used the acid-clay oil refining process. The Bayside Oil site was acquired by the Garratt-Callahan Company in 1980. G-C Lubricants, a specialty lubricant blending company, conducted operations on the eastern portion of the site. California Oil Recyclers, Inc. (CORI) leased the western portion of the site from late 1981 to late 1987 to store and recycle/re-refine used motor and fuel oils into useable fuel oil by batch distillation. Waste oil, fuel oil, diesel fuel, oily water, processing residues, lab chemicals, demulsifying chemicals, boiler treatment chemicals, and alkaline caustic liquids were generated, used, stored, treated or managed at the facility in a tank farm, main operations area, and storage building (Aquifer Sciences, Inc., May 19, 1989, and Watson Consulting, March 6, 2013).

  Beginning in June 1988, a number of subsurface investigations have been performed both onsite and offsite. Significant chemical impacts to soil were discovered on the site associated with former on-site operations. First encountered groundwater on the site contained floating product at some locations. COCs include petroleum hydrocarbons, PCBs, and VOCs including benzene, xylenes, PCE, TCE, cis-1,2-DCE, and vinyl chloride.

- 1007 Bransten Road (located approximately 700 feet southwest of *subject property*). This property was used in the 1950s as a "Rock Wool Insulation Factory", and was later redeveloped with two buildings that have housed miscellaneous business operations, including machine shops. Historical records indicate machine oils and cleaning/degreasing solvents have been used and stored on the site in both drums and containers, and waste oils and waste solvents have been generated on the site. Subsurface investigations completed at the site beginning in January 2009 have discovered mainly petroleum hydrocarbons and VOCs in soil and groundwater beneath the site. The concentrations of all of these contaminants in groundwater decrease significantly at the downgradient (eastern) property line (Green Environment inc., July 31, 2009).

- 1015 Commercial Street (located approximately 800 feet southwest *of subject property*). In April 1985, three (3) underground storage tanks (USTs) were removed from the site, including one 10,000 gallon gasoline tank, one (1) 10,000 gallon diesel tank and one (1) 10,000 gallon mineral spirits tank. In February 1986, eleven (11) USTs were removed from the site. The USTs had contained vinyl acetate monomer,

butyl cellosolve, amyl acetate, xylenes, isobutyl isobutyrate, lacquer thinner, toluene, isopropyl alcohol, and n-propyl acetate (BlaineTech Services, February 20, 1986). In August 1995, seven (7) 10,000 gallon metal USTs were removed from the site (AES Construction, August 1996). The USTs had contained propylene glycol, aliphatic hydrocarbons, ethylene glycol, butyl acrylate, methyl methacrylate, styrene monomer, naphtha, and vinyl acetate. Groundwater samples indicated the presence of significant concentrations of petroleum hydrocarbons, and low levels of VOCs including BTEX compounds and naphthalene.

Based on available information, GEI does not believe that the HVOCs detected in groundwater are from an onsite source.

2.4 Regional Geology and Hydrogeology

The *subject property* is situated in San Mateo County in the San Francisco Bay Region, which is part of the Coast Ranges geological province. The San Francisco Bay Region occupies the structural trough formed by two northwest trending mountain ranges; the Santa Cruz Mountains to the southwest of the valley and the Diablo Range to the northeast. The Diablo Range is predominantly composed of Franciscan Formation, which is uppermost Jurassic to lower Upper Cretaceous eugosynclinal assemblage. The Santa Cruz Mountains are predominantly composed of material formed of Cenozoic shelf and slope deposits. A thick blanket of latest Cretaceous and Tertiary clastic sedimentary rocks and isolated intrusions of serpentine covers large parts of the province. Folds, thrust faults, steep reverse faults, and strike-slip faults developed as a consequence of Cenozoic deformations that occur very often within the province, and some of them are continuing today. The Quaternary history of the region is recorded by sedimentary marine strata alternating with non-marine strata. The changes of the depositional environment are related to the fluctuation of sea level corresponding to the glacial and interglacial periods. Late Quaternary deposits fill the center of the San Francisco Bay Area and most of the strata are of continental origin characterized as alluvial and fluvial materials (Brabb, Graymer, and Jones, 1998).

Groundwater in the flatland areas of the Bay region occurs in the Holocene through Pleistocene alluvial and stream channel deposits. The water bearing zones are generally discontinuous. Within the Bay region, higher water tables are found most commonly in tidal mudflats underlain by Bay mud and in low flood-basins at the outer margins of alluvial fans. The lower water tables occur in higher well-drained alluvial areas underlain by coarse-grained deposits. Recharge to the groundwater is accomplished through man-made percolation ponds, natural recharge basins, and infiltration from surface waters (lakes and streams) or precipitation. The regional gradient in all water bearing zones is generally

estimated to be toward the San Francisco Bay.

2.5 Site Geology and Hydrogeology

Lithologic observations from the soil recovered during previous borings and well installation at the site generally encountered olive-gray clay with minor gravel locally interbedded with silty sand with minor gravel from beneath the asphalt or concrete surface to between approximately 5 and 8 feet bts. Beneath the clay with gravel, a dark gray to olive gray high plasticity (locally fat) clay was generally encountered between 8 and 14 feet bts, though with depth below 10 feet the clay becomes light brown with increasing sand content. Near the upper contact of this fat clay, petroleum hydrocarbon staining and odor were often observed with associated elevated flame-ionization detector (FID) measurements; fine rootlets were also observed (generally at between 7.5 to 8 feet bts). No hydrocarbon staining or odor were observed at 8 feet bts in the three (3) borings completed upgradient of the *subject property* building (B-15 through B-17). A permeable sand, silty sand or clayey sand was then often encountered between 12 and 16 feet bts, within which first encountered groundwater was observed. Most borings were then generally terminated within a light brown clay at between approximately 16 feet bts and the maximum depth explored of 18 feet bts. Groundwater generally stabilized at between approximately 6.4 and 9.0 feet bts.

Although impacts to soil in the source area have historically been observed as deep as 13.5 feet bts, visual evidence of impact to soil was not observed at MW-1 below 8.5 feet bts, and FID readings were low at 3 to 16 parts per million by volume (ppmv).

The groundwater flow direction and gradient has not been determined for the *subject property*. The groundwater flow direction in the upper water-bearing zone in the immediate vicinity of the *subject property* has been determined to be to the north-northeast at a hydraulic gradient of approximately 0.005 foot per foot based upon historic monitoring of twenty-two groundwater monitoring wells installed (including one well at 821 Industrial Road approximately 200 feet northwest of *subject property*) by the parties responsible for the chemical release(s) at and from the 977 Bransten Road site (Watson Consulting/Georestoration Inc., March 6, 2013).

2.6 Background Metal Concentrations

Metals occur naturally in soils. EPA (1989) and DTSC (1997) guidance indicates that risk evaluations for metals are only necessary when the levels exceed naturally occurring background concentrations. To distinguish between site-related contamination and naturally-occurring or ambient contaminant levels, in **Table 3** concentrations of the five (5)

metals analyzed in *subject property* soils are compared to the following references for background metals concentrations in soils:

Background Concentrations of Trace and Major Elements in California Soils, Kearney Foundation of Soil Science, Division of Agriculture and Natural Resources, University of California. March 1996.

Background Metal Concentrations in Soils in Northern Santa Clara County, California in *Recent Geologic Studies in the San Francisco Bay Area*, Christina M. Scott. 1995.

The Scott (1995) report is used as a reference for background concentrations of chromium, nickel, lead, and zinc, in soils on the *subject property*, as this report represents soils nearest to the *subject property* geographically. The Scott report does not provide a background level for cadmium, as cadmium was not detected in a majority of the soil samples collected for the Northern Santa Clara County document. The Bradford et al (1996) report includes data for soils collected over the entire state of California, with each soil location numbered (from 1 to 50). Location number 49, Venice soil from San Joaquin County, is the nearest geographically to the *subject property*. Values from location 49 were used as background screening levels for cadmium in *subject property* soils, as indicated in **Table 3**.

A summary of *subject property* soil metal concentrations and background concentrations is provided in **Table A** below**.**

Table A. Comparison of Metals Concentrations in Subject Property Soils to Background Concentrations (in milligrams per kilogram)

	Cadmium	Chromium	Lead	Nickel	Zinc
Maximum concentration (on site location)	1.5 (MW-1)	800 (B-6)	870 (WSP-1)	2,200 (B-6)	110 (B-11)
Mean sitewide concentration	0.12	143.7	54.2	300.82	47.66
Local background level (Scott 1995)	0.73[1]	51.28	11.43	73.53	65.27

[1] *From Bradford et al, 1996 (Venice soil)*

Based upon a combination of the maximum concentrations detected, the mean concentrations of the five metals in *subject property* soils in comparison to the referenced average background concentrations (and high and low range of referenced concentrations; see **Table 3** and summary **Table A**), it appears that chromium, lead and nickel concentrations in *subject property* soils in the tar-like substance source area exceed background levels.

2.7 Nature and Extent of Contamination

Sample locations from investigations on the *subject property* from 2008 through 2012 are shown in **Figure 4**, and the sample analytical results are presented in **Tables 1** through **4,** and **Figures 5** through **11**. A detailed description of the nature and extent of contamination is presented below.

2.7.1 Tar-like Substance

An initial sample of the tar-like substance was collected by GEI from the sump in the electrical room of the *subject property* building in December 2008. The tar-like substance was found to contain the following chemical constituents: acetone (170 micrograms per kilogram [µg/kg]), phenanthrene (22,000 µg/kg), chrysene (13,000 µg/kg), benzo[g,h,i]perylene (15,000 µg/kg), fluoranthene (13,000 µg/kg), pyrene (9,500 µg/kg), PCB-1260 (13,000 µg/kg), diesel range organics (90,000 milligrams per kilogram [mg/kg]), motor oil range organics (220,000 mg/kg), cadmium (1.5 mg/kg), chromium (3.0 mg/kg), nickel (2.3 mg/kg), lead (1,200 mg/kg), zinc (13 mg/kg), and a pH of 1.70. Water present in the sump above the tar-like substance in December 2008 was also sampled and analyzed for TPHg, VOCs, and heavy metals (cadmium, chromium, lead, nickel and zinc), and was found to contain the following chemical constituents: cadmium (0.012 milligrams per liter (mg/l), chromium (0.041 mg/l), lead (0.53 mg/l), nickel (0.036 mg/l), zinc (0.30 mg/l), and a pH of 2.54 (GEI, January 8, 2009).

The extent of the black tar-like substance appears to be limited to the immediate vicinity of the trenched area shown in **Figure 4**, to a maximum depth of 14.2 feet bts, as the tar-like substance has been observed in only one (1) boring (WSP-1) on the *subject property*, at a depth from 12.5 to 14.2 feet bts (WSP, July 21, 2010).

2.7.2 Soil

Two (2) primary VOCs were detected in soil on the *subject property* at low concentrations, specifically acetone and 2-butanone (methyl ethyl ketone or MEK) (**Table 1**, **Figure 8**). Both of these compounds have been generally widely used historically as cleaning products. In addition, low concentrations of other VOCs including: naphthalene at borings B-10 and WSP-1; toluene at borings WSP-1, B-5, and B-6; PCE at borings B-11, B-12, B-14, and B-15; trichloroethylene (TCE) at borings B-5 and B-15; trimethylbenzenes (TMB) at borings WSP-1, B-5, and B-11; xylenes at borings WSP-1 and B-14; and carbon disulfide at borings B-5 and B-9 were detected in *subject property* soils.

Total extractable petroleum hydrocarbons in the diesel (TPHd) and motor oil (TPHmo) ranges were detected at every sample location, with the exception of TPHmo in soil samples from MW-1 and B-7. The highest concentrations of extractable TPH are generally observed in the 7.0 to 13.0 feet depth range, in the eastern portion of the *subject property* (**Table 1, Figure 5**). Sample locations with the highest concentrations of TPHd and TPHmo were detected in borings B-5 and B-6 (7.5-8.0 feet depth) and boring WSP-1 (12.5-13.5 feet depth). Significant (>1,000 mg/kg) concentrations of TPHd and TPHmo were also observed between 7.5 and 9.5 feet bts at borings B-9, B-11, B-12, and WSP-3. TPHg was detected in only two (2) soil samples, at a maximum concentration of 0.44 mg/kg.

Generally, low concentrations of PAHs were detected in most of the soil samples collected from the 7.5-10 feet depth range (**Table 1**, **Figure 6**). The most common PAHs reported were chrysene and pyrene. Several other PAHs were reported at least once, with the highest concentrations of PAHs reported from borings WSP-1 (12.5-13.5 feet depth) and WSP-3 (8.5-9.5 feet depth).

The only PCB isomer detected in *subject property* soils above laboratory detection limits is PCB-1260. PCB-1260 was detected in soil samples with extractable TPH, and generally there was a correlation of relative concentrations of extractable TPH and PCB-1260. The highest concentrations of PCB-1260 were detected in soil samples collected from borings B-5, B-6, B-7, B-9, B-13, B-14, WSP-1, WSP-2, and WSP-3, with the highest concentrations of PCB-1260 observed in the 7.5-8.5 feet depth range (**Table 1, Figure 6**).

Five (5) metals (cadmium, chromium, lead, nickel, and zinc) have been analyzed in soil and groundwater samples collected on the *subject property*. With the exception of cadmium, all of the metals have been reported above laboratory reporting limits, at varying concentrations in all soil samples (**Table 3, Figure 10**). Cadmium was detected in only six (6) soil samples, at concentrations generally consistent with reported naturally occurring background concentrations. Chromium was detected in every soil sample, with the concentrations detected generally consistent with reported naturally occurring background concentrations, with the exception of certain soil samples collected at boring WSP-1 (170 mg/kg at 6.5 to 7.5’), boring B-5 (760 mg/kg at 5.5 to 6.0’, 270 mg/kg at 7.5 to 8.0’), boring B-6 (120 mg/kg at 3.5 to 4.0’, 800 mg/kg at 5.5 to 6.0’), boring B-7 (480 mg/kg at 5.5 to 6.0’), boring B-9 (360 mg/kg at 5.0 to 5.5’), boring B-10 (430 mg/kg at 5.5 to 6.0’), boring B-12 (240 mg/kg at 5.5 to 6.0’), boring B-13 (320 mg/kg at 5.5 to 6.0’), boring B-14 (460 mg/kg at 5.5 to 6.0’), and boring MW-1 (180 mg/kg at 6.0 to 6.5’). Lead was detected in every soil sample, with the concentrations detected generally consistent with reported naturally occurring

background concentrations, with the exception of certain soil samples collected at boring WSP-1 (870 mg/kg at 12.5 to 13.5'), boring WSP-2 (110 mg/kg at 12.5 to 13.5'), boring B-6 (180 mg/kg at 7.5 to 8.0'), boring B-9 (140 mg/kg at 7.5 to 8.0'), boring B-11 (280 mg/kg at 7.5 to 8.0'), boring B-12 (110 mg/kg at 8.0 to 8.5'), and boring B-14 (330 mg/kg at 8.0 to 8.5'). Nickel was detected in every soil sample, with the concentrations detected generally consistent with reported naturally occurring background concentrations, with the exception of certain soil samples collected at boring WSP-1 (470 mg/kg at 12.5 to 13.5'), boring WSP-2 (150 mg/kg at 12.5 to 13.5'), boring B-5 (1,700 mg/kg at 5.5 to 6.0' and 740 mg/kg at 7.5 to 8.0'), boring B-6 (180 mg/kg at 3.5 to 4.0' and 2,200 mg/kg at 5.5 to 6.0'), boring B-7 (1,100 mg/kg at 5.5 to 6.0'), boring B-9 (900 mg/kg at 5.0 to 5.5'), boring B-10 (980 mg/kg at 5.5 to 6.0'), boring B-11 (130 mg/kg at 6.0 to 6.5'), boring B-12 (770 mg/kg at 5.5 to 6.0'), boring B-13 (1,100 mg/kg at 5.5 to 6.0'), boring B-14 (1,400 mg/kg at 5.5 to 6.0'), and boring MW-1 (340 mg/kg at 6.0 to 6.5', and 150 mg/kg at 8.0 to 8.5'). Zinc was detected in every soil sample, generally consistent with reported naturally occurring background concentrations.

2.7.3 Groundwater

Acetone and MEK have not been detected in groundwater (**Table 2**). MTBE has been detected in a few groundwater samples, with the highest concentration (12 µg/L) detected in a grab groundwater sample collected from boring B-16. No other non-halogenated VOCs have been detected in groundwater beneath the *subject property*. HVOCs have been detected in all groundwater samples with the HVOCs detected in all or most of the groundwater samples being chloroform, 1,2-dichloroethane (1,2-DCA), PCE and TCE (**Table 2).** Chloroform has been detected in all but one (1) groundwater samples, ranging from 1.7 µg/L to 21 µg/L. 1,2-DCA was detected in all groundwater samples, ranging from 4.1 µg/L to 25 µg/L. PCE has been detected in all but two (2) groundwater samples, ranging from 4.6 µg/L to 1,700 µg/L. The highest concentration of PCE was detected in the inferred upgradient boring B-15, located in the southwest corner of the *subject property*, outside the *subject property* building (**Figure 9**). The next highest PCE concentration was detected in boring B-13 at 730 µg/L, located within Suite D of the *subject property* building, near the tar-like substance source area (**Figure 9**). TCE was detected in all but one (1) groundwater samples, ranging from 0.52 µg/L to 110 µg/L. The highest concentration of TCE in groundwater was found at boring B-5, located just outside the east side of Suite D (**Figure 9**). TCE is a common degradation product of PCE, along with cis-1,2-dichloroethene (cis-1,2-DCE) and vinyl chloride. Both of the latter compounds were detected in a majority of the groundwater samples, ranging from 1.1 µg/L to 11 µg/L for cis-1,2-DCE, and 0.52 µg/L to 4.9 µg/L for vinyl chloride. The highest concentration of cis-1,2-DCE in groundwater was found at boring B-5, located just outside the east side of Suite D (**Figure 9**). The highest concentration

of vinyl chloride in groundwater was found at boring B-17, located in the western corner of the *subject property*, outside the *subject property* building (**Figure 9**). Other HVOCs detected in groundwater samples (in more than 50% of the samples) include carbon tetrachloride (CCL4) ranging from 1.5 µg/L to 48 µg/L, 1,1-DCA ranging from 4.1 µg/L to 25 µg/L, 1,1-dichloroethene (1,1-DCE) ranging from 0.59 µg/L to 3.6 µg/L, CFC-11 ranging from 11 µg/L to 53 µg/L, and CFC-113 ranging from 2.7 µg/L to 52 µg/L.

TPHg was detected in groundwater samples collected predominantly in the easterly borings at maximum concentrations of 310 µg/L in boring WSP-3 and 250 µg/L in boring B-5. TPHg concentrations were all noted by the laboratory as due to discrete peaks in the gas chromatogram, indicating that the reported TPHg is due primarily to VOCs, rather than gasoline.

TPHd and TPHmo, though detected at elevated concentrations in historical boring WSP-3 (21,000 µg/L and 62,000 µg/L, respectively) were not reported above detection limits in any groundwater sample analyzed during more recent investigations (**Table 2, Figure 5**).

Five (5) different PAHs (naphthalene, fluoranthene, fluorene, chrysene, and phenanthrene) were detected above laboratory reporting limits in one (1) or more groundwater samples (**Table 2, Figure 7**). However, the PAH detections were infrequent and at low concentrations (< 1.0 µg/L).

There were no detections of any PCBs in any groundwater samples (**Table 2**).

Chromium, nickel, lead and zinc were detected at elevated concentrations in the grab groundwater samples collected by WSP in 2009 (**Table 4**). However, the grab groundwater samples collected by WSP were not filtered prior to preservation, and thus the reported concentrations reflect total, not dissolved metals. In the groundwater samples subsequently collected by GEI, the samples were filtered by the laboratory prior to preservation, and thus the reported concentrations reflect dissolved metals. Only dissolved zinc has been detected frequently in *subject property* grab groundwater samples, at a maximum concentration of 23 µg/L (**Table 4**).

2.8 Risk Evaluation

2.8.1 Screening Levels

A Tier 1 risk evaluation for the *subject property* was performed by GEI using established environmental risk screening levels for both residential and commercial/industrial sites where groundwater is a potential source of drinking water. Environmental risk screening levels considered in the risk evaluation for soil included:

- OEHHA California Human Health Screening Levels (CHHSLs) for commercial/industrial AND residential land use (Cal-EPA, January 2005, September 2009);
- US EPA Region 9 Regional Screening Levels (RSLs) for residential and industrial soils (US EPA, November 2013);
- US EPA Region 9 Preliminary Remediation Goals (PRGs) (2004) and "Cal-Modified" 2004 US EPA Region 9 PRGs, California Department of Toxic Substances Control Office of Human and Ecological Risk, Human Health Risk Assessment Note Number: 3, May 21, 2013)
- San Francisco Bay Region RWQCB Environmental Screening Levels (ESLs) for residential and commercial/industrial land use where groundwater IS a potential source of drinking water (RWQCB, Tables A-1, A-2, C-1, and C-2, December 2013);

Environmental risk screening levels considered in the risk evaluation for groundwater included:

- California Department of Public Health (CDPH) MCLs for drinking water, state (CDPH, June 2012);
- US EPA Maximum Contaminant Levels (MCLs) for drinking water, federal (US EPA, March 2010);
- US EPA Region 9 RSLs for Tapwater (US EPA, November 2013) ; and
- SF Bay Area RWQCB ESLs for groundwater, where groundwater IS a potential source of drinking water (RWQCB, Table F-1a, December 2013).
- SF Bay Area RWQCB ESLs for groundwater, for Evaluation of Potential Vapor Intrusion (RWQCB, Table E-1, December 2013).

For risk evaluation, detected chemical concentrations in soil and groundwater were compared to the most conservative of the above listed environmental risk screening levels for residential and commercial/industrial land uses, but only comparing chemical

concentrations to RWQCB ESLs where no other screening levels have been established (TPHg, TPHd, TPHmo, and phenanthrene). If a chemical constituent was reported at a concentration above one (1) or more of the environmental risk screening levels, it is considered a contaminant of potential concern (COPC).

For metal constituents in soil, only concentrations above reported naturally occurring background concentrations AND environmental risk screening levels are considered COPCs.

Tar-Like Substance Comparison to Screening Levels

The tar-like substance was sampled and analyzed in 2008, and the analytical results are presented in **Section 2.7.1**. A comparison of chemical constituents detected in the tar-like substance to environmental risk screening levels is not appropriate given that the tar-like substance is of a material nature that is not consistent with the assumptions and models used to derive environmental screening levels.

Water overlying the tar-like substance in the sump was also sampled, and analyzed chemical constituents detected in the water did not exceed screening levels.

It should also be noted that both the tar-like substance and water present in the trench in 2008 above the tar-like substance had a very low pH, 1.70 and 2.54, respectively, representing a physical direct contact risk.

Soil Risk Screening and COPCs

Organic chemical soil constituents at concentrations above an environmental risk screening level for residential and/or commercial land uses are depicted by a shaded box in **Table 1.** Thus, organic COPCs in soil include TPHd, TPHmo, PCB-1260, benzo(a)pyrene, and benzo(b)fluoranthene. Metal soil constituents at concentrations above reported naturally occurring background concentrations AND an environmental risk screening level for residential and/or commercial land uses are depicted by a shaded box in **Table 3.** Thus, lead and nickel are soil COPCs.

Groundwater Risk Screening and COPCs

Organic chemical groundwater constituents at concentrations above an environmental risk screening level are depicted by a shaded box in **Table 2**, and include TPHg,TPHd, TPHmo, MTBE, CCL4, chloroform, 1,2-DCA, cis-1,2-DCE, PCE, TCE and vinyl chloride. All are considered organic COPCs in groundwater with the exception of

TPHg, not considered a COPC due to its reported concentrations noted by the laboratory as primarily due to discrete VOCs. Dissolved metal groundwater constituents are compared to environmental risk screening levels in **Table 4**, and no dissolved metals have been detected at or above an environmental risk screening level, and thus metals are not COPCs in groundwater.

Chemicals of Concern (COCs)

Soil

Factoring the low frequency of detection in soil at concentrations above environmental risk screening levels, GEI eliminated benzo(a)pyrene and benzo(b)fluoranthene as organic COCs in soil. Thus, the only organic COCs in soil are TPHd, TPHmo, and PCB-1260.

Factoring the low frequency of detection in soil at concentrations above environmental risk screening levels, GEI eliminated nickel as a metal COC in soil. Using guidance from the DTSC Office of Human and Ecological Risk (HERO) Human Health Risk Assessment (HHRA) Note Number 3 (DTSC, May 21, 2013), the 95% upper confidence level (UCL) for lead was calculated for the *subject property*. Using all data points, the 95% UCL is 96 mg/kg, which is above the residential CHHSL for lead of 80 mg/kg. However, one (1) sample collected from borehole WSP-1 contained an anomalously high concentration of lead at 870 mg/kg, and is considered an outlier. This sample was collected immediately adjacent to the tar collection trench at a depth of 12.5 to 13.5 feet, and was observed to contain the tar-like substance. Recalculating without this sample lead concentration, the 95% UCL for lead at the *subject property* is 57 mg/kg, which is below the residential CHHSL for lead (**Appendix B**). Thus, GEI eliminated lead as a metal COC in soil.

Groundwater

TPHd and TPHmo have been detected in only one (1) of eighteen (18) grab groundwater samples, and have not been detected in a groundwater well sample, thus TPHd and TPHmo are not considered COCs in groundwater. The concentrations of seven (7) VOCs exceed environmental risk screening levels in more than one (1) sample: CCL4; chloroform; 1,2-DCA; cis-1,2-DCE; PCE; TCE and vinyl chloride **(Table 2),** and thus are COCs in groundwater. However, as stated in Section 2.3, there does not appear to be an onsite source of the VOCs detected in groundwater on the *subject property*.

2.8.2 Exposure Pathways

The following potential exposure pathways were explored in performing a risk evaluation for COPCs at the *subject property*.

Direct Contact

Direct contact with the tar-like substance presents a health risk due to the low pH of the substance. As the *subject property* is capped with a building with a concrete slab foundation and paving, direct contact with the tar-like substance can occur only during subsurface construction activities, or if the tar-like substance migrates to the surface through cracks, gaps or penetrations in the concrete slab or paving.

The highest concentrations of COCs in soils are found at depths greater than 7.5 feet bts. COCs in soil were not reported above any environmental risk screening levels at depths shallower than 7.5 feet bts. Soil on the *subject property* is capped by the *subject property* building and paving outside the building. Thus, there is not a direct contact exposure pathway for onsite workers or typical construction contractors associated with COCs.

Upon penetration of the permeable sand at between 12 and 16 feet bts, groundwater generally stabilized at between approximately 6.4 and 9.0 feet bts. Direct contact with impacted soil or groundwater is therefore not considered an exposure pathway for onsite workers or typical construction contractors.

Drinking Water

There are no water supply wells within a one (1) mile radius of the *subject property*. Water supply for the City of San Carlos is provided by the California Water Service Company and comes from the Hetch Hetchy Reservoir. Drinking water is not considered to be a potential exposure pathway at the *subject property*.

Major Construction Activities

Major construction activities present the most likely potential human exposure routes to the tar-like substance, and impacted soil and groundwater on the *subject property*. However, there are currently no plans for major construction at the *subject property*.

Potential Vapor Inhalation

Based on a comparison of VOC concentrations detected in *subject property* groundwater to RWQCB Table E-1 ESLs for Evaluation of Potential Vapor Intrusion (December 2013), vapor intrusion may be a potential exposure pathway on the *subject property*. The source of the VOCs is considered to be off-site, as presented in **Section 2.3**. Indoor air sampling was conducted in the electrical room of the *subject property* building on July 7, 2009, to confirm whether the tar-like substance presented a vapor inhalation hazard (GeoCon, September 14, 2009). One (1) indoor air sample was collected over an eight (8) hour time period. The air sample was analyzed for VOCs, PAHs, naphthalene, PCBs, and select metals (cadmium, chromium, lead, nickel, and zinc). Sample analyses were selected based on results of the 2008 GEI sampling of the tar-like substance, to determine whether any of the constituents present in the tar-like substance were migrating as vapors into the air. PCE was not detected in the air sample. Acetone was detected in the indoor air sample at a concentration of 24 micrograms per cubic meter ($\mu g/m^3$), well below the Table E-3 RWQCB ESL for Ambient and Indoor Air Screening Levels of 140,000 $\mu g/m^3$. Low levels of other VOCs, including toluene, ethylbenzene, xylenes, trimethylbenzenes, and 1,1,1-trichloroethane, were also detected in the air sample at levels well below the Table E-3 RWQCB ESLs. PAHs, naphthalene, PCBs, and metals were not detected above method detection limits in the indoor air sample.

3.0 REMOVAL ACTION OBJECTIVES AND GOALS

Site characterization and risk assessment have revealed the presence of COCs in soil and groundwater at the *subject property*. Removal Action Objectives (RAOs) have been developed based upon the current environmental conditions and reasonably anticipated future uses of the *subject property*. Based on the RAOs, removal action goals were developed that establish specific concentrations of chemicals in soil that are protective of both human health and the environment. Specific removal action goals have been developed for the *subject property* from information obtained in investigations at the *subject property*, and risk management decisions based upon the current and proposed future use of the *subject property*. Information used to develop the removal action goals included laboratory analytical results, hydrogeologic data, and a Tier 1 risk assessment.

In addition, a review of pertinent laws, regulations, and other criteria was performed to identify applicable or relevant and appropriate requirements (ARARs) and other criteria to be considered for remediating the *subject property*.

RAOs, ARARs and removal action goals for the *subject property* are presented below.

3.1 Removal Action Objectives

RAOs have been established that are protective of human health and the environment and reduce the potential for exposure to the COCs in soil that may be encountered at the *subject property*. RAOs were not established for COCs in groundwater because the source of the COCs does not appear to be on the *subject property*. The RAOs for soil are presented below.

- Minimize or eliminate potential exposure of humans to the tar-like substance present on the *subject property* through any potential contact.

- Minimize or eliminate potential exposure of humans to COCs (TPHd, TPHmo and PCB-1260) in soil, through any potential contact.

- Reduce the human health-based risks associated with onsite contamination in soil to a level that is acceptable for commercial/industrial land use.

3.2 Applicable or Relevant and Appropriate Requirements (ARARs)

Applicable or relevant and appropriate requirements (ARARs) are federal and state environmental statutes, regulations, and standards. Applicable requirements are federal or state laws or regulations that specifically address a hazardous substance, pollutant, contaminant, removal action, or location. Relevant and appropriate requirements that, while not "applicable," address problems or situations sufficiently similar to those encountered that their use is well suited to the particular site. State requirements are ARARs only if they are more stringent than federal requirements.

In addition to ARARs, this analysis includes an evaluation of To-Be-Considered criteria (TBCs). TBCs are advisories, criteria, or guidance that may be considered for a particular action or specific issue, as appropriate. TBCs are not ARARs because they are neither promulgated nor enforceable.

The ARARs or TBCs may be: 1) chemical; 2) location; or 3) activity specific. Chemical-specific ARARs or TBCs are usually health- or risk-based numerical values or methodologies used to determine acceptable concentrations of chemicals that may be found in, or discharged to, the environment. Location-specific ARARs or TBCs restrict actions or contaminant concentrations in certain environmentally sensitive areas. Action-specific ARARs or TBCs are usually technology- or activity-based requirements or limitations on actions or conditions involving specific chemicals of concern.

A summary of the ARARs and TBCs is presented in **Table 5**.

3.3 Removal Action Goals

Risk-based removal action goals for COCs in soil are presented in **Table B** below. There are no removal action goals for groundwater as stated in **Section 3.1** above. The removal action goals for COCs in soil are based upon residential (unrestricted) use CHHSLs, where established, and residential ESLs where CHHSLs have not been established.

Table B. COC Removal Action Goals for Soil

COC	Removal Goal	Source
TPHd	100 mg/kg	RWQCB Table A-1 ESL (residential land use)
TPHmo	100 mg/kg	RWQCB Table A-1 ESL (residential land use)
PCB-1260	89 μg/kg	OEHHA CHHSL (residential land use)

4.0 EVALUATION OF REMOVAL ACTION ALTERNATIVES

The purpose of this Section of the *RAW* is to identify and screen possible removal action alternatives that may best achieve the RAOs discussed in **Section 3.0**. The removal action alternatives were screened and evaluated on the basis of their effectiveness, ease of implementation, and cost.

4.1 Identification of Removal Action Alternatives

In order to address elevated levels of extractable petroleum hydrocarbons and PCB-1260 in soil, the following removal action alternatives have been identified and evaluated.

- Alternative 1 – no further action other than monitoring and cleaning of the tar-like substance collection sump.
- Alternative 2 – soil excavation and off-site disposal.
- Alternative 3 – institutional controls, and operation and maintenance.

4.1.1 Alternative 1 – No Further Action (NFA)

The NFA alternative would not include any institutional controls or remedial actions, other than annual monitoring and cleaning of the existing collection sump for the black tar-like substance.

4.1.2 Alternative 2 – Soil Excavation and Off-Site Disposal

The soil excavation/off-site disposal alternative would consist of feasibly removing and transporting the tar-like substance and impacted soil to an appropriate, permitted off-site facility for disposal. Excavation involves the use of backhoes and/or excavators, loaders and/or other appropriate equipment. The majority of soil that would be targeted for removal to meet the removal action goals is located beneath the building on the *subject property* (**Figure 13**). Thus, equipment would be required to remove large sections of the floor and concrete slab of the building, and excavation equipment would need to fit inside the space. Workers would be required to use personal protective equipment to reduce exposure to COCs. Sloping excavation sidewalls may result in increased volume of soil requiring excavation. Confirmation soil sampling and analysis would be conducted to verify that cleanup criteria were met at the excavation bottom and perimeter. Excavation may require soil stockpiling, prior to loading into trucks for offsite disposal.

To achieve the removal action goals, soil beneath the *subject property* building in the vicinity of borings B-9, B-11, B-12, B-13, B-14, WSP-1 and WSP-3, and east of the building in the vicinity of borings B-5, B-6, B-7, would require removal to depths ranging up to 13.5 feet (see **Figure 13**). The volume of soil removed would be approximately 1,900 cubic yards (2,600 tons), assuming the excavation does not need to be expanded based on confirmation sample results.

In order to meet unrestricted use criteria, removal action goals for this alternative would be to residential screening levels. Removal action goals for Alternative 2 are provided in **Table C** below.

Table C. COC Removal Action Goals for Soil in Alternative 2

COC	Removal Goal	Source
TPHd	100 mg/kg	RWQCB Table A-1 ESL (residential land use)
TPHmo	100 mg/kg	RWQCB Table A-1 ESL (residential land use)
PCB-1260	89 μg/kg	OEHHA CHHSL (residential land use)

4.1.3 Alternative 3 – Institutional Controls, Operation and Maintenance

Alternative 3 would not involve any soil remedial actions. Onsite COCs above cleanup goals are currently capped with the existing cover (building floors, pavement, etc.). Alternative 3 would consist of institutional controls and operation and maintenance to limit exposure to COCs. Institutional control would involve the development of and compliance with a recorded land use covenant, which will limit site use to commercial/industrial and prohibit sensitive land uses, and would include the requirement for implementation of an Operation and Maintenance Plan in the event of any future major construction that would involve the potential exposure to the tar-like substance and/or COCs in soil. Operation and maintenance activities would involve annual cleaning of the tar-like substance collection sump, and proper offsite disposal of the tar-like substance. Monitoring would include: periodic monitoring of the existing groundwater monitoring well (MW-1) in order to confirm that COCs in soil beneath the *subject property* remain of limited mobility, and impacts to groundwater remain stable or decrease over time; and periodic visual inspection of the *subject property* to look for visible evidence of the tar-like substance on any floor surfaces, and if observed, prompt and proper removal and disposal of the tar-like substance.

4.2 Evaluation Criteria

Each removal action alternative was independently analyzed without consideration to the other alternatives. Each of the removal action alternatives is screened based on effectiveness, implementation, and cost.

In the effectiveness evaluation, the following factors are considered:

- *Overall Protection of Human Health and the Environment* - this criterion evaluates whether the removal action alternative provides adequate protection to human health and the environment, and is able to meet the RAOs.
- *Compliance with ARARs/TBCs* - this criterion evaluates the ability of the removal action alternative to comply with ARARs.
- *Short-Term Effectiveness* - this criterion evaluates the effects of the removal action alternative during the construction and implementation phases until removal action objectives are met, and accounts for the protection of workers and the community during removal activities and environmental impacts from implementing the removal action.
- *Long-Term Effectiveness and Permanence* - This criterion addresses issues related to the management of residual risk remaining on site after a removal action has been performed and has met it objectives. The primary focus is on the controls that may be required to manage risk posed by treatment residuals and/or untreated wastes.
- *Reduction of Toxicity, Mobility, or Volume* - This criterion evaluates whether the removal technology employed results in significant reduction in toxicity, mobility, or volume of the hazardous substances.

The implementation criterion evaluates the technical and administrative feasibility of implementing the removal action alternative, as well as the availability of the necessary equipment and services. This includes the ability to design and perform a removal action alternative, the ability to obtain services and equipment, the ability to monitor the performance and effectiveness of technologies, the ability to obtain necessary permits and approvals from agencies, and likely acceptance by the State and the community.

The cost criterion assesses the relative cost of each removal action alternative based on estimated fixed capital for construction, and initial implementation and ongoing operational and maintenance costs. The actual costs will depend on true labor and material cost, competitive market conditions, final project scope, and the implementation schedule.

4.3 Analysis of Removal Action Alternatives

4.3.1 Alternative 1 – No Further Action (NFA)

Effectiveness

Overall Protection of Human Health and the Environment – Alternative 1 would not protect human health and the environment and would not meet the RAOs.

Compliance with ARARs/TBCs – Alternative 1 would not comply with ARARs and TBCs.

Short-Term Effectiveness – does not apply to Alternative 1.

Long-Term Effectiveness and Permanence – does not apply to Alternative 1.

Reduction of Toxicity, Mobility, or Volume – Alternative 1 would do little to reduce the toxicity or mobility of the tar-like substance and the associated soil COC impacts, as natural degradation of the tar-like substance is unlikely. Alternative 1 would have some positive impact on reducing the volume of the tar-like substance and the associated soil COC impacts due to the fact that there would be some removal of the tar-like substance via the collection trench/sump and periodic cleaning of the sump. Though Alternative 1 would have no effect on the toxicity or mobility of the tar-like substance and associated COC impacted soil, the potential risks to human health and the environment if the tar-like substance and impacted soils are left in place has been determined to be low (see **Section 2.7)**. Based on the concentrations of COCs observed in soils in the source area of the tar-like substance, and the concentrations of soil COCs observed in groundwater, the mobility of the contamination associated with the tar-like substance beneath the *subject property* is also low.

Implementation
Alternative 1 would not require implementing any measures at the site, other than annual monitoring and cleaning of the tar-like substance collection sump located in the electrical panel room of the *subject property* building.

Cost
GEI estimates the annual monitoring of the tar-like substance collection sump, cleaning of the sump, and proper offsite disposal of the tar-like substance to be $5,000 per year.

4.3.2 Alternative 2 – Soil Excavation and Offsite Disposal

Effectiveness
Overall Protection of Human Health and the Environment – Alternative 2 would protect human health and the environment and meet all of the RAOs, with the exception of the minimization or elimination of potential exposure of humans to COCs in groundwater through any potential contact.

Compliance with ARARs/TBCs – Alternative 2 would comply with ARARs and TBCs.

Short-Term Effectiveness – Alternative 2 would be effective in the short term if appropriate health and safety measures are employed (e.g. personal protective equipment, engineering controls, dust suppression, and traffic and equipment operating safety procedures) during the soil removal, loading and transport activities to protect contractors, on-site workers and the public.

Long-Term Effectiveness and Permanence – Alternative 2 would have long-term effectiveness and permanence.

Reduction of Toxicity, Mobility, or Volume – Alternative 2 would have a significant positive impact on reducing the volume of the tar-like substance and the associated COC soil impacts.

Implementation

Excavation/off-site disposal is a well-proven, readily implementable technology that is a common method for mitigating contaminated sites where circumstances allow. It is a relatively simple process, with proven results. Equipment and labor required to implement this alternative are uncomplicated and readily available. The shallow depths of the identified contamination make excavation implementable. However, the location of the main mass of the tar-like substance and associated COC soil impacts beneath the building on the *subject property* makes implementation of excavation much more challenging than at an outdoor excavation site, and increases the risk to the health and safety of workers performing the excavation, and to the integrity of the building. The excavation walls will be shored for contractor and building safety purposes. In addition, several building occupants would have to be relocated during excavation activities.

Cost

The estimated cost for excavation, transportation, and disposal of the tar-like substance and impacted soils (COCs exceeding Removal Action Goal concentrations) is approximately $980,000. This estimate includes: permitting; building preparation (engineering, shoring, temporary utility relocation, demolition of interior walls); soil excavation, loading, stockpiling, transportation and disposal; confirmation sampling; building and utility restoration; and reporting. The estimate does not include outside costs to the building owner, including tenant relocation and lost rental income. The total estimated cost of Alternative 2 is based upon the removal and offsite disposal of approximately 1400 tons of impacted soil from approximately 7 to 13 feet bts in an area of approximately 4300 square feet **(Figure 13)**. Soil from the top seven (7) feet bts would be inspected while being stockpiled onsite and re-used to backfill the excavation

as appropriate. This assumes that insignificant volumes of the tar-like substance will be encountered in this soil. A detailed cost analysis is provided in **Appendix C.**

4.3.3 Alternative 3 – Institutional Controls, Operation and Maintenance

Effectiveness

Overall Protection of Human Health and the Environment – Alternative 3 would protect human health and the environment and meet all of the RAOs, with the exception of the minimization or elimination of potential exposure of humans to COCs in groundwater through any potential contact.

Compliance with ARARs/TBCs – Alternative 3 would fully comply with ARARs and TBCs.

Short-Term Effectiveness – Alternative 3 would be effective in the short term.

Long-Term Effectiveness and Permanence – Alternative 3 would have long-term effectiveness and permanence. The institutional controls would restrict property usage; as the property could not be used for a residence, school for anyone under the age of 21, daycare, or hospital.

Reduction of Toxicity, Mobility, or Volume – Alternative 3 would have some positive impact on reducing the volume of the tar-like substance and the associated soil COC impacts due to the fact that there would be some removal of the tar-like substance via the collection trench/sump and periodic cleaning of the sump. Though Alternative 3 would have no effect on the toxicity or mobility of the tar-like substance and associated COC impacted soil, the potential risks to human health and the environment if the tar-like substance and impacted soils are left in place has been determined to be low (see **Section 2.7)**. Based on the concentrations of COCs observed in soils in the source area of the tar-like substance and the concentrations of soil COCs observed in groundwater, the mobility of the contamination associated with the tar-like substance beneath the *subject property* is also low.

Implementation

Implementation of the institutional controls and operation and maintenance programs could be easily completed, maintained and enforced. In addition, leaving the tar-like substance and impacted soils in place prevents potential health and safety risks to workers who may be exposed to the COCs in soil during soil removal activities, and the risk to the integrity of the *subject property* building during soil removal activities.

Cost
GEI estimates the cost of the development and recording of a land use covenant with an Operation and Maintenance Plan to be $10,000. GEI estimates the maintenance of the tar-like substance collection sump, periodically cleaning of the collection sump, and proper offsite disposal of the tar-like substance to be $5,000 per year. The estimated cost of semi-annual monitoring of groundwater monitoring well MW-1, semi-annual visual inspections of the *subject property* to look for visible evidence of the tar-like substance on any floor surfaces and annual reporting is $7,000 per year. GEI estimates the prompt and proper removal and disposal of any observed tar-like substance on surfaces to be $1,000 per year. Thus, in the initial five (5) year period, GEI estimates the total cost of Alternative 3 to be $75,000. GEI expects that after the initial five (5) year period, annual costs will decrease as the need for site management and monitoring should decrease. The net present value of thirty (30) years of Operation and Maintenance is therefore estimated to be approximately $325,000. A detailed cost analysis is provided in **Appendix C**.

4.4 Recommended Removal Action Alternative

Based on comparison of the effectiveness, implementability, and cost of the three (3) removal action alternatives, Alternative 3 is the preferred and recommended removal action for the *subject property*, as it cost-effectively achieves all of the RAOs.

5.0 REMOVAL ACTION IMPLEMENTATION

Implementation of the selected removal action will be carried out as described below.

5.1 Institutional Controls

GEI will prepare a draft Operation and Maintenance Plan specific to the *subject property* using applicable DTSC guidance. DTSC will prepare a draft Land Use Restriction specific to the *subject property*. The draft Operation and Maintenance Plan will be submitted to DTSC for comment. DTSC's comments will be incorporated into a final Operation and Maintenance Plan for signatures by Tanklage and DTSC, and then the signed Land Use Restriction referring to and appending the Operation and Maintenance Plan will be recorded by Tanklage with the San Mateo County Recorder.

At the least, the land use covenant will ensure that:

- the *subject property* will not be used for a residence, hospital, school for persons under 21 years of age, or a day care center for children;

- activities that may disturb the Cap (e.g., excavation, grading, removal, trenching, filling, earth movement, or mining) shall not be permitted on the Capped *subject property* without a Soil Management Plan and prior written approval by DTSC;
- all uses and development of the Capped *subject property* shall preserve the integrity or effectiveness of the Cap;
- all uses shall preserve the physical accessibility to and integrity of the groundwater monitoring system;
- the Cap shall not be altered without prior written approval by DTSC; and
- drilling for any water, oil or gas will not be permitted without prior written approval by DTSC.

5.2 Operation and Maintenance

GEI will develop a written protocol (Operation and Maintenance Plan) for maintenance of the tar-like substance collection sump, periodically cleaning of the tar-like substance collection sump, and proper offsite disposal of the tar-like substance. Tanklage will then obtain bids from qualified contractors, and work with the selected contractor to perform the operation and maintenance tasks. An Operation and Maintenance Agreement will be drafted by DTSC, to be signed by Tanklage and DTSC.

Visual Inspections

Tanklage will perform and document visual inspections of the *subject property* on a quarterly basis to look for visible evidence of the tar-like substance on any floor surfaces, and if observed, direct the operation and maintenance contractor to perform prompt and proper removal and disposal of the tar-like substance.

Groundwater Monitoring

Based upon summary findings for the initial year of quarterly monitoring and sampling of MW-1 (GEI, April 24, 2012), GEI recommends the following:

- monitoring and sampling frequency for MW-1 be reduced to semi-annual (i.e., two [2] times annually) for the next five (5) years for VOCs;
- monitoring and sampling frequency for MW-1 be reduced to annual (i.e., one [1] time annually) for the next five (5) years for TPHg, TPHd, TPHmo, PAHs, and PCBs;
- eliminating analyses for TDS and metals; and
- eliminating the collection of duplicate samples.

The monitoring protocol will adhere to the protocol established in the *Groundwater Monitoring Well Installation Work Plan (GEI, November 29, 2011)*, including the appended *Quality Assurance Project Plan* and *Health and Safety Plan*.

5.3 Reporting

An annual *Operation and Maintenance Report* will be prepared and submitted to DTSC which will include descriptions and results of site institutional control, management and monitoring activities. In addition, every five years, a *Five Year Review Report* will be prepared and submitted to DTSC in which the effectiveness, implementation and cost of the removal actions will be evaluated, and any recommendations for improvement provided.

6.0 PUBLIC PARTICIPATION

The public participation requirements for the *RAW* process included: (1) the development of a community profile, (2) publishing a notice of the availability of the draft *RAW* for a 30-day public review and comment, (3) making the draft *RAW* and other supporting documents available at DTSC's office and in the local information repository, and (4) responding to public comments received on the draft *RAW* and CEQA documents.

Once the 30-day public comment period was completed, DTSC reviewed and responded to the public comments received, with DTSC's written response to the public comments provided in **Appendix D**. DTSC determined the draft *RAW* did not require any significant changes, and that the draft *RAW* could be finalized and approved for implementation.

7.0 CEQA DOCUMENTATION

The California Environmental Quality Act (CEQA), modeled after the National Environmental Policy Act (NEPA) of 1969, was enacted in 1970 as a system of checks and balances for land-use development and management decisions in California. It is an administrative procedure to ensure comprehensive environmental review of cumulative impacts prior to project approval. It has no agency enforcement tool, but allows challenge in courts. A CEQA project is a project that has a potential for resulting in a direct physical change in the environment or a reasonably foreseeable indirect physical change in the environment. CEQA applies to all discretionary projects proposed to be carried out or approved by California public agencies, unless an exemption applies.

DTSC has prepared and will file a Notice of Exemption at the time of approval of the Final *RAW*. The Notice of Exemption is provided in **Appendix E**.

8.0 REFERENCES

AES Construction. *Report of Findings Underground Storage Tank Removal, Kelly Moore Paint Co., 1015 Commercial Street, San Carlos, California*. August 1996.

Aquifer Sciences, Inc. *Phase I Hydrogeologic Investigation Report, 977 Bransten Road, San Carlos, California*. May 19, 1989.

BlaineTech Services. *Field Sampling at Kelly Moore, 919 Old County Road, San Carlos, CA on February 11, 1986*. February 20, 1986.

Brabb, E.E., R.W. Graymer, and D.L. Jones. *Geology of the onshore part of San Mateo County, California: A digital database.* USGS Open File Report 98-137.

Catney, Philip; Nigel Lawson, Monica Palaseanu-Lovejoy, Sally Shaw, Colin Smith, Tom Stafford, Simon Talbot, and Xu Hao. *Acid tar lagoons: risks and sustainable remediation in an urban context*. March 1, 2005.

Conor Pacific/EFW. *Subsurface Characterization Report for the Former California Oil Recyclers Inc. Site, 977 Bransten Road, San Carlos, California.* July 14, 2000.

DTSC. *Representative Sampling of Groundwater for Hazardous Substances, Guidance Manual for Groundwater Investigations.* July, 1995. Revised February, 2008.

DTSC. Letter re: *Well Installation Work Plan, Dated November 29, 2011, Tanklage Square, 837 Industrial Road, San Carlos, California*. December 21, 2011.

Geocon Environmental Consultants (GeoCon). *Indoor Air Sampling Report, 837 Industrial Road, San Carlos, California*. September 14, 2009.

Green Environment inc. (GEI). *Letter Report to Tanklage Properties, Inc. 837 Industrial Road, San Carlos, California*. January 8, 2009.

Green Environment inc. (GEI). *Expanded Site Investigation, 1007 and 1011 Bransten Road, San Carlos, California.* July 31, 2009.

Green Environment inc. (GEI). *Expanded Site Investigation Report, 837 Industrial Road, San Carlos, California.* March 2, 2011.

Green Environment inc. (GEI). *Groundwater Monitoring Well Installation Work Plan, 837 Industrial Road, Tanklage Square, San Carlos, California.* November 29, 2011.
Purcell, Rhoades & Associates. *Soil Investigation, Intersection of Industrial Road and Bransten Road, San Carlos, California*. March 7, 1977.

Stantec. *Combined 2010 Annual Progress Report and Monitoring Report.* August 16, 2010.

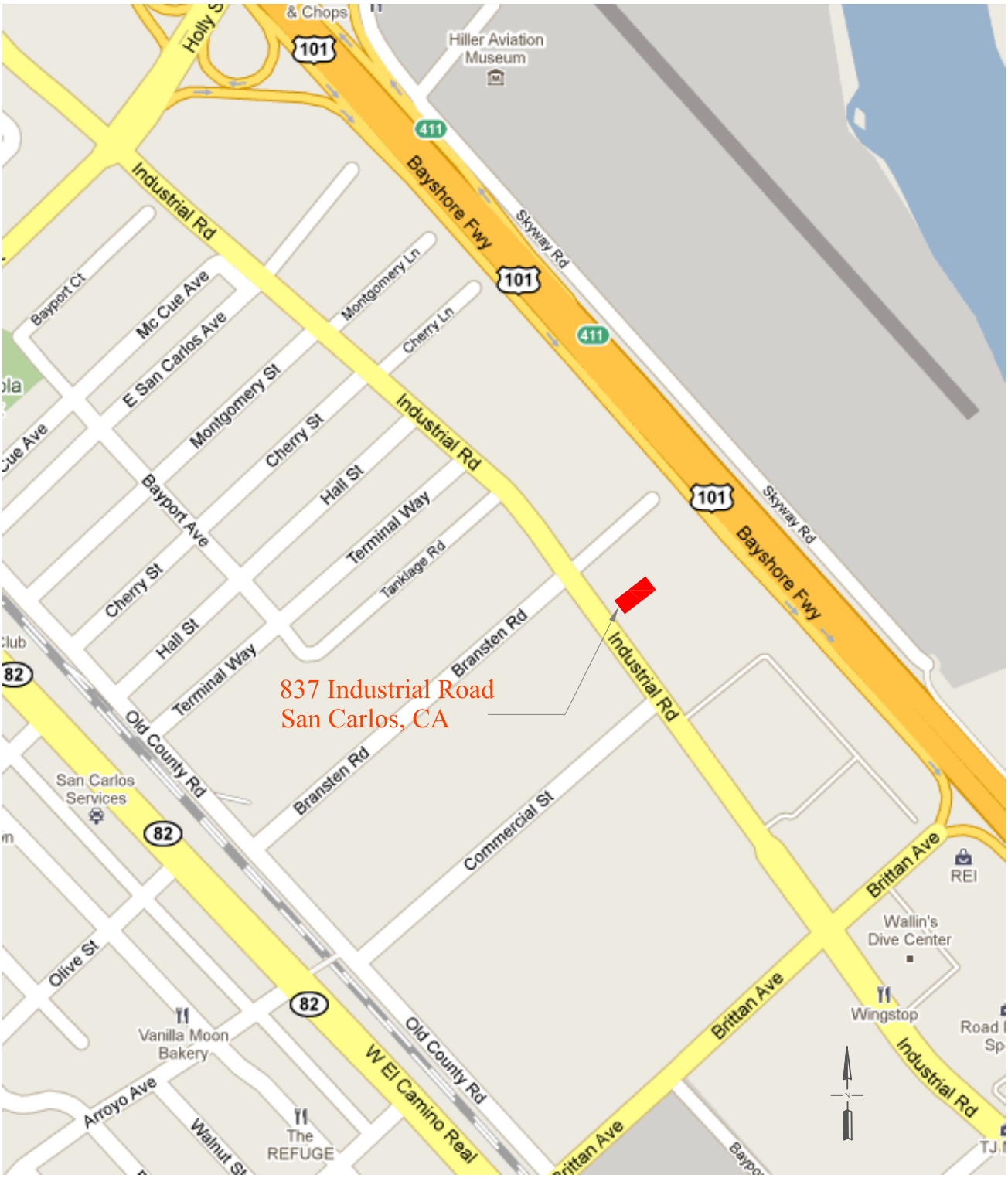
Watson Consulting/Georestoration Inc. *Semiannual Groundwater Monitoring Report Third and Fourth Quarter 2012 Sampling Events, G-C Lubricants, 977 Bransten Road, San Carlos, California CAD056670029*. March 6, 2013.

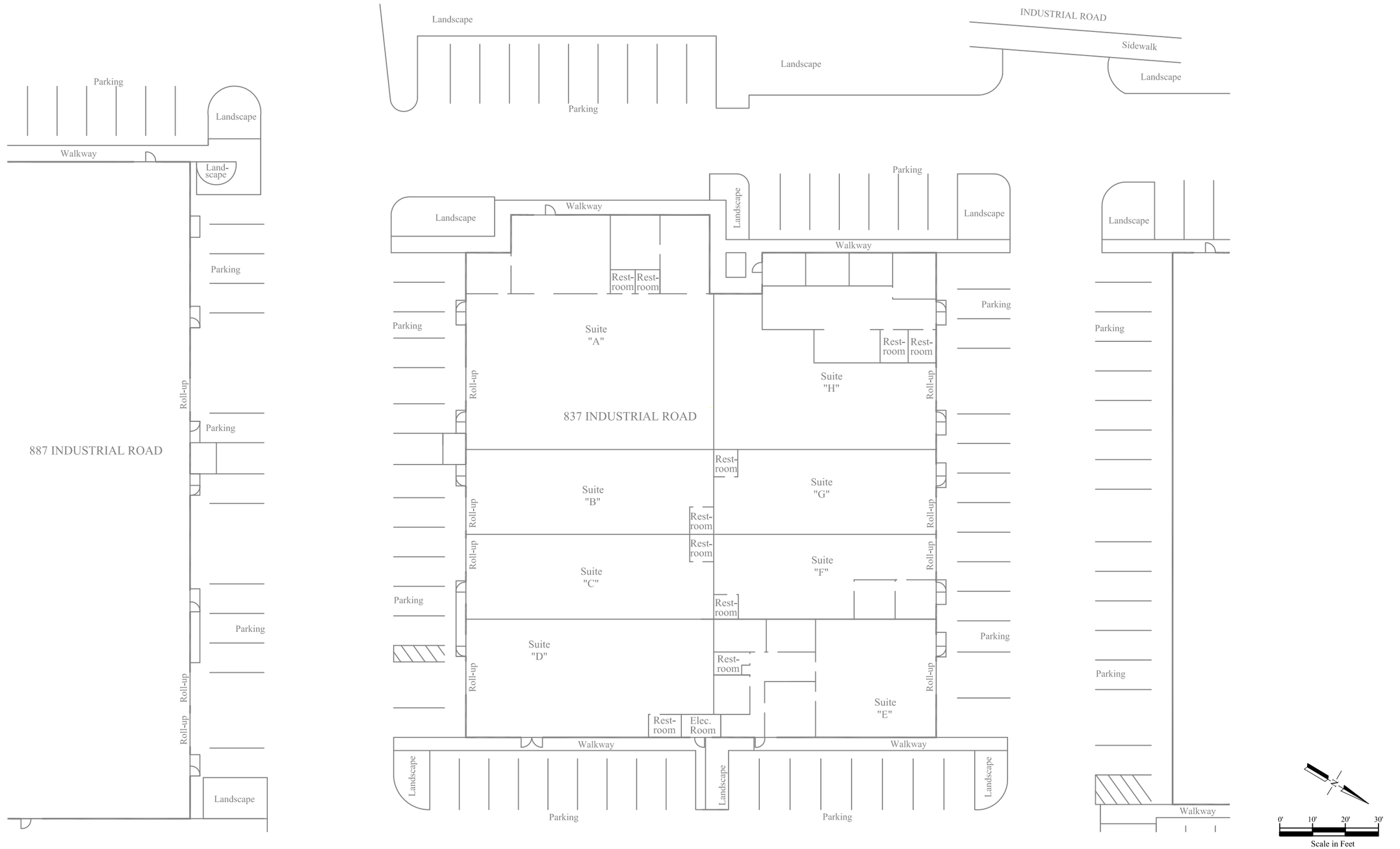
WSP Environment & Energy. *Soil and Groundwater Investigation Work Plan, Tanklage Construction Co., Inc., 837 Industrial Road, San Carlos, California Final*. May 21, 2010. Revised July 21, 2010.

FIGURES

Vicinity Map

Figure 1

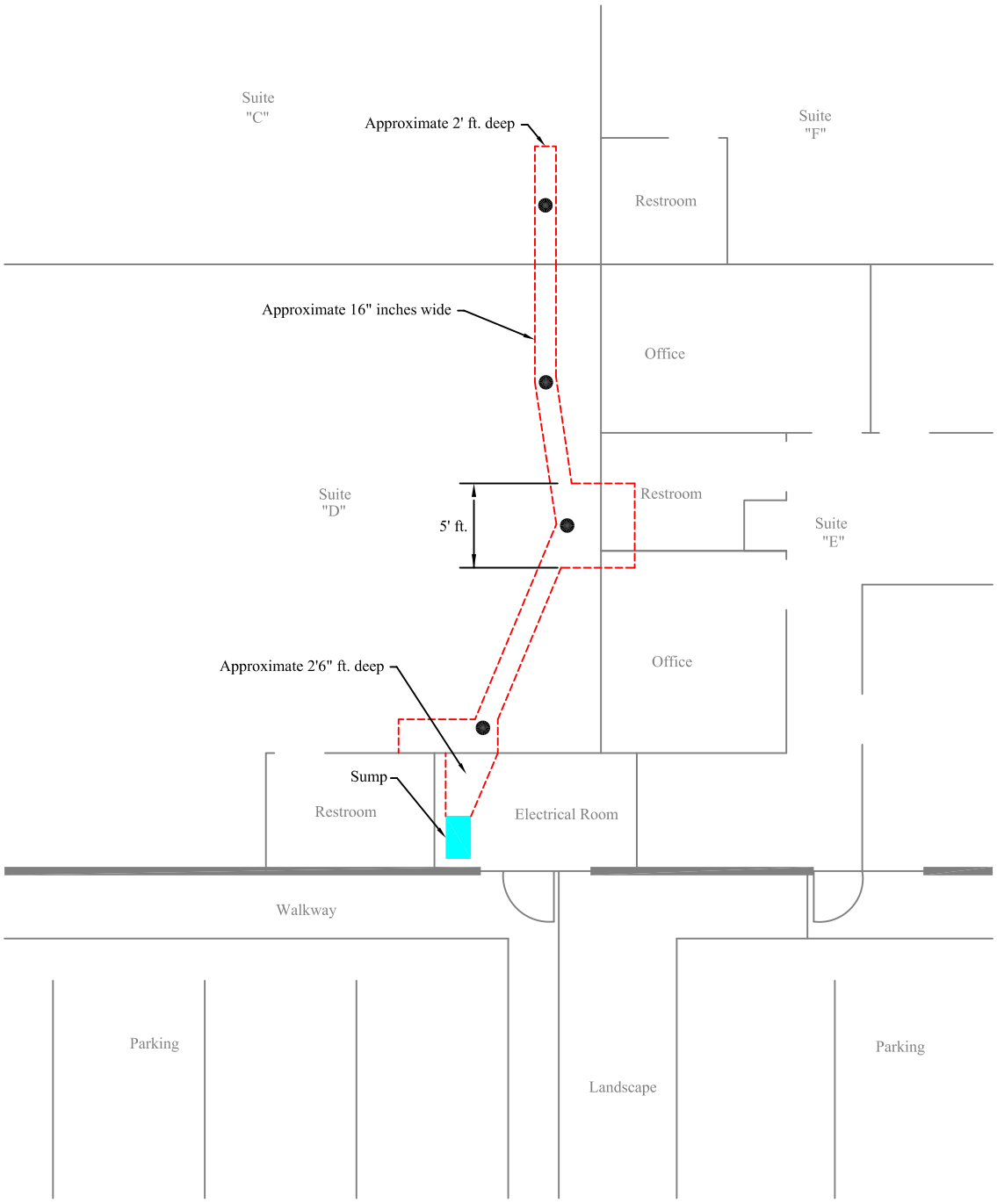


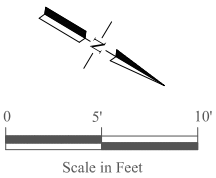


Legend:

GEI Green Environment inc
www.greenenvironment.com

Drawing Name:	SITE PLAN
Address:	837 Industrial Road San Carlos, California
Drawn by:	KA
Date:	09/13/2013
Scale:	1" = 30'-0"
Job #	B10655
Figure #	FIGURE 2





Note:

- Metal access plate to trench
- Concrete surface trench
- Concrete sump box

GEI Green Environment inc.
www.greenenvironment.com

Drawing Name: DIAGRAM OF TRENCH AND SUMP FOR TAR-LIKE SUBSTANCE COLLECTION	Drawn by: KA
	Date: 09/13/2013
	Scale: 1" = 10'
Address: 837 Industrial Road, San Carlos, California	Job # B10655
	Figure # FIGURE 3

Legend:

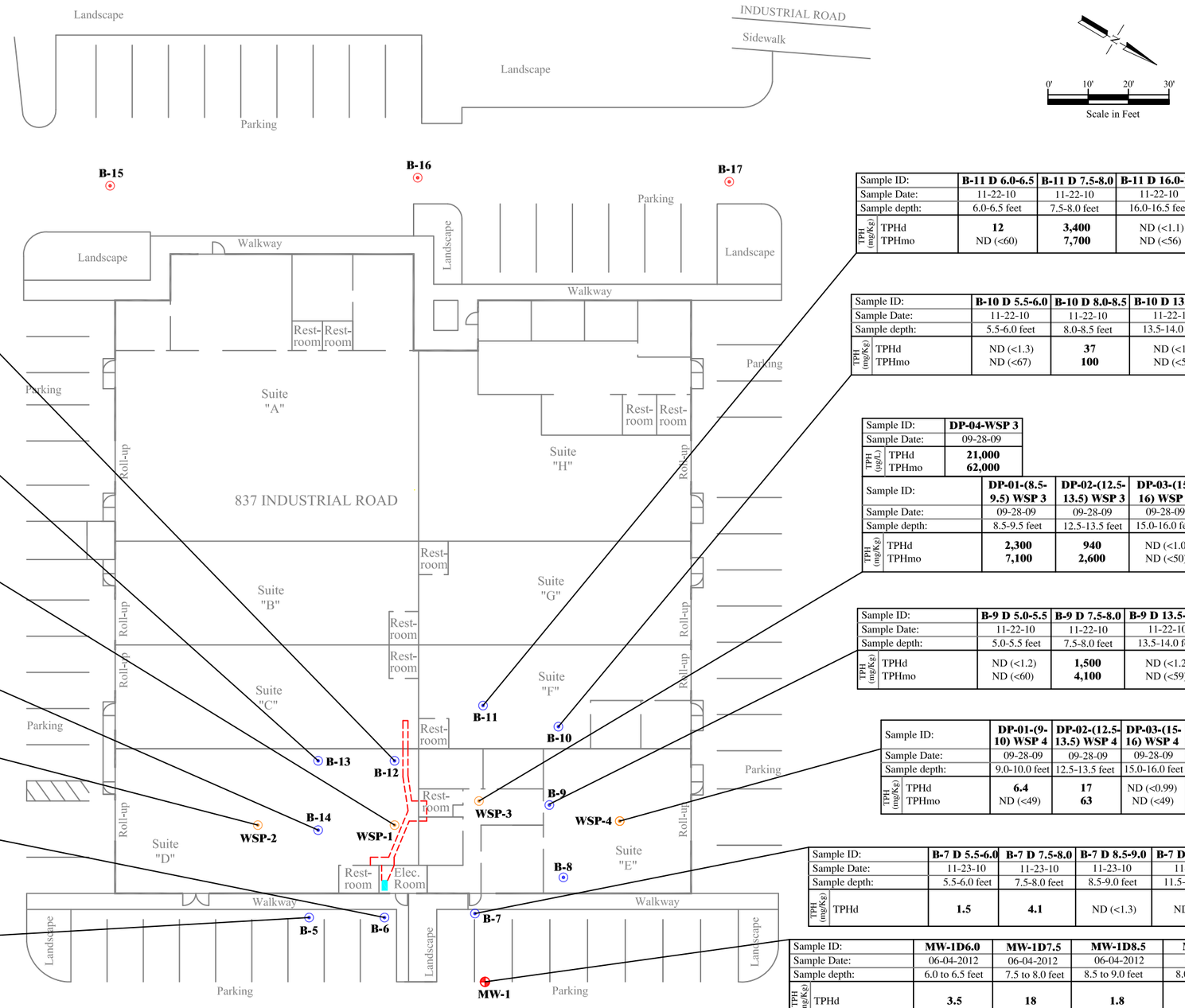
MW-1	Groundwater monitoring well (GEI, June 2012)
WSP-1	Soil boring (WSP, 09/28/09)
B-5	Soil boring (GEI, 11/22/10, 11/23/10)
B-15	Soil boring (GEI, 01/20/11)
CC-1	Exploratory concrete cores
	Concrete surface trench
	Concrete sump box

GEI Green Environment inc.
www.greenenvironment.com

Drawing Name: SITE PLAN WITH SAMPLE AND CORE LOCATIONS

Address: 837 Industrial Road
San Carlos, California

Drawn by:	KA
Date:	09/13/2013
Scale:	1" = 30'-0"
Job #	B10655
Figure #	FIGURE 4



Sample ID:	B-12 D 5.5-6.0	B-12 D 8.0-8.5	B-12 D 13.5-14.0
Sample Date:	11-23-10	11-23-10	11-23-10
Sample depth:	5.5-6.0 feet	8.0-8.5 feet	13.5-14.0 feet
TPH (mg/Kg) TPHd	ND (<1.1)	**1,500**	ND (<1.2)
TPH (mg/Kg) TPHmo	ND (<57)	**2,700**	ND (<60)

Sample ID:	B-13 D 5.5-6.0	B-13 D 8.0-8.5 B-3 D 8.0-8.5	B-13 D 13.5-14.0
Sample Date:	11-23-10	11-23-10	11-23-10
Sample depth:	5.5-6.0 feet	8.0-8.5 feet	13.5-14.0 feet
TPH (mg/Kg) TPHd	ND (1.1)	**74**	ND (<1.2)
TPH (mg/Kg) TPHmo	ND (<55)	**150**	ND (<59)

B-3 D 8.0-8.5 is a duplicate of B-13 D 8.0-8.5, highest concentrations are reported.

Sample ID:	DP-01(6.5-7.5)-WSP 1	DP-02(12.5-13.5)-WSP 1	DP-03(15-16)-WSP 1
Sample Date:	09-28-09	09-28-09	09-28-09
Sample depth:	6.5-7.5 feet	12.5-13.5 feet	15.0-16.0 feet
TPH (mg/Kg) TPHd	**54**	**4,800**	ND (<1.0)
TPH (mg/Kg) TPHmo	**150**	**11,000**	ND (<50)

Sample ID:	B-14 D 5.5-6.0 B-3 D 5.5-6.0	B-14 D 8.0-8.5	B-14 D 10-10.5 B-3 D 10.0-10.5	B-14 D 14.0-14.5
Sample Date:	11-23-10	11-23-10	11-23-10	11-23-10
Sample depth:	5.5-6.0 feet	8.0-8.5 feet	10.0-10.5 feet	14.0-14.5 feet
TPH (mg/Kg) TPHd	ND (<1.3)	**26**	**1.6**	ND (<1.2)
TPH (mg/Kg) TPHmo	ND (<64)	**68**	ND (<63)	ND (<58)

B-3 D 5.5-6.0 is a duplicate of B-14 D 5.5-6.0, highest concentrations are reported.
B-3 D 10.0-10.5 is a duplicate of B-13 D 8.0-8.5, highest concentrations are reported.

Sample ID:	DP-03-(12.5-13.5) WSP 2
Sample Date:	09-28-09
Sample depth:	12.5-13.5 feet
TPH (mg/Kg) TPHd	**110**
TPH (mg/Kg) TPHmo	**300**

Sample ID:	B-6 D 3.5-4.0	B-6 D 5.5-6.0	B-6 D 7.5-8.0	B-6 D 12.5-13.0
Sample Date:	11-23-10	11-23-10	11-23-10	11-23-10
Sample depth:	3.5-4.0 feet	5.5-6.0 feet	7.5-8.0 feet	12.5-13.0 feet
TPH (mg/Kg) TPHd	**2.3**	ND (<1.4)	**5,400**	ND (<1.2)
TPH (mg/Kg) TPHmo	ND (<64)	ND (<72)	**11,000**	ND (<58)

Sample ID:	B-5 D 5.5-6.0	B-5 D 7.5-8.0	B-5 D 16-16.5
Sample Date:	11-22-10	11-22-10	11-22-10
Sample depth:	5.5-6.0 feet	7.5-8.0 feet	16.0-16.5 feet
TPH (mg/Kg) TPHd	ND (<1.3)	**3,700**	ND (<1.2)
TPH (mg/Kg) TPHmo	ND (<67)	**11,000**	ND (<58)

Sample ID:	B-11 D 6.0-6.5	B-11 D 7.5-8.0	B-11 D 16.0-16.5
Sample Date:	11-22-10	11-22-10	11-22-10
Sample depth:	6.0-6.5 feet	7.5-8.0 feet	16.0-16.5 feet
TPH (mg/Kg) TPHd	**12**	**3,400**	ND (<1.1)
TPH (mg/Kg) TPHmo	ND (<60)	**7,700**	ND (<56)

Sample ID:	B-10 D 5.5-6.0	B-10 D 8.0-8.5	B-10 D 13.5-14.0
Sample Date:	11-22-10	11-22-10	11-22-10
Sample depth:	5.5-6.0 feet	8.0-8.5 feet	13.5-14.0 feet
TPH (mg/Kg) TPHd	ND (<1.3)	**37**	ND (<1.2)
TPH (mg/Kg) TPHmo	ND (<67)	**100**	ND (<58)

Sample ID:	DP-04-WSP 3
Sample Date:	09-28-09
TPH (µg/L) TPHd	**21,000**
TPH (µg/L) TPHmo	**62,000**

Sample ID:	DP-01-(8.5-9.5) WSP 3	DP-02-(12.5-13.5) WSP 3	DP-03-(15-16) WSP 3
Sample Date:	09-28-09	09-28-09	09-28-09
Sample depth:	8.5-9.5 feet	12.5-13.5 feet	15.0-16.0 feet
TPH (mg/Kg) TPHd	**2,300**	**940**	ND (<1.0)
TPH (mg/Kg) TPHmo	**7,100**	**2,600**	ND (<50)

Sample ID:	B-9 D 5.0-5.5	B-9 D 7.5-8.0	B-9 D 13.5-14.0
Sample Date:	11-22-10	11-22-10	11-22-10
Sample depth:	5.0-5.5 feet	7.5-8.0 feet	13.5-14.0 feet
TPH (mg/Kg) TPHd	ND (<1.2)	**1,500**	ND (<1.2)
TPH (mg/Kg) TPHmo	ND (<60)	**4,100**	ND (<59)

Sample ID:	DP-01-(9-10) WSP 4	DP-02-(12.5-13.5) WSP 4	DP-03-(15-16) WSP 4
Sample Date:	09-28-09	09-28-09	09-28-09
Sample depth:	9.0-10.0 feet	12.5-13.5 feet	15.0-16.0 feet
TPH (mg/Kg) TPHd	**6.4**	**17**	ND (<0.99)
TPH (mg/Kg) TPHmo	ND (<49)	**63**	ND (<49)

Sample ID:	B-7 D 5.5-6.0	B-7 D 7.5-8.0	B-7 D 8.5-9.0	B-7 D 11.5-12.0
Sample Date:	11-23-10	11-23-10	11-23-10	11-23-10
Sample depth:	5.5-6.0 feet	7.5-8.0 feet	8.5-9.0 feet	11.5-12.0 feet
TPH (mg/Kg) TPHd	**1.5**	**4.1**	ND (<1.3)	ND (<1.2)

Sample ID:	MW-1D6.0	MW-1D7.5	MW-1D8.5	MW-1D20
Sample Date:	06-04-2012	06-04-2012	06-04-2012	06-04-2012
Sample depth:	6.0 to 6.5 feet	7.5 to 8.0 feet	8.5 to 9.0 feet	8.0 to 8.5 feet
TPH (mg/Kg) TPHd	**3.5**	**18**	**1.8**	**5.5**

MW-1D20 is a duplicate of MW-1D7.5, highest concentrations are reported.

Legend:
- **MW-1** Groundwater monitoring well (GEI, June 2012)
- **WSP-1** Soil boring (WSP, 09/28/09)
- **B-5** Soil boring (GEI, 11/22/10, 11/23/10)
- **B-15** Soil boring (GEI, 01/20/11)
- Concrete surface trench
- Concrete sump box

ND (<2.0) Not detected at or above the laboratory reporting limit.
Only detected compounds shown on figure, highest concentrations are reported.

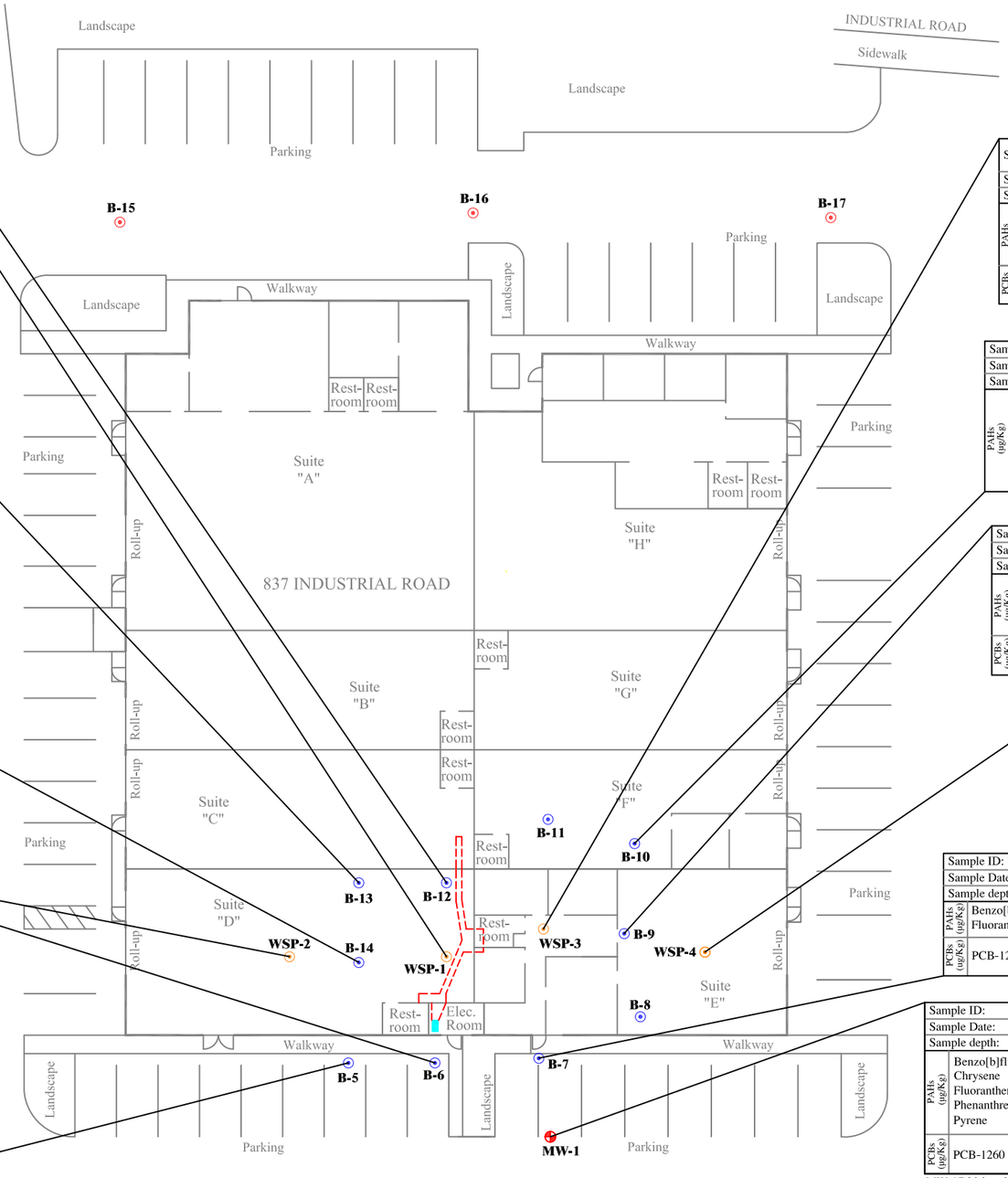
TPH Total extractable petroleum hydrocarbon
TPHd Diesel Range Organics
TPHmo Motor Oil Range Organics
(µg/L) Micrograms per liter
(mg/Kg) Milligrams per kilogram

GEI Green Environment inc
www.greenenvironment.com

Drawing Name: SOIL AND GROUNDWATER ANALYTICAL RESULTS: EXTRACTABLE PETROLEUM HYDROCARBONS

Address: 837 Industrial Road, San Carlos, California

Drawn by: KA
Date: 09/13/2013
Scale: 1" = 30'-0"
Job #: B10655
Figure #: FIGURE 5



0' 10' 20' 30'
Scale in Feet

Sample ID:		B-12 D 5.5-6.0	B-12 D 8.0-8.5	B-12 D 13.5-14.0
Sample Date:		11-23-10	11-23-10	11-23-10
Sample depth:		5.5-6.0 feet	8.0-8.5 feet	13.5-14.0 feet
PAHs (ug/Kg)	Phenanthrene	ND (<5.6)	**140**	ND (<5.9)
	Chrysene	ND (<5.6)	**220**	ND (<5.9)
	Fluoranthene	ND (<5.6)	**120**	ND (<5.9)

Sample ID:		DP-01(6.5-7.5)-WSP 1	DP-02(12.5-13.5)-WSP 1	DP-03(15-16)-WSP 1
Sample Date:		09-28-09	09-28-09	09-28-09
Sample depth:		6.5-7.5 feet	12.5-13.5 feet	15.0-16.0 feet
PAHs (ug/Kg)	Phenanthrene	ND (<50)	**1,200**	ND (<5.0)
	Chrysene	**88**	**1,200**	ND (<5.0)
	Benzo[b]fluoranthene	**52**	ND (<720)	ND (<5.0)
PCBs (ug/Kg)	PCB-1260	ND (<50)	**1,500**	ND (<49)

Sample ID:		B-13 D 5.5-6.0	B-13 D 8.0-8.5 B-3 D 8.0-8.5	B-13 D 13.5-14.0
Sample Date:		11-23-10	11-23-10	11-23-10
Sample depth:		5.5-6.0 feet	8.0-8.5 feet	13.5-14.0 feet
PCBs (ug/Kg)	PCB-1260	ND (<55)	**38,000**	ND (<60)

B-3 D 8.0-8.5 is a duplicate of B-13 D 8.0-8.5, highest concentrations are reported.

Sample ID:		B-14 D 5.5-6.0 B-3 D 5.5-6.0	B-14 D 8.0-8.5	B-14 D 10-10.5 B-3 D 10.0-10.5	B-14 D 14.0-14.5
Sample Date:		11-23-10	11-23-10	11-23-10	11-23-10
Sample depth:		5.5-6.0 feet	8.0-8.5 feet	10.0-10.5 feet	14.0-14.5 feet
PAHs (ug/Kg)	Acenaphthylene	ND (<6.4)	ND (<6.6)	**42**	ND (<5.8)
	Phenanthrene	ND (<6.4)	ND (<6.6)	**54**	ND (<5.8)
	Anthracene	ND (<6.4)	ND (<6.6)	**35**	ND (<5.8)
	Benzo[a]anthracene	ND (<6.4)	ND (<6.6)	**160**	ND (<5.8)
	Chrysene	ND (<6.4)	**12**	**160**	ND (<5.8)
	Benzo[a]pyrene	ND (<6.4)	**13**	**200**	ND (<5.8)
	Benzo[b]fluoranthene	ND (<6.4)	ND (<6.6)	**210**	ND (<5.8)
	Benzo[k]fluoranthene	ND (<6.4)	ND (<6.6)	**83**	ND (<5.8)
	Benzo[g,h,i]perylene	ND (<6.4)	ND (<6.6)	**76**	ND (<5.8)
	Indeno[1,2,3-cd]pyrene	ND (<6.4)	ND (<6.6)	**82**	ND (<5.8)
	Fluoranthene	ND (<6.4)	ND (<6.6)	**180**	ND (<5.8)
	Pyrene	ND (<6.4)	**10**	**180**	ND (<5.8)
	Dibenz(a,h)anthracene	ND (<6.4)	ND (<6.6)	**27**	ND (<5.8)
PCBs (ug/Kg)	PCB-1260	ND (<63)	**770**	ND (<63)	ND (<58)

B-3 D 5.5-6.0 is a duplicate of B-14 D 5.5-6.0, highest concentrations are reported.
B-3 D 10.0-10.5 is a duplicate of B-13 D 8.0-8.5, highest concentrations are reported.

Sample ID:		DP-03-(12.5-13.5) WSP 2
Sample Date:		09-28-09
Sample depth:		12.5-13.5 feet
PCBs (ug/Kg)	PCB-1260	**1,400**

Sample ID:		B-6 D 3.5-4.0	B-6 D 5.5-6.0	B-6 D 7.5-8.0	B-6 D 12.5-13.0
Sample Date:		11-23-10	11-23-10	11-23-10	11-23-10
Sample depth:		3.5-4.0 feet	5.5-6.0 feet	7.5-8.0 feet	12.5-13.0 feet
PAHs (ug/Kg)	Chrysene	ND (<6.4)	ND (<7.2)	**430**	ND (<5.7)
	Pyrene	ND (<6.4)	ND (<7.2)	**310**	ND (<5.7)
PCBs (ug/Kg)	PCB-1260	ND (<64)	ND (<73)	**6,700**	ND (<57)

Sample ID:		B-5 D 5.5-6.0	B-5 D 7.5-8.0	B-5 D 16-16.5
Sample Date:		11-22-10	11-22-10	11-22-10
Sample depth:		5.5-6.0 feet	7.5-8.0 feet	16.0-16.5 feet
PAHs (ug/Kg)	Chrysene	ND (<6.7)	**140**	ND (<5.8)
	Benzo[a]pyrene	ND (<6.7)	**61**	ND (<5.8)
	Fluoranthene	ND (<6.7)	**69**	ND (<5.8)
	Pyrene	ND (<6.7)	**160**	ND (<5.8)
PCBs (ug/Kg)	PCB-1260	ND (<67)	**44,000**	ND (<58)

Sample ID:		DP-01-(8.5-9.5) WSP 3	DP-02-(12.5-13.5) WSP 3	DP-03-(15-16) WSP 3
Sample Date:		09-28-09	09-28-09	09-28-09
Sample depth:		8.5-9.5 feet	12.5-13.5 feet	15.0-16.0 feet
PAHs (ug/Kg)	Phenanthrene	**2,300**	ND (<250)	ND (<5.0)
	Chrysene	**3,800**	ND (<250)	ND (<5.0)
	Benzo[b]fluoranthene	**1,900**	ND (<250)	ND (<5.0)
	Fluoranthene	**1,900**	ND (<250)	ND (<5.0)
PCBs (ug/Kg)	PCB-1260	**880**	**1,800**	ND (<50)

Sample ID:		B-10 D 5.5-6.0	B-10 D 8.0-8.5	B-10 D 13.5-14.0
Sample Date:		11-22-10	11-22-10	11-22-10
Sample depth:		5.5-6.0 feet	8.0-8.5 feet	13.5-14.0 feet
PAHs (ug/Kg)	Naphthalene	ND (<6.6)	**40**	ND (<5.8)
	Phenanthrene	ND (<6.6)	**18**	ND (<5.8)
	Chrysene	ND (<6.6)	**54**	ND (<5.8)
	Benzo[a]pyrene	ND (<6.6)	**35**	ND (<5.8)
	Benzo[b]fluoranthene	ND (<6.6)	**32**	ND (<5.8)
	Fluoranthene	ND (<6.6)	**20**	ND (<5.8)
	Pyrene	ND (<6.6)	**26**	ND (<5.8)

Sample ID:		B-9 D 5.0-5.5	B-9 D 7.5-8.0	B-9 D 13.5-14.0
Sample Date:		11-22-10	11-22-10	11-22-10
Sample depth:		5.0-5.5 feet	7.5-8.0 feet	13.5-14.0 feet
PAHs (ug/Kg)	Chrysene	ND (<6.0)	**180**	ND (<5.9)
	Benzo[a]pyrene	ND (<6.0)	**41**	ND (<5.9)
	Benzo[b]fluoranthene	ND (<6.0)	**63**	ND (<5.9)
	Pyrene	ND (<6.0)	**49**	ND (<5.9)
PCBs (ug/Kg)	PCB-1260	ND (<60)	**4,900**	ND (<59)

Sample ID:		DP-01-(9-10) WSP 4	DP-02-(12.5-13.5) WSP 4	DP-03-(15-16) WSP 4
Sample Date:		09-28-09	09-28-09	09-28-09
Sample depth:		9.0-10.0 feet	12.5-13.5 feet	15.0-16.0 feet
PCBs (ug/Kg)	PCB-1260	**79**	**160**	ND (<49)

Sample ID:		B-7 D 5.5-6.0	B-7 D 7.5-8.0	B-7 D 8.5-9.0	B-7 D 11.5-12.0
Sample Date:		11-23-10	11-23-10	11-23-10	11-23-10
Sample depth:		5.5-6.0 feet	7.5-8.0 feet	8.5-9.0 feet	11.5-12.0 feet
PAHs (ug/Kg)	Benzo[b]fluoranthene	**6.6**	ND (<7.9)	ND (<6.4)	ND (<5.8)
	Fluoranthene	**6.6**	ND (<7.9)	ND (<6.4)	ND (<5.8)
PCBs (ug/Kg)	PCB-1260	ND (<64)	**720**	ND (<64)	ND (<58)

Sample ID:		MW-1D6.0	MW-1D7.5	MW-1D8.5	MW-1D20
Sample Date:		06-04-2012	06-04-2012	06-04-2012	06-04-2012
Sample depth:		6.0 to 6.5 feet	7.5 to 8.0 feet	8.5 to 9.0 feet	8.0 to 8.5 feet
PAHs (ug/Kg)	Benzo[b]fluoranthene	ND (<6.4)	**12**	ND (<6.1)	ND (<6.5)
	Chrysene	ND (<6.4)	**9.3**	ND (<6.1)	ND (<6.5)
	Fluoranthene	ND (<6.4)	**16**	ND (<6.1)	ND (<6.5)
	Phenanthrene	ND (<6.4)	**9.9**	ND (<6.1)	ND (<6.5)
	Pyrene	ND (<6.4)	**14**	ND (<6.1)	ND (<6.5)
PCBs (ug/Kg)	PCB-1260	ND (<64)	**260**	ND (<61)	ND (<65)

MW-1D20 is a duplicate of MW-1D7.5, highest concentrations are reported.

Legend:
- **MW-1** Groundwater monitoring well (GEI, June 2012)
- **WSP-1** Soil boring (WSP, 09/28/09)
- **B-5** Soil boring (GEI, 11/22/10, 11/23/10)
- **B-15** Soil boring (GEI, 01/20/11)
- Concrete surface trench
- Concrete sump box

(µg/Kg) Micrograms per kilogram
PCBs Polychlorinated Biphenyls
PAHs Poly-aromatic Hydrocarbons

ND (<2.0) Not detected at or above the laboratory reporting limit.
Only detected compounds shown on figure, highest concentrations are reported.

GEI Green Environment inc
www.greenenvironment.com

Drawing Name: SOIL ANALYTICAL RESULTS: PAHs AND PCBs

Address: 837 Industrial Road
San Carlos, California

Drawn by:	KA
Date:	09/13/2013
Scale:	1" = 30'-0"
Job #	B10655
Figure #	FIGURE 6

Sample ID:	B-12
Sample Date:	11-23-10
PAHs (ug/L) Naphthalene	0.10

Sample ID:	DP-04-WSP 3
Sample Date:	09-28-09
PAHs (ug/L) Phenanthrene	0.18
Chrysene	0.30
Fluoranthene	0.14

Sample ID:	B-5
Sample Date:	11-22-10
PAHs (ug/L) Fluorene	0.19

Sample ID:	B-7	B-7 DUP (B-4)
Sample Date:	11-23-10	11-23-10
PAHs (ug/L) Fluorene	0.10	0.11

Legend:

- **MW-1** Groundwater monitoring well (GEI, June 2012)
- **WSP-1** Soil boring (WSP, 09/28/09)
- **B-5** Soil boring (GEI, 11/22/10, 11/23/10)
- **B-15** Soil boring (GEI, 01/20/11)
- Concrete surface trench
- Concrete sump box

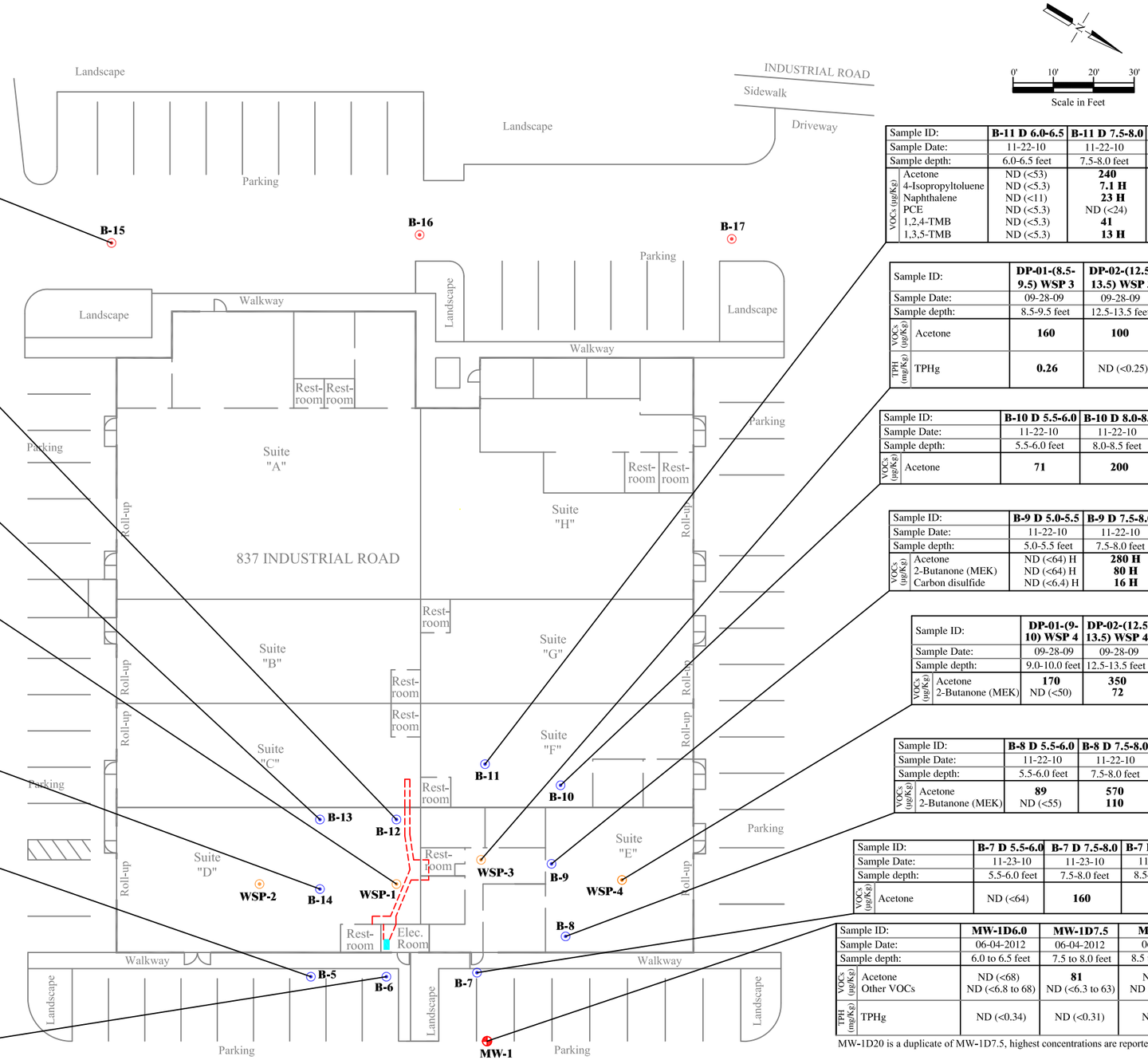
PCBs Polychlorinated Biphenyls
PAHs Poly-aromatic Hydrocarbons
(µg/L) Micrograms per liter
Only detected compounds shown on figure.
ND (<2.0) Not detected at or above the laboratory reporting limit.

GEI Green Environment inc.
www.greenenvironment.com

Drawing Name: GROUNDWATER ANALYTICAL RESULTS: PAHs AND PCBs

Address: 837 Industrial Road
San Carlos, California

Drawn by:	KA
Date:	09/13/2013
Scale:	1" = 30'-0"
Job #	B10655
Figure #	FIGURE 7



Sample ID:	B-15 D 5.5-6.0	B-15 D 8.0-8.5
Sample Date:	01-20-11	01-20-11
Sample depth:	5.5-6.0 feet	8.0-8.5 feet
VOCs (µg/Kg) Acetone	**300 H**	ND (<47) H
2-Butanone (MEK)	**65 H**	ND (<47) H
cis-1,2-Dichloroethene	ND (<6.0) H	**63 H**
PCE	ND (<6.0) H	**68 H**
TCE	ND (<6.0) H	**220 H**
Vinyl chloride	ND (<6.0) H	**110 H**

Sample ID:	B-12 D 5.5-6.0	B-12 D 8.0-8.5	B-12 D 13.5-14.0
Sample Date:	11-23-10	11-23-10	11-23-10
Sample depth:	5.5-6.0 feet	8.0-8.5 feet	13.5-14.0 feet
VOCs (µg/Kg) Acetone	ND (<49)	**420**	ND (<56)
2-Butanone (MEK)	ND (<49)	**100**	ND (<56)
PCE	ND (<4.9)	ND (<7.7)	**4.9**

Sample ID:	B-13 D 5.5-6.0	B-13 D 8.0-8.5 B-3 D 8.0-8.5	B-13 D 13.5-14.0
Sample Date:	11-23-10	11-23-10	11-23-10
Sample depth:	5.5-6.0 feet	8.0-8.5 feet	13.5-14.0 feet
VOCs (µg/Kg) Acetone	ND (<55)	**240**	ND (<56)
PCE	ND (<5.5)	ND (<18)	**22 H**

B-3 D 8.0-8.5 is a duplicate of B-13 D 8.0-8.5, highest concentrations are reported.

Sample ID:	DP-01(6.5-7.5)-WSP 1	DP-02(12.5-13.5)-WSP 1	DP-03(15-16)-WSP 1
Sample Date:	09-28-09	09-28-09	09-28-09
Sample depth:	6.5-7.5 feet	12.5-13.5 feet	15.0-16.0 feet
VOCs (µg/Kg) Acetone	**51**	**180**	ND (<50)
4-Isopropyltoluene	ND (<5.1)	**5.8**	ND (<5.0)
Naphthalene	ND (<10)	**33**	ND (<9.9)
Toluene	ND (<5.1)	**9.3**	ND (<5.0)
1,2,4-TMB	ND (<5.1)	**31**	ND (<5.0)
1,3,5-TMB	ND (<5.1)	**13**	ND (<5.0)
Xylenes, Total	ND (<10)	**24**	ND (<9.9)
TPH (mg/Kg) TPHg	ND (<0.25)	**0.44**	ND (<0.25)

Sample ID:	B-14 D 5.5-6.0 B-3 D 5.5-6.0	B-14 D 8.0-8.5	B-14 D 10-10.5 B-3 D 10.0-10.5	B-14 D 14.0-14.5
Sample Date:	11-23-10	11-23-10	11-23-10	11-23-10
Sample depth:	5.5-6.0 feet	8.0-8.5 feet	10.0-10.5 feet	14.0-14.5 feet
VOCs (µg/Kg) Acetone	ND (<62)	**240**	**70**	ND (<55)
PCE	ND (<6.2)	ND (<10)	ND (<6.9) H	**16 H**
Xylenes, Total	ND (<12)	**14**	ND (<14) H	ND (<11)

B-3 D 5.5-6.0 is a duplicate of B-14 D 5.5-6.0, highest concentrations are reported.
B-3 D 10.0-10.5 is a duplicate of B-13 D 8.0-8.5, highest concentrations are reported.

Sample ID:	B-5 D 5.5-6.0	B-5 D 7.5-8.0	B-5 D 16-16.5
Sample Date:	11-22-10	11-22-10	11-22-10
Sample depth:	5.5-6.0 feet	7.5-8.0 feet	16.0-16.5 feet
VOCs (µg/Kg) Acetone	ND (<61)	**600**	ND (<58)
2-Butanone (MEK)	ND (<61)	**170**	ND (<58)
Carbon disulfide	ND (<6.1)	**9.4**	ND (<5.8)
Toluene	ND (<6.1)	**11**	ND (<5.8)
TCE	ND (<6.1)	ND (<7.2)	**9.4**
CFC-113	ND (<6.1)	ND (<7.2)	**5.2**
1,2,4-TMB	ND (<6.1)	**9.9**	ND (<5.8)

Sample ID:	B-6 D 3.5-4.0	B-6 D 5.5-6.0	B-6 D 7.5-8.0	B-6 D 12.5-13.0
Sample Date:	11-23-10	11-23-10	11-23-10	11-23-10
Sample depth:	3.5-4.0 feet	5.5-6.0 feet	7.5-8.0 feet	12.5-13.0 feet
VOCs (µg/Kg) Acetone	ND (<55)	ND (<72)	**380**	ND (<43)
Toluene	ND (<5.5)	ND (<7.2)	**13**	ND (<4.3)

Sample ID:	B-11 D 6.0-6.5	B-11 D 7.5-8.0	B-11 D 16.0-16.5
Sample Date:	11-22-10	11-22-10	11-22-10
Sample depth:	6.0-6.5 feet	7.5-8.0 feet	16.0-16.5 feet
VOCs (µg/Kg) Acetone	ND (<53)	**240**	ND (<54)
4-Isopropyltoluene	ND (<5.3)	**7.1 H**	ND (<5.4)
Naphthalene	ND (<11)	**23 H**	ND (<11)
PCE	ND (<5.3)	ND (<24)	**5.0 H**
1,2,4-TMB	ND (<5.3)	**41**	ND (<5.4)
1,3,5-TMB	ND (<5.3)	**13 H**	ND (<5.4)

Sample ID:	DP-01-(8.5-9.5) WSP 3	DP-02-(12.5-13.5) WSP 3	DP-03-(15-16) WSP 3
Sample Date:	09-28-09	09-28-09	09-28-09
Sample depth:	8.5-9.5 feet	12.5-13.5 feet	15.0-16.0 feet
VOCs (µg/Kg) Acetone	**160**	**100**	ND (<50)
TPH (mg/Kg) TPHg	**0.26**	ND (<0.25)	ND (<0.25)

Sample ID:	B-10 D 5.5-6.0	B-10 D 8.0-8.5	B-10 D 13.5-14.0
Sample Date:	11-22-10	11-22-10	11-22-10
Sample depth:	5.5-6.0 feet	8.0-8.5 feet	13.5-14.0 feet
VOCs (µg/Kg) Acetone	**71**	**200**	ND (<55)

Sample ID:	B-9 D 5.0-5.5	B-9 D 7.5-8.0	B-9 D 13.5-14.0
Sample Date:	11-22-10	11-22-10	11-22-10
Sample depth:	5.0-5.5 feet	7.5-8.0 feet	13.5-14.0 feet
VOCs (µg/Kg) Acetone	ND (<64) H	**280 H**	ND (<55)
2-Butanone (MEK)	ND (<64) H	**80 H**	ND (<55)
Carbon disulfide	ND (<6.4) H	**16 H**	ND (<5.5)

Sample ID:	DP-01-(9-10) WSP 4	DP-02-(12.5-13.5) WSP 4	DP-03-(15-16) WSP 4
Sample Date:	09-28-09	09-28-09	09-28-09
Sample depth:	9.0-10.0 feet	12.5-13.5 feet	15.0-16.0 feet
VOCs (µg/Kg) Acetone	**170**	**350**	ND (<50)
2-Butanone (MEK)	ND (<50)	**72**	ND (<50)

Sample ID:	B-8 D 5.5-6.0	B-8 D 7.5-8.0	B-8 D 13.5-14.0
Sample Date:	11-22-10	11-22-10	11-22-10
Sample depth:	5.5-6.0 feet	7.5-8.0 feet	13.5-14.0 feet
VOCs (µg/Kg) Acetone	**89**	**570**	ND (<56)
2-Butanone (MEK)	ND (<55)	**110**	ND (<56)

Sample ID:	B-7 D 5.5-6.0	B-7 D 7.5-8.0	B-7 D 8.5-9.0	B-7 D 11.5-12.0
Sample Date:	11-23-10	11-23-10	11-23-10	11-23-10
Sample depth:	5.5-6.0 feet	7.5-8.0 feet	8.5-9.0 feet	11.5-12.0 feet
VOCs (µg/Kg) Acetone	ND (<64)	**160**	**77**	ND (<57)

Sample ID:	MW-1D6.0	MW-1D7.5	MW-1D8.5	MW-1D20
Sample Date:	06-04-2012	06-04-2012	06-04-2012	06-04-2012
Sample depth:	6.0 to 6.5 feet	7.5 to 8.0 feet	8.5 to 9.0 feet	8.0 to 8.5 feet
VOCs (µg/Kg) Acetone	ND (<68)	**81**	ND (<45)	**140**
Other VOCs	ND (<6.8 to 68)	ND (<6.3 to 63)	ND (<4.5 to 45)	ND (<7.4 to 74)
HFI (mg/Kg) TPHg	ND (<0.34)	ND (<0.31)	ND (<0.23)	ND (<0.37)

MW-1D20 is a duplicate of MW-1D7.5, highest concentrations are reported.

Legend:

- **MW-1** Groundwater monitoring well (GEI, June 2012)
- **WSP-1** Soil boring (WSP, 09/28/09)
- **B-5** Soil boring (GEI, 11/22/10, 11/23/10)
- **B-15** Soil boring (GEI, 01/20/11)
- Concrete surface trench
- Concrete sump box

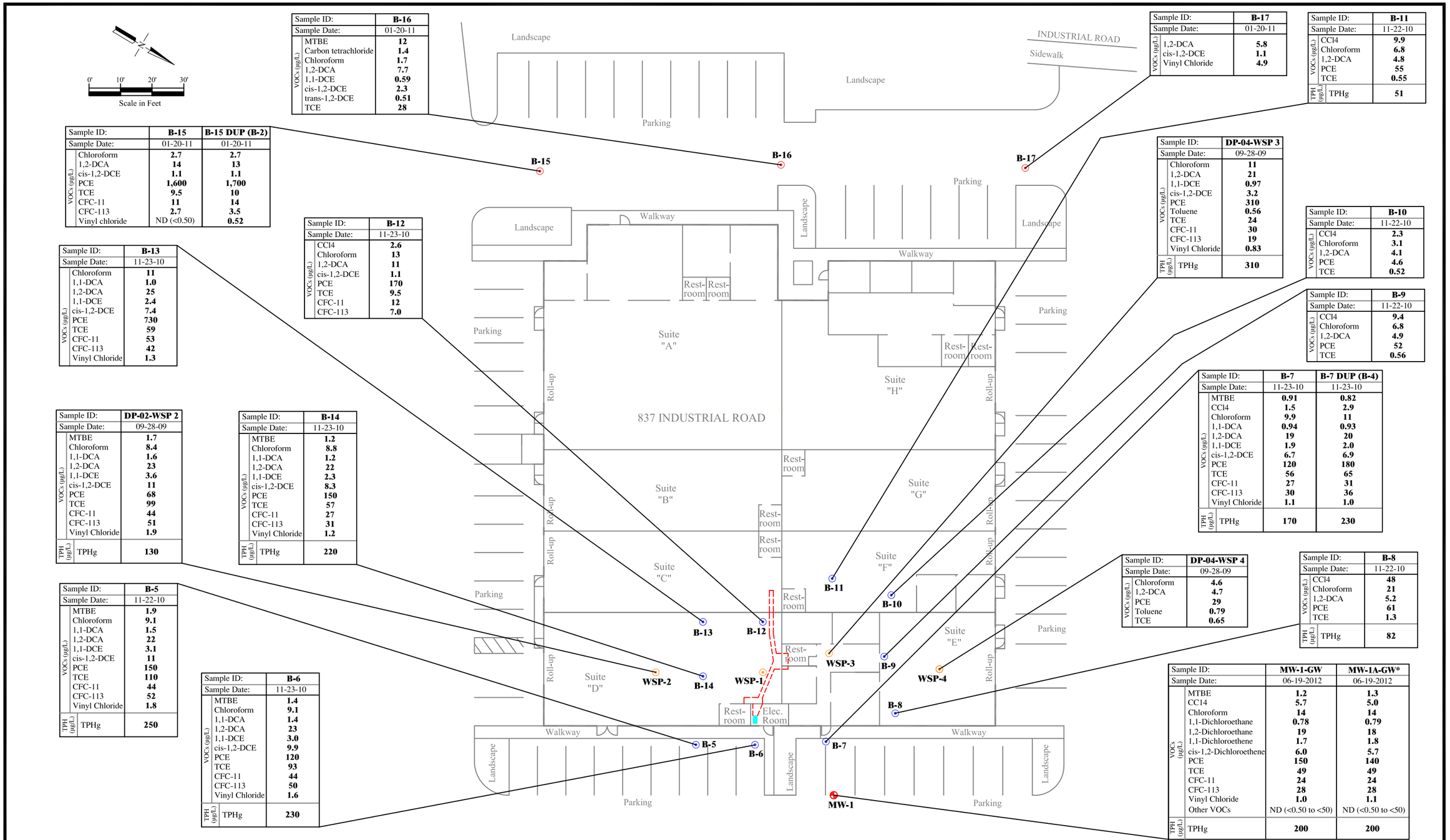
TPH Total petroleum hydrocarbon
TPHg Gasoline Range Organics
(mg/Kg) Milligrams per kilogram
(µg/Kg) Micrograms per kilogram
VOCs Volatile Organic Compounds
PCE Tetrachloroethene
TCE Trichloroethene
1,2,4-TMB 1,2,4-Trimethylbenzene
1,3,5-TMB 1,3,5-Trimethylbenzene
CFC-113 1,1,2-Trichloro-1,2,2-trifluoroethane
ND (<2.0) Not detected at or above the laboratory reporting limit
H Sample was prepped or analyzed beyond the specified holding time.
Only detected compounds shown on figure, highest concentrations are reported.

GEI Green Environment inc.
www.greenenvironment.com

Drawing Name: SOIL ANALYTICAL RESULTS: VOCs

Address: 837 Industrial Road
San Carlos, California

Drawn by:	KA
Date:	09/13/2013
Scale:	1" = 30'-0"
Job #	B10655
Figure #	FIGURE 8



Sample ID:	B-16
Sample Date:	01-20-11
VOCs (µg/L) MTBE	12
Carbon tetrachloride	1.4
Chloroform	1.7
1,2-DCA	7.7
1,1-DCE	0.59
cis-1,2-DCE	2.3
trans-1,2-DCE	0.51
TCE	28

Sample ID:	B-17
Sample Date:	01-20-11
VOCs (µg/L) 1,2-DCA	5.8
cis-1,2-DCE	1.1
Vinyl Chloride	4.9

Sample ID:	B-11
Sample Date:	11-22-10
VOCs (µg/L) CCl4	9.9
Chloroform	6.8
1,2-DCA	4.8
PCE	55
TCE	0.55
TPH (µg/L) TPHg	51

Sample ID:	B-15	B-15 DUP (B-2)
Sample Date:	01-20-11	01-20-11
VOCs (µg/L) Chloroform	2.7	2.7
1,2-DCA	14	13
cis-1,2-DCE	1.1	1.1
PCE	1,600	1,700
TCE	9.5	10
CFC-11	11	14
CFC-113	2.7	3.5
Vinyl chloride	ND (<0.50)	0.52

Sample ID:	DP-04-WSP 3
Sample Date:	09-28-09
VOCs (µg/L) Chloroform	11
1,2-DCA	21
1,1-DCE	0.97
cis-1,2-DCE	3.2
PCE	310
Toluene	0.56
TCE	24
CFC-11	30
CFC-113	19
Vinyl Chloride	0.83
TPH (µg/L) TPHg	310

Sample ID:	B-12
Sample Date:	11-23-10
VOCs (µg/L) CCl4	2.6
Chloroform	13
1,2-DCA	11
cis-1,2-DCE	1.1
PCE	170
TCE	9.5
CFC-11	12
CFC-113	7.0

Sample ID:	B-10
Sample Date:	11-22-10
VOCs (µg/L) CCl4	2.3
Chloroform	3.1
1,2-DCA	4.1
PCE	4.6
TCE	0.52

Sample ID:	B-13
Sample Date:	11-23-10
VOCs (µg/L) Chloroform	11
1,1-DCA	1.0
1,2-DCA	25
1,1-DCE	2.4
cis-1,2-DCE	7.4
PCE	730
TCE	59
CFC-11	53
CFC-113	42
Vinyl Chloride	1.3

Sample ID:	B-9
Sample Date:	11-22-10
VOCs (µg/L) CCl4	9.4
Chloroform	6.8
1,2-DCA	4.9
PCE	52
TCE	0.56

Sample ID:	B-7	B-7 DUP (B-4)
Sample Date:	11-23-10	11-23-10
VOCs (µg/L) MTBE	0.91	0.82
CCl4	1.5	2.9
Chloroform	9.9	11
1,1-DCA	0.94	0.93
1,2-DCA	19	20
1,1-DCE	1.9	2.0
cis-1,2-DCE	6.7	6.9
PCE	120	180
TCE	56	65
CFC-11	27	31
CFC-113	30	36
Vinyl Chloride	1.1	1.0
TPH (µg/L) TPHg	170	230

Sample ID:	DP-02-WSP 2
Sample Date:	09-28-09
VOCs (µg/L) MTBE	1.7
Chloroform	8.4
1,1-DCA	1.6
1,2-DCA	23
1,1-DCE	3.6
cis-1,2-DCE	11
PCE	68
TCE	99
CFC-11	44
CFC-113	51
Vinyl Chloride	1.9
TPH (µg/L) TPHg	130

Sample ID:	B-14
Sample Date:	11-23-10
VOCs (µg/L) MTBE	1.2
Chloroform	8.8
1,1-DCA	1.2
1,2-DCA	22
1,1-DCE	2.3
cis-1,2-DCE	8.3
PCE	150
TCE	57
CFC-11	27
CFC-113	31
Vinyl Chloride	1.2
TPH (µg/L) TPHg	220

Sample ID:	DP-04-WSP 4
Sample Date:	09-28-09
VOCs (µg/L) Chloroform	4.6
1,2-DCA	4.7
PCE	29
Toluene	0.79
TCE	0.65

Sample ID:	B-8
Sample Date:	11-22-10
VOCs (µg/L) CCl4	48
Chloroform	21
1,2-DCA	5.2
PCE	61
TCE	1.3
TPH (µg/L) TPHg	82

Sample ID:	B-5
Sample Date:	11-22-10
VOCs (µg/L) MTBE	1.9
Chloroform	9.1
1,1-DCA	1.5
1,2-DCA	22
1,1-DCE	3.1
cis-1,2-DCE	11
PCE	150
TCE	110
CFC-11	44
CFC-113	52
Vinyl Chloride	1.8
TPH (µg/L) TPHg	250

Sample ID:	B-6
Sample Date:	11-23-10
VOCs (µg/L) MTBE	1.4
Chloroform	9.1
1,1-DCA	1.4
1,2-DCA	23
1,1-DCE	3.0
cis-1,2-DCE	9.9
PCE	120
TCE	93
CFC-11	44
CFC-113	50
Vinyl Chloride	1.6
TPH (µg/L) TPHg	230

Sample ID:	MW-1-GW	MW-1A-GW*
Sample Date:	06-19-2012	06-19-2012
VOCs (µg/L) MTBE	1.2	1.3
CC14	5.7	5.0
Chloroform	14	14
1,1-Dichloroethane	0.78	0.79
1,2-Dichloroethane	19	18
1,1-Dichloroethene	1.7	1.8
cis-1,2-Dichloroethene	6.0	5.7
PCE	150	140
TCE	49	49
CFC-11	24	24
CFC-113	28	28
Vinyl Chloride	1.0	1.1
Other VOCs	ND (<0.50 to <50)	ND (<0.50 to <50)
TPH (µg/L) TPHg	200	200

Legend:

- **MW-1** Groundwater monitoring well (GEI, June 2012)
- **WSP-1** Soil boring (WSP, 09/28/09)
- **B-5** Soil boring (GEI, 11/22/10, 11/23/10)
- **B-15** Soil boring (GEI, 01/20/11)
- Concrete surface trench
- Concrete sump box

ND (<2.0) Not detected at or above the laboratory reporting limit.
* Duplicate water sample from MW-1
Only detected compounds shown on figure.

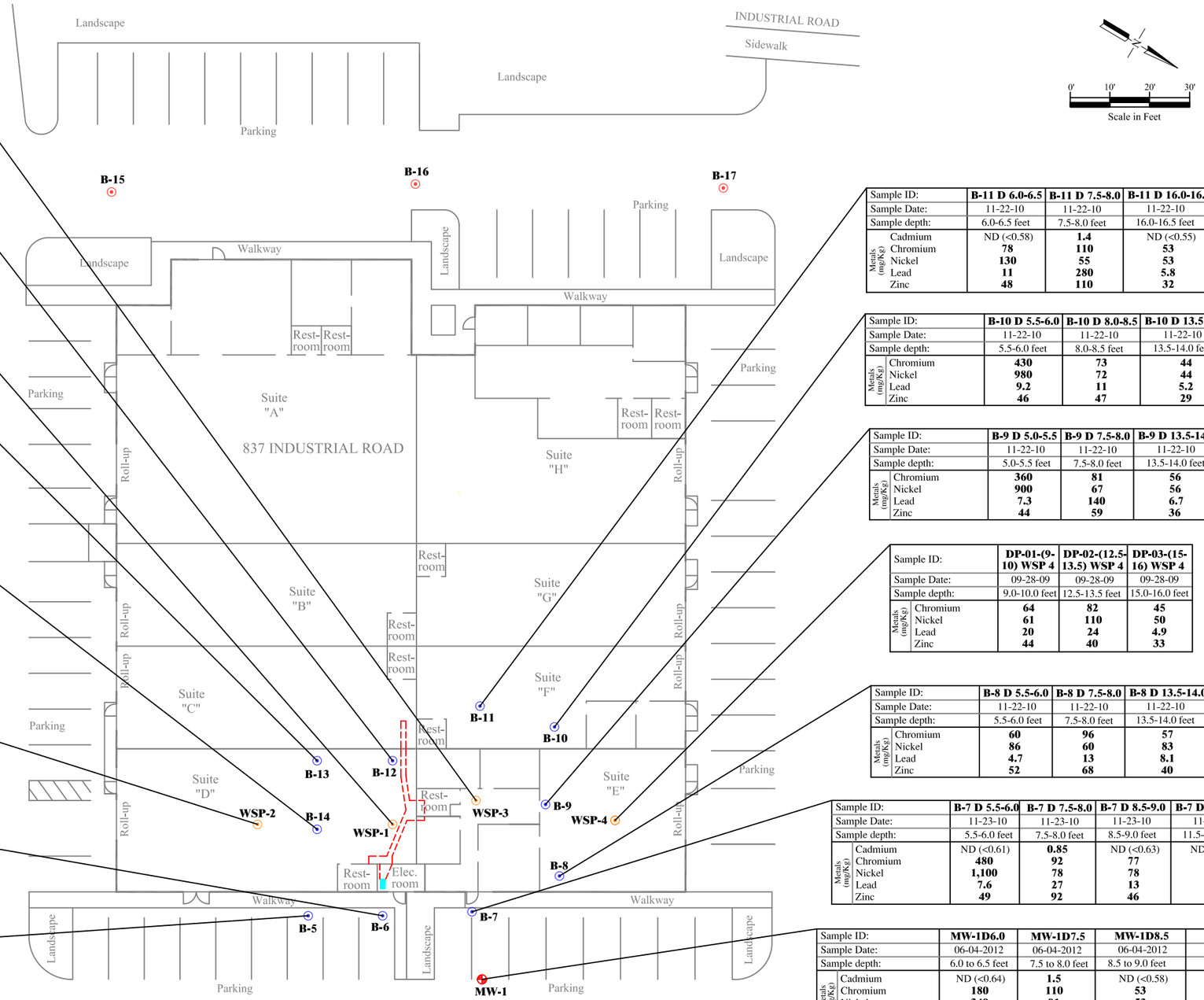
VOCs	Volatile Organic Compounds	MTBE	Methyl tert-butyl ether
TPH	Total petroleum hydrocarbon	CCl4	Carbon tetrachloride
TPHg	Gasoline Range Organics	cis-1,2-DCE	cis-1,2-Dichloroethene
PCE	Tetrachloroethene	1,1-DCE	1,1-Dichloroethene
TCE	Trichloroethene	1,1-DCA	1,1-Dichloroethane
CFC-11	Trichlorofluoromethane	1,2-DCA	1,2-Dichloroethane
CFC-113	1,1,2-Trichloro-1,2,2-trifluoroethane	(µg/L)	Micrograms per liter

GEI Green Environment inc
www.greenenvironment.com

Drawing Name: GROUNDWATER ANALYTICAL RESULTS: VOCs

Address: 837 Industrial Road
San Carlos, California

Drawn by:	KA
Date:	09/13/2013
Scale:	1" = 30'-0"
Job #	B10655
Figure #	FIGURE 9



Sample ID:		DP-01-(8.5-9.5) WSP 3	DP-02-(12.5-13.5) WSP 3	DP-03-(15-16) WSP 3
Sample Date:		09-28-09	09-28-09	09-28-09
Sample depth:		8.5-9.5 feet	12.5-13.5 feet	15.0-16.0 feet
Metals (mg/Kg)	Chromium	**43**	**35**	**37**
	Nickel	**65**	**46**	**42**
	Lead	**54**	**54**	**4.0**
	Zinc	**32**	**26**	**28**

Sample ID:		B-12 D 5.5-6.0	B-12 D 8.0-8.5	B-12 D 13.5-14.0
Sample Date:		11-23-10	11-23-10	11-23-10
Sample depth:		5.5-6.0 feet	8.0-8.5 feet	13.5-14.0 feet
Metals (mg/Kg)	Chromium	**240**	**87**	**49**
	Nickel	**770**	**84**	**60**
	Lead	**9.5**	**110**	**5.8**
	Zinc	**40**	**80**	**35**

Sample ID:		DP-01(6.5-7.5)-WSP 1	DP-02(12.5-13.5)-WSP 1	DP-03(15-16)-WSP 1
Sample Date:		09-28-09	09-28-09	09-28-09
Sample depth:		6.5-7.5 feet	12.5-13.5 feet	15.0-16.0 feet
Metals (mg/Kg)	Cadmium	ND (<0.32)	**0.98**	ND (<0.32)
	Chromium	**170**	**36**	**41**
	Nickel	**470**	**34**	**44**
	Lead	**8.4**	**870**	**4.4**
	Zinc	**38**	**57**	**30**

Sample ID:		B-13 D 5.5-6.0	B-13 D 8.0-8.5 B-3 D 8.0-8.5	B-13 D 13.5-14.0
Sample Date:		11-23-10	11-23-10	11-23-10
Sample depth:		5.5-6.0 feet	8.0-8.5 feet	13.5-14.0 feet
Metals (mg/Kg)	Cadmium	ND (<0.53)	**0.80**	ND (<0.57)
	Chromium	**320**	**61**	**43**
	Nickel	**1,100**	**50**	**50**
	Lead	**6.1**	**24**	**6.7**
	Zinc	**33**	**54**	**35**

B-3 D 8.0-8.5 is a duplicate of B-13 D 8.0-8.5, highest concentrations are reported.

Sample ID:		B-14 D 5.5-6.0 B-3 D 5.5-6.0	B-14 D 8.0-8.5	B-14 D 10-10.5 B-3 D 10.0-10.5	B-14 D 14.0-14.5
Sample Date:		11-23-10	11-23-10	11-23-10	11-23-10
Sample depth:		5.5-6.0 feet	8.0-8.5 feet	10.0-10.5 feet	14.0-14.5 feet
Metals (mg/Kg)	Cadmium	ND (<0.65)	**0.63**	ND (<0.60)	ND (<0.59)
	Chromium	**460**	**66**	**47**	**39**
	Nickel	**1,400**	**65**	**50**	**50**
	Lead	**8.4**	**330**	**8.2**	**5.6**
	Zinc	**49**	**88**	**31**	**31**

B-3 D 5.5-6.0 is a duplicate of B-14 D 5.5-6.0, highest concentrations are reported.
B-3 D 10.0-10.5 is a duplicate of B-13 D 8.0-8.5, highest concentrations are reported.

Sample ID:		DP-03-(12.5-13.5) WSP 2
Sample Date:		09-28-09
Sample depth:		12.5-13.5 feet
Metals (mg/Kg)	Chromium	**86**
	Nickel	**150**
	Lead	**110**
	Zinc	**57**

Sample ID:		B-6 D 3.5-4.0	B-6 D 5.5-6.0	B-6 D 7.5-8.0	B-6 D 12.5-13.0
Sample Date:		11-23-10	11-23-10	11-23-10	11-23-10
Sample depth:		3.5-4.0 feet	5.5-6.0 feet	7.5-8.0 feet	12.5-13.0 feet
Metals (mg/Kg)	Chromium	**120**	**800**	**83**	**44**
	Nickel	**180**	**2,200**	**120**	**51**
	Lead	**16**	**6.8**	**180**	**5.5**
	Zinc	**52**	**53**	**54**	**32**

Sample ID:		B-5 D 5.5-6.0	B-5 D 7.5-8.0	B-5 D 16-16.5
Sample Date:		11-22-10	11-22-10	11-22-10
Sample depth:		5.5-6.0 feet	7.5-8.0 feet	16.0-16.5 feet
Metals (mg/Kg)	Chromium	**760**	**270**	**66**
	Nickel	**1,700**	**740**	**91**
	Lead	**6.9**	**26**	**8.0**
	Zinc	**46**	**49**	**47**

Sample ID:		B-11 D 6.0-6.5	B-11 D 7.5-8.0	B-11 D 16.0-16.5
Sample Date:		11-22-10	11-22-10	11-22-10
Sample depth:		6.0-6.5 feet	7.5-8.0 feet	16.0-16.5 feet
Metals (mg/Kg)	Cadmium	ND (<0.58)	**1.4**	ND (<0.55)
	Chromium	**78**	**110**	**53**
	Nickel	**130**	**55**	**53**
	Lead	**11**	**280**	**5.8**
	Zinc	**48**	**110**	**32**

Sample ID:		B-10 D 5.5-6.0	B-10 D 8.0-8.5	B-10 D 13.5-14.0
Sample Date:		11-22-10	11-22-10	11-22-10
Sample depth:		5.5-6.0 feet	8.0-8.5 feet	13.5-14.0 feet
Metals (mg/Kg)	Chromium	**430**	**73**	**44**
	Nickel	**980**	**72**	**44**
	Lead	**9.2**	**11**	**5.2**
	Zinc	**46**	**47**	**29**

Sample ID:		B-9 D 5.0-5.5	B-9 D 7.5-8.0	B-9 D 13.5-14.0
Sample Date:		11-22-10	11-22-10	11-22-10
Sample depth:		5.0-5.5 feet	7.5-8.0 feet	13.5-14.0 feet
Metals (mg/Kg)	Chromium	**360**	**81**	**56**
	Nickel	**900**	**67**	**56**
	Lead	**7.3**	**140**	**6.7**
	Zinc	**44**	**59**	**36**

Sample ID:		DP-01-(9-10) WSP 4	DP-02-(12.5-13.5) WSP 4	DP-03-(15-16) WSP 4
Sample Date:		09-28-09	09-28-09	09-28-09
Sample depth:		9.0-10.0 feet	12.5-13.5 feet	15.0-16.0 feet
Metals (mg/Kg)	Chromium	**64**	**82**	**45**
	Nickel	**61**	**110**	**50**
	Lead	**20**	**24**	**4.9**
	Zinc	**44**	**40**	**33**

Sample ID:		B-8 D 5.5-6.0	B-8 D 7.5-8.0	B-8 D 13.5-14.0
Sample Date:		11-22-10	11-22-10	11-22-10
Sample depth:		5.5-6.0 feet	7.5-8.0 feet	13.5-14.0 feet
Metals (mg/Kg)	Chromium	**60**	**96**	**57**
	Nickel	**86**	**60**	**83**
	Lead	**4.7**	**13**	**8.1**
	Zinc	**52**	**68**	**40**

Sample ID:		B-7 D 5.5-6.0	B-7 D 7.5-8.0	B-7 D 8.5-9.0	B-7 D 11.5-12.0
Sample Date:		11-23-10	11-23-10	11-23-10	11-23-10
Sample depth:		5.5-6.0 feet	7.5-8.0 feet	8.5-9.0 feet	11.5-12.0 feet
Metals (mg/Kg)	Cadmium	ND (<0.61)	**0.85**	ND (<0.63)	ND (<0.57)
	Chromium	**480**	**92**	**77**	**71**
	Nickel	**1,100**	**78**	**78**	**65**
	Lead	**7.6**	**27**	**13**	**7.4**
	Zinc	**49**	**92**	**46**	**39**

Sample ID:		MW-1D6.0	MW-1D7.5	MW-1D8.5	MW-1D20
Sample Date:		06-04-2012	06-04-2012	06-04-2012	06-04-2012
Sample depth:		6.0 to 6.5 feet	7.5 to 8.0 feet	8.5 to 9.0 feet	8.0 to 8.5 feet
Metals (mg/Kg)	Cadmium	ND (<0.64)	**1.5**	ND (<0.58)	ND (<0.63)
	Chromium	**180**	**110**	**53**	**95**
	Nickel	**340**	**91**	**53**	**150**
	Zinc	**57**	**85**	**30**	**60**

MW-1D20 is a duplicate of MW-1D7.5, highest concentrations are reported.

Legend:

- **MW-1** Groundwater monitoring well (GEI, June 2012)
- **WSP-1** Soil boring (WSP, 09/28/09)
- **B-5** Soil boring (GEI, 11/22/10, 11/23/10)
- **B-15** Soil boring (GEI, 01/20/11)
- Concrete surface trench
- Concrete sump box

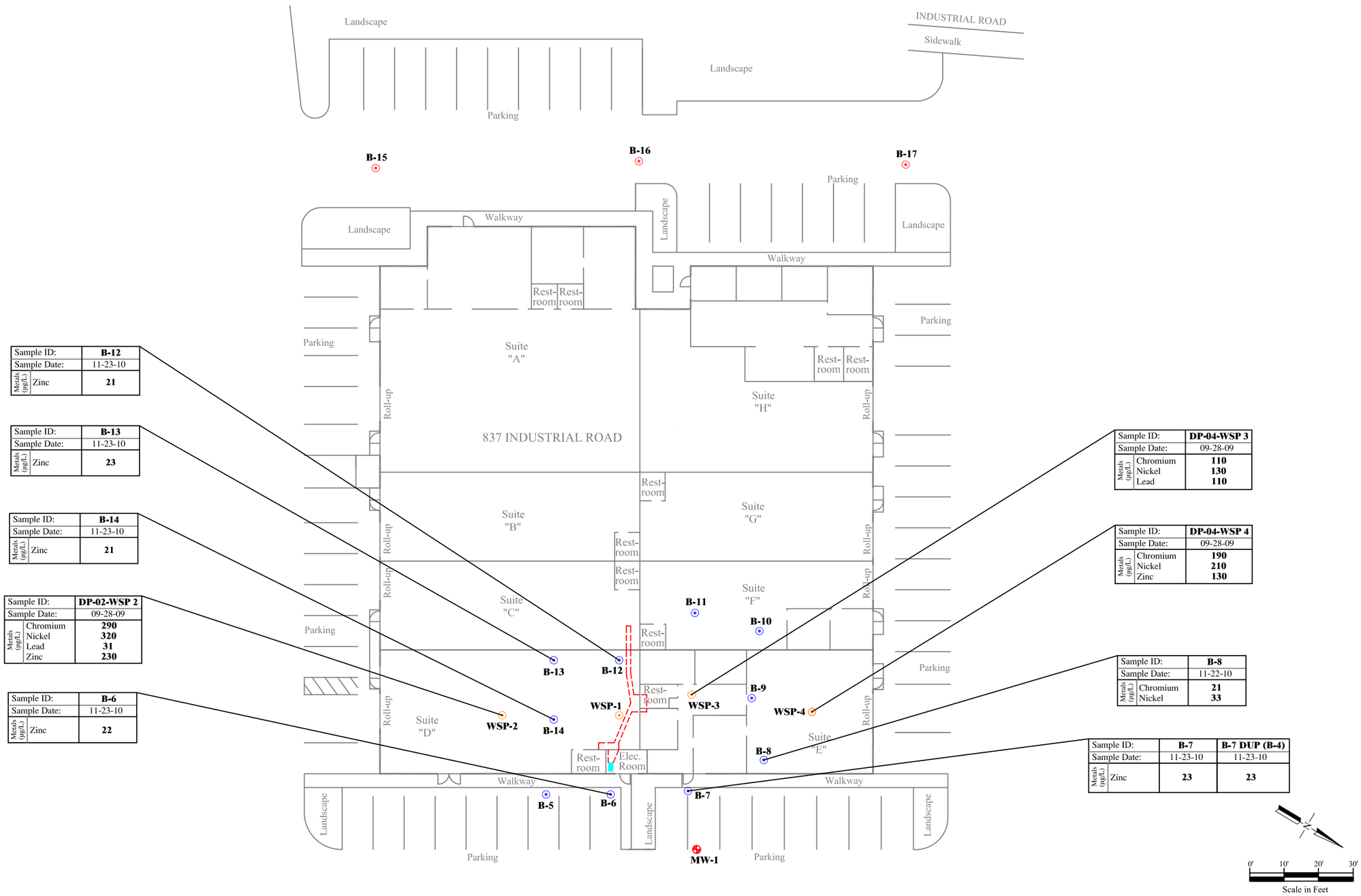
(mg/Kg) Milligrams per kilogram
ND (<2.0) Not detected at or above the laboratory reporting limit.
Only detected compounds shown on figure, highest concentrations are reported.

GEI Green Environment inc.
www.greenenvironment.com

Drawing Name: SOIL ANALYTICAL RESULTS: METALS

Address: 837 Industrial Road
San Carlos, California

Drawn by:	KA
Date:	09/13/2013
Scale:	1" = 30'-0"
Job #	B10655
Figure #	FIGURE 10



Sample ID:	B-12
Sample Date:	11-23-10
Metals (µg/L) Zinc	21

Sample ID:	B-13
Sample Date:	11-23-10
Metals (µg/L) Zinc	23

Sample ID:	B-14
Sample Date:	11-23-10
Metals (µg/L) Zinc	21

Sample ID:	DP-02-WSP 2
Sample Date:	09-28-09
Metals (µg/L) Chromium	290
Nickel	320
Lead	31
Zinc	230

Sample ID:	B-6
Sample Date:	11-23-10
Metals (µg/L) Zinc	22

Sample ID:	DP-04-WSP 3
Sample Date:	09-28-09
Metals (µg/L) Chromium	110
Nickel	130
Lead	110

Sample ID:	DP-04-WSP 4
Sample Date:	09-28-09
Metals (µg/L) Chromium	190
Nickel	210
Zinc	130

Sample ID:	B-8
Sample Date:	11-22-10
Metals (µg/L) Chromium	21
Nickel	33

Sample ID:	B-7	B-7 DUP (B-4)
Sample Date:	11-23-10	11-23-10
Metals (µg/L) Zinc	23	23

Legend:

- **MW-1** Groundwater monitoring well (GEI, June 2012)
- **WSP-1** Soil boring (WSP, 09/28/09)
- **B-5** Soil boring (GEI, 11/22/10, 11/23/10)
- **B-15** Soil boring (GEI, 01/20/11)
- Concrete surface trench
- Concrete sump box

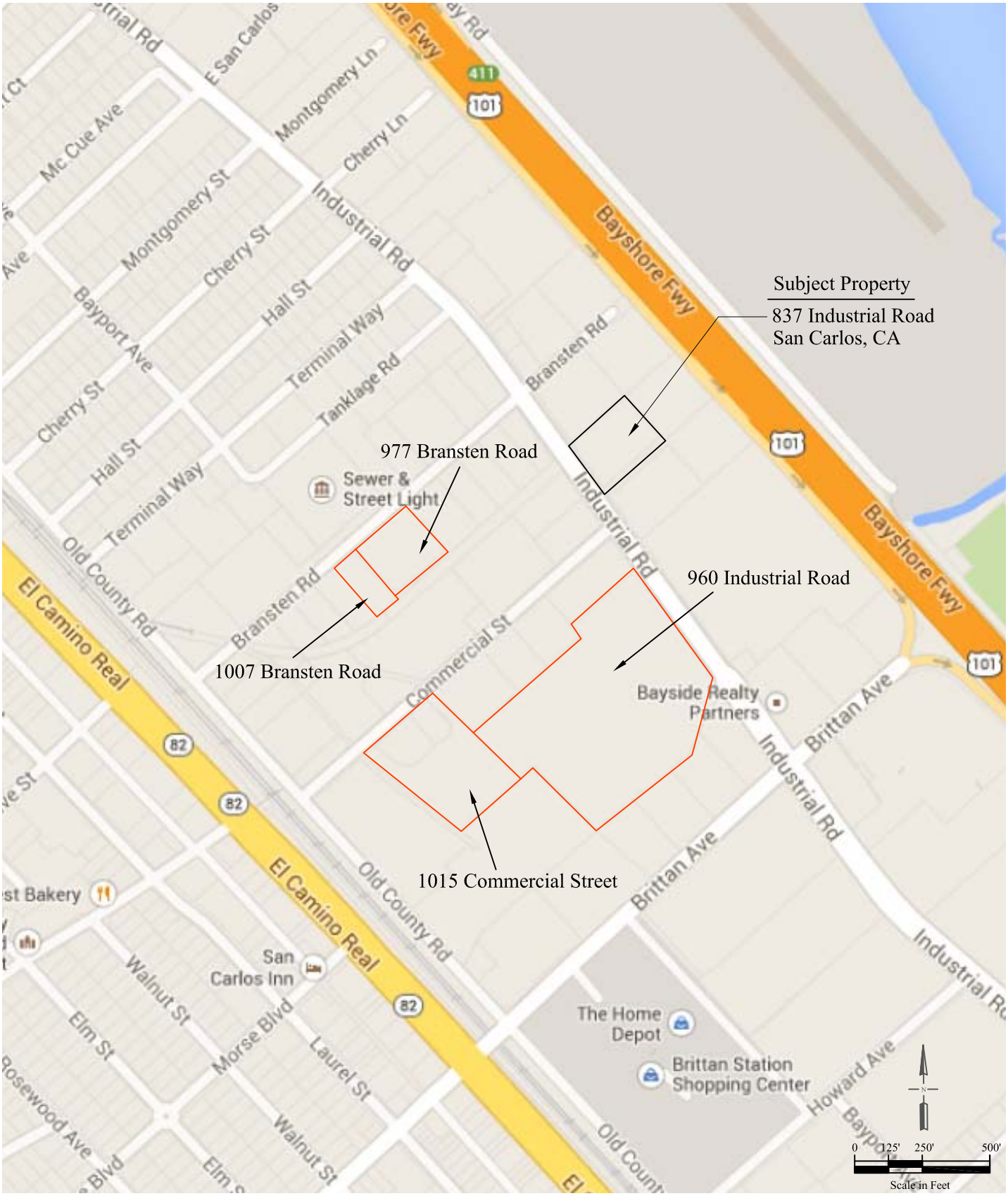
(µg/L) Micrograms per liter
ND (<2.0) Not detected at or above the laboratory reporting limit.
Only detected compounds shown on figure.

GEI Green Environment inc.
www.greenenvironment.com

Drawing Name: GROUNDWATER ANALYTICAL RESULTS: METALS

Address: 837 Industrial Road
San Carlos, California

Drawn by:	KA
Date:	09/13/2013
Scale:	1" = 30'-0"
Job #	B10655
Figure #	FIGURE 11



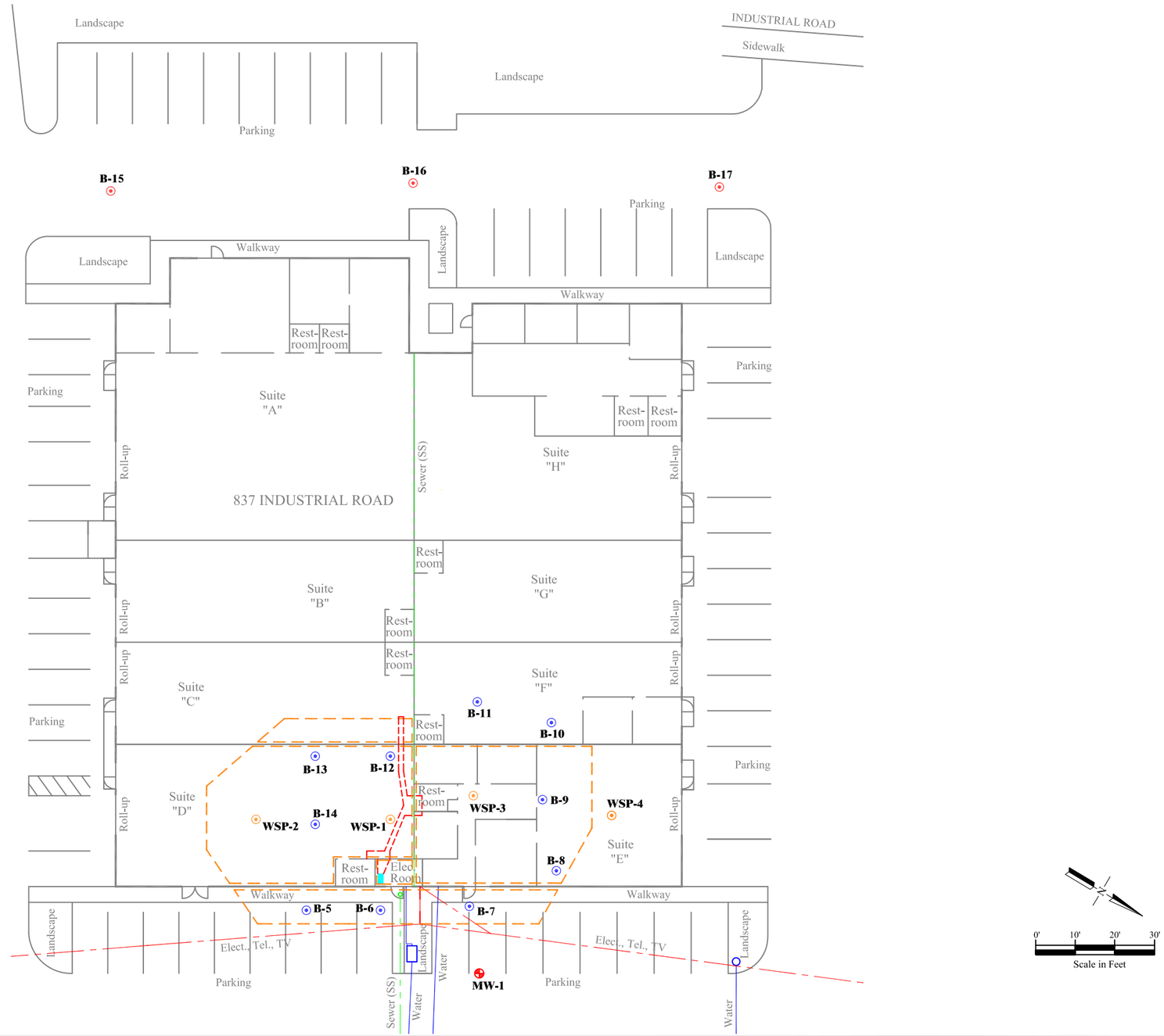
Note:
Reference: Google Maps, 2013

GEI Green Environment inc.
www.greenenvironment.com

Drawing Name:
POTENTIAL OFF-SITE SOURCES OF VOC'S IN GROUNDWATER

Address:
837 Industrial Road
San Carlos, California

Drawn by:	KA
Date:	09/13/2013
Scale:	1" = 500' (Approximate)
Job #	B10655
Figure #	FIGURE 12



Legend:

- **MW-1** Groundwater monitoring well (GEI, June 2012)
- **WSP-1** Soil boring (WSP, 09/28/09)
- **B-5** Soil boring (GEI, 11/22/10, 11/23/10)
- **B-15** Soil boring (GEI, 01/20/11)
- Concrete surface trench
- Concrete sump box
- Proposed excavation areas

Underground utilities approximate locations:

- Water
- Elect., Tel., Cable TV
- Sewer (SS)

GEI Green Environment inc.
www.greenenvironment.com

Drawing Name: EXCAVATION AREA FOR ALTERNATIVE 2

Address: 837 Industrial Road
San Carlos, California

Drawn by:	KA
Date:	09/13/2013
Scale:	1" = 30'-0"
Job #	B10655
Figure #	FIGURE 13

TABLES

Table 1:
Soil Organic Analytical Results

Sample ID	Sample Date	Field Point	Sample Depth (ft bfs)	pH (SU)	TPHg (mg/Kg)	TPHd (mg/Kg)	TPHmo (mg/Kg)	PCBs: PCB-1260 (µg/Kg)	PCBs: Other PCBs (µg/Kg)
DP-01 (6.5-7.5)-WSP 1	09/28/09	WSP-1	6.5 to 7.5	7.48	ND (<0.25)	**54**	**150**	ND (<50)	ND (<50)
DP-02 (12.5-13.5)-WSP 1[1]	09/28/09	WSP-1	12.5 to 13.5	3.90	**0.44**	**4,800**	**11,000**	**1,500**	ND (<300)
DP-03 (15-16)-WSP 1	09/28/09	WSP-1	15.0 to 16.0	8.30	ND (<0.25)	ND (<1.0)	ND (<50)	ND (<49)	ND (<49)
DP-03-(12.5-13.5) WSP 2	09/28/09	WSP-2	12.5 to 13.5	8.30	ND (<0.25)	**110**	**300**	**1,400**	ND (<500)
DP-01-(8.5-9.5) WSP 3 [2]	09/28/09	WSP-3	8.5 to 9.5	6.93	**0.26**	**2,300**	**7,100**	**880**	ND (<290)
DP-02-(12.5-13.5) WSP 3	09/28/09	WSP-3	12.5 to 13.5	7.54	ND (<0.25)	**940**	**2,600**	**1,800**	ND (<490)
DP-03-(15-16) WSP 3	09/28/09	WSP-3	15.0 to 16.0	8.64	ND (<0.25)	ND (<1.0)	ND (<50)	ND (<50)	ND (<50)
DP-01-(9-10) WSP 4	09/28/09	WSP-4	9.0 to 10.0	8.04	ND (<0.25)	**6.4**	ND (<49)	**79**	ND (<50)
DP-02-(12.5-13.5) WSP 4	09/28/09	WSP-4	12.5 to 13.5	8.10	ND (<0.22)	**17**	**63**	**160**	ND (<50)
DP-03-(15-16) WSP 4	09/28/09	WSP-4	15.0 to 16.0	8.64	ND (<0.25)	ND (<0.99)	ND (<49)	ND (<49)	ND (<49)
B-5 D 5.5-6.0	11/22/10	B-5	5.5 to 6.0	8.06	ND (<0.31)	ND (<1.3)	ND (<67)	ND (<67)	ND (<67)
B-5 D 7.5-8.0	11/22/10	B-5	7.5 to 8.0	7.52	ND (<0.36)	**3,700**	**11,000**	**44,000**	ND (<33,000)
B-5 D 16-16.5	11/22/10	B-5	16.0 to 16.5	8.92	ND (<0.29) [ND (<0.22)]	ND (<1.2)	ND (<58)	ND (<58)	ND (<58)
B-6 D 3.5-4.0	11/23/10	B-6	3.5 to 4.0	7.85	ND (<0.27)	**2.3**	ND (<64)	ND (<64)	ND (<64)
B-6 D 5.5-6.0	11/23/10	B-6	5.5 to 6.0	8.04	ND (<0.36) [ND (<0.30)]	ND (<1.4)	ND (<72)	ND (<73)	ND (<73)
B-6 D 7.5-8.0	11/23/10	B-6	7.5 to 8.0	7.77	ND (<0.46)	**5,400**	**11,000**	**6,700**	ND (<1,400)
B-6 D 12.5-13.0	11/23/10	B-6	12.5 to 13.0	8.79	ND (<0.22)	ND (<1.2)	ND (<58)	ND (<57)	ND (<57)
B-7 D 5.5-6.0	11/23/10	B-7	5.5 to 6.0	8.30	ND (<0.32) [ND (<0.28)]	**1.5**	ND (<64)	ND (<64)	ND (<64)
B-7 D 7.5-8.0	11/23/10	B-7	7.5 to 8.0	7.87	ND (<0.44)	**4.1**	ND (<79)	**720**	ND (<390)
B-7 D 8.5-9.0	11/23/10	B-7	8.5 to 9.0	8.08	ND (<0.32) [ND (<0.25)]	ND (<1.3)	ND (<65)	ND (<64)	ND (<64)
B-7 D 11.5-12.0	11/23/10	B-7	11.5 to 12.0	9.30	ND (<0.28) [ND (<0.23)]	ND (<1.2)	ND (<58)	ND (<58)	ND (<58)
B-8 D 5.5-6.0	11/22/10	B-8	5.5 to 6.0	7.77 H	ND (<0.27) [ND (<0.23)] H	ND (<1.2)	ND (<59)	ND (<59)	ND (<59)
B-8 D 7.5-8.0	11/22/10	B-8	7.5 to 8.0	8.30 H	ND (<0.35) [ND (<0.37)] H	ND (<1.5)	ND (<76)	ND (<76)	ND (<76)
B-8 D 13.5-14.0	11/22/10	B-8	13.5 to 14.0	8.84 H	ND (<0.28) [ND (<0.25)] H	ND (<1.2)	ND (<58)	ND (<58)	ND (<58)
B-9 D 5.0-5.5	11/22/10	B-9	5.0 to 5.5	7.86 H	ND (<0.30) [ND (<0.32)] H	ND (<1.2)	ND (<60)	ND (<60)	ND (<60)
B-9 D 7.5-8.0	11/22/10	B-9	7.5 to 8.0	8.12 H	ND (<0.38) H	**1,500**	**4,100**	**4,900**	ND (<1,600)
B-9 D 13.5-14.0	11/22/10	B-9	13.5 to 14.0	8.61 H	ND (<0.28) [ND (<0.23)] H	ND (<1.2)	ND (<59)	ND (<59)	ND (<59)
B-10 D 5.5-6.0	11/22/10	B-10	5.5 to 6.0	7.88 H	ND (<0.31) [ND (<0.34)] H	ND (<1.3)	ND (<67)	ND (<67)	ND (<67)
B-10 D 8.0-8.5	11/22/10	B-10	8.0 to 8.5	5.38 H	ND (<0.33) [ND (<0.28)] H	**37**	**100**	ND (<68)	ND (<68)
B-10 D 13.5-14.0	11/22/10	B-10	13.5 to 14.0	8.20 H	ND (<0.28) [ND (<0.21)] H	ND (<1.2)	ND (<58)	ND (<58)	ND (<58)
B-11 D 6.0-6.5	11/22/10	B-11	6.0 to 6.5	7.48	ND (<0.26)	**12**	ND (<60)	ND (<60)	ND (<60)
B-11 D 7.5-8.0	11/22/10	B-11	7.5 to 8.0	6.26	ND (<1.2) [ND (<0.33)] H	**3,400**	**7,700**	ND (<720)	ND (<720)
B-11 D 16.0-16.5	11/22/10	B-11	16.0 to 16.5	8.71 H	ND (<0.27) [ND (<0.23)] H	ND (<1.1)	ND (<56)	ND (<55)	ND (<55)
B-12 D 5.5-6.0	11/23/10	B-12	5.5 to 6.0	7.89	ND (<0.25)	ND (<1.1)	ND (<57)	ND (<56)	ND (<56)
B-12 D 8.0-8.5	11/23/10	B-12	8.0 to 8.5	6.49	ND (<0.38)	**1,500**	**2,700**	ND (<79)	ND (<79)
B-12 D 13.5-14.0	11/23/10	B-12	13.5 to 14.0	8.44	ND (<0.28) [ND (<0.23)]	ND (<1.2)	ND (<60)	ND (<59)	ND (<59)
B-13 D 5.5-6.0	11/23/10	B-13	5.5 to 6.0	8.23	ND (<0.27)	ND (<1.1)	ND (<55)	ND (<55)	ND (<55)
B-13 D 8.0-8.5	11/23/10	B-13	8.0 to 8.5	7.96	ND (<0.88) [ND (<0.28)] H	**74**	**150**	**38,000**	ND (<35,000)
B-3 D 8.0-8.5[1]	11/23/10	B-13	8.0 to 8.5	7.98	ND (<0.29) [ND (<0.27)] H	ND (<1.2)	ND (<62)	ND (<62)	ND (<62)
B-13 D 13.5-14.0	11/23/10	B-13	13.5 to 14.0	9.06	ND (<0.28) [ND (<0.24)] H	ND (<1.2)	ND (<59)	ND (<60)	ND (<60)
B-14 D 5.5-6.0	11/23/10	B-14	5.5 to 6.0	8.17	ND (<0.27) [ND (<0.28)] H	ND (<1.2)	ND (<59)	ND (<59)	ND (<59)
B-3 D 5.5-6.0[2]	11/23/10	B-14	5.5 to 6.0	8.02	ND (<0.31) [ND (<0.26)] H	ND (<1.3)	ND (<64)	ND (<63)	ND (<63)
B-14 D 8.0-8.5	11/23/10	B-14	8.0 to 8.5	7.81	ND (<0.32) [ND (<0.52)] H	**26**	**68**	**770**	ND (<330)
B-14 D 10-10.5	11/23/10	B-14	10.0 to 10.5	8.38	ND (<0.30) [ND (<0.34)] H	**1.6**	ND (<63)	ND (<63)	ND (<63)
B-3 D 10.0-10.5[3]	11/23/10	B-14	10.0 to 10.5	8.97	ND (<0.29) [ND (<0.35)] H	ND (<1.2)	ND (<60)	ND (<60)	ND (<60)
B-14 D 14.0-14.5	11/23/10	B-14	14.0 to 14.5	8.41	ND (<0.27) [ND (<0.23)] H	ND (<1.2)	ND (<58)	ND (<58)	ND (<58)
B-15 D 5.5-6.0	01/20/11	B-15	5.5 to 6.0	NA	NA	NA	NA	NA	NA

Volatile Organic Compounds, VOCs [8] (all µg/Kg)

Sample ID	Acetone	2-Butanone (MEK)	Carbon disulfide	4-Isopropyl-toluene	Naphthalene	PCE	Toluene	TCE	CFC-113	1,2,4-TMB	1,3,5-TMB	Xylenes, Total	Other VOCs [6]
DP-01 (6.5-7.5)-WSP 1	**51**	ND (<51)	ND (<5.1)	ND (<5.1)	ND (<10)	ND (<5.1)	ND (<5.1)	ND (<5.1)	ND (<5.1)	ND (<5.1)	ND (<5.1)	ND (<10)	ND (<5.1) to ND (<51)
DP-02 (12.5-13.5)-WSP 1[1]	**180**	ND (<46)	ND (<4.6)	**5.8**	**33**	ND (<4.6)	**9.3**	ND (<4.6)	ND (<4.6)	**31**	**13**	**24**	ND (<4.6) to ND (<46)
DP-03 (15-16)-WSP 1	ND (<50)	ND (<50)	ND (<5.0)	ND (<5.0)	ND (<9.9)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<9.9)	ND (<5.0) to ND (<50)
DP-03-(12.5-13.5) WSP 2	ND (<50)	ND (<50)	ND (<5.0)	ND (<5.0)	ND (<10)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<10)	ND (<5.0) to ND (<50)
DP-01-(8.5-9.5) WSP 3 [2]	**160**	ND (<45)	ND (<4.5)	ND (<4.5)	ND (<9.0)	ND (<4.5)	ND (<4.5)	ND (<4.5)	ND (<4.5)	ND (<4.5)	ND (<4.5)	ND (<9.0)	ND (<4.5) to ND (<45)
DP-02-(12.5-13.5) WSP 3	**100**	ND (<49)	ND (<4.9)	ND (<4.9)	ND (<9.9)	ND (<4.9)	ND (<4.9)	ND (<4.9)	ND (<4.9)	ND (<4.9)	ND (<4.9)	ND (<9.9)	ND (<4.9) to ND (<49)
DP-03-(15-16) WSP 3	ND (<50)	ND (<50)	ND (<5.0)	ND (<5.0)	ND (<9.9)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<9.9)	ND (<5.0) to ND (<50)
DP-01-(9-10) WSP 4	**170**	ND (<50)	ND (<5.0)	ND (<5.0)	ND (<9.9)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<9.9)	ND (<5.0) to ND (<50)
DP-02-(12.5-13.5) WSP 4	**350**	**72**	ND (<4.4)	ND (<4.4)	ND (<8.8)	ND (<4.4)	ND (<4.4)	ND (<4.4)	ND (<4.4)	ND (<4.4)	ND (<4.4)	ND (<8.8)	ND (<4.4) to ND (<44)
DP-03-(15-16) WSP 4	ND (<50)	ND (<50)	ND (<5.0)	ND (<5.0)	ND (<9.9)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<9.9)	ND (<5.0) to ND (<50)
B-5 D 5.5-6.0	[ND (<61)]	[ND (<61)]	[ND (<6.1)]	[ND (<6.1)]	[ND (<12)]	[ND (<6.1)]	[ND (<6.1)]	[ND (<6.1)]	[ND (<6.1)]	[ND (<6.1)]	[ND (<6.1)]	[ND (<12)]	[ND (<6.1) to ND (<61)]
B-5 D 7.5-8.0	[**600**]*	[**170**]	[**9.4**]	[ND (<7.2)]	[ND (<14)]	[ND (<7.2)]	[**11**]	[ND (<7.2)]	[ND (<7.2)]	[**9.9**]	[ND (<7.2)]	[ND (<14)]	[ND (<7.2) to ND (<72)]
B-5 D 16-16.5	ND (<58) [ND (<44)]	ND (<58) [ND (<44)]	ND (<5.8) [ND (<4.4)]	ND (<5.8) [ND (<4.4)]	ND (<12) [ND (<8.8)]	ND (<5.8) [ND (<4.4)]	ND (<5.8) [ND (<4.4)]	ND (<5.8) [**9.4**]	ND (<5.8) [**5.2**]	ND (<5.8) [ND (<4.4)]	ND (<5.8) [ND (<4.4)]	ND (<12) [ND (<8.8)]	ND (<5.8) to ND (<58) [ND (<4.4) to ND (<44)]
B-6 D 3.5-4.0	[ND (<55)]	[ND (<55)]	[ND (<5.5)]	[ND (<5.5)]	[ND (<11)]	[ND (<5.5)]	[ND (<5.5)]	[ND (<5.5)]	[ND (<5.5)]	[ND (<5.5)]	[ND (<5.5)]	[ND (<11)]	[ND (<5.5) to ND (<55)]
B-6 D 5.5-6.0	ND (<72) [ND (<61)]	ND (<72) [ND (<61)]	ND (<7.2) [ND (<6.1)]	ND (<7.2) [ND (<6.1)]	ND (<14) [ND (<12)]	ND (<7.2) [ND (<6.1)]	ND (<7.2) [ND (<6.1)]	ND (<7.2) [ND (<6.1)]	ND (<7.2) [ND (<6.1)]	ND (<7.2) [ND (<6.1)]	ND (<7.2) [ND (<6.1)]	ND (<14) [ND (<12)]	ND (<7.2) to ND (<72) [ND (<6.1) to ND (<61)]
B-6 D 7.5-8.0	[**380**]	[ND (<93)]	[ND (<9.3)]	[ND (<9.3)]	[ND (<19)]	[ND (<9.3)]	[**13**]	[ND (<9.3)]	[ND (<9.3)]	[ND (<9.3)]	[ND (<9.3)]	[ND (<19)]	[ND (<9.3) to ND (<93)]
B-6 D 12.5-13.0	[ND (<43)]	[ND (<43)]	[ND (<4.3)]	[ND (<4.3)]	[ND (<8.6)]	[ND (<4.3)]	[ND (<4.3)]	[ND (<4.3)]	[ND (<4.3)]	[ND (<4.3)]	[ND (<4.3)]	[ND (<8.6)]	[ND (<4.3) to ND (<43)]
B-7 D 5.5-6.0	ND (<64) [ND (<56)]	ND (<64) [ND (<56)]	ND (<6.4) [ND (<5.6)]	ND (<6.4) [ND (<5.6)]	ND (<13) [ND (<11)]	ND (<6.4) [ND (<5.6)]	ND (<6.4) [ND (<5.6)]	ND (<6.4) [ND (<5.6)]	ND (<6.4) [ND (<5.6)]	ND (<6.4) [ND (<5.6)]	ND (<6.4) [ND (<5.6)]	ND (<13) [ND (<11)]	ND (<6.4) to ND (<64) [ND (<5.6) to ND (<56)]
B-7 D 7.5-8.0	[**160**]	[ND (<88)]	[ND (<8.8)]	[ND (<8.8)]	[ND (<18)]	[ND (<8.8)]	[ND (<8.8)]	[ND (<8.8)]	[ND (<8.8)]	[ND (<8.8)]	[ND (<8.8)]	[ND (<18)]	[ND (<8.8) to ND (<88)]
B-7 D 8.5-9.0	**77** [ND (<50)]	ND (<63) [ND (<50)]	ND (<6.3) [ND (<5.0)]	ND (<6.3) [ND (<5.0)]	ND (<13) [ND (<10)]	ND (<6.3) [ND (<5.0)]	ND (<6.3) [ND (<5.0)]	ND (<6.3) [ND (<5.0)]	ND (<6.3) [ND (<5.0)]	ND (<6.3) [ND (<5.0)]	ND (<6.3) [ND (<5.0)]	ND (<13) [ND (<10)]	ND (<6.3) to ND (<63) [ND (<5.0) to ND (<50)]
B-7 D 11.5-12.0	ND (<57) [ND (<46)]	ND (<57) [ND (<46)]	ND (<5.7) [ND (<4.6)]	ND (<5.7) [ND (<4.6)]	ND (<11) [ND (<9.1)]	ND (<5.7) [ND (<4.6)]	ND (<5.7) [ND (<4.6)]	ND (<5.7) [ND (<4.6)]	ND (<5.7) [ND (<4.6)]	ND (<5.7) [ND (<4.6)]	ND (<5.7) [ND (<4.6)]	ND (<11) [ND (<9.1)]	ND (<5.7) to ND (<57) [ND (<4.6) to ND (<46)]
B-8 D 5.5-6.0	**89** [**53**] H	ND (<55) [ND (<45)] H	ND (<5.5) [ND (<4.5)] H	ND (<5.5) [ND (<4.5)] H	ND (<11) [ND (<9.0)] H	ND (<5.5) [ND (<4.5)] H	ND (<5.5) [ND (<4.5)] H	ND (<5.5) [ND (<4.5)] H	ND (<5.5) [ND (<4.5)] H	ND (<5.5) [ND (<4.5)] H	ND (<5.5) [ND (<4.5)] H	ND (<11) [ND (<9.0)] H	ND (<5.5) to ND (<55) [ND (<4.5) to ND (<45)] H
B-8 D 7.5-8.0	**570*** [ND (<74)] H	**110** [ND (<74)] H	ND (<7.0) [ND (<7.4)] H	ND (<7.0) [ND (<7.4)] H	ND (<14) [ND (<15)] H	ND (<7.0) [ND (<7.4)] H	ND (<7.0) [ND (<7.4)] H	ND (<7.0) [ND (<7.4)] H	ND (<7.0) [ND (<7.4)] H	ND (<7.0) [ND (<7.4)] H	ND (<7.0) [ND (<7.4)] H	ND (<14) [ND (<15)] H	ND (<7.0) to ND (<70) [ND (<7.4) to ND (<74)] H
B-8 D 13.5-14.0	ND (<56) [ND (<50)] H	ND (<56) [ND (<50)] H	ND (<5.6) [ND (<5.0)] H	ND (<5.6) [ND (<5.0)] H	ND (<11) [ND (<10)] H	ND (<5.6) [ND (<5.0)] H	ND (<5.6) [ND (<5.0)] H	ND (<5.6) [ND (<5.0)] H	ND (<5.6) [ND (<5.0)] H	ND (<5.6) [ND (<5.0)] H	ND (<5.6) [ND (<5.0)] H	ND (<11) [ND (<10)] H	ND (<5.6) to ND (<56) [ND (<5.0) to ND (<50)] H
B-9 D 5.0-5.5	ND (<60) [ND (<64)] H	ND (<60) [ND (<64)] H	ND (<6.0) [ND (<6.4)] H	ND (<6.0) [ND (<6.4)] H	ND (<12) [ND (<13)] H	ND (<6.0) [ND (<6.4)] H	ND (<6.0) [ND (<6.4)] H	ND (<6.0) [ND (<6.4)] H	ND (<6.0) [ND (<6.4)] H	ND (<6.0) [ND (<6.4)] H	ND (<6.0) [ND (<6.4)] H	ND (<12) [ND (<13)] H	ND (<6.0) to ND (<60) [ND (<6.4) to ND (<64)] H
B-9 D 7.5-8.0	[**280**] H	[**80**] H	[**16**] H	[ND (<7.6)] H	[ND (<15)] H	[ND (<7.6)] H	[ND (<7.6)] H	[ND (<7.6)] H	[ND (<7.6)] H	[ND (<7.6)] H	[ND (<7.6)] H	[ND (<15)] H	[ND (<7.6) to ND (<76)] H
B-9 D 13.5-14.0	ND (<55) [ND (<46)] H	ND (<55) [ND (<46)] H	ND (<5.5) [ND (<4.6)] H	ND (<5.5) [ND (<4.6)] H	ND (<11) [ND (<9.2)] H	ND (<5.5) [ND (<4.6)] H	ND (<5.5) [ND (<4.6)] H	ND (<5.5) [ND (<4.6)] H	ND (<5.5) [ND (<4.6)] H	ND (<5.5) [ND (<4.6)] H	ND (<5.5) [ND (<4.6)] H	ND (<11) [ND (<9.2)] H	ND (<5.5) to ND (<55) [ND (<4.6) to ND (<46)] H
B-10 D 5.5-6.0	**71** [ND (<68)] H	ND (<62) [ND (<68)] H	ND (<6.2) [ND (<6.8)] H	ND (<6.2) [ND (<6.8)] H	ND (<12) [ND (<14)] H	ND (<6.2) [ND (<6.8)] H	ND (<6.2) [ND (<6.8)] H	ND (<6.2) [ND (<6.8)] H	ND (<6.2) [ND (<6.8)] H	ND (<6.2) [ND (<6.8)] H	ND (<6.2) [ND (<6.8)] H	ND (<12) [ND (<14)] H	ND (<6.2) to ND (<62) [ND (<6.8) to ND (<68)] H
B-10 D 8.0-8.5	**200** [**69**] H	ND (<65) [ND (<55)] H	ND (<6.5) [ND (<5.5)] H	ND (<6.5) [ND (<5.5)] H	ND (<13) [ND (<11)] H	ND (<6.5) [ND (<5.5)] H	ND (<6.5) [ND (<5.5)] H	ND (<6.5) [ND (<5.5)] H	ND (<6.5) [ND (<5.5)] H	ND (<6.5) [ND (<5.5)] H	ND (<6.5) [ND (<5.5)] H	ND (<13) [ND (<11)] H	ND (<6.5) to ND (<65) [ND (<5.5) to ND (<55)] H
B-10 D 13.5-14.0	ND (<55) [ND (<43)] H	ND (<55) [ND (<43)] H	ND (<5.5) [ND (<4.3)] H	ND (<5.5) [ND (<4.3)] H	ND (<11) [ND (<8.6)] H	ND (<5.5) [ND (<4.3)] H	ND (<5.5) [ND (<4.3)] H	ND (<5.5) [ND (<4.3)] H	ND (<5.5) [ND (<4.3)] H	ND (<5.5) [ND (<4.3)] H	ND (<5.5) [ND (<4.3)] H	ND (<11) [ND (<8.6)] H	ND (<5.5) to ND (<55) [ND (<4.3) to ND (<43)] H
B-11 D 6.0-6.5	[ND (<53)]	[ND (<53)]	[ND (<5.3)]	[ND (<5.3)]	[ND (<11)]	[ND (<5.3)]	[ND (<5.3)]	[ND (<5.3)]	[ND (<5.3)]	[ND (<5.3)]	[ND (<5.3)]	[ND (<11)]	[ND (<5.3) to ND (<53)]
B-11 D 7.5-8.0	**240** [**170**] H	ND (<240) [ND (<66)] H	ND (<24) [ND (<6.6)] H	ND (<24) [**7.1**] H	ND (<49) [**23**] H	ND (<24) [ND (<6.6)] H	ND (<24) [ND (<6.6)] H	ND (<24) [ND (<6.6)] H	ND (<24) [ND (<6.6)] H	**41** [**33**] H	ND (<24) [**13**] H	ND (<49) [ND (<13)] H	ND (<24) to ND (<240) [ND (<6.6) to ND (<66)] H
B-11 D 16.0-16.5	ND (<54) [ND (<45)] H	ND (<54) [ND (<45)] H	ND (<5.4) [ND (<4.5)] H	ND (<5.4) [ND (<4.5)] H	ND (<11) [ND (<9.1)] H	ND (<5.4) [**5.0**] H	ND (<5.4) [ND (<4.5)] H	ND (<5.4) [ND (<4.5)] H	ND (<5.4) [ND (<4.5)] H	ND (<5.4) [ND (<4.5)] H	ND (<5.4) [ND (<4.5)] H	ND (<11) [ND (<9.1)] H	ND (<5.4) to ND (<54) [ND (<4.5) to ND (<45)]
B-12 D 5.5-6.0	[ND (<49)]	[ND (<49)]	[ND (<4.9)]	[ND (<4.9)]	[ND (<9.9)]	[ND (<4.9)]	[ND (<4.9)]	[ND (<4.9)]	[ND (<4.9)]	[ND (<4.9)]	[ND (<4.9)]	[ND (<9.9)]	[ND (<4.9) to ND (<49)]
B-12 D 8.0-8.5	[**420**]	[**100**]	[ND (<7.7)]	[ND (<7.7)]	[ND (<15)]	[ND (<7.7)]	[ND (<7.7)]	[ND (<7.7)]	[ND (<7.7)]	[ND (<7.7)]	[ND (<7.7)]	[ND (<15)]	[ND (<7.7) to ND (<77)]
B-12 D 13.5-14.0	ND (<56) [ND (<46)]	ND (<56) [ND (<46)]	ND (<5.6) [ND (<4.6)]	ND (<5.6) [ND (<4.6)]	ND (<11) [ND (<9.2)]	ND (<5.6) [**4.9**]	ND (<5.6) [ND (<4.6)]	ND (<5.6) [ND (<4.6)]	ND (<5.6) [ND (<4.6)]	ND (<5.6) [ND (<4.6)]	ND (<5.6) [ND (<4.6)]	ND (<11) [ND (<9.2)]	ND (<5.6) to ND (<56) [ND (<4.6) to ND (<46)]
B-13 D 5.5-6.0	[ND (<55)]	[ND (<55)]	[ND (<5.5)]	[ND (<5.5)]	[ND (<11)]	[ND (<5.5)]	[ND (<5.5)]	[ND (<5.5)]	[ND (<5.5)]	[ND (<5.5)]	[ND (<5.5)]	[ND (<11)]	[ND (<5.5) to ND (<55)]
B-13 D 8.0-8.5	**240** [ND (<57)] H	ND (<180) [ND (<57)] H	ND (<18) [ND (<5.7)] H	ND (<18) [ND (<5.7)] H	ND (<35) [ND (<11)] H	ND (<18) [ND (<5.7)] H	ND (<18) [ND (<5.7)] H	ND (<18) [ND (<5.7)] H	ND (<18) [ND (<5.7)] H	ND (<18) [ND (<5.7)] H	ND (<18) [ND (<5.7)] H	ND (<35) [ND (<11)] H	ND (<18) to ND (<180) [ND (<5.7) to ND (<57)] H
B-3 D 8.0-8.5[1]	ND (<58) [ND (<53)] H	ND (<58) [ND (<53)] H	ND (<5.8) [ND (<5.3)] H	ND (<5.8) [ND (<5.3)] H	ND (<12) [ND (<11)] H	ND (<5.8) [ND (<5.3)] H	ND (<5.8) [ND (<5.3)] H	ND (<5.8) [ND (<5.3)] H	ND (<5.8) [ND (<5.3)] H	ND (<5.8) [ND (<5.3)] H	ND (<5.8) [ND (<5.3)] H	ND (<12) [ND (<11)] H	ND (<5.8) to ND (<58) [ND (<5.3) to ND (<53)] H
B-13 D 13.5-14.0	ND (<56) [ND (<48)] H	ND (<56) [ND (<48)] H	ND (<5.6) [ND (<4.8)] H	ND (<5.6) [ND (<4.8)] H	ND (<11) [ND (<9.6)] H	ND (<5.6) [**22**] H	ND (<5.6) [ND (<4.8)] H	ND (<5.6) [ND (<4.8)] H	ND (<5.6) [ND (<4.8)] H	ND (<5.6) [ND (<4.8)] H	ND (<5.6) [ND (<4.8)] H	ND (<11) [ND (<9.6)] H	ND (<5.6) to ND (<56) [ND (<4.8) to ND (<48)] H
B-14 D 5.5-6.0	ND (<55) [ND (<55)] H	ND (<55) [ND (<55)] H	ND (<5.5) [ND (<5.5)] H	ND (<5.5) [ND (<5.5)] H	ND (<11) [ND (<11)] H	ND (<5.5) [ND (<5.5)] H	ND (<5.5) [ND (<5.5)] H	ND (<5.5) [ND (<5.5)] H	ND (<5.5) [ND (<5.5)] H	ND (<5.5) [ND (<5.5)] H	ND (<5.5) [ND (<5.5)] H	ND (<11) [ND (<11)] H	ND (<5.5) to ND (<55) [ND (<5.5) to ND (<55)] H
B-3 D 5.5-6.0[2]	ND (<62) [ND (<52)] H	ND (<62) [ND (<52)] H	ND (<6.2) [ND (<5.2)] H	ND (<6.2) [ND (<5.2)] H	ND (<12) [ND (<10)] H	ND (<6.2) [ND (<5.2)] H	ND (<6.2) [ND (<5.2)] H	ND (<6.2) [ND (<5.2)] H	ND (<6.2) [ND (<5.2)] H	ND (<6.2) [ND (<5.2)] H	ND (<6.2) [ND (<5.2)] H	ND (<12) [ND (<10)] H	ND (<6.2) to ND (<62) [ND (<5.2) to ND (<52)] H
B-14 D 8.0-8.5	**240** [**190**] H	ND (<64) [ND (<100)] H	ND (6.4) [ND (<10)] H	ND (<6.4) [ND (<10)] H	ND (<13) [ND (<21)] H	ND (6.4) [ND (<10)] H	ND (6.4) [ND (<10)] H	ND (6.4) [ND (<10)] H	ND (6.4) [ND (<10)] H	ND (6.4) [ND (<10)] H	ND (6.4) [ND (<10)] H	**14** [ND (<21)] H	ND (<6.4) to ND (<64) [ND (<10) to ND (<100)] H
B-14 D 10-10.5	**70** [ND (<68)] H	ND (<61) [ND (<68)] H	ND (<6.1) [ND (<6.8)] H	ND (<6.1) [ND (<6.8)] H	ND (<12) [ND (<14)] H	ND (<6.1) [ND (<6.8)] H	ND (<6.1) [ND (<6.8)] H	ND (<6.1) [ND (<6.8)] H	ND (<6.1) [ND (<6.8)] H	ND (<6.1) [ND (<6.8)] H	ND (<6.1) [ND (<6.8)] H	ND (<12) [ND (<14)] H	ND (<6.1) to ND (<61) [ND (<6.8) to ND (<68)] H
B-3 D 10.0-10.5[3]	ND (<58) [ND (<69)] H	ND (<58) [ND (<69)] H	ND (<5.8) [ND (<6.9)] H	ND (<5.8) [ND (<6.9)] H	ND (<12) [ND (<14)] H	ND (<5.8) [ND (<6.9)] H	ND (<5.8) [ND (<6.9)] H	ND (<5.8) [ND (<6.9)] H	ND (<5.8) [ND (<6.9)] H	ND (<5.8) [ND (<6.9)] H	ND (<5.8) [ND (<6.9)] H	ND (<12) [ND (<14)] H	ND (<5.8) to ND (<58) [ND (<6.9) to ND (<69)] H
B-14 D 14.0-14.5	ND (<55) [ND (<46)] H	ND (<55) [ND (<46)] H	ND (<5.5) [ND (<4.6)] H	ND (<5.5) [ND (<4.6)] H	ND (<11) [ND (<9.2)] H	ND (<5.5) [**16**] H	ND (<5.5) [ND (<4.6)] H	ND (<5.5) [ND (<4.6)] H	ND (<5.5) [ND (<4.6)] H	ND (<5.5) [ND (<4.6)] H	ND (<5.5) [ND (<4.6)] H	ND (<11) [ND (<9.2)] H	ND (<5.5) to ND (<55) [ND (<4.6) to ND (<46)] H
B-15 D 5.5-6.0	**280** [**300**] H	ND (<68) [**65**] H	ND (<6.8) [ND (<6.0)] H	ND (<6.8) [ND (<6.0)] H	ND (<14) [ND (<12)] H	ND (<6.8) [ND (<6.0)] H	ND (<6.8) [ND (<6.0)] H	ND (<6.8) [ND (<6.0)] H	ND (<6.8) [ND (<6.0)] H	ND (<6.8) [ND (<6.0)] H	ND (<6.8) [ND (<6.0)] H	ND (<14) [ND (<12)] H	ND (<6.8) to ND (<68) [ND (<6.0) to ND (<60)] H

Polyaromatic Hydrocarbons, PAHs (all µg/Kg)

Sample ID	Naphthalene	Phenanthrene	Chrysene	Benzo[a] pyrene	Benzo[b] fluoranthene	Fluoranthene	Pyrene	Other PAHs
DP-01 (6.5-7.5)-WSP 1	ND (<50)	ND (<50)	**88**	ND (<50)	**52**	ND (<50)	ND (<50)	ND (<50)
DP-02 (12.5-13.5)-WSP 1[1]	ND (<720)	**1,200**	**1,200**	ND (<720)	ND (<720)	ND (<720)	ND (<720)	ND (<720)
DP-03 (15-16)-WSP 1	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)
DP-03-(12.5-13.5) WSP 2	ND (<25)	ND (<25)	ND (<25)	ND (<25)	ND (<25)	ND (<25)	ND (<25)	ND (<25)
DP-01-(8.5-9.5) WSP 3 [2]	ND (<1,400)	**2,300**	**3,800**	ND (<1,400)	**1,900**	**1,900**	ND (<1,400)	ND (<1,400)
DP-02-(12.5-13.5) WSP 3	ND (<250)	ND (<250)	ND (<250)	ND (<250)	ND (<250)	ND (<250)	ND (<250)	ND (<250)
DP-03-(15-16) WSP 3	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)
DP-01-(9-10) WSP 4	ND (<4.9)	ND (<4.9)	ND (<4.9)	ND (<4.9)	ND (<4.9)	ND (<4.9)	ND (<4.9)	ND (<4.9)
DP-02-(12.5-13.5) WSP 4	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)
DP-03-(15-16) WSP 4	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)
B-5 D 5.5-6.0	ND (<6.7)	ND (<6.7)	ND (<6.7)	ND (<6.7)	ND (<6.7)	ND (<6.7)	ND (<6.7)	ND (<6.7)
B-5 D 7.5-8.0	ND (<33)	ND (<33)	**140**	**61**	ND (<33)	**69**	**160**	ND (<33)
B-5 D 16-16.5	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)
B-6 D 3.5-4.0	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)
B-6 D 5.5-6.0	ND (<7.2)	ND (<7.2)	ND (<7.2)	ND (<7.2)	ND (<7.2)	ND (<7.2)	ND (<7.2)	ND (<7.2)
B-6 D 7.5-8.0	ND (<140)	ND (<140)	**430**	ND (<140)	ND (<140)	ND (<140)	**310**	ND (<140)
B-6 D 12.5-13.0	ND (<5.7)	ND (<5.7)	ND (<5.7)	ND (<5.7)	ND (<5.7)	ND (<5.7)	ND (<5.7)	ND (<5.7)
B-7 D 5.5-6.0	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)	**6.6**	**6.6**	ND (<6.4)	ND (<6.4)
B-7 D 7.5-8.0	ND (<7.9)	ND (<7.9)	ND (<7.9)	ND (<7.9)	ND (<7.9)	ND (<7.9)	ND (<7.9)	ND (<7.9)
B-7 D 8.5-9.0	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)
B-7 D 11.5-12.0	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)
B-8 D 5.5-6.0	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)
B-8 D 7.5-8.0	ND (<7.6)	ND (<7.6)	ND (<7.6)	ND (<7.6)	ND (<7.6)	ND (<7.6)	ND (<7.6)	ND (<7.6))
B-8 D 13.5-14.0	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)
B-9 D 5.0-5.5	ND (<6.0)	ND (<6.0)	ND (<6.0)	ND (<6.0)	ND (<6.0)	ND (<6.0)	ND (<6.0)	ND (<6.0)
B-9 D 7.5-8.0	ND (<39)	ND (<39)	**180**	**41**	**63**	ND (<39)	**49**	ND (<39)
B-9 D 13.5-14.0	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)
B-10 D 5.5-6.0	ND (<6.6)	ND (<6.6)	ND (<6.6)	ND (<6.6)	ND (<6.6)	ND (<6.6)	ND (<6.6)	ND (<6.6)
B-10 D 8.0-8.5	**40**	**18**	**54**	**35**	**32**	**20**	**26**	ND (<14)
B-10 D 13.5-14.0	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)
B-11 D 6.0-6.5	ND (<6.0)	ND (<6.0)	ND (<6.0)	ND (<6.0)	ND (<6.0)	ND (<6.0)	ND (<6.0)	ND (<6.0)
B-11 D 7.5-8.0	ND (<18,000)	ND (<18,000)	ND (<18,000)	ND (<18,000)	ND (<18,000)	ND (<18,000)	ND (<18,000)	ND (<18,000)
B-11 D 16.0-16.5	ND (<5.5)	ND (<5.5)	ND (<5.5)	ND (<5.5)	ND (<5.5)	ND (<5.5)	ND (<5.5)	ND (<5.5)
B-12 D 5.5-6.0	ND (<5.6)	ND (<5.6)	ND (<5.6)	ND (<5.6)	ND (<5.6)	ND (<5.6)	ND (<5.6)	ND (<5.6)
B-12 D 8.0-8.5	ND (<79)	**140**	**220**	ND (<79)	ND (<79)	**120**	ND (<79)	ND (<79)
B-12 D 13.5-14.0	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)
B-13 D 5.5-6.0	ND (<5.5)	ND (<5.5)	ND (<5.5)	ND (<5.5)	ND (<5.5)	ND (<5.5)	ND (<5.5)	ND (<5.5)
B-13 D 8.0-8.5	ND (<14)	ND (<14)	ND (<14)	ND (<14)	ND (<14)	ND (<14)	ND (<14)	ND (<14)
B-3 D 8.0-8.5[1]	ND (<6.2)	ND (<6.2)	ND (<6.2)	ND (<6.2)	ND (<6.2)	ND (<6.2)	ND (<6.2)	ND (<6.2)
B-13 D 13.5-14.0	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)
B-14 D 5.5-6.0	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)
B-3 D 5.5-6.0[2]	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)
B-14 D 8.0-8.5	ND (<6.6)	ND (<6.6)	**12**	**13**	ND (<6.6)	ND (<6.6)	**10**	ND (<6.6)
B-14 D 10-10.5	ND (<6.3)	ND (<6.3)	ND (<6.3)	ND (<6.3)	ND (<6.3)	ND (<6.3)	ND (<6.3)	ND (<6.3)
B-3 D 10.0-10.5[3]	ND (<6.0)	**54**	**160**	**200**	**210**	**180**	**180**	ND (<6.0)
B-14 D 14.0-14.5	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)
B-15 D 5.5-6.0	NA	NA	NA	NA	NA	NA	NA	NA

Table 1:
Soil Organic Analytical Results

837 Industrial Road,
San Carlos, CA

Sample ID	Sample Date	Field Point	Sample Depth	pH	TPHg	TPHd	TPHmo	PCBs		Volatile Organic Compounds, VOCs [8]														Polyaromatic Hydrocarbons, PAHs							
								PCB-1260	Other PCBs	Acetone	2-Butanone (MEK)	Carbon disulfide	4-Isopropyl-toluene	Naphthalene	PCE	Toluene	TCE	CFC-113	1,2,4-TMB	1,3,5-TMB	Xylenes, Total	Other VOCs [6]	Naphthalene	Phenanthrene	Chrysene	Benzo[a] pyrene	Benzo[b] fluoranthene	Fluoranthene	Pyrene	Other PAHs
			ft bfs	SU	mg/Kg	mg/Kg	mg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg
B-15 D 8.0-8.5 (4)	01/20/11	B-15	8.0 to 8.5	NA	NA	NA	NA	NA	NA	ND (<57) [ND (<47)] H	ND (<57) [ND (<47)] H	ND (<5.7) [ND (<4.7)] H	ND (<5.7) [ND (<4.7)] H	ND (<11) [ND (<9.4)] H	ND (<5.7) **[68]** H	ND (<5.7) [ND (<4.7)] H	ND (<5.7) **[220]** H	ND (<5.7) [ND (<4.7)] H	ND (<5.7) [ND (<4.7)] H	ND (<5.7) [ND (<4.7)] H	ND (<11) [ND (<9.4)] H	ND (<5.7) to ND (<57) [ND (<4.7) to ND (<47)] H	NA	NA	NA	NA	NA	NA	NA	NA
MW-1D6.0	06/04/12	MW-1	6.0 to 6.5	7.64	ND (<0.34)	**3.5**	ND (<65)	ND (<64)	ND (<64)	ND (<68)	ND (<68)	ND (<6.8)	ND (<6.8)	ND (<14)	ND (<6.8)	ND (<6.8)	ND (<6.8)	ND (<6.8)	ND (<6.8)	ND (<6.8)	ND (<14)	ND (<6.8) to ND (<68)	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)
MW-1D7.5	06/04/12	MW-1	7.5 to 8.0	7.73	ND (<0.31)	**18**	ND (<77)	**260**	ND (<75)	**81**	ND (<63)	ND (<6.3)	ND (<6.3)	ND (<13)	ND (<6.3)	ND (<6.3)	ND (<6.3)	ND (<6.3)	ND (<6.3)	ND (<6.3)	ND (<13)	ND (<6.3) to ND (<63)	ND (<7.7)	**9.9**	**9.3**	ND (<7.7)	**12**	**16**	**14**	ND (<7.7)
MW-1D8.5	06/04/12	MW-1	8.5 to 9.0	8.70	ND (<0.23)	**1.8**	ND (<60)	ND (<61)	ND (<61)	ND (<45)	ND (<45)	ND (<4.5)	ND (<4.5)	ND (<9.0)	ND (<4.5)	ND (<4.5)	ND (<4.5)	ND (<4.5)	ND (<4.5)	ND (<4.5)	ND (<9.0)	ND (<4.5) to ND (<45)	ND (<6.1)	ND (<6.1)	ND (<6.1)	ND (<6.1)	ND (<6.1)	ND (<6.1)	ND (<6.1)	ND (<6.1)
MW-1D20 (5)	06/04/12	MW-1	8.0 to 8.5	7.53	ND (<0.37)	**5.5**	ND (<65)	ND (<65)	ND (<65)	**140**	ND (<74)	ND (<7.4)	ND (<7.4)	ND (<15)	ND (<7.4)	ND (<7.4)	ND (<7.4)	ND (<7.4)	ND (<7.4)	ND (<7.4)	ND (<15)	ND (<7.4) to ND (<74)	ND (<6.5)	ND (<6.5)	ND (<6.5)	ND (<6.5)	ND (<6.5)	ND (<6.5)	ND (<6.5)	ND (<6.5)
Environmental Risk Screening Levels (7)																															
OEHHA CHHSLs (Commercial/Industrial Land Use)					NE	NE	NE	300*	300*	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	130*	NE	NE	NE	NE
OEHHA CHHSLs (Residential Land Use)					NE	NE	NE	89	89	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	38	NE	NE	NE	NE
U.S. EPA Region 9 RSLs (Industrial Soil)					NE	NE	NE	740	Varies by compound	630,000,000	200,000,000	3,700,000*	NE	18,000	110,000	45,000,000	6,400	180,000,000*	260,000*	10,000,000*	2,700,000*	Varies by compound	18,000	NE	210,000	210	2,100	22,000,000	17,000,000	Varies by compound
U.S. EPA Region 9 RSLs (Residential Soil)					NE	NE	NE	220	Varies by compound	61,000,000	28,000,000	820,000	NE	3,600	22,000	5,000,000	910	43,000,000	62,000	780,000	630,000	Varies by compound	3,600	NE	15,000	15	150	2,300,000	1,700,000	Varies by compound
DTSC HERO PRGs (Industrial Soil)					NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	1,300	NE	NE	NE	NE	69,700	NE	Varies by compound	NE	NE	13,000	NE	NE	NE	NE	Varies by compound
DTSC HERO PRGs (Residential Soil)					NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	480	NE	NE	NE	NE	21,300	NE	Varies by compound	NE	NE	3,800	NE	NE	NE	NE	Varies by compound
RWQCB ESLs (Table A-1, Residential or Unrestricted Land Use, Groundwater Potential Source of Drinking Water, Shallow Soil)					100	100	100	220	220	500	4,500	NE	NE	1,200	550	2,900	460	NE	NE	NE	2,300	Varies by compound	1,200	11,000	3,800	38	380	40,000	85,000	Varies by compound
RWQCB ESLs (Table A-2, Commercial/Industrial Land Use, Groundwater Potential Source of Drinking Water, Shallow Soil)					500*	110*	500*	740	740	500*	4,500*	NE	NE	1,200*	700*	2,900*	460*	NE	NE	NE	2,300	Varies by compound	1,200*	11,000*	13,000*	130	1,300*	40,000*	85,000*	Varies by compound
RWQCB ESLs (Table C-1, Residential or Unrestricted Land Use, Groundwater Potential Source of Drinking Water, Deep Soil)					500	110	500	220	220	500	4,500	NE	NE	1,200	550	2,900	460	NE	NE	NE	2,300	Varies by compound	1,200	11,000	3,800	38	380	60,000	85,000	Varies by compound
RWQCB ESLs (Table C-2, Commercial/Industrial Land Use, Groundwater Potential Source of Drinking Water, Deep Soil)					770	110	1,000	740	740	500	4,500	NE	NE	1,200	700	2,900	460	NE	NE	NE	2,300	Varies by compound	1,200	11,000	13,000	130	1,300	60,000	85,000	Varies by compound

Table Notes:

General:

Depth: Sample depth in feet below top of floor surface, feet bfs
µg/kg: Micrograms per kilogram, 09/09 data reported as wet weight, 11/2010 and 01/2011 data reported as dry-weight corrected
mg/kg: Milligrams per kilogram, 09/09 data reported as wet weight, 11/2010 and 01/2011 data reported as dry-weight corrected
ND (<2.5): Not detected at or above the laboratory reporting limit
NE: Not established
NA: Not analyzed

TPH: Total petroleum hydrocarbons
TPHg: Gasoline range organics (C5-C12)
TPHd: Diesel range organics (C10-C28)
TPHmo: Motor oil range organics (C24-C36)
PAHs: Polyaromatic Hydrocarbons by EPA Method 8270C
PCBs: Polychlorinated Biphenyls by EPA Method 8082

VOCs: Volatile Organic Compounds by EPA Method 8260B
CFC-113: 1,1,2-trichloro-1,2,2-trifluoroethane
PCE: Tetrachloroethene
TCE: Trichloroethene
1,2,4-TMB: 1,2,4-Trimethylbenzene
1,3,5-TMB: 1,3,5-Trimethylbenzene

Detailed:

(1) Sample B-3 D 8.0-8.5 is a duplicate sample of B-13 D 8.0-8.5
(2) Sample B-3 D 5.5-6.0 is a duplicate sample of B-14 D 5.5-6.0
(3) Sample B-3 D 10.0-10.5 is a duplicate sample of B-14 D 10-10.5; B-3 D 10.0-10.5 also contained, Acenaphthylene (42 µg/Kg), Anthracene (35 µg/Kg), Benzo[a]anthracene (160 µg/Kg), Benzo[k]fluoranthene (83 µg/Kg), Benzo[g,h,I]perylene (76 µg/Kg), Indeno[1,2,3-cd]pyrene (82 µg/Kg), Dibenz(a,h)anthracene (27 µg/Kg).
(4) Sample B-15 D 8.0-8.5 also contained, cis-1,2-Dichloroethene (63 µg/Kg) and Vinyl chloride (110 µg/Kg). Commercial RSLs and ESLs for cis-1,2-Dichloroethene (2,000,000 ug/kg, 190 ug/kg) and Vinyl Chloride (1700 ug/kg, 85 ug/kg).
(5) Sample MW-1D20 is a duplicate sample of MW-1D7.5
(6) VOCs sampled but not detected above laboratory reporting limits. Reporting limits varied as indicated in parentheses. For reporting limits for specific VOCs, refer to the lab reports from each sampling event (referenced in report text).
(7) **Environmental Risk Screening Levels**

OEHHA CHHSLs: California Human Health Screening Levels (CHHSLs) published by the California Environmental Protection Agency (CAL-EPA, January 2005, revised for Lead in September 2009):
"Use of California Human Health Screening Levels (CHHSLs) in Evaluation of Contaminated Properties."
Developed by the Office of Environmental Health Hazard Assessment (OEHHA), CHHSLs used to screen sites for human health concerns where chemical releases have occurred.

EPA Region 9 RSLs: Regional Screening Levels (RSLs) published by the Region 9, United States Environmental Protection Agency (USEPA, October 2004, November 2010, May 2013, November 2013):
RSLs provided are chemical-specific concentrations for individual contaminants in soil that may warrant further investigation or site cleanup.

DTSC HERO: Table 1. US EPA Region 9 Preliminary Remediation Goals (PRGs) (2004) and "Cal-Modified" 2004 US EPA Region 9 PRGs, California Department of Toxic Substances Control Office of Human and Ecological Risk, Human Health Risk Assessment Note Number: 3, May 21, 2013)

RWQCB ESLs: Environmental Screening Levels (ESLs) were taken from the San Francisco Bay Region, Regional Water Quality Control Board (RWQCB-SF):
"*Screening for Environmental Concerns at Sites With Contaminated Soil and Groundwater* ," Interim Final, November 2007, May 2008, Feb 2013, May 2013, December 2013.
For the purpose of this document, soil refers to any unlithified material in the unsaturated zone that is situated above the capillary fringe of the shallowest saturated unit.
"Shallow soil" defined as less than or equal to three (3) meters below ground surface. "Deep Soils" defined as greater than three (3) meters below ground surface. ESLs provided for scenario where groundwater IS considered a current or potential drinking water resource.
In the convention of the RWQCB, ESLs should be compared to chemical concentrations in soil reported on a dry-weight basis.

(8) **VOC Results from 2010 Investigation**
For most samples from the 2010 GEI investigation, results are provided from two different method analyses. The top result represents analysis by EPA Method 8260B of unpreserved soil.
The bottom result (presented in brackets) represents analysis by EPA Method 8260B, with soil preparation by Method 5035. These samples were analyzed beyond their specified hold time, as noted by the 'H' in the results.

H Sample was prepped or analyzed beyond the specified holding time.
[ ] EPA Method 8260B with preparation 5035.
81 **Bold** font indicates a detection above laboratory reporting limits
81 Highlighted gray indicates reported value is above the yellow shaded residential screening level
89 Highlighted yellow indicates the residential screening level used to highlight data gray

Table 2.
Groundwater Organic Analytical Results

Sample ID	Sample Date	Field Point	pH	PCBs	Total Petroleum Hydrocarbons, TPH			Volatile Organic Compounds, VOCs													Polyaromatic Hydrocarbons, PAHs		
					TPHg	TPHd	TPHmo	MTBE	CCl4	Chloroform	1,1-DCA	1,2-DCA	1,1-DCE	cis-1,2-DCE	PCE	TCE	CFC-11	CFC-113	Vinyl Chloride	Other VOCs	Naphthalene	Fluorene	Other PAHs
			SU	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
DP-02-WSP 2	09/28/09	WSP-2	8.16	ND (<0.53)	**130**	ND (<64)	ND (<380)	**1.7**	ND (<0.50)	**8.4**	**1.6**	**23**	**3.6**	**11**	**68**	**99**	**44**	**51**	**1.9**	ND (<0.50 to <50)	ND (<0.10)	ND (<0.10)	ND (<0.10)
DP-04-WSP 3 (1)	09/28/09	WSP-3	7.41	ND (<0.52)	**310**	**21,000**	**62,000**	ND (<0.50)	ND (<0.50)	**11**	ND (<0.50)	**21**	**0.97**	**3.2**	**310**	**24**	**30**	**19**	**0.83**	ND (<0.50 to <50)	ND (<0.11)	ND (<0.11)	ND (<0.11)
DP-04-WSP 4 (2)	09/28/09	WSP-4	7.49	ND (<0.62)	ND (<50)	ND (<72)	ND (<430)	ND (<0.50)	ND (<0.50)	**4.6**	ND (<0.50)	**4.7**	ND (<0.50)	ND (<0.50)	**29**	**0.65**	ND (<1.0)	ND (<0.50)	ND (<0.50)	ND (<0.50 to <50)	ND (<0.10)	ND (<0.10)	ND (<0.10)
B-5	11/22/10	B-5	7.39	ND (<0.55)	**250**	ND (<53)	ND (<320)	**1.9**	ND (<0.50)	**9.1**	**1.5**	**22**	**3.1**	**11**	**150**	**110**	**44**	**52**	**1.8**	ND (<0.50 to <50)	ND (<0.11)	**0.19**	ND (<0.11)
B-6	11/23/10	B-6	7.52	ND (<0.52)	**230**	ND (<52)	ND (<310)	**1.4**	ND (<0.50)	**9.1**	**1.4**	**23**	**3.0**	**9.9**	**120**	**93**	**44**	**50**	**1.6**	ND (<0.50 to <50)	ND (<0.10)	ND (<0.10)	ND (<0.10)
B-7	11/23/10	B-7	7.34	ND (<0.54)	**170**	ND (<51)	ND (<310)	**0.91**	**1.5**	**9.9**	**0.94**	**19**	**1.9**	**6.7**	**120**	**56**	**27**	**30**	**1.1**	ND (<0.50 to <50)	ND (<0.10)	**0.10**	ND (<0.10)
B-4 (8)	11/23/10	B-7	7.36	ND (<0.52)	**230**	ND (<52)	ND (<310)	**0.82**	**2.9**	**11**	**0.93**	**20**	**2.0**	**6.9**	**180**	**65**	**31**	**36**	**1.0**	ND (<0.50 to <50)	ND (<0.10)	**0.11**	ND (<0.10)
B-8	11/22/10	B-8	7.30	ND (<0.54)	**82**	ND (<51)	ND (<300)	ND (<0.50)	**48**	**21**	ND (<0.50)	**5.2**	ND (<0.50)	ND (<0.50)	**61**	**1.3**	ND (<1.0)	ND (<0.50)	ND (<0.50)	ND (<0.50 to <50)	ND (<0.11)	ND (<0.11)	ND (<0.11)
B-9	11/22/10	B-9	7.48 H	ND (<0.52)	ND (<50)	ND (<55)	ND (<330)	ND (<0.50)	**9.4**	**6.8**	ND (<0.50)	**4.9**	ND (<0.50)	ND (<0.50)	**52**	**0.56**	ND (<1.0)	ND (<0.50)	ND (<0.50)	ND (<0.50 to <50)	ND (<0.11)	ND (<0.11)	ND (<0.11)
B-10	11/22/10	B-10	7.48 H	ND (<0.59)	ND (<50)	ND (<55)	ND (<330)	ND (<0.50)	**2.3**	**3.1**	ND (<0.50)	**4.1**	ND (<0.50)	ND (<0.50)	**4.6**	**0.52**	ND (<1.0)	ND (<0.50)	ND (<0.50)	ND (<0.50 to <50)	ND (<0.11)	ND (<0.11)	ND (<0.11)
B-11	11/22/10	B-11	7.56	ND (<0.52)	**51**	ND (<53)	ND (<320)	ND (<0.50)	**9.9**	**6.8**	ND (<0.50)	**4.8**	ND (<0.50)	ND (<0.50)	**55**	**0.55**	ND (<1.0)	ND (<0.50)	ND (<0.50)	ND (<0.50 to <50)	ND (<0.14)	ND (<0.14)	ND (<0.14)
B-12	11/23/10	B-12	7.26	ND (<0.56)	ND (<250)	ND (<52)	ND (<310)	ND (<0.50)	**2.6**	**13**	ND (<0.50)	**11**	ND (<0.50)	**1.1**	**170**	**9.5**	**12**	**7.0**	ND (<0.50)	ND (<0.50 to <50)	**0.10**	ND (<0.10)	ND (<0.10)
B-13	11/23/10	B-13	7.49	ND (<0.52)	ND (<1,000)	ND (<51)	ND (<310)	ND (<10)	ND (<0.50)	**11**	**1.0**	**25**	**2.4**	**7.4**	**730**	**59**	**53**	**42**	**1.3**	ND (<0.50 to <50)	ND (<0.10)	ND (<0.10)	ND (<0.10)
B-14	11/23/10	B-14	7.54	ND (<0.53)	**220**	ND (<48)	ND (<290)	**1.2**	ND (<0.50)	**8.8**	**1.2**	**22**	**2.3**	**8.3**	**150**	**57**	**27**	**31**	**1.2**	ND (<0.50 to <50)	ND (<0.10)	ND (<0.10)	ND (<0.10)
B-15	01/20/11	B-15	NA	NA	ND (<2,500)	NA	NA	ND (<0.50)	ND (<0.50)	**2.7**	ND (<0.50)	**14**	ND (<0.50)	**1.1**	**1,600**	**9.5**	**11**	**2.7**	ND (<0.50)	ND (<0.50 to <50)	NA	NA	NA
B-2 (9)	01/20/11	B-15	NA	NA	ND (<2,500)	NA	NA	ND (<0.50)	ND (<0.50)	**2.7**	ND (<0.50)	**13**	ND (<0.50)	**1.1**	**1,700**	**10**	**14**	**3.5**	**0.52**	ND (<0.50 to <50)	NA	NA	NA
B-16 (3)	01/20/11	B-16	NA	NA	ND (<50)	NA	NA	**12**	**1.4**	**1.7**	ND (<0.50)	**7.7**	**0.59**	**2.3**	ND (<0.50)	**28**	ND (<1.0)	ND (<0.50)	ND (<0.50)	ND (<0.50 to <50)	NA	NA	NA
B-17	01/20/11	B-17	NA	NA	ND (<50)	NA	NA	ND (<0.50)	ND (<0.50)	ND (<1.0)	ND (<0.50)	**5.8**	ND (<0.50)	**1.1**	ND (<0.50)	ND (<0.50)	ND (<1.0)	ND (<0.50)	**4.9**	ND (<0.50 to <50)	NA	NA	NA
MW-1-GW	06/19/12	MW-1	NA	ND (<0.53)	**200**	ND (<52)	ND (<100)	**1.2**	**5.7**	**14**	**0.78**	**19**	**1.7**	**6.0**	**150**	**49**	**24**	**28**	**1.0**	ND (<0.50 to <50)	ND (<0.11)	ND (<0.11)	ND (<0.11)
MW-1A-GW (7)	06/19/12	MW-1	NA	ND (<0.52)	**200**	ND (<52)	ND (<100)	**1.3**	**5.0**	**14**	**0.79**	**18**	**1.8**	**5.7**	**140**	**49**	**24**	**28**	**1.1**	ND (<0.50 to <50)	ND (<0.10)	ND (<0.10)	ND (<0.10)
Environmental Risk Screening Levels (ESLs) (4)																							
Table F-1a ESLs for groundwater, where groundwater IS a current or potential source of drinking water				0.014	100	100	100	5	0.5	80	5	0.5	6	6	5	5	_	_	0.5	Varies by compound	6.1	3.9	Varies by compound
Table E-1 ESLs for groundwater, for Evaluation of Potential Vapor Intrusion				NE	NE	NE	NE	100,000	48	1,700	NE	1,000	130,000	26,000	640	1,300	_	_	18	Varies by compound	1,600	NE	NE
Maximum Contaminant Levels (MCLs) (5)																							
California Primary MCLs for Drinking Water				0.5	NE	NE	NE	13	0.5	NE	5	0.5	6	6	5	5	150	1,200	0.5	Varies by compound	NE	NE	Varies by compound
US EPA MCLs for Drinking Water				0.5	NE	NE	NE	NE	5	NE	NE	5	7	70	5	5	NE	NE	2	Varies by compound	NE	NE	Varies by compound
Regional Screening Levels (RSLs) (6)																							
USEPA Region 9 RSLs for Tap Water				Varies by compound	NE	NE	NE	12	0.39	0.19	2.4	0.15	260	28	9.7	0.44	1,100	53,000	0.015	Varies by compound	0.14	220	Varies by compound

Table Notes:

General:

µg/L: Micrograms per liter
ND (<1): Not detected at or above the laboratory reporting limit
NA: Not analyzed
NE: Not established

TPH: Total petroleum hydrocarbons
TPHg: Gasoline range organics (C5-C12)
TPHd: Desiel range organics (C10-C28)
TPHmo: Motor oil range organics (C24-C36)
VOCs: Volatile organic compounds (VOCs) by EPA Method 8260B
PAHs: Polyaromatic Hydrocarbons (PAHs) by EPA Method 8270C
PCBs: Polychlorinated Biphenyls (PCBs) by EPA Method 8082

MTBE: methyl-tert-butyl ether
cis-1,2-DCE: cis-1,2-Dichloroethene
1,2-DCA: 1,2-Dichloroethane
1,1-DCE: 1,1-Dichloroethene
1,1-DCA: 1,1-Dichloroethane

PCE: Tetrachloroethene
TCE: Trichloroethene
CCl4: Carbon tetrachloride
CFC-11: Trichlorofluoromethane
CFC-113: 1,1,2-Trichloro-1,2,2-trifluoroethane

Detailed:

1 Sample WSP-3 also contained, Toluene (0.56 µg/L), Phenanthrene (0.18 µg/L), Chrysene (0.30 µg/L), Fluoranthene (0.14 µg/L). Table F-1a ESLs for Toluene (40 ug/l), Phenanthrene (4.6 ug/l), Chrysene (0.35 ug/l), Fluoranthene (8 ug/l).
2 Sample WSP-4 also contained, Toluene (0.79 µg/L). Table F-1a ESLs for Toluene (40 ug/l)
3 Sample B-16 also contained, trans-1,2-Dichloroethene (0.51 µg/L). Table F-1a ESLs for trans-1,2-Dichloroethene (10 ug/l).
4 **Environmental Risk Screening Levels**
Environmental Screening Levels (ESLs) were taken from the San Francisco Bay Region, Regional Water Quality Control Board (RWQCB-SF):
"*Screening for Environmental Concerns at Sites With Contaminated Soil and Groundwater* ," Interim Final, November 2007, May 2008, Feb 2013, May 2013, December 2013.
ESLs for TPHg correspond to TPH (gasolines)
Table F-1a ESLs correspond to groundwater where groundwater IS a current or potential source of drinking water.
Table E-1 ESLs correspond to groundwater for Evaluation of Potential Vapor Intrusion at a Commercial/Industrial Land Use site.
5 Primary Maximum Contaminant Levels (MCLs) for Drinking Water per California Code of Regulations (CCR), Title 22, Chapter 15, Article 5, Section 64444.
6 Regional Screening Levels (RSLs) Tapwater Supporting Table published by the Region 9, United States Environmental Protection Agency (USEPA, October 2004, November 2010, May 2013, November 2013).
7 MW-1A-GW is a duplicate sample of MW-1-GW.
8 B-4 is a duplicate sample of B-7
9 B-2 is a duplicate sample of B-15
H Sample was prepped or analyzed beyond the specified holding time.

290 **Bold** font indicates a detection above laboratory reporting limits
290 Highlight value indicates reported value is above one or more environmental screening levels
0.5 Highlighted yellow indicates the screening level used to highlight data gray

Sample ID	Sample Date	Sample Depth ft bfs	Boring	Cadmium mg/kg	Chromium mg/kg	Lead mg/kg	Nickel mg/kg	Zinc mg/kg
DP-01(6.5-7.5)-WSP1	9/28/2009	6.5 to 7.5	WSP-1	ND (<0.32)	170	8.4	470	38
DP-02(12.5-13.5)-WSP1	9/28/2009	12.5 to 13.5	WSP-1	0.98	36	870	34	57
DP-03(15-16)-WSP1	9/28/2009	15.0 to 16.0	WSP-1	ND (<0.32)	41	4.4	44	30
DP-03(12.5-13.5)-WSP2	9/28/2009	12.5 to 13.5	WSP-2	ND (<0.32)	86	110	150	57
DP-01(8.5-9.5)-WSP3	9/28/2009	8.5 to 9.5	WSP-3	ND (<0.30)	43	54	65	32
DP-02(12.5-13.5)-WSP3	9/28/2009	12.5 to 13.5	WSP-3	ND (<0.32)	35	54	46	26
DP-03(15-16)-WSP3	9/28/2009	15.0 to 16.0	WSP-3	ND (<0.31)	37	4.0	42	28
DP-01(9-10)-WSP4	9/28/2009	9.0 to 10.0	WSP-4	ND (<0.30)	64	20	61	44
DP-02(12.5-13.5)-WSP4	9/28/2009	12.5 to 13.5	WSP-4	ND (<0.31)	82	24	110	40
DP-03(15-16)-WSP4	9/28/2009	15.0 to 16.0	WSP-4	ND (<0.33)	45	4.9	50	33
B-5 D 5.5-6.0	11/22/10	5.5 to 6.0	B-5	ND (<0.67)	760	6.9	1,700	46
B-5 D 7.5-8.0	11/22/10	7.5 to 8.0	B-5	ND (<0.68)	270	26	740	49
B-5 D 16-16.5	11/22/10	16.0 to 16.5	B-5	ND (<0.59)	66	8.0	91	47
B-6 D 3.5-4.0	11/23/10	3.5 to 4.0	B-6	ND (<0.66)	120	16	180	52
B-6 D 5.5-6.0	11/23/10	5.5 to 6.0	B-6	ND (<0.72)	800	6.8	2,200	53
B-6 D 7.5-8.0	11/23/10	7.5 to 8.0	B-6	ND (<0.68)	83	180	120	54
B-6 D 12.5-13.0	11/23/10	12.5 to 13.0	B-6	ND (<0.58)	44	5.5	51	32
B-7 D 5.5-6.0	11/23/10	5.5 to 6.0	B-7	ND (<0.61)	480	7.6	1,100	49
B-7 D 7.5-8.0	11/23/10	7.5 to 8.0	B-7	0.85	92	27	78	92
B-7 D 11.5-12.0	11/23/10	11.5 to 12.0	B-7	ND (<0.57)	71	7.4	65	39
B-7 D 8.5-9.0	11/23/10	8.5 to 9.0	B-7	ND (<0.63)	77	13	78	46
B-8 D 5.5-6.0	11/22/10	5.5 to 6.0	B-8	ND (<0.59)	60	4.7	86	52
B-8 D 7.5-8.0	11/22/10	7.5 to 8.0	B-8	ND (<0.80)	96	13	60	68
B-8 D 13.5-14.0	11/22/10	13.5 to 14.0	B-8	ND (<0.56)	57	8.1	83	40
B-9 D 5.0-5.5	11/22/10	5.0 to 5.5	B-9	ND (<0.57)	360	7.3	900	44
B-9 D 7.5-8.0	11/22/10	7.5 to 8.0	B-9	ND (<0.75)	81	140	67	59
B-9 D 13.5-14.0	11/22/10	13.5 to 14.0	B-9	ND (<0.58)	56	6.7	56	36
Background References [1]								
Scott (1995)*				NE	51.28 (30.5 to 72)	11.43 (6.8 to 16.1)	73.53 (46.4 to 101)	65.27 (47.7 to 82.8)
Bradford et al (1996)**				0.73 (0.05 to 1.70)	49 (23 to 1,579)	21.1 (12.4 to 97.1)	41 (9 to 509)	122 (88 to 236)
Environmental Risk Screening Levels [2]								
OEHHA CHHSLs (Residential Land Use)				1.7	100,000 [3]	80	1,600	23,000
OEHHA CHHSLs (Commercial/Industrial Land Use)				7.5	100,000 [3]	320	16,000	100,000
DTSC HERO PRGs (Residential Soil)				4.0	NE	80	NE	NE
DTSC HERO PRGs (Industrial Soil)				5.1	NE	320	NE	NE

Sample ID	Sample Date	Sample Depth ft bfs	Boring	Cadmium mg/kg	Chromium mg/kg	Lead mg/kg	Nickel mg/kg	Zinc mg/kg
B-10 D 5.5-6.0	11/22/10	5.5 to 6.0	B-10	ND (<0.67)	430	9.2	980	46
B-10 D 8.0-8.5	11/22/10	8.0 to 8.5	B-10	ND (<0.69)	73	11	72	47
B-10 D 13.5-14.0	11/22/10	13.5 to 14.0	B-10	ND (<0.58)	44	5.2	44	29
B-11 D 6.0-6.5	11/22/10	6.0 to 6.5	B-11	ND (<0.58)	78	11	130	48
B-11 D 7.5-8.0	11/22/10	7.5 to 8.0	B-11	1.4	110	280	55	110
B-11 D 16.0-16.5	11/22/10	16.0 to 16.5	B-11	ND (<0.55)	53	5.8	53	32
B-12 D 5.5-6.0	11/23/10	5.5 to 6.0	B-12	ND (<0.57)	240	9.5	770	40
B-12 D 8.0-8.5	11/23/10	8.0 to 8.5	B-12	ND (<0.80)	87	110	84	80
B-12 D 13.5-14.0	11/23/10	13.5 to 14.0	B-12	ND (<0.59)	49	5.8	60	35
B-13 D 5.5-6.0	11/23/10	5.5 to 6.0	B-13	ND (<0.53)	320	6.1	1,100	33
B-13 D 8.0-8.5	11/23/10	8.0 to 8.5	B-13	0.80	61	24	49	50
B-3 D 8.0-8.5[5]	11/23/10	8.0 to 8.5	B-13	ND (<0.61)	51	8.8	50	54
B-13 D 13.5-14.0	11/23/10	13.5 to 14.0	B-13	ND (<0.57)	43	6.7	50	35
B-14 D 5.5-6.0	11/23/10	5.5 to 6.0	B-14	ND (<0.59)	240	8.4	570	42
B-3 D 5.5-6.0[6]	11/23/10	5.5 to 6.0	B-14	ND (<0.65)	460	4.4	1,400	49
B-14 D 8.0-8.5	11/23/10	8.0 to 8.5	B-14	0.63	66	330	65	88
B-14 D 10-10.5	11/23/10	10 to 10.5	B-14	ND (<0.60)	47	8.2	50	31
B-3 D 10.0-10.5[7]	11/23/10	10 to 10.5	B-14	ND (<0.60)	44	5.8	48	28
B-14 D 14.0-14.5	11/23/10	14.0 to 14.5	B-14	ND (<0.59)	39	5.6	50	31
MW-1D6.0	01/20/11	6.0 to 6.5	MW-1	ND (<0.64)	180	NA	340	57
MW-1D7.5	01/20/11	7.5 to 8.0	MW-1	1.5	110	NA	91	85
MW-1D8.5	01/20/11	8.5 to 9.0	MW-1	ND (<0.58)	53	NA	53	30
MW-1D20[4]	01/20/11	8.0 to 8.5	MW-1	ND (<0.63)	95	NA	150	60
Sitewide Arithmetic Mean				0.1232	143.7	54.2	300.82	47.66
Scott (1995)				NE	51.28 (30.5 to 72)	11.43 (6.8 to 16.1)	73.53 (46.4 to 101)	65.27 (47.7 to 82.8)
Bradford et al (1996)				0.73 (0.05 to 1.70)	49 (23 to 1,579)	21.1 (12.4 to 97.1)	41 (9 to 509)	122 (88 to 236)
OEHHA CHHSLs (Residential Land Use)				1.7	100,000 [3]	80	1,600	23,000
OEHHA CHHSLs (Commercial/Industrial Land Use)				7.5	100,000 [3]	320	16,000	100,000
OEHHA CHHSLs (Residential Land Use)				4.0	NE	80	NE	NE
OEHHA CHHSLs (Commercial/Industrial Land Use)				5.1	NE	320	NE	NE

General Notes:

Sample Depth:	Sample depth in feet below top of floor surface, feet bfs	ND (<1.0):	Not detected at or above the laboratory reporting limit
mg/kg:	Milligrams per kilogram, 09/09 data reported as wet weight, 11/2010 data reported as dry-weight corrected	NE:	Not established
Laboratory/Lab Methods:	TestAmerica Laboratories, Inc., Pleasanton, California (CAELAP #2496); EPA Method 6010B		

Detail Notes:

(1) **References for background metal concentrations as follows:**
Lawrence Berkeley National Laboratory (1995): *"Protocol for Determining Background Concentrations of Metals in Soil at Lawrence Berkeley National Laboratory (LBNL)* ,"
A Joint Effort of Environment, Health and Safety Division, Lawrence Berkeley National Laboratory, University of California, Berkeley, CA. August 1995.

* Scott, Christina M. (1995): *"Background Metal Concentrations in Soils in Northern Santa Clara County, California,"* in: "Recent Geologic Studies in the San Francisco Bay Area,"
Top value represents average concentration from between 104 and 158 samples collected, and is used for comparison to site data. The range of values is presented in parentheses.

** Bradford, G. R., Chang, A. C., Page, A. L., Bakhtar, D., Frampton, J. A. and Wright, H. (1996): *"Background Concentrations of Trace and Major Elements in California Soils,"*
Kearney Foundation Special Report, Kearney Foundation of Soil Science, Division of Agriculture and Natural Resources, University of California, March 1996
Report covers soils over the entire state of California. For Tanklage Square site location, soil #49 from the report was used: Venice soil series from San Joaquin County, "Eric, thermic, Typic Medihemists" soils.
The range shown in parentheses reflects CA-wide range of values.

(2) Environmental Risk Screening Levels
OEHHA CHHSLs: California Human Health Screening Levels (CHHSLs) published by the California Environmental Protection Agency (CAL-EPA, January 2005, revised for Lead in September 2009):
"Use of California Human Health Screening Levels (CHHSLs) in Evaluation of Contaminated Properties."
Developed by the Office of Environmental Health Hazard Assessment (OEHHA), CHHSLs used to screen sites for human health concerns where chemical releases have occurred.
DTSC HERO: Table 1. RSL Calculator Risk-based Concentration Preliminary Remediation Goals (PRGs), California Department of Toxic Substances Control Office of Human and Ecological Risk, Human Health Risk Assessment Note Number: 3, May 21, 2013)

(3) Chromium (III)
(4) Sample MW-1D20 is a duplicate sample of MW-1D7.5
(5) Sample B-3 D 8.0-8.5 is a duplicate sample of B-13 D 8.0-8.5
(6) Sample B-3 D 5.5-6.0 is a duplicate sample of B-14 D 5.5-6.0
(7) Sample B-3 D 10.0-10.5 is a duplicate sample of B-14 D 10-10.5

290	**Bold** font indicates a detection above laboratory reporting limits
81	Highlighted gray indicates reported value is above the reported background concentration range AND the yellow shaded residential screening level
89	Highlighted yellow indicates the residential screening level used to higlight data gray

Table 4.
Groundwater Dissolved Metals Analytical Results

837 Industrial Road, San Carlos, CA

Sample ID	Sample Date	Boring	Cadmium	Chromium	Lead	Nickel	Zinc
			µg/l	µg/l	µg/l	µg/l	µg/l
B-5	11/22/10	B-5	ND (<2.0)	ND (<10)	ND (<5.0)	ND (<10)	ND (<20)
B-6	11/22/10	B-6	ND (<2.0)	ND (<10)	ND (<5.0)	ND (<10)	**22**
B-7	11/23/10	B-7	ND (<2.0)	ND (<10)	ND (<5.0)	ND (<10)	**23**
B-7 DUP (B-4)	11/23/10	B-7	ND (<2.0)	ND (<10)	ND (<5.0)	ND (<10)	**23**
B-8	11/22/10	B-8	ND (<2.0)	**21**	ND (<5.0)	**33**	ND (<20)
B-9	11/22/10	B-9	ND (<2.0)	ND (<10)	ND (<5.0)	ND (<10)	ND (<20)
B-10	11/22/10	B-10	ND (<2.0)	ND (<10)	ND (<5.0)	ND (<10)	ND (<20)
B-11	11/22/10	B-11	ND (<2.0)	ND (<10)	ND (<5.0)	ND (<10)	ND (<20)
B-12	11/23/10	B-12	ND (<2.0)	ND (<10)	ND (<5.0)	ND (<10)	**21**
B-13	11/23/10	B-13	ND (<2.0)	ND (<10)	ND (<5.0)	ND (<10)	**23**
B-14	11/23/10	B-14	ND (<2.0)	ND (<10)	ND (<5.0)	ND (<10)	**21**
MW-1-GW	06/19/12	MW-1	ND (<2.0)	ND (<10)	NA	ND (<10)	ND (<20)
MW-1A-GW (1)	06/19/12	MW-1	ND (<2.0)	ND (<10)	NA	ND (<10)	ND (<20)
Environmental Screening Levels (2)							
RWQCB ESLs (Table F-1a, Groundwater Potential Source of Drinking Water)			0.25	180 (4)	2.5	8.2	81
California MCLs			5 (3)	50 (3)	15 (5)	100 (3)	NE

General Notes: Laboratory/Lab Methods: TestAmerica Laboratories, Inc., Pleasanton, California (CAELAP #2496); EPA Method 6010B

µg/l Micrograms per liter (parts per billion equivalent)
ND (<1.0): Not detected at or above the laboratory reporting limit
NA: Not analyzed

Detail Notes:

(1) Sample MW-1A-GW is a duplicate sample of MW-1-GW.

(2) **Environmental Risk Screening Levels**
RWQCB E Environmental Screening Levels (ESLs) were taken from the San Francisco Bay Region, Regional Water Quality Control Board (RWQCB-SF):
Screening for Environmental Concerns at Sites With Contaminated Soil and Groundwater, Interim Final, November 2007, May 2008, Feb 2013, May 2013, December 2013.

California Maximum Contaminant Levels (MCLs) in Drinking Water. California Code of Regulation Title 22. Division 4. Environmental Health Chapter 15. Domestic Water Quality and Monitoring Regulations.

(3) Primary MCL
(4) Chromium (III)
(5) Regulatory Action Level

23 **Bold** font indicates a detection above laboratory reporting limits
7.5 Highlighted yellow indicates the screening level used to highlight data gray

Table 5. Summary of ARARs and TBCs

Standard, Requirement, Criteria, Limitation	Citation	Description	Type of ARAR / TBC
Federal			
Clean Air Act	42 USC 7401-7642	Emission standards from stationary and mobile sources.	Chemical
Hazardous Waste Identification	40 CFR 261.24	Establishes criteria to determine whether solid waste exhibits hazard characteristics of toxicity.	Chemical
National Primary and Secondary Ambient Air Quality Standards (NAAQS)	40 CFR Part 150	Establishes NAAQS for criteria pollutants: particulate matter (PM10), sulfur dioxide, carbon monoxide, nitrogen dioxide, ozone, and lead.	Chemical
Toxic Substance Control Act	40 CFR 761, Subpart G	Federally managed law that regulates the manufacture, use, distribution in commerce, and disposal of chemical substances, specifically polychlorinated biphenyls (PCB).	Chemical
Hazardous Materials Transportation, Marking, Labeling and Placarding	US Department of Transportation (DOT) 49 USC 1802, et seq. and 49 CFR 171 and 172	Provides standards for marking, labeling, placarding, and transportation of waste.	Action
National Pollutant Discharge Elimination System (NPDES)	40 CFR Parts 122-124	Establishes requirements to ensure storm water discharges do not contribute to a violation of surface water quality standards.	Action
Occupational Health and Safety	29 CFR 1910.120	Establishes requirements for health and safety training.	Action
Transport of Hazardous Waste	40 CFR 263 and 49 CFR 100-185	Standards applicable to transporters of hazardous waste.	Action
Clean Water Act	33 USC 1251	Establishes regulatory and non-regulatory tools to sharply reduce direct pollutant discharges into waterways, finance municipal wastewater treatment facilities, and manage polluted runoff. Establishes ambient water quality criteria. Establishes Section 404 permitting requirements and Section 401 certification requirements for navigable waters.	Chemical/ Action
Classification and regulation of hazardous waste	40 CFR 260	Establishes criteria for the determination of hazardous waste and its regulation.	Chemical/ Action
USEPA "Superfund" Program	Comprehensive, Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) (US 1986). Part of the National Contingency Plan (NCP; US 1994)	Provides federal authority to respond to abandoned or uncontrolled hazardous waste disposal sites as well as to incidents involving hazardous substances, also provides for liability, compensation, cleanup, and emergency response in connection with cleanup of these "Superfund" sites.	Chemical/ Action
Resource Conservation and Recovery Act (RCRA)	42 USC 6901 et seq.	Classifies and regulates hazardous wastes and facilities which treat, store and dispose of hazardous materials.	Chemical/ Action
Health Risk Assessment	US EPA, Risk Assessment Guidance for Superfund, 1989	Guidance and framework to assess health risk.	TBC
EPA Regional Screening Levels	USEPA, Region 9, May 2013	Establishes screening levels for chemical contamination at hazardous waste sites.	TBC
State and Local			
Determination of Characteristic Wastes	22 CCR 66261.24	Establishes criteria for identifying characteristic wastes.	Chemical
Ambient Air Quality Standards	H&S Sec. 39000-44071	Establishes standards for emissions of chemical vapors and dust.	Chemical
Safe Drinking Water and Toxics Enforcement Act (Proposition 65)	22 CCR 12000	Warning requirements for toxic chemicals.	Chemical
Hazardous Waste Control	Health and Safety Code, Chapter 6.5, Sec. 25100-25250.26	Establishes hazardous waste control measures.	Action
Hazardous Waste Generator Requirements	22 CCR 66262.11 et seq.	Establishes standards applicable to generators of hazardous waste.	Action
Transportation of Hazardous Waste	22 CCR Chapter 13	Governs transportation of hazardous materials	Action
Occupational Health and Safety	8 CCR Sect. 1500, 2300, and 3200 et seq.	Establishes standards for working conditions and employees matter; and notification requirements.	Action
California Environmental Quality Act	Public Resources Code Section 21000-21177	Mandates environmental impact review of projects approved by governmental agencies.	Action
Hazardous Substances Account Act	Health and Safety Code, Chapter 6.8, Sec 25300-25395.15	Establishes site mitigation and cost recovery programs.	Action
Emission Standard	BAAQMD Regulation 6	Regulation 6 establishes emission standards for particulate matter.	Action
DTSC Policies and Procedures	DTSC	Applicable policies, procedures, management memos and related guidance documents including, but limited to, document numbers EO-92-MM, EO-95-007-PP, OPP 92-1, OPP 87-14, and OPP 86-22R.	Action
State Fire Marshal, Basic Operational Requirements	Title 19 CCR, Division 1, Chapter 1, Article 1	Establishes minimum standards for the prevention of fire and for the protection of life and property against fire, explosion and panic.	Action
Standards for Discharges of Waste to Land	Title 23 CCR, Division 3, Chapter 15, Article 1, Section 2511(d) and Articles 2, 8, and 9.	Exempts from Chapter 15 actions taken by a public agency to clean up waste, provided that waste removed from place of release shall be discharged according to the Article 2.	Action

Porter-Cologne Water Quality Control Act	Title 23 CCR, Division 3, Chapter 15, Article 2; Waste Classification and Management	Establishes/defines procedures and criteria for classification and management of waste.	Chemical/ Action
Determination of Hazardous Waste	22 CCR 66260.1 et seq.	Establishes criteria for determining waste classification for the purposes of transportation and disposal of wastes.	Chemical/ Action
Land Disposal Restrictions	22 CCR Chapter 18	Identifies hazardous waste restricted from land disposal unless specific treatment standards are met.	Chemical/ Action
Land Use Covenants	22 CCR Chapter 39, Division 4.5, Section 67391.1	Specify that a land use covenant imposing appropriate limitations on land use shall be executed and recorded when hazardous materials, hazardous wastes or constituents, or hazardous substances will remain at the property at levels which are not suitable for unrestricted use of the land.	Chemical/ Action
State Water Resources Control Board Non-Degradation Policy	Resolution 68-16 of the Basin Plan for San Francisco Bay	Limits water pollution to existing high quality waters.	Location
Stockpiling Requirements of Contaminated Soil	H&S Sec. 25123.3(a)(20)	Establishes standards for stockpiling of non-RCRA contaminated soil.	Location
Water Quality Control for the San Francisco Bay Basin	RWQCB	Establishes water quality objectives for the San Francisco Bay.	Location
Regional Water Quality Control Board (RWQCB)	RWQCB	Adopts narrative standards and permissible concentrations of organic and inorganic chemicals for surface water, groundwater, point sources and non-point sources. Establishes beneficial uses of surface waters and groundwater.	Location
NPDES Permit	NPDES (National Pollutant Discharge Elimination System)	The State Water Resources Control Board (SWRCB), as part of the National Pollutant Discharge Elimination System (NPDES), has adopted a statewide NPDES General Permit for Stormwater Discharges Associated with Construction Activity (General Permit) to address discharges of storm water runoff from construction projects that encompass one acre or more in total acreage of soil disturbances.	TBC
Cal OSHA	8 CCR 5192	Requires workers involved in hazardous substance operations associated with cleanup of sites perform the cleanup operations in accordance with Cal OSHA health and safety requirements.	TBC
RWQCB Environmental Screening Levels	Screening For Environmental Concerns at Sites with Contaminated Soil and Ground water (Interim Final) RWQCB May 2013	Establishes screening levels for contaminants at hazardous waste sites.	TBC
California Human Health Screening Levels (CHHSLs)	Use of California Human Health Screening Levels (CHHSLs) in Evaluation of Contaminated Properties September 2010	Used to screen sites for potential human health concerns where releases of hazardous chemicals to soils have occurred.	TBC

Table 6. Summary of ARARs and TBCs

Standard, Requirement, Criteria, Limitation	Citation	Description	Type of ARAR / TBC
Federal			
Clean Air Act	42 USC 7401-7642	Emission standards from stationary and mobile sources.	Chemical
Hazardous Waste Identification	40 CFR 261.24	Establishes criteria to determine whether solid waste exhibits hazard characteristics of toxicity.	Chemical
National Primary and Secondary Ambient Air Quality Standards (NAAQS)	40 CFR Part 150	Establishes NAAQS for criteria pollutants: particulate matter (PM10), sulfur dioxide, carbon monoxide, nitrogen dioxide, ozone, and lead.	Chemical
Toxic Substance Control Act	40 CFR 761, Subpart G	Federally managed law that regulates the manufacture, use, distribution in commerce, and disposal of chemical substances, specifically polychlorinated biphenyls (PCB).	Chemical
Hazardous Materials Transportation, Marking, Labeling and Placarding	US Department of Transportation (DOT) 49 USC 1802, et seq. and 49 CFR 171 and 172	Provides standards for marking, labeling, placarding, and transportation of waste.	Action
National Pollutant Discharge Elimination System (NPDES)	40 CFR Parts 122-124	Establishes requirements to ensure storm water discharges do not contribute to a violation of surface water quality standards.	Action
Occupational Health and Safety	29 CFR 1910.120	Establishes requirements for health and safety training.	Action
Transport of Hazardous Waste	40 CFR 263 and 49 CFR 100-185	Standards applicable to transporters of hazardous waste.	Action
Clean Water Act	33 USC 1251	Establishes regulatory and non-regulatory tools to sharply reduce direct pollutant discharges into waterways, finance municipal wastewater treatment facilities, and manage polluted runoff. Establishes ambient water quality criteria. Establishes Section 404 permitting requirements and Section 401 certification requirements for navigable waters.	Chemical/ Action
Classification and regulation of hazardous waste	40 CFR 260	Establishes criteria for the determination of hazardous waste and its regulation.	Chemical/ Action
USEPA "Superfund" Program	Comprehensive, Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) (US 1986). Part of the National Contingency Plan (NCP; US 1994)	Provides federal authority to respond to abandoned or uncontrolled hazardous waste disposal sites as well as to incidents involving hazardous substances, also provides for liability, compensation, cleanup, and emergency response in connection with cleanup of these "Superfund" sites.	Chemical/ Action
Resource Conservation and Recovery Act (RCRA)	42 USC 6901 et seq.	Classifies and regulates hazardous wastes and facilities which treat, store and dispose of hazardous materials.	Chemical/ Action
Health Risk Assessment	US EPA, Risk Assessment Guidance for Superfund, 1989	Guidance and framework to assess health risk.	TBC
EPA Regional Screening Levels	USEPA, Region 9, May 2013	Establishes screening levels for chemical contamination at hazardous waste sites.	TBC
State and Local			
Determination of Characteristic Wastes	22 CCR 66261.24	Establishes criteria for identifying characteristic wastes.	Chemical
Ambient Air Quality Standards	H&S Sec. 39000-44071	Establishes standards for emissions of chemical vapors and dust.	Chemical
Safe Drinking Water and Toxics Enforcement Act (Proposition 65)	22 CCR 12000	Warning requirements for toxic chemicals.	Chemical
Hazardous Waste Control	Health and Safety Code, Chapter 6.5, Sec. 25100-25250.26	Establishes hazardous waste control measures.	Action
Hazardous Waste Generator Requirements	22 CCR 66262.11 et seq.	Establishes standards applicable to generators of hazardous waste.	Action
Transportation of Hazardous Waste	22 CCR Chapter 13	Governs transportation of hazardous materials	Action
Occupational Health and Safety	8 CCR Sect. 1500, 2300, and 3200 et seq.	Establishes standards for working conditions and employees matter; and notification requirements.	Action
California Environmental Quality Act	Public Resources Code Section 21000-21177	Mandates environmental impact review of projects approved by governmental agencies.	Action
Hazardous Substances Account Act	Health and Safety Code, Chapter 6.8, Sec 25300-25395.15	Establishes site mitigation and cost recovery programs.	Action
Emission Standard	BAAQMD Regulation 6	Regulation 6 establishes emission standards for particulate matter.	Action
DTSC Policies and Procedures	DTSC	Applicable policies, procedures, management memos and related guidance documents including, but limited to, document numbers EO-92-MM, EO-95-007-PP, OPP 92-1, OPP 87-14, and OPP 86-22R.	Action
State Fire Marshal, Basic Operational Requirements	Title 19 CCR, Division 1, Chapter 1, Article 1	Establishes minimum standards for the prevention of fire and for the protection of life and property against fire, explosion and panic.	Action
Standards for Discharges of Waste to Land	Title 23 CCR, Division 3, Chapter 15, Article 1, Section 2511(d) and Articles 2, 8, and 9.	Exempts from Chapter 15 actions taken by a public agency to clean up waste, provided that waste removed from place of release shall be discharged according to the Article 2.	Action

Porter-Cologne Water Quality Control Act	Title 23 CCR, Division 3, Chapter 15, Article 2; Waste Classification and Management	Establishes/defines procedures and criteria for classification and management of waste.	Chemical/ Action
Determination of Hazardous Waste	22 CCR 66260.1 et seq.	Establishes criteria for determining waste classification for the purposes of transportation and disposal of wastes.	Chemical/ Action
Land Disposal Restrictions	22 CCR Chapter 18	Identifies hazardous waste restricted from land disposal unless specific treatment standards are met.	Chemical/ Action
Land Use Covenants	22 CCR Chapter 39, Division 4.5, Section 67391.1	Specify that a land use covenant imposing appropriate limitations on land use shall be executed and recorded when hazardous materials, hazardous wastes or constituents, or hazardous substances will remain at the property at levels which are not suitable for unrestricted use of the land.	Chemical/ Action
State Water Resources Control Board Non-Degradation Policy	Resolution 68-16 of the Basin Plan for San Francisco Bay	Limits water pollution to existing high quality waters.	Location
Stockpiling Requirements of Contaminated Soil	H&S Sec. 25123.3(a)(20)	Establishes standards for stockpiling of non-RCRA contaminated soil.	Location
Water Quality Control for the San Francisco Bay Basin	RWQCB	Establishes water quality objectives for the San Francisco Bay.	Location
Regional Water Quality Control Board (RWQCB)	RWQCB	Adopts narrative standards and permissible concentrations of organic and inorganic chemicals for surface water, groundwater, point sources and non-point sources. Establishes beneficial uses of surface waters and groundwater.	Location
NPDES Permit	NPDES (National Pollutant Discharge Elimination System)	The State Water Resources Control Board (SWRCB), as part of the National Pollutant Discharge Elimination System (NPDES), has adopted a statewide NPDES General Permit for Stormwater Discharges Associated with Construction Activity (General Permit) to address discharges of storm water runoff from construction projects that encompass one acre or more in total acreage of soil disturbances.	TBC
Cal OSHA	8 CCR 5192	Requires workers involved in hazardous substance operations associated with cleanup of sites perform the cleanup operations in accordance with Cal OSHA health and safety requirements.	TBC
RWQCB Environmental Screening Levels	Screening For Environmental Concerns at Sites with Contaminated Soil and Ground water (Interim Final) RWQCB May 2013	Establishes screening levels for contaminants at hazardous waste sites.	TBC
California Human Health Screening Levels (CHHSLs)	Use of California Human Health Screening Levels (CHHSLs) in Evaluation of Contaminated Properties September 2010	Used to screen sites for potential human health concerns where releases of hazardous chemicals to soils have occurred.	TBC

APPENDICES

Appendix A: Photos

Photos of Work Performed by ERS

November 2012

Repairs to Southeast Wall of Restroom in Suite E

Toilet was removed, flooring covered, and drywall cut to provide access to the trench

Once drywall removed, small amount of tar-like substance visible under insulation

Tar-like substance

Removing insullation around pipe to allow clean up

Pipes and concrete-covered trench exposed

Small amount of tar-like substance along rear wall

Tar-like substance was removed and fresh concrete poured to seal area around pipes

Fresh concrete

New drywall installed, flooring uncovered and toilet re-installed

Photos of Work Performed by Superior Coring and Cutting, Inc.

12.5.2012

Concrete Cores Collected from Warehouse Area of Suite E (See **Figure 4**)

CC-1: concrete cored in area of brown staining to see if tar-like substance has seeped into the area

CC-1

CC-1

CC-1

CC-2: cored adjacent to crack in concrete floor with black staining evident

CC-2

CC-3: cored along crack in concrete floor with black staining evident

CC-3

CC-3

Photos of Concrete Covered Trench and Access Plates

8.21.2013

Sump with concrete plate, located in electrical room

Concrete covered trench with access plate (Suite D)

Access plate (Suite D)

Access plaste (Suite D)

Access plate with tar-like substance visible in trench (Suite D)

Appendix B – 95% UCL Calculation for Lead

95% UCL Calculation for Lead

837 Industrial Road, San Carlos, CA

	All Data	Without DP-02(12.5-13.5)-WSP2
n	46	45
sq rt of n	6.78	6.71
mean	54	36
stddev	141	70
t value	2.01	2.01
95% UCL	96	57

Appendix C: Cost Analyses for Removal Action Alternatives 2 and 3

Cost Analysis for Alternative 2: Soil Excavation and Removal				
Task	**Unit**	**Quantity**	**Unit Cost**	**Total**
Task 1: Pre-Field Activities				
Mark Excavation Area for utility clearance	HR	4	$95.00	$380.00
Private utility locator	LS	1	$500.00	$500.00
Acquire USA Ticket	HR	1	$95.00	$95.00
Acquire Permits	LS	1	$4,000.00	$4,000.00
Project Management	HR	20	$125.00	$2,500.00
Subtotal				**$7,475.00**
Task 2: Building Preparation				
Soils engineer fees	LS	1	$3,450.00	$3,450.00
Utilities management (temporary power lines, fire line support, re-direct phone/data lines, on-site generator)	LS	1	$78,000.00	$78,000.00
Dismantle interior walls & remove concrete floors / slab	LS	1	$11,800.00	$11,800.00
Structural engineer fees	LS	1	$5,750.00	$5,750.00
Subtotal				**$99,000.00**
Task 3: Excavation and Backfill				
Excavate soils to approx. depth of 12 feet beneath building (includes shoring and sewer line support)	LS	1	$38,700.00	$38,700.00
Excavate soils to approx. depth of 12 feet beneath parking lot (includes protection of several utilities present beneath excavation area)	LS	1	$74,300.00	$74,300.00
Shoring of excavation walls and building	LS	1	$232,375.00	$232,375.00
Stockpile top 7ft of soil for re-use as backfill[1]	LS	1	$10,000.00	$10,000.00
Backfill excavations with stockpiled material and quarried base rock material and compact to 90% compaction	LS	1	$73,800.00	$73,800.00
Quarried base rock material cost	YD	700	$33.00	$23,100.00
Restoration of sidewalk & landscaping	LS	1	$20,000.00	$20,000.00
Subtotal				**$472,275.00**
Task 4: Confirmation Sampling				
Sample soil from excavation walls and floor. Analyze for TPHd, TPHmo, PCB-1260, and lead.	EA	20	$140.00	$2,800.00
Subtotal				**$2,800.00**
Task 5: Building Repair				
Resurface interior excavation with reinforced concrete	LS	1	$31,500.00	$31,500.00
Resurface exterior excavation with asphalt	LS	1	$1,000.00	$1,000.00
Site clean-up	LS	1	$4,100.00	$4,100.00
Replace and refinish interior walls, ceiling and flooring	SQ FT	900	$150.00	$135,000.00
Engineer fees	LS	1	$5,000.00	$5,000.00
Replace utility room electrical and phone to code	LS	1	$75,000.00	$75,000.00
Subtotal				**$251,600.00**
Task 6: Transportation and Disposal				
Top 7 feet of soil [1]	TON	0	$0.00	$0.00
Bottom 6 feet of soil (Class II Non-Haz)[2]	TON	1,120	$41.00	$45,920.00
Bottom 6 feet of soil (Class I Hazardous)[3]	TON	280	$131.00	$36,680.00
Subtotal				**$82,600.00**

Task	Unit	Quantity	Unit Cost	Total
Task 7: Reporting				
CAD	HR	25	$75.00	$1,875.00
Geologist	HR	60	$125.00	$7,500.00
QA/QC	HR	10	$150.00	$1,500.00
Project Management	HR	10	$150.00	$1,500.00
Subtotal				**$12,375.00**
			contractor mark up	*$50,000.00*
TOTAL				**$978,125.00**

Table notes:

[1] Significant concentrations of COCs are not observed until 7.5 feet below top surface.

[2] Based on analysis of soil samples to date and classification of soils previously removed from the site, it is assumed that approximately 80% of the soils below 7 feet depth will be classified as Class II non-hazardous waste. Assumes 1.5 tons/yard.

[3] It is assumed that approximately 20% of the soils removed from below 7 feet depth will be classified as Class I hazardous waste. Assumes 1.5

Cost Analysis for Alternative 3: Operation and Maintenance				
Task	**Unit**	**Quantity**	**Unit Cost**	**Total**
Task 1: Operation and Maintenance Plan				
CAD	HR	20	$75.00	$1,500.00
Geologist	HR	50	$125.00	$6,250.00
QA/QC	HR	10	$150.00	$1,500.00
Project Management	HR	5	$150.00	$750.00
Subtotal				**$10,000.00**
Task 2: Annual Sump Maintenance				
Project Management	HR	8	$150.00	$1,200.00
Geologist	HR	12	$125.00	$1,500.00
Environmental Contractor	LS	2	$1,000.00	$2,000.00
Waste Removal	LS	2	$150.00	$300.00
Subtotal (annual)				**$5,000.00**
Subtotal (net 5 years)				**$25,000.00**
Task 3: Groundwater Sampling and Visual Inspections				
Pre-field activities & preparation	HR	10	$95.00	$950.00
GW Sampling Contractor to sample MW-1	LS	2	$500.00	$1,000.00
Field Support Services	HR	6	$95.00	$570.00
Lab analyses of GW samples (TPHd, TPHmo, PCB-1260, lead)	EA	4	$140.00	$560.00
Transportation & disposal of GW sampling drum	EA	2	$150.00	$300.00
Removal/disposal of observed tar-like substance	LS	1	$1,000.00	$1,000.00
Subtotal (annual)				**$4,380.00**
Subtotal (net 5 years)				**$21,900.00**
Task 4: Reporting				
Task 4a: Operation and Maintenance Reporting				
CAD	HR	8	$75.00	$600.00
Geologist	HR	30	$125.00	$3,750.00
QA/QC	HR	4	$150.00	$600.00
Project Management	HR	6	$150.00	$900.00
Task 4b: Five Year Review Report				
CAD	HR	16	$75.00	$1,200.00
Geologist	HR	50	$125.00	$6,250.00
QA/QC	HR	8	$150.00	$1,200.00
Project Management	HR	6	$150.00	$900.00
Subtotal (annual)				**$5,850.00**
Subtotal (net 5 years)				**$15,400.00**
	contractor mark up			*$700.00*
5-year Total Cost				**$73,000.00**

Appendix D – DTSC's Responsiveness Summary (October 2014)

Department of Toxic Substances Control

Matthew Rodriquez
Secretary for
Environmental Protection

Miriam Barcellona Ingenito
Acting Director
700 Heinz Avenue
Berkeley, California 94710-2721

Edmund G. Brown Jr.
Governor

Responsiveness Summary
Removal Action Workplan for Tanklage Square, 837 Industrial Road, San Carlos, California

October 2014

In August 2014, the California Department of Toxic Substances Control (DTSC) released for public comment a Draft Removal Action Workplan (Draft RAW) for the Tanklage Square Site, located at 837 Industrial Road, San Carlos, California (Site). The Draft RAW was prepared by Green Environmental on behalf of Tanklage Family Partnership to address contamination at the Site.

DTSC invited comments from the public on the Draft RAW for 30 days from August 5 to September 4, 2014. The public was notified of the comment period by an announcement placed in the *San Mateo Times* on August 5, 2014. A fact sheet entitled *Draft Removal Action Workplan for Tanklage Square,* was prepared to provide information on the Site, describe the proposed alternative, and invite public comment on the Draft RAW. The fact sheet was mailed out to a list of approximately 460 contacts, including nearby residents and occupants, neighborhood associations, and interested parties.

During the public comment period, the Draft RAW and supporting documents were available for public review at the San Carlos Library and DTSC's office. The Draft RAW and supporting documents were also posted on DTSC's Envirostor website.

Written comments on the Draft RAW received during the public comment period have been compiled and included in this Responsiveness Summary. Copies of written comments are provided in Attachment A.

The only comments received were in a September 4, 2014 letter from Janet B. O'Hara, Water Resources Control Engineer, TMDL and Planning Division, San Francisco Bay Regional Water Quality Control Board. A response to each comment is provided below.

Comment 1: *This site is located in an area where PCBs are being detected in surface water, i.e., Pulgas Creek, at elevated concentrations. The municipalities are conducting roadside sampling in this area and planning to install stormwater treatment units to reduce PCBs in stormwater runoff. It is important that sites in this area, such as Tanklage Square, do not contribute PCBs to stormwater runoff.*

Printed on Recycled Paper

Response: DTSC has reviewed the proposed alternative in the Draft RAW and has determined that the remedy is protective of human health and the environment. There is no indication that the Site contributes PCBs to stormwater runoff.

- The Site consists of a building and a parking lot and is completely paved except for small landscaped areas with grass, bushes, and trees. The landscaping was installed between 1978 and 1980, during the development of the 6 buildings that compose Tanklage Square. The property owner reports that during construction and landscaping, there were no encounters with the tar-like substance that contains polychlorinated biphenyls (PCBs). The shallowest depth where PCBs were detected in a soil sample was 7.5 feet below ground surface (bgs). PCBs were not detected in the 15 soil samples that were gathered from shallower soils, with depths ranging from 3.5 to 7.5 feet bgs. Because there is no reason to suspect that the planted landscape soils contain PCBs, and because the only exposed soils onsite are the planted landscape soils, DTSC sees no indication that onsite soils contribute PCBs to stormwater runoff.
- A groundwater monitoring well (MW-1) has been installed at an inferred downgradient location from where the tar-like substance has been encountered. Groundwater from this well has been analyzed for PCBs since June 2012. In addition, during site investigations between 2009 and 2010, grab groundwater samples from 14 onsite borings (B4-B14, WSP2-WSP4) were analyzed for PCBs. No PCBs have been detected in any onsite groundwater samples to date. Laboratory reporting limits on these groundwater samples range from 0.47 to 0.62 ug/L. This data demonstrates that PCBs are not moving offsite via groundwater.

Comment 2: *The source of the PCB-containing tar-like substance at Tanklage Square has not been determined, and this substance continues to migrate to the ground surface. Although the RAW states that Tanklage will visually inspect the property quarterly, the fact that the substance is surfacing and is a continuing source of PCB contamination is a concern. Additional source identification should be required to determine, at a minimum, why the PCB-containing substance continues to migrate to the surface.*

Reponse:
The tar-like substance collects in a trench that is below the surface, beneath the building located at 837 Industrial Road, San Carlos. The tar-like substance has never been encountered in any location other than the bathroom where it initially surfaced and in the subsurface trench which was dug to collect the material. The source of the tar-like material is unknown, and the reason why the tar-like material surfaced in a bathroom in 2008 is unknown. The proposed alternative in the Draft RAW prohibits sensitive land uses and requires periodic inspection and cleaning of the trench. DTSC has reviewed the Draft RAW and has determined that the remedy is protective of human health and the environment.

Comment 3: *Also, the sewer line that runs through the building should be sampled.*

Response: The available Site information suggests that the subsurface contamination was present before the development of the Site in the late 1970's. There is no indication that any waste was dumped down the sewer line of the building. The property owner reports that the tar-like substance was never encountered during building construction.

Comment 4: *We understand that only the perimeter of the site is unpaved, but given the unusual nature of the PCB contamination, it is reasonable to require a demonstration that there is no surface contamination. The areas of exposed soil (i.e., landscaping) should be sampled to confirm PCBs are not present.*

Response: The landscaping was installed between 1978 and 1980, during the development of the 6 buildings that compose Tanklage Square. During construction and landscaping, there were no encounters with the tar-like substance at or below the surface. The shallowest depth where PCBs were detected in a soil sample was 7.5 feet below ground surface (bgs). PCBs were not detected in the 15 soil samples that were gathered from shallower soils, with depths ranging from 3.5 to 7.5 feet bgs. It is unlikely that the landscaped features were constructed with contaminated soils from onsite.

Comment 5: *Although this may be implied, the land use covenant section (pp. 31-31) should state that when the property is redeveloped, the tar-like material will be removed.*

Response: DTSC's land use covenants (LUCs) typically contain the following elements: prohibited uses, prohibited activities, soil management requirements, access requirements, and inspection and reporting requirements. The proposed LUC requires DTSC approval and a Soil Management Plan for any activity that will disturb the current cap and any underlying contaminated soil or material. Additional cleanup will be required if the Site is proposed to be redeveloped to sensitive land uses, such as residential land use.

Comment 6: *The RAW considers three alternative actions: Excavation of the tar-like substance under the structure; operation and maintenance with institutional controls (O&M); and no action and identifies O&M as the preferred option. If further study is not feasible, and should the material be left in-place, we find it more appropriate to deem this action an interim remedial measure (IRM) rather than the final remedy for the site, because the selected alternative, O&M, is not a permanent solution. Another option would be to consider the material "currently inaccessible." In such case it would be appropriate to defer removal until such time as the building is demolished*.

Reponse: DTSC finds the proposed alternative to be protective of human health and the environment based on the current land use of the Site as commercial/industrial. This alternative requires an LUC and an Operation and Maintenance Agreement with DTSC to ensure that the necessary inspection and maintenance are implemented as long as the contaminants are capped. Maintenance of the cap prevents exposure to contaminants of concern, and groundwater monitoring data demonstrates that

contaminants of concern are not moving offsite. Given the current land use of the property, DTSC views the LUC and O&M as the permanent solution. Should the land use change in the future, DTSC will be notified per the LUC and Operation and Maintenance requirements, and additional cleanup (such as removal) may be required.

Attachment A – Comments Received During Public Comment Period

- September 4, 2014 letter from Janet B. O'Hara, Water Resources Control Engineer, TMDL and Planning Division, San Francisco Bay Regional Water Quality Control Board

September 4, 2014

George Chow, Project Manager
Department of Toxic Substances
700 Heinz Avenue
Berkeley, California 94710
Sent via email to: George.Chow@dtsc.ca.gov

Subject: Comments on draft Removal Action Workplan – Tanklage Square site, San Carlos, CA

Dear Mr. Chow:

Thank you for the opportunity to provide comments on the subject draft Removal Action Workplan (RAW). As you know, staff at the San Francisco Bay Regional Water Quality Control Board (Water Board) is particularly interested in the Tanklage Square site because the contaminant of concern is PCBs. In 1994, high levels of PCBs in San Francisco Bay fish prompted state health officials to advise the public to limit their consumption of Bay fish. In 2008, the Water Board adopted a Total Maximum Daily Load (TMDL) for PCBs in the Bay. TMDL refers to the amount (or load) of a pollutant that a water body can contain on an average day and still be healthy for people and wildlife. In California, a TMDL is a clean water action plan, or set of actions that responsible parties must undertake in order to restore good water quality. This plan requires municipalities, industry, and others to take actions to reduce PCBs in the Bay. As part of the TMDL implementation plan, the Water Board is reviewing PCB site cleanup activities in an attempt to ensure that PCBs do not migrate off these sites in the future.

We have the following concerns about the Tanklage Square site RAW:

- This site is located in an area where PCBs are being detected in surface water, i.e., Pulgas Creek, at elevated concentrations. The municipalities are conducting roadside sampling in this area and planning to install stormwater treatment units to reduce PCBs in stormwater runoff. It is important that sites in this area, such as Tanklage Square, do not contribute PCBs to stormwater runoff.
- The source of the PCB-containing tar-like substance at Tanklage Square has not been determined, and this substance continues to migrate to the ground surface. Although the RAW states that Tanklage will visually inspect the property quarterly, the fact that the substance is surfacing and is a continuing source of PCB contamination is a concern. Additional source identification should be required to determine, at a minimum, why the PCB-containing substance continues to migrate to the surface. Also, the sewer line that runs through the building should be sampled.
- We understand that only the perimeter of the site is unpaved, but given the unusual nature of the PCB contamination, it is reasonable to require a demonstration that there is no surface contamination. The areas of exposed soil (i.e., landscaping) should be sampled to confirm PCBs are not present.

- Although this may be implied, the land use covenant section (pp. 31-31) should state that when the property is redeveloped, the tar-like material will be removed.

The RAW considers three alternative actions: Excavation of the tar-like substance under the structure; operation and maintenance with institutional controls (O&M); and no action and identifies O&M as the preferred option. If further study is not feasible, and should the material be left in-place, we find it more appropriate to deem this action an interim remedial measure (IRM) rather than the final remedy for the site, because the selected alternative, O&M, is not a permanent solution. Another option would be to consider the material "currently inaccessible." In such case it would be appropriate to defer removal until such time as the building is demolished.

We appreciate your work and the opportunity to comment on this project. If you have questions about these comments, please contact me at johara@waterboards.ca.gov or 510.622.5681.

Sincerely,

Jan O'Hara
Water Resources Control Engineer
TMDL and Planning Division

Appendix E – CEQA Notice of Exemption (October 2014)

CALIFORNIA ENVIRONMENTAL QUALITY ACT
NOTICE OF EXEMPTION

To: Office of Planning and Research
State Clearinghouse
P.O. Box 3044, 1400 Tenth Street, Room 212
Sacramento, CA 95812-3044

From: Department of Toxic Substances Control
Brownfields and Environmental Restoration Program
700 Heinz Avenue
Berkeley, CA 94710

Project Title: Tanklage Square

Project Location: 837 Industrial Road, San Carlos

County: San Mateo County

Project Description:
The California Department of Toxic Substances Control (DTSC), pursuant to authority granted under Chapter 6.8, Division 20, sections 25323.1 and 25356.1 pursuant to the Health and Safety Code (H&SC) is seeking to approve a RAW as submitted on September 2013, by Green Environment, Inc. on behalf of Tanklage Family Partnership. The RAW involves the implementation of a Land Use Covenant/deed restrictions to prohibit the use of the property as a residence, hospital, school, daycare center and limit the Site use to commercial/industrial purposes.

Background:

Tanklage Square is located in a commercial/industrial area of eastern San Carlos. It is bound by Industrial Road to the southwest and Highway 101 to the northeast. Tanklage Square includes 6 commercial/industrial buildings developed by Tanklage between 1978 and 1980 on approximately 8 acres. The Site is located at 837 Industrial Road, San Carlos and consists of a commercial building that faces Industrial Road. The Site (Assessor's Parcel Number 046-140-100, lot 2) is approximately 22,000 square feet, and is divided into 8 suites (A-H), leased by Tanklage to several commercial businesses.

In early 2008, a black-tar like substance was observed in the bathroom of Suite D of the Site. A shallow and sloping trench was dug beneath the building to intersect the tar-like substance and collect the tar-like substance in a small sump. A sample of the black tar-like substance contained acetone, diesel range organic compounds (DRO), motor oil range organic compounds (MRO), polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), and metals. Low concentrations of metals were detected in the water overlying the tar-like substance.

Between 2009 and 2012, Green Environment, Inc. on behalf of Tanklage Family Partnership conducted environmental investigations for soil at the Site to investigate the tar-like substance. In total, 52 soil samples were analyzed for gasoline range organic compounds, diesel range organic compounds, motor oil range organic compounds, PCBs, volatile organic compounds (VOCs), and PAHs, and 27 soil samples were analyzed for metals. Soil samples indicated that soils located in the area of the tar-like substance are impacted primarily with diesel and motor oil range organic compounds with the highest concentrations generally observed from 7 to 13 feet deep. Other lesser soil impacts include PCBs, PAHs (primarily chrysene and pyrene) and several heavy metals. The VOCs acetone and methyl ethyl ketone were detected in soil, but at low concentrations. Other lesser soil impacts with VOCs include carbon disulfide, naphthalene, toluene, Tetrachloroethylene (PCE), trichloroethylene (TCE), trimethylbenzenes (TMB) and xylenes. The limited detections of PCE and TCE were at low concentrations mainly in saturated zone soils.

The Site is currently capped with pavement and a building on top of a concrete slab foundation (Cap). Therefore, direct contact with the tar-like substance or impacted soils can only occur during subsurface construction activities, or if the tar-like substance migrates to the surface through cracks, gaps, or penetrations in the Cap.

Groundwater:

Groundwater samples were analyzed for metals, gasoline range organics, diesel range organics, motor oil range organics, and VOC's. Between 2009 and 2012, investigations included collecting and analyzing 20 grab groundwater samples and the installation of a monitoring well down gradient of the Site. Groundwater is impacted with low levels of halogenated volatile organic compounds (HVOCs), primarily chloroform, 1,2-dichloroethane (1,2-DCA), PCE and TCE. The groundwater sampling results and offsite groundwater data indicate that the HVOCs in groundwater migrated onto the Site from an undetermined off-site source or sources. The highest concentration of PCE was detected in the inferred up gradient location at 1,700 micrograms per liter (ug/L), near the tar-like substance at the center of the Site at 730 ug/L, and at the inferred down gradient location at 180 ug/L. Groundwater is not significantly impacted with diesel to motor oil range

organic compounds, PAHs, PCBs or metals. Groundwater at the Site is not a drinking water source, there are no water supply wells within a one mile radius of the Site, and the water supply for the City of San Carlos is provided by the California Water Service Company and comes from the Hetch Hetchy Reservoir. Therefore, drinking water is not considered to be a potential exposure pathway at the Site.

Chemicals of concern (COCs) for the Site have been determined to be diesel and motor oil range organics and PCBs in soil and PCE in groundwater. The highest detected concentrations for each COC are summarized in the table below.

Maximum Detected Concentrations of COCs

Media	Chemical of Concern	Maximum Detected Concentration
Soil	Diesel Range Organics	5,400 mg/kg
Soil	Motor Oil Range Organics	11,000 mg/kg
Soil	Polychlorinated Biphenyls	44,000 mg/kg
Groundwater	Tetrachloroethylene	1,700 ug/L

Project Activities:

The project activities described in the RAW are a land use covenant and an Operation and Maintenance Plan.

The Land Use Covenant will ensure that:

- The property is not used for a residence, hospital, public or private school for persons under 21 years of age, or a day care center for children.
- Activities that may disturb the Cap (e.g. excavation, grading, removal, trenching, filling, earth movement, or mining) will not be permitted on the Site without prior written approval by DTSC.
- All uses and development of the Site will preserve the integrity or effectiveness of the Cap.
- Any contaminated soils brought to the surface by grading, excavation, trenching or backfilling will be managed in accordance with all applicable provisions of state and federal law.
- Groundwater will not be used without prior written approval by DTSC.
- DTSC will be notified of any proposed change in land use.

The Operation and Maintenance Plan will require:

- Periodic cleaning of the collection sump and proper offsite disposal of any tar-like substance that is collected.
- Periodic visual inspections of the Site to look for evidence of the tar-like substance on any floor surfaces
- Periodic sampling and analysis of one groundwater monitoring well
- An annual report summarizing Operation and Maintenance activities to be submitted to DTSC in December of every year.

Name of Public Agency Approving Project: Department of Toxic Substances Control

Name of Person or Agency Carrying Out Project: Tanklage Family Partnership

Exemption Status: (check one)

☐ Ministerial [PRC, Sec. 21080(b)(1); CCR, Sec. 15268]
☐ Declared Emergency [PRC, Sec. 21080(b)(3); CCR, Sec.15269(a)]
☐ Emergency Project [PRC, Sec. 21080(b)(4); CCR, Sec.15269(b)(c)]
☒ Categorical Exemption: [Class 30 Categorical Exemption Cal. Code Regs,. Title 14, §15330]
☐ Statutory Exemptions: [State code section number]
☐ General Rule [CCR, Sec. 15061(b)(3)]

Exemption Title: Minor actions to prevent, minimize, stabilize, mitigate or eliminate the release or threat of release of hazardous waste or hazardous substances.

Reasons Why Project is Exempt:

1. The project is a minor action designed to prevent, minimize, stabilize, mitigate or eliminate the release or threat of release of hazardous waste or hazardous substances.
2. The project will not exceed $1 million in cost.

3. The project does not involve the onsite use of a hazardous waste incinerator or thermal treatment unit or the relocation of residences or businesses, and does not involve the potential release into the air of volatile organic compounds as defined in Health and Safety Code Section 25123.
4. The exceptions pursuant to Cal. Code Regs., tit. 14, § 15300.2 have been addressed as follows:
   - Cumulative Impact. The project will not result in cumulative impacts because it is a Land Use Covenant/Deed Restriction with no construction activities and the final remedy that would not lead to a succession of projects of the same type in the same place over time.
   - Significant Effect. The environmental safeguards and monitoring procedures that are enforceable and made a condition of project approval will prevent unusual circumstances from occurring so that there is no possibility that the project will have a significant effect on the environment.
   - Scenic Highways. The project will not damage scenic resources, including but not limited to, trees, historic buildings, rock outcroppings, or similar resources, because it is not located within a highway officially designated as a state scenic highway.
   - Hazardous Waste Sites. The project is not located on a site which is included on any list compiled pursuant to Section 65962.5 of the Government Code.

Evidence to support the above reasons is documented in the project file record, available for inspection at the following address:

Department of Toxic Substances Control
Brownfields and Environmental Restoration
700 Heinz Avenue
Berkeley, California 94710

George Chow	Environmental Scientist	(510) 540-3879
Project Manager Name	Project Manager Title	Phone #
		10/20/14
Unit Chief Signature		Date
Denise Tsuji	Senior Environmental Scientist (Supervisory)	(510) 540-3824
Unit Chief Name	Unit Chief Title	Phone #

TO BE COMPLETED BY OPR ONLY

Date Received For Filing and Posting at OPR:

APPENDIX B

DRAFT OPERATIONS AND MAINTENANCE PLAN

PES Environmental, Inc.
Engineering & Environmental Services

February 13, 2015 **D R A F T**

1409.002.02.003

Windy Hill Property Ventures
530 Emerson Street, Suite 150
Palo Alto, California 94301

Attention: Mr. Mike Field

OPERATIONS AND MAINTENANCE PLAN
837 INDUSTRIAL ROAD
SAN CARLOS, CALIFORNIA

Dear Mr. Field:

This plan has been prepared by PES Environmental, Inc. (PES) to describe the operation and maintenance (O&M) program for the commercial property at 837 Industrial Road in San Carlos, California (site; Plate 1). Regulatory oversight of the site is provided by California Environmental Protection Agency (CalEPA), Department of Toxic Substances Control (DTSC). The site is located on a single 1.265-acre parcel (San Mateo County Assessor Parcel Number 046-140-100) within the industrial park known as Tanklage Square. The site has been improved with an approximately 21,657 square-foot building at 837 Industrial Road. The site building is divided into eight (8) suites (A-H), which are leased to commercial businesses. The site is bounded on the northwest by 821 Industrial Road, on the northeast by 853 Industrial Road, on the southeast by 887 Industrial Road, and on the southwest by Industrial Road (Plate 2). One groundwater monitoring well (MW-1) is located on the northeastern side the property (Plate 3).

BACKGROUND

In early 2008, a black, viscous, tar-like material was observed emanating from beneath a concrete floor slab within Suite D of the site. Samples of the material were submitted to an analytical laboratory. The analytical results included detections of the following constituents:

- Acetone at up to 170 micrograms per kilogram (μg/kg);

- Polyaromatic hydrocarbons (PAHs) including phenanthrene (up to 22,000 μg/kg), chrysene (up to 13,000 μg/kg), benzo [g,h,i] perylene (up to 15,000 μg/kg), fluoranthene (up to 13,000 μg/kg), and pyrene (up to 9,500 μg/kg);

- Diesel-range organics (DROs) at up to 90,000 milligrams per kilogram (mg/kg);

- Motor oil-range organics (MRO) at up to 220,000 mg/kg; and

- Polychlorinated biphenyls (PCBs) at up to 13,000 μg/kg.

Chromium, nickel, zinc and lead were also detected. The material was also found to have low pH.

To manage ongoing subsurface intrusion concerns, an intercept trench and recovery sump system was installed by the previous ownership (Tanklage Family Partnership) in 2008. Plates 3 and 4 show the location and diagram of the trench and sump system; respectively. Photographs of the sump and access plates are provided in Appendix B.

Based on agency concerns related to the relatively high concentrations of PCBs detected in soil samples and the oily/tar material, Tanklage Family Partnership entered into a Voluntary Cleanup Agreement (VCA) with DTSC in 2009. Subsequent soil and groundwater investigations were conducted under the oversight of DTSC by WSP Environment & Energy (WSP) between 2009 and 2011. Green Environment, Inc. (GEI) also implemented investigation activities described in a July 2010 Work Plan[1] and conducted additional soil and groundwater investigation at the site in 2011[2]. Historical site data, consisting of summary tables and figures prepared by others, are presented in Appendix A.

Based on these additional investigations GEI concluded that:

- The tar-like substance appeared to be horizontally limited to the immediate vicinity of the trenched area in the northeast portion of the site building and was observed to a maximum vertical depth of 14 feet. Based on the analytical characteristics of the tar-like substance, the tar-like substance was inferred to be an acid tar, a byproduct of an acid-clay oil recycling/refining process which was conducted for a number of years at a nearby property. As such, direct contact with the tar-like substance poses a health and safety risk;

---

[1] WSP Environment & Energy, 2010. *Soil And Groundwater Investigation Workplan, Tanklage Construction Co., Inc. 837 Industrial Road, San Carlos, California.* May 21.

[2] Green Environment Incorporated, 2011. *Expanded Site Investigation 837 Industrial Road, San Carlos, CA.* March 2.

- Soils in the area of the tar-like substance are impacted primarily with diesel- to motor oil-range organic compounds, with the highest concentrations generally observed from 7 to 13 feet deep. Other detected compounds include PCBs, PAHs (primarily chrysene and pyrene) and several heavy metals. Two volatile organic compounds (VOCs) were primarily detected in soil, specifically acetone and methyl ethyl ketone; less frequently detected VOCs in soil included carbon disulfide, naphthalene, toluene, tetrachloroethylene (PCE), trichloroethylene (TCE), trimethylbenzenes (TMB) and xylenes. PCE and TCE were detected at low concentrations and mainly in saturated zone soils; and

- Groundwater is primarily impacted with halogenated volatile organic compounds (HVOCs), primarily chloroform, 1,2-dichloroethane (1,2-DCA), PCE and TCE.

GEI further concluded: (1) the tar-like substance was of limited horizontal and vertical extent and did not significantly impact groundwater; (2) the trench/sump system was effective, and periodic emptying and proper disposal of the accumulated material was recommended; and (3) chlorinated VOC concentrations in groundwater beneath the site appeared to be from an offsite, unknown upgradient source(s).

At the request of DTSC, one groundwater monitoring well (MW-1) was installed in the inferred downgradient direction of the 837 Industrial Road building to assess potential impacts to groundwater from the tar-like substance. Quarterly groundwater monitoring of MW-1 was conducted between June 2012 and March 2013; GEI reported that based on four consecutive quarters of monitoring, groundwater sample results indicated that constituents associated with petroleum hydrocarbons (total petroleum hydrocarbons [TPH] quantified as gasoline [TPHg], diesel [TPHd], motor oil [TPHmo], PAHS, PCBs, and metals) were not detected at concentrations of potential concern.

On October 24, 2014, a Remedial Action Workplan[3] (RAW) was submitted for the site to DTSC. The RAW was approved on October 29, 2014 by DTSC[4,5]. The specific remedial

---

[3] Green Environment Incorporated, 2014. *Final Removal Action Workplan, 837 Industrial Road, San Carlos, CA*. October 24.

[4] California Environmental Protection Agency, Department of Toxic Substances Control (DTSC), 2014. *Approval Letter for Final Removal Action Workplan, 837 Industrial Road, San Carlos, California*. October 29.

[5] In addition to implementation of the DTSC-RAW, a PCB notification and Cleanup Plan is required by the U.S. Environmental Protection Agency (U.S. EPA) under the Toxic Substances Control Act (TSCA). As such, the RAW, along with other information required under 40 CFR 761.61(c) and (a)(3) not already included in the RAW, will be submitted under separate cover to the U.S. EPA as the required TSCA Application under 40 CFR 761.61(c). A written certification required in 40 CFR 761.61(a)(3)(i)(E) will also be submitted with the Application.

components described in the RAW include: (1) maintenance and inspection activities associated with management of impacted soils as capped in place with the current site development; (2) periodic monitoring of groundwater quality at well MW-1; (3) conducting O&M (including periodically removing contents of the recovery/collection sump); and (4) institutional land use controls. As further described in the RAW, a final approved O&M Plan presenting a written protocol for implementation of specific remedial components (identified above in items 1 through 3) is required. The final O&M Plan (i.e., this document) will be incorporated into the signed land use controls (i.e., Land Use Covenant [LUC]), and the LUC will be filed at the San Mateo County Recorders Office.

As of the preparation date of this O&M Plan, there are no plans for significant renovations at the site. Land use is anticipated to remain for commercial purposes. As noted in the RAW, activities that might disturb the cap (e.g., excavation, trenching, etc.) shall not be permitted without advance planning documents (e.g., a Soil Management Plan (SMP) or Intrusive Earthwork Guidance Plan [IEGP]) and prior written approval from DTSC. An IEGP is included as Appendix D for use when the cap is breached, such as when subsurface soils are encountered during maintenance or minor construction activities. A SMP will be required if waste soils are generated. In the event that redevelopment plans are prepared, the owner will work with DTSC to modify the RAW and LUC, as appropriate.

OPERATION AND MAINTENANCE PLAN

The following sections present operation and maintenance procedures and methodologies for: (1) quarterly visual inspections of the cap; (2) periodic maintenance and periodic cleaning of the oil collection sump; (3) contingency notification and cleanup procedures for the asphalt parking lot and interior concrete slab; (4) periodic groundwater monitoring; and (5) proper management, disposal, and recordkeeping for hazardous materials collected from the sump.

Routine Cap Inspection Procedures

On a quarterly basis, the site owner or its designee will perform and document visual inspection of the site (i.e., interior concrete flooring, and exterior landscape and asphalt-paved parking areas) to look for visible evidence of the tar-like substance on any floor or pavement surfaces. Additionally, the sump and access ports (Plate 4) will be inspected to assess accumulation of the tar-like substance and to confirm that the annual cleaning event is adequate.

If suspect staining or the presence of the tar-like material is observed, the site owner or designee will direct a qualified operation and maintenance contractor to perform prompt and proper removal and disposal of the tar-like substance and to repair the cap, as appropriate.

If damage to the cap (e.g., concrete or asphalt-paved parking areas) is observed, in accordance with 40 CFR 761.61, repairs of any breaches which would impair the integrity of the cap will commence within 72 hours of discovery by a qualified contractor.

Procedures for Reportable Breach of Cap

Reports or observations of the tar-like substance that have breached the cap, regardless of quantity, will be reported to the emergency contacts (provided below) immediately following discovery.

Owner

Mr. Michael Field
Windy Hills Property Ventures
530 Emerson Street, Suite 150
Palo Alto, California 94301
Telephone: 650-847-1537
Mobile: 650- 248-3584

Owner's Environmental Consultant

Mr. Carl J. Michelsen, P.G.
PES Environmental, Inc.
1682 Novato Boulevard, Suite 100
Novato, CA 94945
Telephone: 415-899-1600
Fax: 415-899-1601

DTSC Project Manager

Mr. George Chow
DTSC
700 Heinz Avenue
Berkeley, California 94710
Telephone: 510-540-3879

Inspection and Periodic Cleaning Of Collection Sump

On an annual (Second Quarter) basis, the site owner or its designee will perform and document inspection of the recovery sump to look for accumulation of the tar-like substance within the sump collection vault, and if observed, direct the operation and maintenance contractor to perform prompt and proper removal and disposal of the tar-like substance.

The results of the annual sump inspection, and removal and disposal of sump contents will be included in the annual report. The report will include field notes of the annual sump inspection activities and documentation of any related removal and disposal actions of the tar-like substance recovered from the sump.

It is anticipated that the operations and maintenance contractor will utilize disposable equipment to transfer material from the sump to a poly-lined DOT-approved 55-gallon steel drum. It is further anticipated that use of disposable equipment for transfer of the sump contents will reduce or eliminate the requirement for generation of decontamination materials or rinsate during the cleaning activities.

Sump Contents Sampling

In the event that sump materials have accumulated and require removal, prior to initiating off-site disposal, a representative sample of the tar-like substance will be collected and sent to a stationary analytical laboratory for testing, in accordance with the analytical testing requested by the receiving facility. It is anticipated that the sample will be analyzed for the following:

- VOCs by U.S. EPA Test Method 8260B;
- TPHg by U.S. EPA Test Method 8260B;
- TPHd and TPHmo by U.S. EPA Test Method 8015M with silica gel cleanup;
- PAHs by U.S. EPA Test Method 8270C;
- PCBs, using the Soxhlet sample extraction Method 3540C prior to using U.S. EPA Test Method 8082A;
- Title 22 list of 17 metals by U.S. EPA Test Method 6010B and 7471; and
- pH.

Storage, Disposal and Transportation of PCB Remedial Waste

Sump cleaning activities include periodic collection and transporting the tar-like substance to an off-site disposal facility as specified in 40 CFR 761.61(a)(5)(i)(B). Recovered material will be placed in 55-gallon steel DOT-approved drums, labeled appropriately, and stored onsite in a secure, locked location. The following text discusses required procedures for management of PCB remedial waste in the event that PCBs are detected in the sump contents sample.

Bulk PCB remediation waste characterized with total PCB concentrations greater than 1 mg/kg but less than 50 mg/kg will be transported to a Class II landfill, or an equivalent disposal facility in accordance with 761.61(a)(5)(i)(B). If PCB-containing waste with a concentration greater than 1 mg/kg and less than 50 mg/kg are present, a 15-day notification must be provided to a proposed, properly permitted facility (i.e., a facility licensed or registered by the State of California to manage municipal solid waste, or non-municipal, non-hazardous waste; a hazardous waste landfill permitted under Subtitle C of RCRA; or an approved PCB disposal facility).

It is anticipated that material with total PCBs at concentrations greater than or equal to 50 mg/kg will be transported as bulk PCB remediation waste to a Class I landfill, or an equivalent disposal facility in accordance with 761.61(a)(5)(i)(B). For PCB-containing waste with a concentration greater than 50 mg/kg, prior to commencing off-site transportation and disposal, the site owner or designee will submit U.S. EPA Form 7710-53 as notification of PCB activity. A copy of Form 7710-53 is provided in Appendix C.

Following acceptance of the material at an appropriate disposal facility, drums containing material recovered from the sump will be loaded and transported off the site following appropriate California and Federal waste manifesting procedures.

Non-Routine Cap Maintenance or Intrusive Subsurface Activity

This plan describes specific procedures for routine inspection and maintenance of the cap. If it is determined by the site owner that significant cap repairs or other subsurface construction activities are needed that will result in penetration of the cap to any depth, then: (1) applicable worker safety and health procedures, presented in the IEGP (presented in Appendix D) will be followed; (2) an activity-specific health and safety plan will be developed and submitted to DTSC for approval; and (3) DTSC will be notified prior to commencement of work.

Annual O&M Reporting

On an annual basis, the site owner or its designee will submit a report (Annual O&M Report) to DTSC within 45 days of the last inspection of the calendar year. The report will include:

(1) results of quarterly field inspections of the cap; (2) results of site institutional controls, management, repair, maintenance, and monitoring activities; and (3) semiannual groundwater monitoring results (described below).

Additional Recordkeeping Requirements

In accordance with 40 CFR Part 761, annual records consisting of: (1) signed manifests for PCB waste generated, stored, or disposed of at the facility; (2) Certificates of Disposal generated during a calendar year; and (3) records of inspections and cleanups performed in accordance with temporary storage (40 CFR Part 761.65(c)(5)) must be compiled into an annual document log and made available for EPA inspection by July 1 of the following calendar year. Additionally, a written annual report, summarizing the information in the annual document log and annual records for the preceding calendar year, must be submitted to EPA by July 15 of the following year.

Groundwater Monitoring

As described in the RAW, semiannual groundwater monitoring of well MW-1 is required for a period of five years for VOCs. TPHg, TPHd, TPHmo, PAHs, and PCBs will be analyzed on an annual basis during the five-year period. Monitoring will be conducted in accordance with protocol presented in the DTSC-approved *Revised Groundwater Monitoring Well Installation Work Plan*[6], presented in Appendix E. Additionally, Quality Assurance Project Plan (QAPP) procedures presented in the *Revised Groundwater Monitoring Well Installation Work Plan* will be followed. Inspection of the well will be conducted during each sampling event. In the event that the well is damaged, repair or replacement of the protective cover and locking well cap shall be performed.

The results of the groundwater monitoring will be presented in the Annual O&M Report. The groundwater monitoring results reporting will include a description of the methods and procedures utilized during the groundwater sampling events, include laboratory analytical reports and chain-of-custody documentation, summary tables and graphics, and provide manifests documenting investigation-derived waste (IDW) transportation and proper off-site disposal.

[6] Green Environment, Inc., 2012. *Revised Groundwater Monitoring Well Installation Work Plan, 837 Industrial Road, Tanklage Square, San Carlos, California*. January 20.

O&M Schedule

The O&M Plan tasks described herein are anticipated to commence upon approval by DTSC. The anticipated implementation schedule for the various tasks associated with the O&M Plan, as specified in the RAW, are as follows:

Task	Task Implementation Schedule
Cap Inspection	Quarterly Basis
Sump Inspection/Cleaning	Second Quarter (Annual Basis)
Groundwater Monitoring	Second and Fourth Quarter (Semiannual Basis)

FIVE-YEAR REVIEWS

Every five years a review of the approved remedial actions will be conducted by a California registered civil engineer or geologist. The five-year review shall describe the results of all sample analyses, tests, observations, and other data generated or received, and evaluate the adequacy of the implemented remedy in protecting public health, safety and the environment. The review shall be conducted in accordance with the following: (1) the United States EPA *Comprehensive Five-Year Review Guidance* document (OSWER No. 9355.7-03B-P) dated June 2001; and (2) Section 121(c) of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA), 42 U.S.C. 9601 et seq., as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, Pub. L. 99-499. Ninety (90) days before the end of the 5-year period, the site owner will submit a workplan to DTSC describing how the 5-year review will be conducted. The 5-year review report will be submitted to DTSC 60 days after approval of the workplan.

Yours very truly,

PES ENVIRONMENTAL, INC.

D R A F T

Chris J. Baldassari, P.G.
Senior Geologist

D R A F T

Carl J. Michelsen, C.HG.
Principal Geochemist

D R A F T

Attachments: Plate 1 – Site Location
Plate 2 – Site Plan and Vicinity
Plate 3 – Detailed Site Plan
Plate 4 – Diagram of Trench and Sump for Tar-Like Substance Collection

Appendices: A – Historical Site Data
B – Photographs of Sump and Collection System
C – U.S. Environmental Protection Agency Form 7710-53
D – Intrusive Earthwork Guidance Plan
E – 2012 Revised Groundwater Monitoring Well Installation Plan (Prepared by GEI)

ATTACHMENTS

PLATES

Aerial Photo: February 23, 2014 (Google 2014)

PES Environmental, Inc.
Engineering & Environmental Services

Site Location
Operations and Maintenance Plan
837 Industrial Road
San Carlos, California

PLATE
1

JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE
1409.002.02.003	140900202003_OM_1-4	DRAFT	2/15

Explanation

Approximate Subject Property Boundary

821 Street Address on Industrial Road

831* Street Address on Bransten Road

N

0 100

SCALE IN FEET

Aerial Photo: February 23, 2014 (Google 2014)

PES Environmental, Inc.
Engineering & Environmental Services

Site Plan and Vicinity
Operations and Maintenance Plan
837 Industrial Road
San Carlos, California

PLATE 2

JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE
1409.002.02.003	140900202003_OM_1-4	DRAFT	2/15

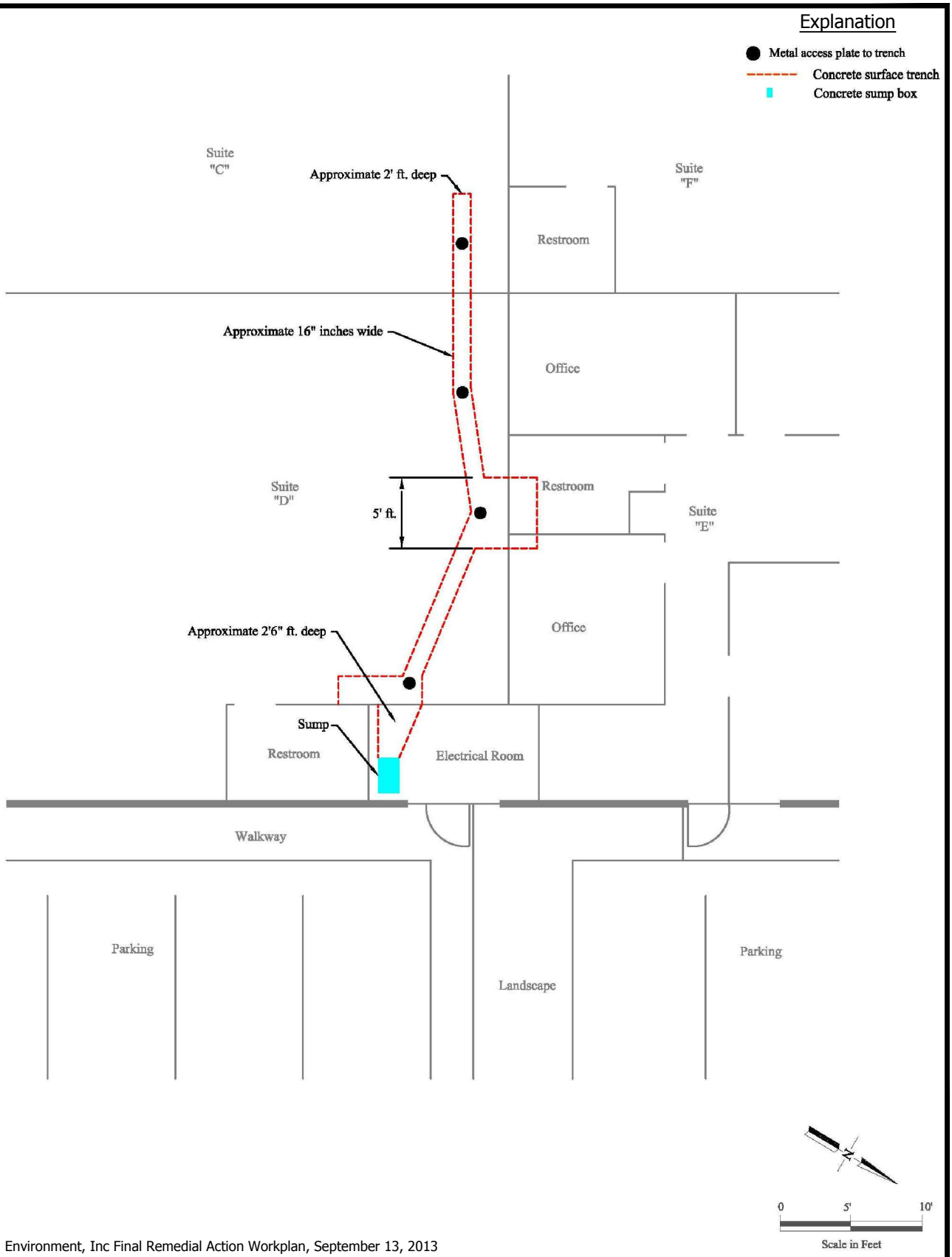
Reference: Green Environment, Inc Final Remedial Action Workplan, September 13, 2013

PES Environmental, Inc.
Engineering & Environmental Services

Detailed Site Plan
Operations and Maintenance Plan
837 Industrial Road
San Carlos, California

PLATE
3

1409.002.02.003	140900202003_OM_1-4	DRAFT	2/15
JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE



Reference: Green Environment, Inc Final Remedial Action Workplan, September 13, 2013

PES Environmental, Inc.
Engineering & Environmental Services

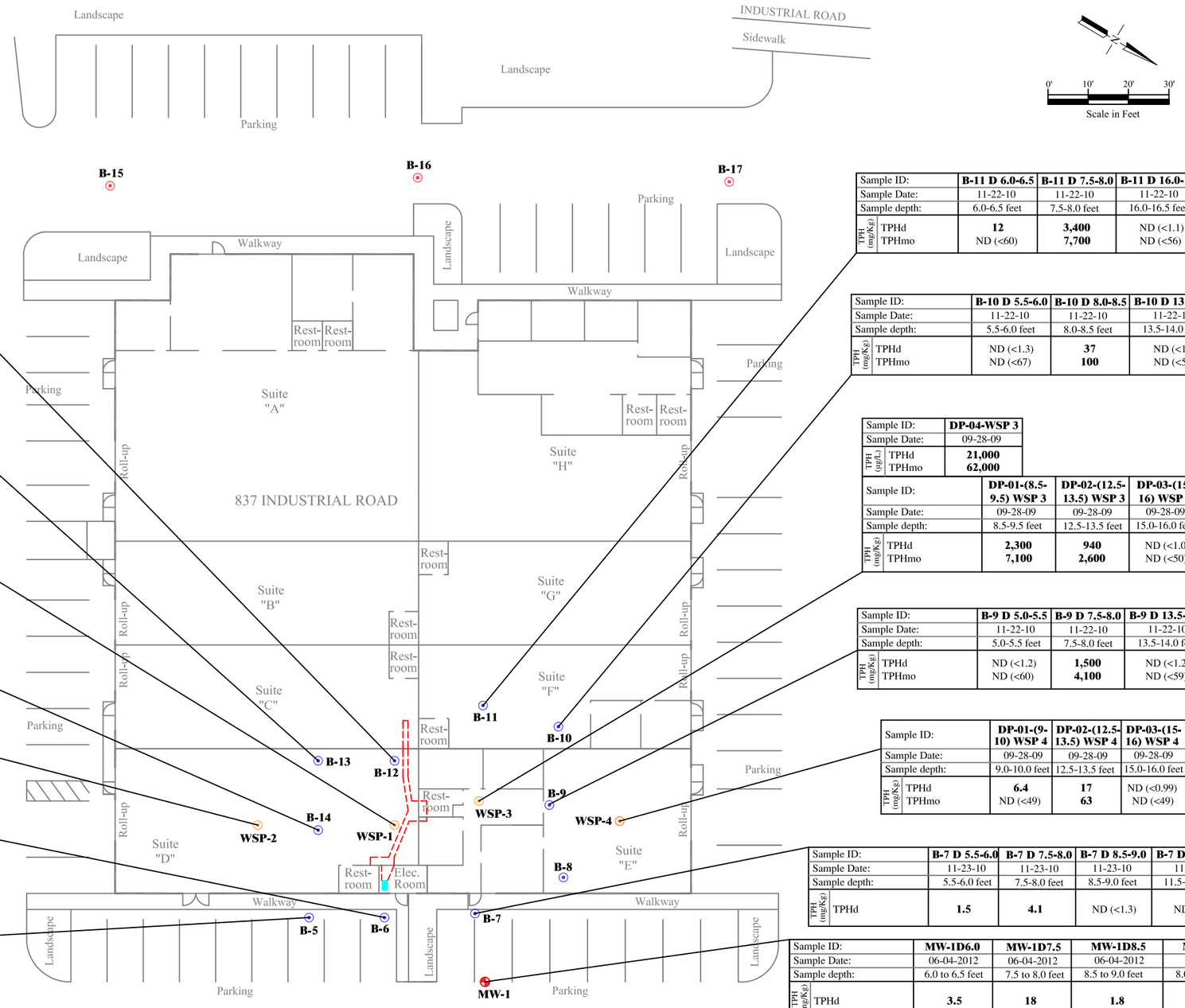
Diagram of Trench and Sump for Tar-Like Substance Collection
Operations and Maintenance Plan
837 Industrial Road
San Carlos, California

PLATE
4

JOB NUMBER	DRAWING NUMBER	REVIEWED BY	DATE
1409.002.02.003	140900202003_OM_1-4	DRAFT	2/15

APPENDIX A

HISTORICAL SITE DATA



Sample ID:	B-12 D 5.5-6.0	B-12 D 8.0-8.5	B-12 D 13.5-14.0
Sample Date:	11-23-10	11-23-10	11-23-10
Sample depth:	5.5-6.0 feet	8.0-8.5 feet	13.5-14.0 feet
TPH (mg/Kg) TPHd	ND (<1.1)	**1,500**	ND (<1.2)
TPH (mg/Kg) TPHmo	ND (<57)	**2,700**	ND (<60)

Sample ID:	B-13 D 5.5-6.0	B-13 D 8.0-8.5 B-3 D 8.0-8.5	B-13 D 13.5-14.0
Sample Date:	11-23-10	11-23-10	11-23-10
Sample depth:	5.5-6.0 feet	8.0-8.5 feet	13.5-14.0 feet
TPH (mg/Kg) TPHd	ND (1.1)	**74**	ND (<1.2)
TPH (mg/Kg) TPHmo	ND (<55)	**150**	ND (<59)

B-3 D 8.0-8.5 is a duplicate of B-13 D 8.0-8.5, highest concentrations are reported.

Sample ID:	DP-01(6.5-7.5)-WSP 1	DP-02(12.5-13.5)-WSP 1	DP-03(15-16)-WSP 1
Sample Date:	09-28-09	09-28-09	09-28-09
Sample depth:	6.5-7.5 feet	12.5-13.5 feet	15.0-16.0 feet
TPH (mg/Kg) TPHd	**54**	**4,800**	ND (<1.0)
TPH (mg/Kg) TPHmo	**150**	**11,000**	ND (<50)

Sample ID:	B-14 D 5.5-6.0 B-3 D 5.5-6.0	B-14 D 8.0-8.5	B-14 D 10-10.5 B-3 D 10.0-10.5	B-14 D 14.0-14.5
Sample Date:	11-23-10	11-23-10	11-23-10	11-23-10
Sample depth:	5.5-6.0 feet	8.0-8.5 feet	10.0-10.5 feet	14.0-14.5 feet
TPH (mg/Kg) TPHd	ND (<1.3)	**26**	**1.6**	ND (<1.2)
TPH (mg/Kg) TPHmo	ND (<64)	**68**	ND (<63)	ND (<58)

B-3 D 5.5-6.0 is a duplicate of B-14 D 5.5-6.0, highest concentrations are reported.
B-3 D 10.0-10.5 is a duplicate of B-13 D 8.0-8.5, highest concentrations are reported.

Sample ID:	DP-03-(12.5-13.5) WSP 2
Sample Date:	09-28-09
Sample depth:	12.5-13.5 feet
TPH (mg/Kg) TPHd	**110**
TPH (mg/Kg) TPHmo	**300**

Sample ID:	B-6 D 3.5-4.0	B-6 D 5.5-6.0	B-6 D 7.5-8.0	B-6 D 12.5-13.0
Sample Date:	11-23-10	11-23-10	11-23-10	11-23-10
Sample depth:	3.5-4.0 feet	5.5-6.0 feet	7.5-8.0 feet	12.5-13.0 feet
TPH (mg/Kg) TPHd	**2.3**	ND (<1.4)	**5,400**	ND (<1.2)
TPH (mg/Kg) TPHmo	ND (<64)	ND (<72)	**11,000**	ND (<58)

Sample ID:	B-5 D 5.5-6.0	B-5 D 7.5-8.0	B-5 D 16-16.5
Sample Date:	11-22-10	11-22-10	11-22-10
Sample depth:	5.5-6.0 feet	7.5-8.0 feet	16.0-16.5 feet
TPH (mg/Kg) TPHd	ND (<1.3)	**3,700**	ND (<1.2)
TPH (mg/Kg) TPHmo	ND (<67)	**11,000**	ND (<58)

Sample ID:	B-11 D 6.0-6.5	B-11 D 7.5-8.0	B-11 D 16.0-16.5
Sample Date:	11-22-10	11-22-10	11-22-10
Sample depth:	6.0-6.5 feet	7.5-8.0 feet	16.0-16.5 feet
TPH (mg/Kg) TPHd	**12**	**3,400**	ND (<1.1)
TPH (mg/Kg) TPHmo	ND (<60)	**7,700**	ND (<56)

Sample ID:	B-10 D 5.5-6.0	B-10 D 8.0-8.5	B-10 D 13.5-14.0
Sample Date:	11-22-10	11-22-10	11-22-10
Sample depth:	5.5-6.0 feet	8.0-8.5 feet	13.5-14.0 feet
TPH (mg/Kg) TPHd	ND (<1.3)	**37**	ND (<1.2)
TPH (mg/Kg) TPHmo	ND (<67)	**100**	ND (<58)

Sample ID:	DP-04-WSP 3
Sample Date:	09-28-09
TPH (µg/L) TPHd	**21,000**
TPH (µg/L) TPHmo	**62,000**

Sample ID:	DP-01-(8.5-9.5) WSP 3	DP-02-(12.5-13.5) WSP 3	DP-03-(15-16) WSP 3
Sample Date:	09-28-09	09-28-09	09-28-09
Sample depth:	8.5-9.5 feet	12.5-13.5 feet	15.0-16.0 feet
TPH (mg/Kg) TPHd	**2,300**	**940**	ND (<1.0)
TPH (mg/Kg) TPHmo	**7,100**	**2,600**	ND (<50)

Sample ID:	B-9 D 5.0-5.5	B-9 D 7.5-8.0	B-9 D 13.5-14.0
Sample Date:	11-22-10	11-22-10	11-22-10
Sample depth:	5.0-5.5 feet	7.5-8.0 feet	13.5-14.0 feet
TPH (mg/Kg) TPHd	ND (<1.2)	**1,500**	ND (<1.2)
TPH (mg/Kg) TPHmo	ND (<60)	**4,100**	ND (<59)

Sample ID:	DP-01-(9-10) WSP 4	DP-02-(12.5-13.5) WSP 4	DP-03-(15-16) WSP 4
Sample Date:	09-28-09	09-28-09	09-28-09
Sample depth:	9.0-10.0 feet	12.5-13.5 feet	15.0-16.0 feet
TPH (mg/Kg) TPHd	**6.4**	**17**	ND (<0.99)
TPH (mg/Kg) TPHmo	ND (<49)	**63**	ND (<49)

Sample ID:	B-7 D 5.5-6.0	B-7 D 7.5-8.0	B-7 D 8.5-9.0	B-7 D 11.5-12.0
Sample Date:	11-23-10	11-23-10	11-23-10	11-23-10
Sample depth:	5.5-6.0 feet	7.5-8.0 feet	8.5-9.0 feet	11.5-12.0 feet
TPH (mg/Kg) TPHd	**1.5**	**4.1**	ND (<1.3)	ND (<1.2)

Sample ID:	MW-1D6.0	MW-1D7.5	MW-1D8.5	MW-1D20
Sample Date:	06-04-2012	06-04-2012	06-04-2012	06-04-2012
Sample depth:	6.0 to 6.5 feet	7.5 to 8.0 feet	8.5 to 9.0 feet	8.0 to 8.5 feet
TPH (mg/Kg) TPHd	**3.5**	**18**	**1.8**	**5.5**

MW-1D20 is a duplicate of MW-1D7.5, highest concentrations are reported.

Legend:
- **MW-1** Groundwater monitoring well (GEI, June 2012)
- **WSP-1** Soil boring (WSP, 09/28/09)
- **B-5** Soil boring (GEI, 11/22/10, 11/23/10)
- **B-15** Soil boring (GEI, 01/20/11)
- Concrete surface trench
- Concrete sump box

ND (<2.0) Not detected at or above the laboratory reporting limit.
Only detected compounds shown on figure, highest concentrations are reported.

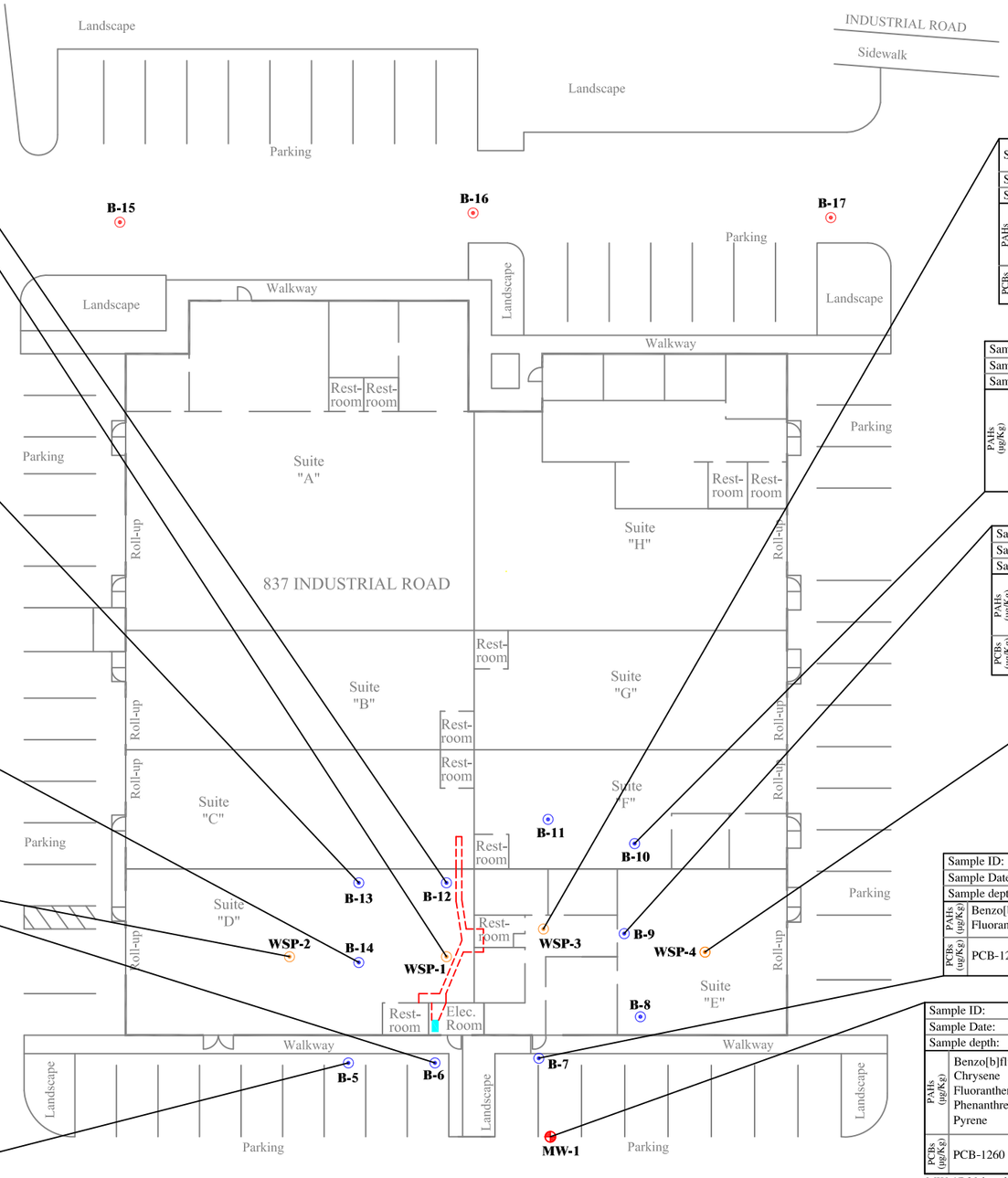
TPH Total extractable petroleum hydrocarbon
TPHd Diesel Range Organics
TPHmo Motor Oil Range Organics
(µg/L) Micrograms per liter
(mg/Kg) Milligrams per kilogram

GEI Green Environment inc
www.greenenvironment.com

Drawing Name: SOIL AND GROUNDWATER ANALYTICAL RESULTS: EXTRACTABLE PETROLEUM HYDROCARBONS

Address: 837 Industrial Road, San Carlos, California

Drawn by: KA
Date: 09/13/2013
Scale: 1" = 30'-0"
Job #: B10655
Figure #: FIGURE 5



0' 10' 20' 30'
Scale in Feet

Sample ID:		B-12 D 5.5-6.0	B-12 D 8.0-8.5	B-12 D 13.5-14.0
Sample Date:		11-23-10	11-23-10	11-23-10
Sample depth:		5.5-6.0 feet	8.0-8.5 feet	13.5-14.0 feet
PAHs (ug/Kg)	Phenanthrene	ND (<5.6)	**140**	ND (<5.9)
	Chrysene	ND (<5.6)	**220**	ND (<5.9)
	Fluoranthene	ND (<5.6)	**120**	ND (<5.9)

Sample ID:		DP-01(6.5-7.5)-WSP 1	DP-02(12.5-13.5)-WSP 1	DP-03(15-16)-WSP 1
Sample Date:		09-28-09	09-28-09	09-28-09
Sample depth:		6.5-7.5 feet	12.5-13.5 feet	15.0-16.0 feet
PAHs (ug/Kg)	Phenanthrene	ND (<50)	**1,200**	ND (<5.0)
	Chrysene	**88**	**1,200**	ND (<5.0)
	Benzo[b]fluoranthene	**52**	ND (<720)	ND (<5.0)
PCBs (ug/Kg)	PCB-1260	ND (<50)	**1,500**	ND (<49)

Sample ID:		B-13 D 5.5-6.0	B-13 D 8.0-8.5 B-3 D 8.0-8.5	B-13 D 13.5-14.0
Sample Date:		11-23-10	11-23-10	11-23-10
Sample depth:		5.5-6.0 feet	8.0-8.5 feet	13.5-14.0 feet
PCBs (ug/Kg)	PCB-1260	ND (<55)	**38,000**	ND (<60)

B-3 D 8.0-8.5 is a duplicate of B-13 D 8.0-8.5, highest concentrations are reported.

Sample ID:		B-14 D 5.5-6.0 B-3 D 5.5-6.0	B-14 D 8.0-8.5	B-14 D 10-10.5 B-3 D 10.0-10.5	B-14 D 14.0-14.5
Sample Date:		11-23-10	11-23-10	11-23-10	11-23-10
Sample depth:		5.5-6.0 feet	8.0-8.5 feet	10.0-10.5 feet	14.0-14.5 feet
PAHs (ug/Kg)	Acenaphthylene	ND (<6.4)	ND (<6.6)	**42**	ND (<5.8)
	Phenanthrene	ND (<6.4)	ND (<6.6)	**54**	ND (<5.8)
	Anthracene	ND (<6.4)	ND (<6.6)	**35**	ND (<5.8)
	Benzo[a]anthracene	ND (<6.4)	ND (<6.6)	**160**	ND (<5.8)
	Chrysene	ND (<6.4)	**12**	**160**	ND (<5.8)
	Benzo[a]pyrene	ND (<6.4)	**13**	**200**	ND (<5.8)
	Benzo[b]fluoranthene	ND (<6.4)	ND (<6.6)	**210**	ND (<5.8)
	Benzo[k]fluoranthene	ND (<6.4)	ND (<6.6)	**83**	ND (<5.8)
	Benzo[g,h,i]perylene	ND (<6.4)	ND (<6.6)	**76**	ND (<5.8)
	Indeno[1,2,3-cd]pyrene	ND (<6.4)	ND (<6.6)	**82**	ND (<5.8)
	Fluoranthene	ND (<6.4)	ND (<6.6)	**180**	ND (<5.8)
	Pyrene	ND (<6.4)	**10**	**180**	ND (<5.8)
	Dibenz(a,h)anthracene	ND (<6.4)	ND (<6.6)	**27**	ND (<5.8)
PCBs (ug/Kg)	PCB-1260	ND (<63)	**770**	ND (<63)	ND (<58)

B-3 D 5.5-6.0 is a duplicate of B-14 D 5.5-6.0, highest concentrations are reported.
B-3 D 10.0-10.5 is a duplicate of B-13 D 8.0-8.5, highest concentrations are reported.

Sample ID:		DP-03-(12.5-13.5) WSP 2
Sample Date:		09-28-09
Sample depth:		12.5-13.5 feet
PCBs (ug/Kg)	PCB-1260	**1,400**

Sample ID:		B-6 D 3.5-4.0	B-6 D 5.5-6.0	B-6 D 7.5-8.0	B-6 D 12.5-13.0
Sample Date:		11-23-10	11-23-10	11-23-10	11-23-10
Sample depth:		3.5-4.0 feet	5.5-6.0 feet	7.5-8.0 feet	12.5-13.0 feet
PAHs (ug/Kg)	Chrysene	ND (<6.4)	ND (<7.2)	**430**	ND (<5.7)
	Pyrene	ND (<6.4)	ND (<7.2)	**310**	ND (<5.7)
PCBs (ug/Kg)	PCB-1260	ND (<64)	ND (<73)	**6,700**	ND (<57)

Sample ID:		B-5 D 5.5-6.0	B-5 D 7.5-8.0	B-5 D 16-16.5
Sample Date:		11-22-10	11-22-10	11-22-10
Sample depth:		5.5-6.0 feet	7.5-8.0 feet	16.0-16.5 feet
PAHs (ug/Kg)	Chrysene	ND (<6.7)	**140**	ND (<5.8)
	Benzo[a]pyrene	ND (<6.7)	**61**	ND (<5.8)
	Fluoranthene	ND (<6.7)	**69**	ND (<5.8)
	Pyrene	ND (<6.7)	**160**	ND (<5.8)
PCBs (ug/Kg)	PCB-1260	ND (<67)	**44,000**	ND (<58)

Sample ID:		DP-01-(8.5-9.5) WSP 3	DP-02-(12.5-13.5) WSP 3	DP-03-(15-16) WSP 3
Sample Date:		09-28-09	09-28-09	09-28-09
Sample depth:		8.5-9.5 feet	12.5-13.5 feet	15.0-16.0 feet
PAHs (ug/Kg)	Phenanthrene	**2,300**	ND (<250)	ND (<5.0)
	Chrysene	**3,800**	ND (<250)	ND (<5.0)
	Benzo[b]fluoranthene	**1,900**	ND (<250)	ND (<5.0)
	Fluoranthene	**1,900**	ND (<250)	ND (<5.0)
PCBs (ug/Kg)	PCB-1260	**880**	**1,800**	ND (<50)

Sample ID:		B-10 D 5.5-6.0	B-10 D 8.0-8.5	B-10 D 13.5-14.0
Sample Date:		11-22-10	11-22-10	11-22-10
Sample depth:		5.5-6.0 feet	8.0-8.5 feet	13.5-14.0 feet
PAHs (ug/Kg)	Naphthalene	ND (<6.6)	**40**	ND (<5.8)
	Phenanthrene	ND (<6.6)	**18**	ND (<5.8)
	Chrysene	ND (<6.6)	**54**	ND (<5.8)
	Benzo[a]pyrene	ND (<6.6)	**35**	ND (<5.8)
	Benzo[b]fluoranthene	ND (<6.6)	**32**	ND (<5.8)
	Fluoranthene	ND (<6.6)	**20**	ND (<5.8)
	Pyrene	ND (<6.6)	**26**	ND (<5.8)

Sample ID:		B-9 D 5.0-5.5	B-9 D 7.5-8.0	B-9 D 13.5-14.0
Sample Date:		11-22-10	11-22-10	11-22-10
Sample depth:		5.0-5.5 feet	7.5-8.0 feet	13.5-14.0 feet
PAHs (ug/Kg)	Chrysene	ND (<6.0)	**180**	ND (<5.9)
	Benzo[a]pyrene	ND (<6.0)	**41**	ND (<5.9)
	Benzo[b]fluoranthene	ND (<6.0)	**63**	ND (<5.9)
	Pyrene	ND (<6.0)	**49**	ND (<5.9)
PCBs (ug/Kg)	PCB-1260	ND (<60)	**4,900**	ND (<59)

Sample ID:		DP-01-(9-10) WSP 4	DP-02-(12.5-13.5) WSP 4	DP-03-(15-16) WSP 4
Sample Date:		09-28-09	09-28-09	09-28-09
Sample depth:		9.0-10.0 feet	12.5-13.5 feet	15.0-16.0 feet
PCBs (ug/Kg)	PCB-1260	**79**	**160**	ND (<49)

Sample ID:		B-7 D 5.5-6.0	B-7 D 7.5-8.0	B-7 D 8.5-9.0	B-7 D 11.5-12.0
Sample Date:		11-23-10	11-23-10	11-23-10	11-23-10
Sample depth:		5.5-6.0 feet	7.5-8.0 feet	8.5-9.0 feet	11.5-12.0 feet
PAHs (ug/Kg)	Benzo[b]fluoranthene	**6.6**	ND (<7.9)	ND (<6.4)	ND (<5.8)
	Fluoranthene	**6.6**	ND (<7.9)	ND (<6.4)	ND (<5.8)
PCBs (ug/Kg)	PCB-1260	ND (<64)	**720**	ND (<64)	ND (<58)

Sample ID:		MW-1D6.0	MW-1D7.5	MW-1D8.5	MW-1D20
Sample Date:		06-04-2012	06-04-2012	06-04-2012	06-04-2012
Sample depth:		6.0 to 6.5 feet	7.5 to 8.0 feet	8.5 to 9.0 feet	8.0 to 8.5 feet
PAHs (ug/Kg)	Benzo[b]fluoranthene	ND (<6.4)	**12**	ND (<6.1)	ND (<6.5)
	Chrysene	ND (<6.4)	**9.3**	ND (<6.1)	ND (<6.5)
	Fluoranthene	ND (<6.4)	**16**	ND (<6.1)	ND (<6.5)
	Phenanthrene	ND (<6.4)	**9.9**	ND (<6.1)	ND (<6.5)
	Pyrene	ND (<6.4)	**14**	ND (<6.1)	ND (<6.5)
PCBs (ug/Kg)	PCB-1260	ND (<64)	**260**	ND (<61)	ND (<65)

MW-1D20 is a duplicate of MW-1D7.5, highest concentrations are reported.

Legend:
- **MW-1** Groundwater monitoring well (GEI, June 2012)
- **WSP-1** Soil boring (WSP, 09/28/09)
- **B-5** Soil boring (GEI, 11/22/10, 11/23/10)
- **B-15** Soil boring (GEI, 01/20/11)
- Concrete surface trench
- Concrete sump box

(µg/Kg) Micrograms per kilogram
PCBs Polychlorinated Biphenyls
PAHs Poly-aromatic Hydrocarbons

ND (<2.0) Not detected at or above the laboratory reporting limit.
Only detected compounds shown on figure, highest concentrations are reported.

GEI Green Environment inc
www.greenenvironment.com

Drawing Name: SOIL ANALYTICAL RESULTS: PAHs AND PCBs

Address: 837 Industrial Road
San Carlos, California

Drawn by:	KA
Date:	09/13/2013
Scale:	1" = 30'-0"
Job #	B10655
Figure #	FIGURE 6

Sample ID:	B-12
Sample Date:	11-23-10
PAHs (ug/L) Naphthalene	0.10

Sample ID:	DP-04-WSP 3
Sample Date:	09-28-09
PAHs (ug/L) Phenanthrene	0.18
Chrysene	0.30
Fluoranthene	0.14

Sample ID:	B-5
Sample Date:	11-22-10
PAHs (ug/L) Fluorene	0.19

Sample ID:	B-7	B-7 DUP (B-4)
Sample Date:	11-23-10	11-23-10
PAHs (ug/L) Fluorene	0.10	0.11

Legend:

- **MW-1** Groundwater monitoring well (GEI, June 2012)
- **WSP-1** Soil boring (WSP, 09/28/09)
- **B-5** Soil boring (GEI, 11/22/10, 11/23/10)
- **B-15** Soil boring (GEI, 01/20/11)
- Concrete surface trench
- Concrete sump box

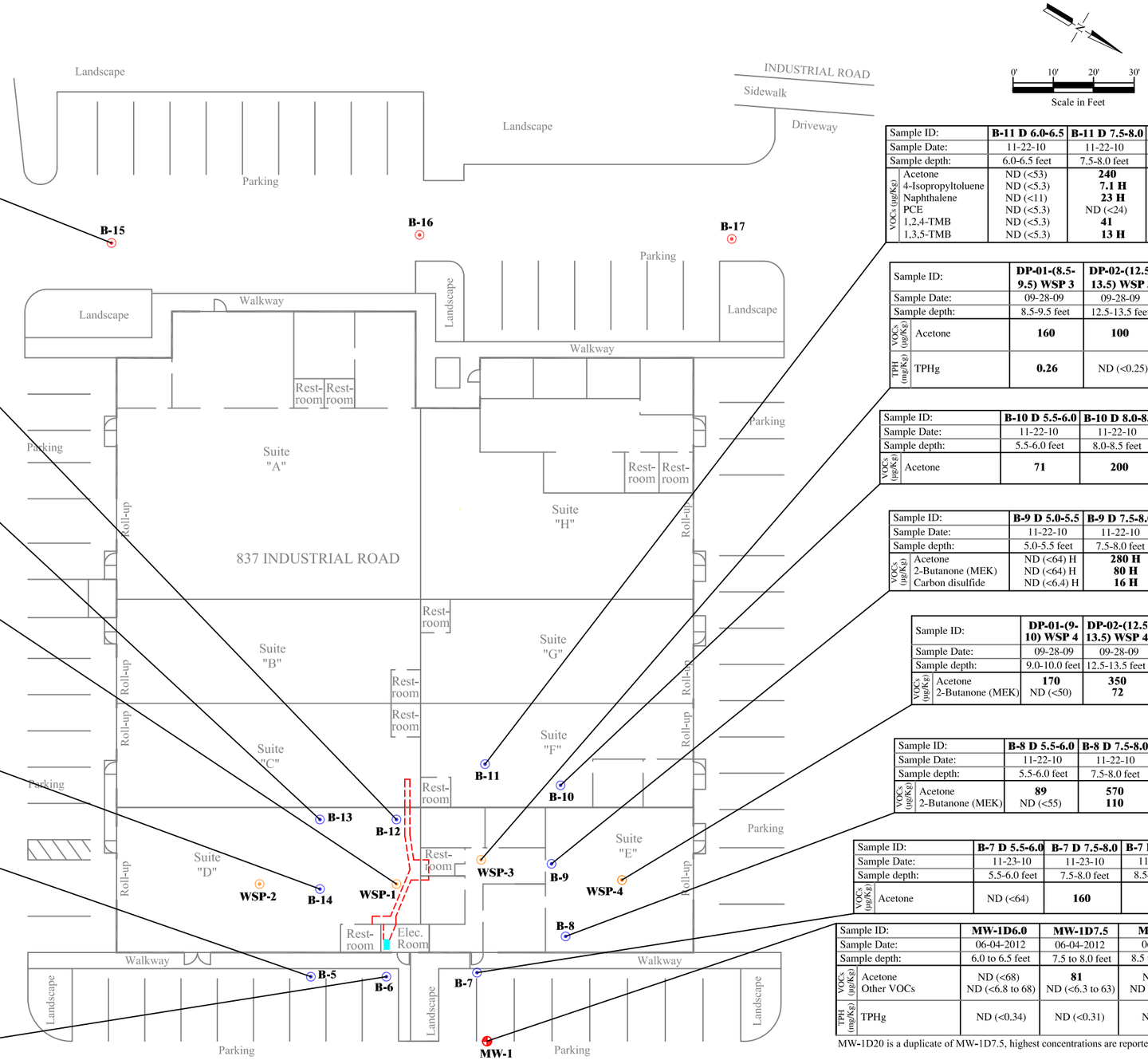
PCBs Polychlorinated Biphenyls
PAHs Poly-aromatic Hydrocarbons
(µg/L) Micrograms per liter
Only detected compounds shown on figure.
ND (<2.0) Not detected at or above the laboratory reporting limit.

GEI Green Environment inc.
www.greenenvironment.com

Drawing Name: GROUNDWATER ANALYTICAL RESULTS: PAHs AND PCBs

Address: 837 Industrial Road
San Carlos, California

Drawn by:	KA
Date:	09/13/2013
Scale:	1" = 30'-0"
Job #	B10655
Figure #	FIGURE 7



Sample ID:	B-15 D 5.5-6.0	B-15 D 8.0-8.5
Sample Date:	01-20-11	01-20-11
Sample depth:	5.5-6.0 feet	8.0-8.5 feet
VOCs (µg/Kg) Acetone	**300 H**	ND (<47) H
2-Butanone (MEK)	**65 H**	ND (<47) H
cis-1,2-Dichloroethene	ND (<6.0) H	**63 H**
PCE	ND (<6.0) H	**68 H**
TCE	ND (<6.0) H	**220 H**
Vinyl chloride	ND (<6.0) H	**110 H**

Sample ID:	B-12 D 5.5-6.0	B-12 D 8.0-8.5	B-12 D 13.5-14.0
Sample Date:	11-23-10	11-23-10	11-23-10
Sample depth:	5.5-6.0 feet	8.0-8.5 feet	13.5-14.0 feet
VOCs (µg/Kg) Acetone	ND (<49)	**420**	ND (<56)
2-Butanone (MEK)	ND (<49)	**100**	ND (<56)
PCE	ND (<4.9)	ND (<7.7)	**4.9**

Sample ID:	B-13 D 5.5-6.0	B-13 D 8.0-8.5 B-3 D 8.0-8.5	B-13 D 13.5-14.0
Sample Date:	11-23-10	11-23-10	11-23-10
Sample depth:	5.5-6.0 feet	8.0-8.5 feet	13.5-14.0 feet
VOCs (µg/Kg) Acetone	ND (<55)	**240**	ND (<56)
PCE	ND (<5.5)	ND (<18)	**22 H**

B-3 D 8.0-8.5 is a duplicate of B-13 D 8.0-8.5, highest concentrations are reported.

Sample ID:	DP-01(6.5-7.5)-WSP 1	DP-02(12.5-13.5)-WSP 1	DP-03(15-16)-WSP 1
Sample Date:	09-28-09	09-28-09	09-28-09
Sample depth:	6.5-7.5 feet	12.5-13.5 feet	15.0-16.0 feet
VOCs (µg/Kg) Acetone	**51**	**180**	ND (<50)
4-Isopropyltoluene	ND (<5.1)	**5.8**	ND (<5.0)
Naphthalene	ND (<10)	**33**	ND (<9.9)
Toluene	ND (<5.1)	**9.3**	ND (<5.0)
1,2,4-TMB	ND (<5.1)	**31**	ND (<5.0)
1,3,5-TMB	ND (<5.1)	**13**	ND (<5.0)
Xylenes, Total	ND (<10)	**24**	ND (<9.9)
TPH (mg/Kg) TPHg	ND (<0.25)	**0.44**	ND (<0.25)

Sample ID:	B-14 D 5.5-6.0 B-3 D 5.5-6.0	B-14 D 8.0-8.5	B-14 D 10-10.5 B-3 D 10.0-10.5	B-14 D 14.0-14.5
Sample Date:	11-23-10	11-23-10	11-23-10	11-23-10
Sample depth:	5.5-6.0 feet	8.0-8.5 feet	10.0-10.5 feet	14.0-14.5 feet
VOCs (µg/Kg) Acetone	ND (<62)	**240**	**70**	ND (<55)
PCE	ND (<6.2)	ND (<10)	ND (<6.9) H	**16 H**
Xylenes, Total	ND (<12)	**14**	ND (<14) H	ND (<11)

B-3 D 5.5-6.0 is a duplicate of B-14 D 5.5-6.0, highest concentrations are reported.
B-3 D 10.0-10.5 is a duplicate of B-13 D 8.0-8.5, highest concentrations are reported.

Sample ID:	B-5 D 5.5-6.0	B-5 D 7.5-8.0	B-5 D 16-16.5
Sample Date:	11-22-10	11-22-10	11-22-10
Sample depth:	5.5-6.0 feet	7.5-8.0 feet	16.0-16.5 feet
VOCs (µg/Kg) Acetone	ND (<61)	**600**	ND (<58)
2-Butanone (MEK)	ND (<61)	**170**	ND (<58)
Carbon disulfide	ND (<6.1)	**9.4**	ND (<5.8)
Toluene	ND (<6.1)	**11**	ND (<5.8)
TCE	ND (<6.1)	ND (<7.2)	**9.4**
CFC-113	ND (<6.1)	ND (<7.2)	**5.2**
1,2,4-TMB	ND (<6.1)	**9.9**	ND (<5.8)

Sample ID:	B-6 D 3.5-4.0	B-6 D 5.5-6.0	B-6 D 7.5-8.0	B-6 D 12.5-13.0
Sample Date:	11-23-10	11-23-10	11-23-10	11-23-10
Sample depth:	3.5-4.0 feet	5.5-6.0 feet	7.5-8.0 feet	12.5-13.0 feet
VOCs (µg/Kg) Acetone	ND (<55)	ND (<72)	**380**	ND (<43)
Toluene	ND (<5.5)	ND (<7.2)	**13**	ND (<4.3)

Sample ID:	B-11 D 6.0-6.5	B-11 D 7.5-8.0	B-11 D 16.0-16.5
Sample Date:	11-22-10	11-22-10	11-22-10
Sample depth:	6.0-6.5 feet	7.5-8.0 feet	16.0-16.5 feet
VOCs (µg/Kg) Acetone	ND (<53)	**240**	ND (<54)
4-Isopropyltoluene	ND (<5.3)	**7.1 H**	ND (<5.4)
Naphthalene	ND (<11)	**23 H**	ND (<11)
PCE	ND (<5.3)	ND (<24)	**5.0 H**
1,2,4-TMB	ND (<5.3)	**41**	ND (<5.4)
1,3,5-TMB	ND (<5.3)	**13 H**	ND (<5.4)

Sample ID:	DP-01-(8.5-9.5) WSP 3	DP-02-(12.5-13.5) WSP 3	DP-03-(15-16) WSP 3
Sample Date:	09-28-09	09-28-09	09-28-09
Sample depth:	8.5-9.5 feet	12.5-13.5 feet	15.0-16.0 feet
VOCs (µg/Kg) Acetone	**160**	**100**	ND (<50)
TPH (mg/Kg) TPHg	**0.26**	ND (<0.25)	ND (<0.25)

Sample ID:	B-10 D 5.5-6.0	B-10 D 8.0-8.5	B-10 D 13.5-14.0
Sample Date:	11-22-10	11-22-10	11-22-10
Sample depth:	5.5-6.0 feet	8.0-8.5 feet	13.5-14.0 feet
VOCs (µg/Kg) Acetone	**71**	**200**	ND (<55)

Sample ID:	B-9 D 5.0-5.5	B-9 D 7.5-8.0	B-9 D 13.5-14.0
Sample Date:	11-22-10	11-22-10	11-22-10
Sample depth:	5.0-5.5 feet	7.5-8.0 feet	13.5-14.0 feet
VOCs (µg/Kg) Acetone	ND (<64) H	**280 H**	ND (<55)
2-Butanone (MEK)	ND (<64) H	**80 H**	ND (<55)
Carbon disulfide	ND (<6.4) H	**16 H**	ND (<5.5)

Sample ID:	DP-01-(9-10) WSP 4	DP-02-(12.5-13.5) WSP 4	DP-03-(15-16) WSP 4
Sample Date:	09-28-09	09-28-09	09-28-09
Sample depth:	9.0-10.0 feet	12.5-13.5 feet	15.0-16.0 feet
VOCs (µg/Kg) Acetone	**170**	**350**	ND (<50)
2-Butanone (MEK)	ND (<50)	**72**	ND (<50)

Sample ID:	B-8 D 5.5-6.0	B-8 D 7.5-8.0	B-8 D 13.5-14.0
Sample Date:	11-22-10	11-22-10	11-22-10
Sample depth:	5.5-6.0 feet	7.5-8.0 feet	13.5-14.0 feet
VOCs (µg/Kg) Acetone	**89**	**570**	ND (<56)
2-Butanone (MEK)	ND (<55)	**110**	ND (<56)

Sample ID:	B-7 D 5.5-6.0	B-7 D 7.5-8.0	B-7 D 8.5-9.0	B-7 D 11.5-12.0
Sample Date:	11-23-10	11-23-10	11-23-10	11-23-10
Sample depth:	5.5-6.0 feet	7.5-8.0 feet	8.5-9.0 feet	11.5-12.0 feet
VOCs (µg/Kg) Acetone	ND (<64)	**160**	**77**	ND (<57)

Sample ID:	MW-1D6.0	MW-1D7.5	MW-1D8.5	MW-1D20
Sample Date:	06-04-2012	06-04-2012	06-04-2012	06-04-2012
Sample depth:	6.0 to 6.5 feet	7.5 to 8.0 feet	8.5 to 9.0 feet	8.0 to 8.5 feet
VOCs (µg/Kg) Acetone	ND (<68)	**81**	ND (<45)	**140**
Other VOCs	ND (<6.8 to 68)	ND (<6.3 to 63)	ND (<4.5 to 45)	ND (<7.4 to 74)
HFI (mg/Kg) TPHg	ND (<0.34)	ND (<0.31)	ND (<0.23)	ND (<0.37)

MW-1D20 is a duplicate of MW-1D7.5, highest concentrations are reported.

Legend:

- **MW-1** Groundwater monitoring well (GEI, June 2012)
- **WSP-1** Soil boring (WSP, 09/28/09)
- **B-5** Soil boring (GEI, 11/22/10, 11/23/10)
- **B-15** Soil boring (GEI, 01/20/11)
- Concrete surface trench
- Concrete sump box

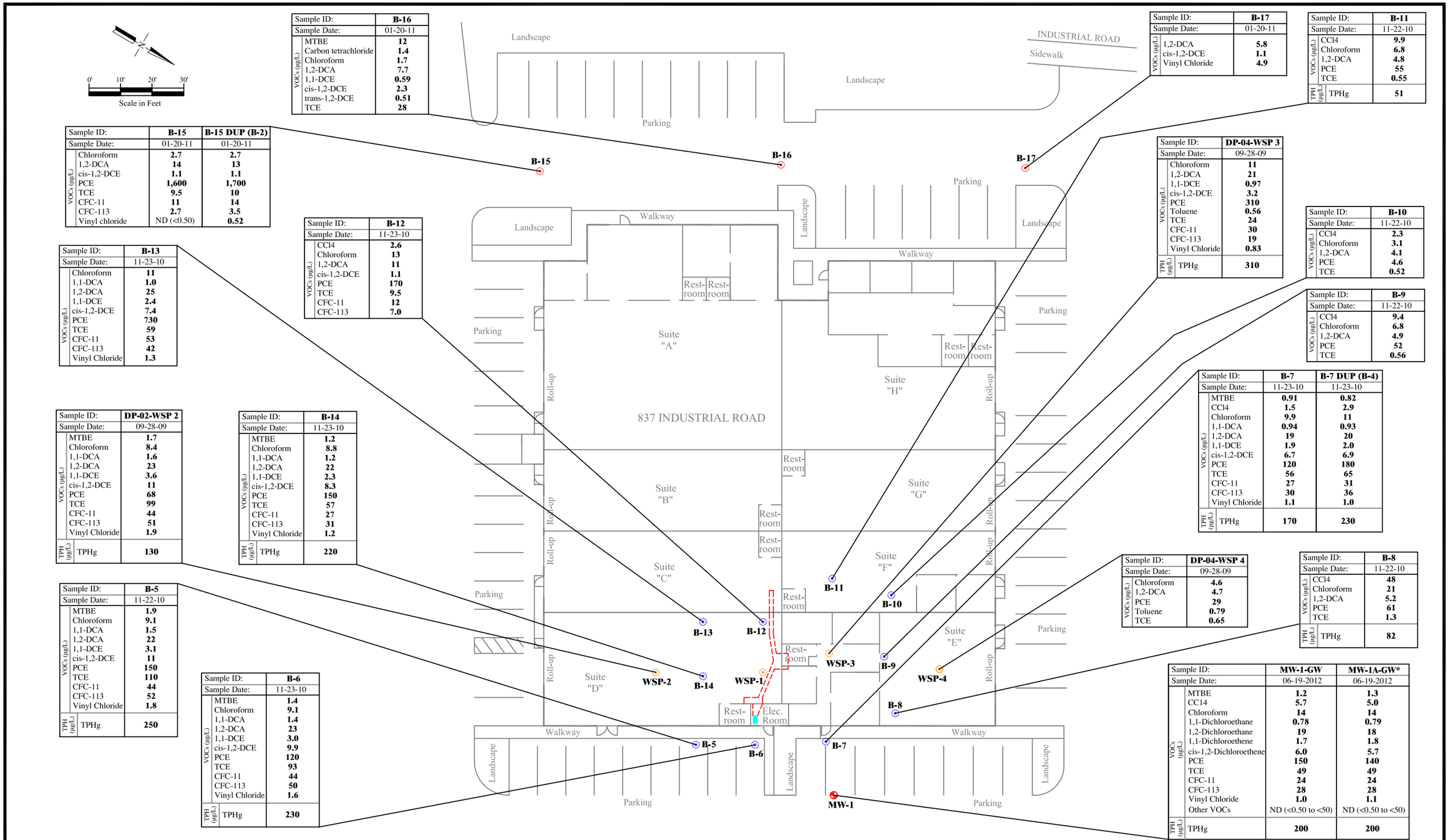
TPH Total petroleum hydrocarbon
TPHg Gasoline Range Organics
(mg/Kg) Milligrams per kilogram
(µg/Kg) Micrograms per kilogram
VOCs Volatile Organic Compounds
PCE Tetrachloroethene
TCE Trichloroethene
1,2,4-TMB 1,2,4-Trimethylbenzene
1,3,5-TMB 1,3,5-Trimethylbenzene
CFC-113 1,1,2-Trichloro-1,2,2-trifluoroethane
ND (<2.0) Not detected at or above the laboratory reporting limit
H Sample was prepped or analyzed beyond the specified holding time.
Only detected compounds shown on figure, highest concentrations are reported.

GEI Green Environment inc.
www.greenenvironment.com

Drawing Name: SOIL ANALYTICAL RESULTS: VOCs

Address: 837 Industrial Road
San Carlos, California

Drawn by:	KA
Date:	09/13/2013
Scale:	1" = 30'-0"
Job #	B10655
Figure #	FIGURE 8



Sample ID:	B-16
Sample Date:	01-20-11
VOCs (µg/L) MTBE	12
Carbon tetrachloride	1.4
Chloroform	1.7
1,2-DCA	7.7
1,1-DCE	0.59
cis-1,2-DCE	2.3
trans-1,2-DCE	0.51
TCE	28

Sample ID:	B-17
Sample Date:	01-20-11
VOCs (µg/L) 1,2-DCA	5.8
cis-1,2-DCE	1.1
Vinyl Chloride	4.9

Sample ID:	B-11
Sample Date:	11-22-10
VOCs (µg/L) CCl4	9.9
Chloroform	6.8
1,2-DCA	4.8
PCE	55
TCE	0.55
TPH (µg/L) TPHg	51

Sample ID:	B-15	B-15 DUP (B-2)
Sample Date:	01-20-11	01-20-11
VOCs (µg/L) Chloroform	2.7	2.7
1,2-DCA	14	13
cis-1,2-DCE	1.1	1.1
PCE	1,600	1,700
TCE	9.5	10
CFC-11	11	14
CFC-113	2.7	3.5
Vinyl chloride	ND (<0.50)	0.52

Sample ID:	DP-04-WSP 3
Sample Date:	09-28-09
VOCs (µg/L) Chloroform	11
1,2-DCA	21
1,1-DCE	0.97
cis-1,2-DCE	3.2
PCE	310
Toluene	0.56
TCE	24
CFC-11	30
CFC-113	19
Vinyl Chloride	0.83
TPH (µg/L) TPHg	310

Sample ID:	B-12
Sample Date:	11-23-10
VOCs (µg/L) CCl4	2.6
Chloroform	13
1,2-DCA	11
cis-1,2-DCE	1.1
PCE	170
TCE	9.5
CFC-11	12
CFC-113	7.0

Sample ID:	B-10
Sample Date:	11-22-10
VOCs (µg/L) CCl4	2.3
Chloroform	3.1
1,2-DCA	4.1
PCE	4.6
TCE	0.52

Sample ID:	B-13
Sample Date:	11-23-10
VOCs (µg/L) Chloroform	11
1,1-DCA	1.0
1,2-DCA	25
1,1-DCE	2.4
cis-1,2-DCE	7.4
PCE	730
TCE	59
CFC-11	53
CFC-113	42
Vinyl Chloride	1.3

Sample ID:	B-9
Sample Date:	11-22-10
VOCs (µg/L) CCl4	9.4
Chloroform	6.8
1,2-DCA	4.9
PCE	52
TCE	0.56

Sample ID:	B-7	B-7 DUP (B-4)
Sample Date:	11-23-10	11-23-10
VOCs (µg/L) MTBE	0.91	0.82
CCl4	1.5	2.9
Chloroform	9.9	11
1,1-DCA	0.94	0.93
1,2-DCA	19	20
1,1-DCE	1.9	2.0
cis-1,2-DCE	6.7	6.9
PCE	120	180
TCE	56	65
CFC-11	27	31
CFC-113	30	36
Vinyl Chloride	1.1	1.0
TPH (µg/L) TPHg	170	230

Sample ID:	DP-02-WSP 2
Sample Date:	09-28-09
VOCs (µg/L) MTBE	1.7
Chloroform	8.4
1,1-DCA	1.6
1,2-DCA	23
1,1-DCE	3.6
cis-1,2-DCE	11
PCE	68
TCE	99
CFC-11	44
CFC-113	51
Vinyl Chloride	1.9
TPH (µg/L) TPHg	130

Sample ID:	B-14
Sample Date:	11-23-10
VOCs (µg/L) MTBE	1.2
Chloroform	8.8
1,1-DCA	1.2
1,2-DCA	22
1,1-DCE	2.3
cis-1,2-DCE	8.3
PCE	150
TCE	57
CFC-11	27
CFC-113	31
Vinyl Chloride	1.2
TPH (µg/L) TPHg	220

Sample ID:	DP-04-WSP 4
Sample Date:	09-28-09
VOCs (µg/L) Chloroform	4.6
1,2-DCA	4.7
PCE	29
Toluene	0.79
TCE	0.65

Sample ID:	B-8
Sample Date:	11-22-10
VOCs (µg/L) CCl4	48
Chloroform	21
1,2-DCA	5.2
PCE	61
TCE	1.3
TPH (µg/L) TPHg	82

Sample ID:	B-5
Sample Date:	11-22-10
VOCs (µg/L) MTBE	1.9
Chloroform	9.1
1,1-DCA	1.5
1,2-DCA	22
1,1-DCE	3.1
cis-1,2-DCE	11
PCE	150
TCE	110
CFC-11	44
CFC-113	52
Vinyl Chloride	1.8
TPH (µg/L) TPHg	250

Sample ID:	B-6
Sample Date:	11-23-10
VOCs (µg/L) MTBE	1.4
Chloroform	9.1
1,1-DCA	1.4
1,2-DCA	23
1,1-DCE	3.0
cis-1,2-DCE	9.9
PCE	120
TCE	93
CFC-11	44
CFC-113	50
Vinyl Chloride	1.6
TPH (µg/L) TPHg	230

Sample ID:	MW-1-GW	MW-1A-GW*
Sample Date:	06-19-2012	06-19-2012
VOCs (µg/L) MTBE	1.2	1.3
CC14	5.7	5.0
Chloroform	14	14
1,1-Dichloroethane	0.78	0.79
1,2-Dichloroethane	19	18
1,1-Dichloroethene	1.7	1.8
cis-1,2-Dichloroethene	6.0	5.7
PCE	150	140
TCE	49	49
CFC-11	24	24
CFC-113	28	28
Vinyl Chloride	1.0	1.1
Other VOCs	ND (<0.50 to <50)	ND (<0.50 to <50)
TPH (µg/L) TPHg	200	200

Legend:

- **MW-1** Groundwater monitoring well (GEI, June 2012)
- **WSP-1** Soil boring (WSP, 09/28/09)
- **B-5** Soil boring (GEI, 11/22/10, 11/23/10)
- **B-15** Soil boring (GEI, 01/20/11)
- Concrete surface trench
- Concrete sump box

ND (<2.0) Not detected at or above the laboratory reporting limit.
* Duplicate water sample from MW-1
Only detected compounds shown on figure.

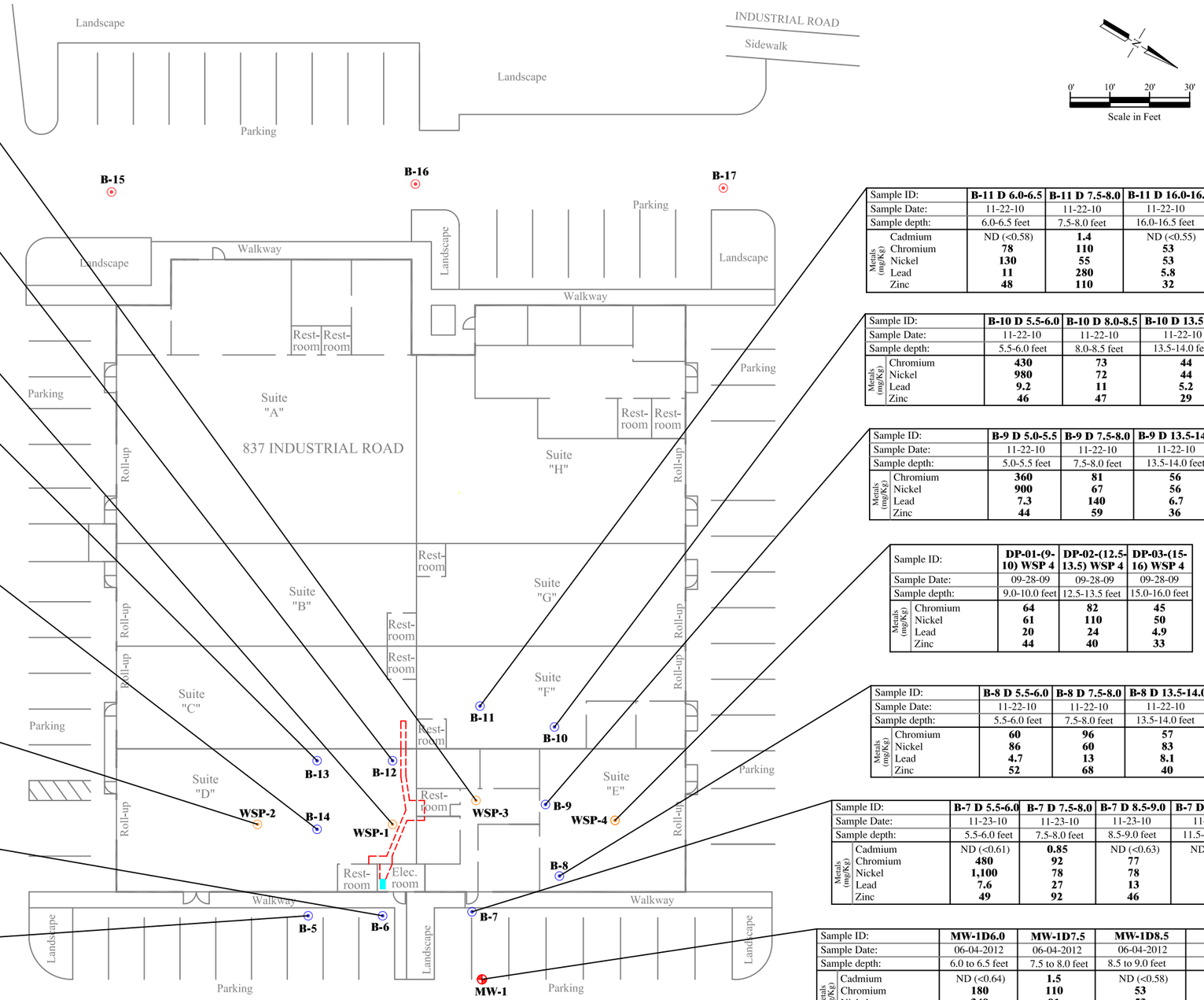
VOCs	Volatile Organic Compounds	MTBE	Methyl tert-butyl ether
TPH	Total petroleum hydrocarbon	CCl4	Carbon tetrachloride
TPHg	Gasoline Range Organics	cis-1,2-DCE	cis-1,2-Dichloroethene
PCE	Tetrachloroethene	1,1-DCE	1,1-Dichloroethene
TCE	Trichloroethene	1,1-DCA	1,1-Dichloroethane
CFC-11	Trichlorofluoromethane	1,2-DCA	1,2-Dichloroethane
CFC-113	1,1,2-Trichloro-1,2,2-trifluoroethane	(µg/L)	Micrograms per liter

GEI Green Environment inc
www.greenenvironment.com

Drawing Name: GROUNDWATER ANALYTICAL RESULTS: VOCs

Address: 837 Industrial Road
San Carlos, California

Drawn by:	KA
Date:	09/13/2013
Scale:	1" = 30'-0"
Job #	B10655
Figure #	FIGURE 9



Sample ID:		DP-01-(8.5-9.5) WSP 3	DP-02-(12.5-13.5) WSP 3	DP-03-(15-16) WSP 3
Sample Date:		09-28-09	09-28-09	09-28-09
Sample depth:		8.5-9.5 feet	12.5-13.5 feet	15.0-16.0 feet
Metals (mg/Kg)	Chromium	**43**	**35**	**37**
	Nickel	**65**	**46**	**42**
	Lead	**54**	**54**	**4.0**
	Zinc	**32**	**26**	**28**

Sample ID:		B-12 D 5.5-6.0	B-12 D 8.0-8.5	B-12 D 13.5-14.0
Sample Date:		11-23-10	11-23-10	11-23-10
Sample depth:		5.5-6.0 feet	8.0-8.5 feet	13.5-14.0 feet
Metals (mg/Kg)	Chromium	**240**	**87**	**49**
	Nickel	**770**	**84**	**60**
	Lead	**9.5**	**110**	**5.8**
	Zinc	**40**	**80**	**35**

Sample ID:		DP-01(6.5-7.5)-WSP 1	DP-02(12.5-13.5)-WSP 1	DP-03(15-16)-WSP 1
Sample Date:		09-28-09	09-28-09	09-28-09
Sample depth:		6.5-7.5 feet	12.5-13.5 feet	15.0-16.0 feet
Metals (mg/Kg)	Cadmium	ND (<0.32)	**0.98**	ND (<0.32)
	Chromium	**170**	**36**	**41**
	Nickel	**470**	**34**	**44**
	Lead	**8.4**	**870**	**4.4**
	Zinc	**38**	**57**	**30**

Sample ID:		B-13 D 5.5-6.0	B-13 D 8.0-8.5 B-3 D 8.0-8.5	B-13 D 13.5-14.0
Sample Date:		11-23-10	11-23-10	11-23-10
Sample depth:		5.5-6.0 feet	8.0-8.5 feet	13.5-14.0 feet
Metals (mg/Kg)	Cadmium	ND (<0.53)	**0.80**	ND (<0.57)
	Chromium	**320**	**61**	**43**
	Nickel	**1,100**	**50**	**50**
	Lead	**6.1**	**24**	**6.7**
	Zinc	**33**	**54**	**35**

B-3 D 8.0-8.5 is a duplicate of B-13 D 8.0-8.5, highest concentrations are reported.

Sample ID:		B-14 D 5.5-6.0 B-3 D 5.5-6.0	B-14 D 8.0-8.5	B-14 D 10-10.5 B-3 D 10.0-10.5	B-14 D 14.0-14.5
Sample Date:		11-23-10	11-23-10	11-23-10	11-23-10
Sample depth:		5.5-6.0 feet	8.0-8.5 feet	10.0-10.5 feet	14.0-14.5 feet
Metals (mg/Kg)	Cadmium	ND (<0.65)	**0.63**	ND (<0.60)	ND (<0.59)
	Chromium	**460**	**66**	**47**	**39**
	Nickel	**1,400**	**65**	**50**	**50**
	Lead	**8.4**	**330**	**8.2**	**5.6**
	Zinc	**49**	**88**	**31**	**31**

B-3 D 5.5-6.0 is a duplicate of B-14 D 5.5-6.0, highest concentrations are reported.
B-3 D 10.0-10.5 is a duplicate of B-13 D 8.0-8.5, highest concentrations are reported.

Sample ID:		DP-03-(12.5-13.5) WSP 2
Sample Date:		09-28-09
Sample depth:		12.5-13.5 feet
Metals (mg/Kg)	Chromium	**86**
	Nickel	**150**
	Lead	**110**
	Zinc	**57**

Sample ID:		B-6 D 3.5-4.0	B-6 D 5.5-6.0	B-6 D 7.5-8.0	B-6 D 12.5-13.0
Sample Date:		11-23-10	11-23-10	11-23-10	11-23-10
Sample depth:		3.5-4.0 feet	5.5-6.0 feet	7.5-8.0 feet	12.5-13.0 feet
Metals (mg/Kg)	Chromium	**120**	**800**	**83**	**44**
	Nickel	**180**	**2,200**	**120**	**51**
	Lead	**16**	**6.8**	**180**	**5.5**
	Zinc	**52**	**53**	**54**	**32**

Sample ID:		B-5 D 5.5-6.0	B-5 D 7.5-8.0	B-5 D 16-16.5
Sample Date:		11-22-10	11-22-10	11-22-10
Sample depth:		5.5-6.0 feet	7.5-8.0 feet	16.0-16.5 feet
Metals (mg/Kg)	Chromium	**760**	**270**	**66**
	Nickel	**1,700**	**740**	**91**
	Lead	**6.9**	**26**	**8.0**
	Zinc	**46**	**49**	**47**

Sample ID:		B-11 D 6.0-6.5	B-11 D 7.5-8.0	B-11 D 16.0-16.5
Sample Date:		11-22-10	11-22-10	11-22-10
Sample depth:		6.0-6.5 feet	7.5-8.0 feet	16.0-16.5 feet
Metals (mg/Kg)	Cadmium	ND (<0.58)	**1.4**	ND (<0.55)
	Chromium	**78**	**110**	**53**
	Nickel	**130**	**55**	**53**
	Lead	**11**	**280**	**5.8**
	Zinc	**48**	**110**	**32**

Sample ID:		B-10 D 5.5-6.0	B-10 D 8.0-8.5	B-10 D 13.5-14.0
Sample Date:		11-22-10	11-22-10	11-22-10
Sample depth:		5.5-6.0 feet	8.0-8.5 feet	13.5-14.0 feet
Metals (mg/Kg)	Chromium	**430**	**73**	**44**
	Nickel	**980**	**72**	**44**
	Lead	**9.2**	**11**	**5.2**
	Zinc	**46**	**47**	**29**

Sample ID:		B-9 D 5.0-5.5	B-9 D 7.5-8.0	B-9 D 13.5-14.0
Sample Date:		11-22-10	11-22-10	11-22-10
Sample depth:		5.0-5.5 feet	7.5-8.0 feet	13.5-14.0 feet
Metals (mg/Kg)	Chromium	**360**	**81**	**56**
	Nickel	**900**	**67**	**56**
	Lead	**7.3**	**140**	**6.7**
	Zinc	**44**	**59**	**36**

Sample ID:		DP-01-(9-10) WSP 4	DP-02-(12.5-13.5) WSP 4	DP-03-(15-16) WSP 4
Sample Date:		09-28-09	09-28-09	09-28-09
Sample depth:		9.0-10.0 feet	12.5-13.5 feet	15.0-16.0 feet
Metals (mg/Kg)	Chromium	**64**	**82**	**45**
	Nickel	**61**	**110**	**50**
	Lead	**20**	**24**	**4.9**
	Zinc	**44**	**40**	**33**

Sample ID:		B-8 D 5.5-6.0	B-8 D 7.5-8.0	B-8 D 13.5-14.0
Sample Date:		11-22-10	11-22-10	11-22-10
Sample depth:		5.5-6.0 feet	7.5-8.0 feet	13.5-14.0 feet
Metals (mg/Kg)	Chromium	**60**	**96**	**57**
	Nickel	**86**	**60**	**83**
	Lead	**4.7**	**13**	**8.1**
	Zinc	**52**	**68**	**40**

Sample ID:		B-7 D 5.5-6.0	B-7 D 7.5-8.0	B-7 D 8.5-9.0	B-7 D 11.5-12.0
Sample Date:		11-23-10	11-23-10	11-23-10	11-23-10
Sample depth:		5.5-6.0 feet	7.5-8.0 feet	8.5-9.0 feet	11.5-12.0 feet
Metals (mg/Kg)	Cadmium	ND (<0.61)	**0.85**	ND (<0.63)	ND (<0.57)
	Chromium	**480**	**92**	**77**	**71**
	Nickel	**1,100**	**78**	**78**	**65**
	Lead	**7.6**	**27**	**13**	**7.4**
	Zinc	**49**	**92**	**46**	**39**

Sample ID:		MW-1D6.0	MW-1D7.5	MW-1D8.5	MW-1D20
Sample Date:		06-04-2012	06-04-2012	06-04-2012	06-04-2012
Sample depth:		6.0 to 6.5 feet	7.5 to 8.0 feet	8.5 to 9.0 feet	8.0 to 8.5 feet
Metals (mg/Kg)	Cadmium	ND (<0.64)	**1.5**	ND (<0.58)	ND (<0.63)
	Chromium	**180**	**110**	**53**	**95**
	Nickel	**340**	**91**	**53**	**150**
	Zinc	**57**	**85**	**30**	**60**

MW-1D20 is a duplicate of MW-1D7.5, highest concentrations are reported.

Legend:

- **MW-1** Groundwater monitoring well (GEI, June 2012)
- **WSP-1** Soil boring (WSP, 09/28/09)
- **B-5** Soil boring (GEI, 11/22/10, 11/23/10)
- **B-15** Soil boring (GEI, 01/20/11)
- Concrete surface trench
- Concrete sump box

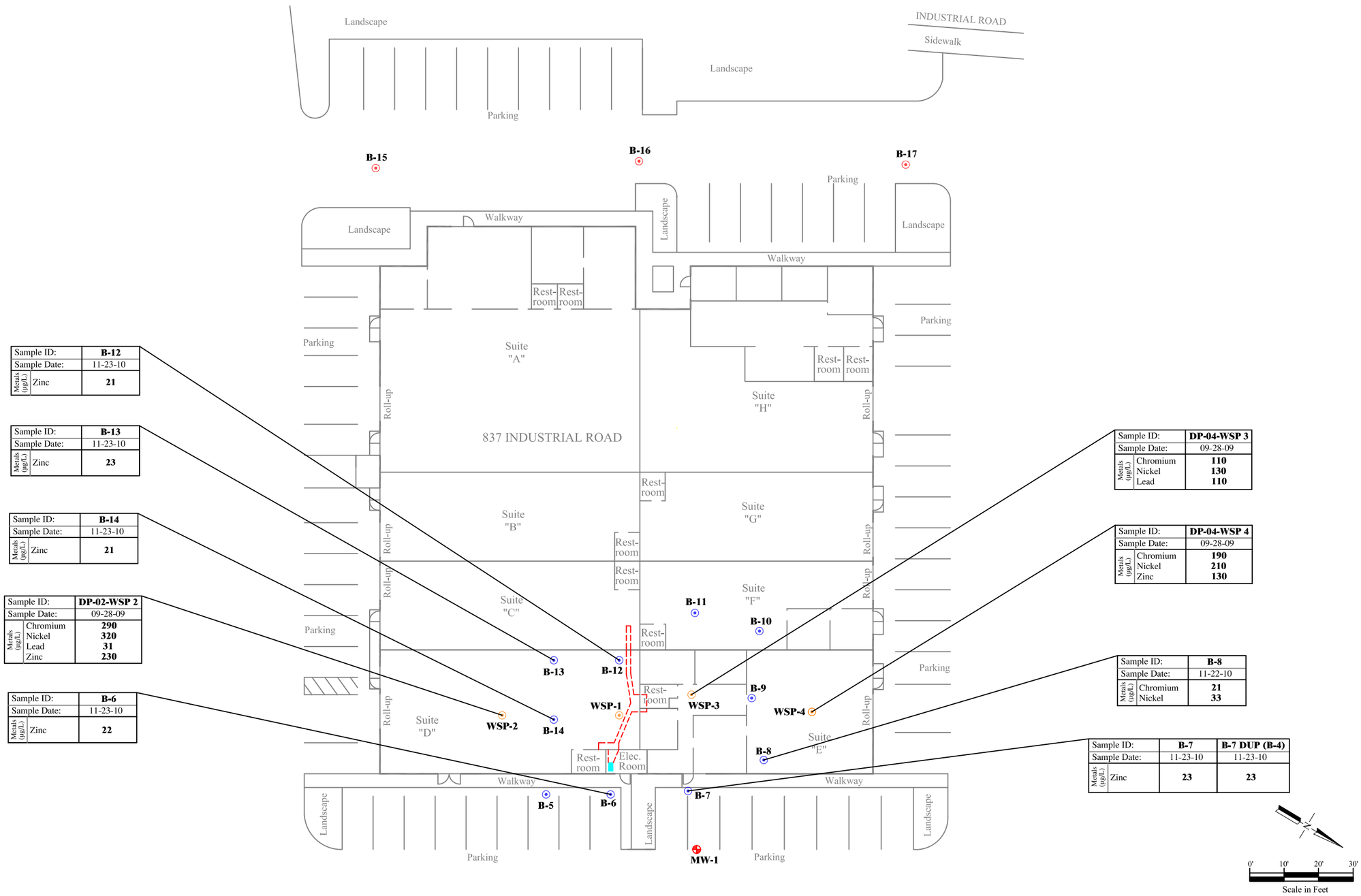
(mg/Kg) Milligrams per kilogram
ND (<2.0) Not detected at or above the laboratory reporting limit.
Only detected compounds shown on figure, highest concentrations are reported.

GEI Green Environment inc.
www.greenenvironment.com

Drawing Name: SOIL ANALYTICAL RESULTS: METALS

Address: 837 Industrial Road
San Carlos, California

Drawn by:	KA
Date:	09/13/2013
Scale:	1" = 30'-0"
Job #	B10655
Figure #	FIGURE 10



Sample ID:	B-12
Sample Date:	11-23-10
Metals (µg/L) Zinc	21

Sample ID:	B-13
Sample Date:	11-23-10
Metals (µg/L) Zinc	23

Sample ID:	B-14
Sample Date:	11-23-10
Metals (µg/L) Zinc	21

Sample ID:	DP-02-WSP 2
Sample Date:	09-28-09
Metals (µg/L) Chromium	290
Nickel	320
Lead	31
Zinc	230

Sample ID:	B-6
Sample Date:	11-23-10
Metals (µg/L) Zinc	22

Sample ID:	DP-04-WSP 3
Sample Date:	09-28-09
Metals (µg/L) Chromium	110
Nickel	130
Lead	110

Sample ID:	DP-04-WSP 4
Sample Date:	09-28-09
Metals (µg/L) Chromium	190
Nickel	210
Zinc	130

Sample ID:	B-8
Sample Date:	11-22-10
Metals (µg/L) Chromium	21
Nickel	33

Sample ID:	B-7	B-7 DUP (B-4)
Sample Date:	11-23-10	11-23-10
Metals (µg/L) Zinc	23	23

Legend:

- **MW-1** Groundwater monitoring well (GEI, June 2012)
- **WSP-1** Soil boring (WSP, 09/28/09)
- **B-5** Soil boring (GEI, 11/22/10, 11/23/10)
- **B-15** Soil boring (GEI, 01/20/11)
- Concrete surface trench
- Concrete sump box

(µg/L) Micrograms per liter
ND (<2.0) Not detected at or above the laboratory reporting limit.
Only detected compounds shown on figure.

GEI Green Environment inc.
www.greenenvironment.com

Drawing Name: GROUNDWATER ANALYTICAL RESULTS: METALS

Address: 837 Industrial Road
San Carlos, California

Drawn by:	KA
Date:	09/13/2013
Scale:	1" = 30'-0"
Job #	B10655
Figure #	FIGURE 11

TABLES

Table 1:
Soil Organic Analytical Results

837 Industrial Road,
San Carlos, CA

Sample ID	Sample Date	Field Point	Sample Depth	pH	TPHg	TPHd	TPHmo	PCBs: PCB-1260	PCBs: Other PCBs	VOCs [8]: Acetone	2-Butanone (MEK)	Carbon disulfide	4-Isopropyl-toluene	Naphthalene	PCE
			ft bfs	SU	mg/Kg	mg/Kg	mg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg
DP-01 (6.5-7.5)-WSP 1	09/28/09	WSP-1	6.5 to 7.5	7.48	ND (<0.25)	**54**	**150**	ND (<50)	ND (<50)	**51**	ND (<51)	ND (<5.1)	ND (<5.1)	ND (<10)	ND (<5.1)
DP-02 (12.5-13.5)-WSP 1[1]	09/28/09	WSP-1	12.5 to 13.5	3.90	**0.44**	**4,800**	**11,000**	**1,500**	ND (<300)	**180**	ND (<46)	ND (<4.6)	**5.8**	**33**	ND (<4.6)
DP-03 (15-16)-WSP 1	09/28/09	WSP-1	15.0 to 16.0	8.30	ND (<0.25)	ND (<1.0)	ND (<50)	ND (<49)	ND (<49)	ND (<50)	ND (<50)	ND (<5.0)	ND (<5.0)	ND (<9.9)	ND (<5.0)
DP-03-(12.5-13.5) WSP 2	09/28/09	WSP-2	12.5 to 13.5	8.30	ND (<0.25)	**110**	**300**	**1,400**	ND (<500)	ND (<50)	ND (<50)	ND (<5.0)	ND (<5.0)	ND (<10)	ND (<5.0)
DP-01-(8.5-9.5) WSP 3 [2]	09/28/09	WSP-3	8.5 to 9.5	6.93	**0.26**	**2,300**	**7,100**	**880**	ND (<290)	**160**	ND (<45)	ND (<4.5)	ND (<4.5)	ND (<9.0)	ND (<4.5)
DP-02-(12.5-13.5) WSP 3	09/28/09	WSP-3	12.5 to 13.5	7.54	ND (<0.25)	**940**	**2,600**	**1,800**	ND (<490)	**100**	ND (<49)	ND (<4.9)	ND (<4.9)	ND (<9.9)	ND (<4.9)
DP-03-(15-16) WSP 3	09/28/09	WSP-3	15.0 to 16.0	8.64	ND (<0.25)	ND (<1.0)	ND (<50)	ND (<50)	ND (<50)	ND (<50)	ND (<50)	ND (<5.0)	ND (<5.0)	ND (<9.9)	ND (<5.0)
DP-01-(9-10) WSP 4	09/28/09	WSP-4	9.0 to 10.0	8.04	ND (<0.25)	**6.4**	ND (<49)	**79**	ND (<50)	**170**	ND (<50)	ND (<5.0)	ND (<5.0)	ND (<9.9)	ND (<5.0)
DP-02-(12.5-13.5) WSP 4	09/28/09	WSP-4	12.5 to 13.5	8.10	ND (<0.22)	**17**	**63**	**160**	ND (<50)	**350**	**72**	ND (<4.4)	ND (<4.4)	ND (<8.8)	ND (<4.4)
DP-03-(15-16) WSP 4	09/28/09	WSP-4	15.0 to 16.0	8.64	ND (<0.25)	ND (<0.99)	ND (<49)	ND (<49)	ND (<49)	ND (<50)	ND (<50)	ND (<5.0)	ND (<5.0)	ND (<9.9)	ND (<5.0)
B-5 D 5.5-6.0	11/22/10	B-5	5.5 to 6.0	8.06	ND (<0.31)	ND (<1.3)	ND (<67)	ND (<67)	ND (<67)	[ND (<61)]	[ND (<61)]	[ND (<6.1)]	[ND (<6.1)]	[ND (<12)]	[ND (<6.1)]
B-5 D 7.5-8.0	11/22/10	B-5	7.5 to 8.0	7.52	ND (<0.36)	**3,700**	**11,000**	**44,000**	ND (<33,000)	[**600**]*	[**170**]	[**9.4**]	[ND (<7.2)]	[ND (<14)]	[ND (<7.2)]
B-5 D 16-16.5	11/22/10	B-5	16.0 to 16.5	8.92	ND (<0.29) [ND (<0.22)]	ND (<1.2)	ND (<58)	ND (<58)	ND (<58)	ND (<58) [ND (<44)]	ND (<58) [ND (<44)]	ND (<5.8) [ND (<4.4)]	ND (<5.8) [ND (<4.4)]	ND (<12) [ND (<8.8)]	ND (<5.8) [ND (<4.4)]
B-6 D 3.5-4.0	11/23/10	B-6	3.5 to 4.0	7.85	ND (<0.27)	**2.3**	ND (<64)	ND (<64)	ND (<64)	[ND (<55)]	[ND (<55)]	[ND (<5.5)]	[ND (<5.5)]	[ND (<11)]	[ND (<5.5)]
B-6 D 5.5-6.0	11/23/10	B-6	5.5 to 6.0	8.04	ND (<0.36) [ND (<0.30)]	ND (<1.4)	ND (<72)	ND (<73)	ND (<73)	ND (<72) [ND (<61)]	ND (<72) [ND (<61)]	ND (<7.2) [ND (<6.1)]	ND (<7.2) [ND (<6.1)]	ND (<14) [ND (<12)]	ND (<7.2) [ND (<6.1)]
B-6 D 7.5-8.0	11/23/10	B-6	7.5 to 8.0	7.77	ND (<0.46)	**5,400**	**11,000**	**6,700**	ND (<1,400)	[**380**]	[ND (<93)]	[ND (<9.3)]	[ND (<9.3)]	[ND (<19)]	[ND (<9.3)]
B-6 D 12.5-13.0	11/23/10	B-6	12.5 to 13.0	8.79	ND (<0.22)	ND (<1.2)	ND (<58)	ND (<57)	ND (<57)	[ND (<43)]	[ND (<43)]	[ND (<4.3)]	[ND (<4.3)]	[ND (<8.6)]	[ND (<4.3)]
B-7 D 5.5-6.0	11/23/10	B-7	5.5 to 6.0	8.30	ND (<0.32) [ND (<0.28)]	**1.5**	ND (<64)	ND (<64)	ND (<64)	ND (<64) [ND (<56)]	ND (<64) [ND (<56)]	ND (<6.4) [ND (<5.6)]	ND (<6.4) [ND (<5.6)]	ND (<13) [ND (<11)]	ND (<6.4) [ND (<5.6)]
B-7 D 7.5-8.0	11/23/10	B-7	7.5 to 8.0	7.87	ND (<0.44)	**4.1**	ND (<79)	**720**	ND (<390)	[**160**]	[ND (<88)]	[ND (<8.8)]	[ND (<8.8)]	[ND (<18)]	[ND (<8.8)]
B-7 D 8.5-9.0	11/23/10	B-7	8.5 to 9.0	8.08	ND (<0.32) [ND (<0.25)]	ND (<1.3)	ND (<65)	ND (<64)	ND (<64)	**77** [ND (<50)]	ND (<63) [ND (<50)]	ND (<6.3) [ND (<5.0)]	ND (<6.3) [ND (<5.0)]	ND (<13) [ND (<10)]	ND (<6.3) [ND (<5.0)]
B-7 D 11.5-12.0	11/23/10	B-7	11.5 to 12.0	9.30	ND (<0.28) [ND (<0.23)]	ND (<1.2)	ND (<58)	ND (<58)	ND (<58)	ND (<57) [ND (<46)]	ND (<57) [ND (<46)]	ND (<5.7) [ND (<4.6)]	ND (<5.7) [ND (<4.6)]	ND (<11) [ND (<9.1)]	ND (<5.7) [ND (<4.6)]
B-8 D 5.5-6.0	11/22/10	B-8	5.5 to 6.0	7.77 H	ND (<0.27) [ND (<0.23)] H	ND (<1.2)	ND (<59)	ND (<59)	ND (<59)	**89** [**53**] H	ND (<55) [ND (<45)] H	ND (<5.5) [ND (<4.5)] H	ND (<5.5) [ND (<4.5)] H	ND (<11) [ND (<9.0)] H	ND (<5.5) [ND (<4.5)] H
B-8 D 7.5-8.0	11/22/10	B-8	7.5 to 8.0	8.30 H	ND (<0.35) [ND (<0.37)] H	ND (<1.5)	ND (<76)	ND (<76)	ND (<76)	**570*** [ND (<74)] H	**110** [ND (<74)] H	ND (<7.0) [ND (<7.4)] H	ND (<7.0) [ND (<7.4)] H	ND (<14) [ND (<15)] H	ND (<7.0) [ND (<7.4)] H
B-8 D 13.5-14.0	11/22/10	B-8	13.5 to 14.0	8.84 H	ND (<0.28) [ND (<0.25)] H	ND (<1.2)	ND (<58)	ND (<58)	ND (<58)	ND (<56) [ND (<50)] H	ND (<56) [ND (<50)] H	ND (<5.6) [ND (<5.0)] H	ND (<5.6) [ND (<5.0)] H	ND (<11) [ND (<10)] H	ND (<5.6) [ND (<5.0)] H
B-9 D 5.0-5.5	11/22/10	B-9	5.0 to 5.5	7.86 H	ND (<0.30) [ND (<0.32)] H	ND (<1.2)	ND (<60)	ND (<60)	ND (<60)	ND (<60) [ND (<64)] H	ND (<60) [ND (<64)] H	ND (<6.0) [ND (<6.4)] H	ND (<6.0) [ND (<6.4)] H	ND (<12) [ND (<13)] H	ND (<6.0) [ND (<6.4)] H
B-9 D 7.5-8.0	11/22/10	B-9	7.5 to 8.0	8.12 H	ND (<0.38) H	**1,500**	**4,100**	**4,900**	ND (<1,600)	[**280**] H	[**80**] H	[**16**] H	[ND (<7.6)] H	[ND (<15)] H	[ND (<7.6)] H
B-9 D 13.5-14.0	11/22/10	B-9	13.5 to 14.0	8.61 H	ND (<0.28) [ND (<0.23)] H	ND (<1.2)	ND (<59)	ND (<59)	ND (<59)	ND (<55) [ND (<46)] H	ND (<55) [ND (<46)] H	ND (<5.5) [ND (<4.6)] H	ND (<5.5) [ND (<4.6)] H	ND (<11) [ND (<9.2)] H	ND (<5.5) [ND (<4.6)] H
B-10 D 5.5-6.0	11/22/10	B-10	5.5 to 6.0	7.88 H	ND (<0.31) [ND (<0.34)] H	ND (<1.3)	ND (<67)	ND (<67)	ND (<67)	**71** [ND (<68)] H	ND (<62) [ND (<68)] H	ND (<6.2) [ND (<6.8)] H	ND (<6.2) [ND (<6.8)] H	ND (<12) [ND (<14)] H	ND (<6.2) [ND (<6.8)] H
B-10 D 8.0-8.5	11/22/10	B-10	8.0 to 8.5	5.38 H	ND (<0.33) [ND (<0.28)] H	**37**	**100**	ND (<68)	ND (<68)	**200** [**69**] H	ND (<65) [ND (<55)] H	ND (<6.5) [ND (<5.5)] H	ND (<6.5) [ND (<5.5)] H	ND (<13) [ND (<11)] H	ND (<6.5) [ND (<5.5)] H
B-10 D 13.5-14.0	11/22/10	B-10	13.5 to 14.0	8.20 H	ND (<0.28) [ND (<0.21)] H	ND (<1.2)	ND (<58)	ND (<58)	ND (<58)	ND (<55) [ND (<43)] H	ND (<55) [ND (<43)] H	ND (<5.5) [ND (<4.3)] H	ND (<5.5) [ND (<4.3)] H	ND (<11) [ND (<8.6)] H	ND (<5.5) [ND (<4.3)] H
B-11 D 6.0-6.5	11/22/10	B-11	6.0 to 6.5	7.48	ND (<0.26)	**12**	ND (<60)	ND (<60)	ND (<60)	[ND (<53)]	[ND (<53)]	[ND (<5.3)]	[ND (<5.3)]	[ND (<11)]	[ND (<5.3)]
B-11 D 7.5-8.0	11/22/10	B-11	7.5 to 8.0	6.26	ND (<1.2) [ND (<0.33)] H	**3,400**	**7,700**	ND (<720)	ND (<720)	**240** [**170**] H	ND (<240) [ND (<66)] H	ND (<24) [ND (<6.6)] H	ND (<24) [**7.1**] H	ND (<49) [**23**] H	ND (<24) [ND (<6.6)] H
B-11 D 16.0-16.5	11/22/10	B-11	16.0 to 16.5	8.71 H	ND (<0.27) [ND (<0.23)] H	ND (<1.1)	ND (<56)	ND (<55)	ND (<55)	ND (<54) [ND (<45)] H	ND (<54) [ND (<45)] H	ND (<5.4) [ND (<4.5)] H	ND (<5.4) [ND (<4.5)] H	ND (<11) [ND (<9.1)] H	ND (<5.4) [**5.0**] H
B-12 D 5.5-6.0	11/23/10	B-12	5.5 to 6.0	7.89	ND (<0.25)	ND (<1.1)	ND (<57)	ND (<56)	ND (<56)	[ND (<49)]	[ND (<49)]	[ND (<4.9)]	[ND (<4.9)]	[ND (<9.9)]	[ND (<4.9)]
B-12 D 8.0-8.5	11/23/10	B-12	8.0 to 8.5	6.49	ND (<0.38)	**1,500**	**2,700**	ND (<79)	ND (<79)	[**420**]	[**100**]	[ND (<7.7)]	[ND (<7.7)]	[ND (<15)]	[ND (<7.7)]
B-12 D 13.5-14.0	11/23/10	B-12	13.5 to 14.0	8.44	ND (<0.28) [ND (<0.23)]	ND (<1.2)	ND (<60)	ND (<59)	ND (<59)	ND (<56) [ND (<46)]	ND (<56) [ND (<46)]	ND (<5.6) [ND (<4.6)]	ND (<5.6) [ND (<4.6)]	ND (<11) [ND (<9.2)]	ND (<5.6) [**4.9**]
B-13 D 5.5-6.0	11/23/10	B-13	5.5 to 6.0	8.23	ND (<0.27)	ND (<1.1)	ND (<55)	ND (<55)	ND (<55)	[ND (<55)]	[ND (<55)]	[ND (<5.5)]	[ND (<5.5)]	[ND (<11)]	[ND (<5.5)]
B-13 D 8.0-8.5	11/23/10	B-13	8.0 to 8.5	7.96	ND (<0.88) [ND (<0.28)] H	**74**	**150**	**38,000**	ND (<35,000)	**240** [ND (<57)] H	ND (<180) [ND (<57)] H	ND (<18) [ND (<5.7)] H	ND (<18) [ND (<5.7)] H	ND (<35) [ND (<11)] H	ND (<18) [ND (<5.7)] H
B-3 D 8.0-8.5[1]	11/23/10	B-13	8.0 to 8.5	7.98	ND (<0.29) [ND (<0.27)] H	ND (<1.2)	ND (<62)	ND (<62)	ND (<62)	ND (<58) [ND (<53)] H	ND (<58) [ND (<53)] H	ND (<5.8) [ND (<5.3)] H	ND (<5.8) [ND (<5.3)] H	ND (<12) [ND (<11)] H	ND (<5.8) [ND (<5.3)] H
B-13 D 13.5-14.0	11/23/10	B-13	13.5 to 14.0	9.06	ND (<0.28) [ND (<0.24)] H	ND (<1.2)	ND (<59)	ND (<60)	ND (<60)	ND (<56) [ND (<48)] H	ND (<56) [ND (<48)] H	ND (<5.6) [ND (<4.8)] H	ND (<5.6) [ND (<4.8)] H	ND (<11) [ND (<9.6)] H	ND (<5.6) [**22**] H
B-14 D 5.5-6.0	11/23/10	B-14	5.5 to 6.0	8.17	ND (<0.27) [ND (<0.28)] H	ND (<1.2)	ND (<59)	ND (<59)	ND (<59)	ND (<55) [ND (<55)] H	ND (<55) [ND (<55)] H	ND (<5.5) [ND (<5.5)] H	ND (<5.5) [ND (<5.5)] H	ND (<11) [ND (<11)] H	ND (<5.5) [ND (<5.5)] H
B-3 D 5.5-6.0[2]	11/23/10	B-14	5.5 to 6.0	8.02	ND (<0.31) [ND (<0.26)] H	ND (<1.3)	ND (<64)	ND (<63)	ND (<63)	ND (<62) [ND (<52)] H	ND (<62) [ND (<52)] H	ND (<6.2) [ND (<5.2)] H	ND (<6.2) [ND (<5.2)] H	ND (<12) [ND (<10)] H	ND (<6.2) [ND (<5.2)] H
B-14 D 8.0-8.5	11/23/10	B-14	8.0 to 8.5	7.81	ND (<0.32) [ND (<0.52)] H	**26**	**68**	**770**	ND (<330)	**240** [**190**] H	ND (<64) [ND (<100)] H	ND (6.4) [ND (<10)] H	ND (<6.4) [ND (<10)] H	ND (<13) [ND (<21)] H	ND (6.4) [ND (<10)] H
B-14 D 10-10.5	11/23/10	B-14	10.0 to 10.5	8.38	ND (<0.30) [ND (<0.34)] H	**1.6**	ND (<63)	ND (<63)	ND (<63)	**70** [ND (<68)] H	ND (<61) [ND (<68)] H	ND (<6.1) [ND (<6.8)] H	ND (<6.1) [ND (<6.8)] H	ND (<12) [ND (<14)] H	ND (<6.1) [ND (<6.8)] H
B-3 D 10.0-10.5[3]	11/23/10	B-14	10.0 to 10.5	8.97	ND (<0.29) [ND (<0.35)] H	ND (<1.2)	ND (<60)	ND (<60)	ND (<60)	ND (<58) [ND (<69)] H	ND (<58) [ND (<69)] H	ND (<5.8) [ND (<6.9)] H	ND (<5.8) [ND (<6.9)] H	ND (<12) [ND (<14)] H	ND (<5.8) [ND (<6.9)] H
B-14 D 14.0-14.5	11/23/10	B-14	14.0 to 14.5	8.41	ND (<0.27) [ND (<0.23)] H	ND (<1.2)	ND (<58)	ND (<58)	ND (<58)	ND (<55) [ND (<46)] H	ND (<55) [ND (<46)] H	ND (<5.5) [ND (<4.6)] H	ND (<5.5) [ND (<4.6)] H	ND (<11) [ND (<9.2)] H	ND (<5.5) [**16**] H
B-15 D 5.5-6.0	01/20/11	B-15	5.5 to 6.0	NA	NA	NA	NA	NA	NA	**280** [**300**] H	ND (<68) [**65**] H	ND (<6.8) [ND (<6.0)] H	ND (<6.8) [ND (<6.0)] H	ND (<14) [ND (<12)] H	ND (<6.8) [ND (<6.0)] H

Sample ID	VOCs [8]: Toluene	TCE	CFC-113	1,2,4-TMB	1,3,5-TMB	Xylenes, Total	Other VOCs [6]	PAHs: Naphthalene	Phenanthrene	Chrysene	Benzo[a] pyrene	Benzo[b] fluoranthene	Fluoranthene	Pyrene	Other PAHs
	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg
DP-01 (6.5-7.5)-WSP 1	ND (<5.1)	ND (<5.1)	ND (<5.1)	ND (<5.1)	ND (<5.1)	ND (<10)	ND (<5.1) to ND (<51)	ND (<50)	ND (<50)	**88**	ND (<50)	**52**	ND (<50)	ND (<50)	ND (<50)
DP-02 (12.5-13.5)-WSP 1[1]	**9.3**	ND (<4.6)	ND (<4.6)	**31**	**13**	**24**	ND (<4.6) to ND (<46)	ND (<720)	**1,200**	**1,200**	ND (<720)	ND (<720)	ND (<720)	ND (<720)	ND (<720)
DP-03 (15-16)-WSP 1	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<9.9)	ND (<5.0) to ND (<50)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)
DP-03-(12.5-13.5) WSP 2	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<10)	ND (<5.0) to ND (<50)	ND (<25)	ND (<25)	ND (<25)	ND (<25)	ND (<25)	ND (<25)	ND (<25)	ND (<25)
DP-01-(8.5-9.5) WSP 3 [2]	ND (<4.5)	ND (<4.5)	ND (<4.5)	ND (<4.5)	ND (<4.5)	ND (<9.0)	ND (<4.5) to ND (<45)	ND (<1,400)	**2,300**	**3,800**	ND (<1,400)	**1,900**	**1,900**	ND (<1,400)	ND (<1,400)
DP-02-(12.5-13.5) WSP 3	ND (<4.9)	ND (<4.9)	ND (<4.9)	ND (<4.9)	ND (<4.9)	ND (<9.9)	ND (<4.9) to ND (<49)	ND (<250)	ND (<250)	ND (<250)	ND (<250)	ND (<250)	ND (<250)	ND (<250)	ND (<250)
DP-03-(15-16) WSP 3	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<9.9)	ND (<5.0) to ND (<50)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)
DP-01-(9-10) WSP 4	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<9.9)	ND (<5.0) to ND (<50)	ND (<4.9)	ND (<4.9)	ND (<4.9)	ND (<4.9)	ND (<4.9)	ND (<4.9)	ND (<4.9)	ND (<4.9)
DP-02-(12.5-13.5) WSP 4	ND (<4.4)	ND (<4.4)	ND (<4.4)	ND (<4.4)	ND (<4.4)	ND (<8.8)	ND (<4.4) to ND (<44)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)
DP-03-(15-16) WSP 4	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<9.9)	ND (<5.0) to ND (<50)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)	ND (<5.0)
B-5 D 5.5-6.0	[ND (<6.1)]	[ND (<6.1)]	[ND (<6.1)]	[ND (<6.1)]	[ND (<6.1)]	[ND (<12)]	[ND (<6.1) to ND (<61)]	ND (<6.7)	ND (<6.7)	ND (<6.7)	ND (<6.7)	ND (<6.7)	ND (<6.7)	ND (<6.7)	ND (<6.7)
B-5 D 7.5-8.0	[**11**]	[ND (<7.2)]	[ND (<7.2)]	[**9.9**]	[ND (<7.2)]	[ND (<14)]	[ND (<7.2) to ND (<72)]	ND (<33)	ND (<33)	**140**	**61**	ND (<33)	**69**	**160**	ND (<33)
B-5 D 16-16.5	ND (<5.8) [ND (<4.4)]	ND (<5.8) [**9.4**]	ND (<5.8) [**5.2**]	ND (<5.8) [ND (<4.4)]	ND (<5.8) [ND (<4.4)]	ND (<12) [ND (<8.8)]	ND (<5.8) to ND (<58) [ND (<4.4) to ND (<44)]	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)
B-6 D 3.5-4.0	[ND (<5.5)]	[ND (<5.5)]	[ND (<5.5)]	[ND (<5.5)]	[ND (<5.5)]	[ND (<11)]	[ND (<5.5) to ND (<55)]	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)
B-6 D 5.5-6.0	ND (<7.2) [ND (<6.1)]	ND (<7.2) [ND (<6.1)]	ND (<7.2) [ND (<6.1)]	ND (<7.2) [ND (<6.1)]	ND (<7.2) [ND (<6.1)]	ND (<14) [ND (<12)]	ND (<7.2) to ND (<72) [ND (<6.1) to ND (<61)]	ND (<7.2)	ND (<7.2)	ND (<7.2)	ND (<7.2)	ND (<7.2)	ND (<7.2)	ND (<7.2)	ND (<7.2)
B-6 D 7.5-8.0	[**13**]	[ND (<9.3)]	[ND (<9.3)]	[ND (<9.3)]	[ND (<9.3)]	[ND (<19)]	[ND (<9.3) to ND (<93)]	ND (<140)	ND (<140)	**430**	ND (<140)	ND (<140)	ND (<140)	**310**	ND (<140)
B-6 D 12.5-13.0	[ND (<4.3)]	[ND (<4.3)]	[ND (<4.3)]	[ND (<4.3)]	[ND (<4.3)]	[ND (<8.6)]	[ND (<4.3) to ND (<43)]	ND (<5.7)	ND (<5.7)	ND (<5.7)	ND (<5.7)	ND (<5.7)	ND (<5.7)	ND (<5.7)	ND (<5.7)
B-7 D 5.5-6.0	ND (<6.4) [ND (<5.6)]	ND (<6.4) [ND (<5.6)]	ND (<6.4) [ND (<5.6)]	ND (<6.4) [ND (<5.6)]	ND (<6.4) [ND (<5.6)]	ND (<13) [ND (<11)]	ND (<6.4) to ND (<64) [ND (<5.6) to ND (<56)]	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)	**6.6**	**6.6**	ND (<6.4)	ND (<6.4)
B-7 D 7.5-8.0	[ND (<8.8)]	[ND (<8.8)]	[ND (<8.8)]	[ND (<8.8)]	[ND (<8.8)]	[ND (<18)]	[ND (<8.8) to ND (<88)]	ND (<7.9)	ND (<7.9)	ND (<7.9)	ND (<7.9)	ND (<7.9)	ND (<7.9)	ND (<7.9)	ND (<7.9)
B-7 D 8.5-9.0	ND (<6.3) [ND (<5.0)]	ND (<6.3) [ND (<5.0)]	ND (<6.3) [ND (<5.0)]	ND (<6.3) [ND (<5.0)]	ND (<6.3) [ND (<5.0)]	ND (<13) [ND (<10)]	ND (<6.3) to ND (<63) [ND (<5.0) to ND (<50)]	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)
B-7 D 11.5-12.0	ND (<5.7) [ND (<4.6)]	ND (<5.7) [ND (<4.6)]	ND (<5.7) [ND (<4.6)]	ND (<5.7) [ND (<4.6)]	ND (<5.7) [ND (<4.6)]	ND (<11) [ND (<9.1)]	ND (<5.7) to ND (<57) [ND (<4.6) to ND (<46)]	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)
B-8 D 5.5-6.0	ND (<5.5) [ND (<4.5)] H	ND (<5.5) [ND (<4.5)] H	ND (<5.5) [ND (<4.5)] H	ND (<5.5) [ND (<4.5)] H	ND (<5.5) [ND (<4.5)] H	ND (<11) [ND (<9.0)] H	ND (<5.5) to ND (<55) [ND (<4.5) to ND (<45)] H	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)
B-8 D 7.5-8.0	ND (<7.0) [ND (<7.4)] H	ND (<7.0) [ND (<7.4)] H	ND (<7.0) [ND (<7.4)] H	ND (<7.0) [ND (<7.4)] H	ND (<7.0) [ND (<7.4)] H	ND (<14) [ND (<15)] H	ND (<7.0) to ND (<70) [ND (<7.4) to ND (<74)] H	ND (<7.6)	ND (<7.6)	ND (<7.6)	ND (<7.6)	ND (<7.6)	ND (<7.6)	ND (<7.6)	ND (<7.6))
B-8 D 13.5-14.0	ND (<5.6) [ND (<5.0)] H	ND (<5.6) [ND (<5.0)] H	ND (<5.6) [ND (<5.0)] H	ND (<5.6) [ND (<5.0)] H	ND (<5.6) [ND (<5.0)] H	ND (<11) [ND (<10)] H	ND (<5.6) to ND (<56) [ND (<5.0) to ND (<50)] H	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)
B-9 D 5.0-5.5	ND (<6.0) [ND (<6.4)] H	ND (<6.0) [ND (<6.4)] H	ND (<6.0) [ND (<6.4)] H	ND (<6.0) [ND (<6.4)] H	ND (<6.0) [ND (<6.4)] H	ND (<12) [ND (<13)] H	ND (<6.0) to ND (<60) [ND (<6.4) to ND (<64)] H	ND (<6.0)	ND (<6.0)	ND (<6.0)	ND (<6.0)	ND (<6.0)	ND (<6.0)	ND (<6.0)	ND (<6.0)
B-9 D 7.5-8.0	[ND (<7.6)] H	[ND (<7.6)] H	[ND (<7.6)] H	[ND (<7.6)] H	[ND (<7.6)] H	[ND (<15)] H	[ND (<7.6) to ND (<76)] H	ND (<39)	ND (<39)	**180**	**41**	**63**	ND (<39)	**49**	ND (<39)
B-9 D 13.5-14.0	ND (<5.5) [ND (<4.6)] H	ND (<5.5) [ND (<4.6)] H	ND (<5.5) [ND (<4.6)] H	ND (<5.5) [ND (<4.6)] H	ND (<5.5) [ND (<4.6)] H	ND (<11) [ND (<9.2)] H	ND (<5.5) to ND (<55) [ND (<4.6) to ND (<46)] H	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)
B-10 D 5.5-6.0	ND (<6.2) [ND (<6.8)] H	ND (<6.2) [ND (<6.8)] H	ND (<6.2) [ND (<6.8)] H	ND (<6.2) [ND (<6.8)] H	ND (<6.2) [ND (<6.8)] H	ND (<12) [ND (<14)] H	ND (<6.2) to ND (<62) [ND (<6.8) to ND (<68)] H	ND (<6.6)	ND (<6.6)	ND (<6.6)	ND (<6.6)	ND (<6.6)	ND (<6.6)	ND (<6.6)	ND (<6.6)
B-10 D 8.0-8.5	ND (<6.5) [ND (<5.5)] H	ND (<6.5) [ND (<5.5)] H	ND (<6.5) [ND (<5.5)] H	ND (<6.5) [ND (<5.5)] H	ND (<6.5) [ND (<5.5)] H	ND (<13) [ND (<11)] H	ND (<6.5) to ND (<65) [ND (<5.5) to ND (<55)] H	**40**	**18**	**54**	**35**	**32**	**20**	**26**	ND (<14)
B-10 D 13.5-14.0	ND (<5.5) [ND (<4.3)] H	ND (<5.5) [ND (<4.3)] H	ND (<5.5) [ND (<4.3)] H	ND (<5.5) [ND (<4.3)] H	ND (<5.5) [ND (<4.3)] H	ND (<11) [ND (<8.6)] H	ND (<5.5) to ND (<55) [ND (<4.3) to ND (<43)] H	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)
B-11 D 6.0-6.5	[ND (<5.3)]	[ND (<5.3)]	[ND (<5.3)]	[ND (<5.3)]	[ND (<5.3)]	[ND (<11)]	[ND (<5.3) to ND (<53)]	ND (<6.0)	ND (<6.0)	ND (<6.0)	ND (<6.0)	ND (<6.0)	ND (<6.0)	ND (<6.0)	ND (<6.0)
B-11 D 7.5-8.0	ND (<24) [ND (<6.6)] H	ND (<24) [ND (<6.6)] H	ND (<24) [ND (<6.6)] H	**41** [**33**] H	ND (<24) [**13**] H	ND (<49) [ND (<13)] H	ND (<24) to ND (<240) [ND (<6.6) to ND (<66)] H	ND (<18,000)	ND (<18,000)	ND (<18,000)	ND (<18,000)	ND (<18,000)	ND (<18,000)	ND (<18,000)	ND (<18,000)
B-11 D 16.0-16.5	ND (<5.4) [ND (<4.5)] H	ND (<5.4) [ND (<4.5)] H	ND (<5.4) [ND (<4.5)] H	ND (<5.4) [ND (<4.5)] H	ND (<5.4) [ND (<4.5)] H	ND (<11) [ND (<9.1)] H	ND (<5.4) to ND (<54) [ND (<4.5) to ND (<45)]	ND (<5.5)	ND (<5.5)	ND (<5.5)	ND (<5.5)	ND (<5.5)	ND (<5.5)	ND (<5.5)	ND (<5.5)
B-12 D 5.5-6.0	[ND (<4.9)]	[ND (<4.9)]	[ND (<4.9)]	[ND (<4.9)]	[ND (<4.9)]	[ND (<9.9)]	[ND (<4.9) to ND (<49)]	ND (<5.6)	ND (<5.6)	ND (<5.6)	ND (<5.6)	ND (<5.6)	ND (<5.6)	ND (<5.6)	ND (<5.6)
B-12 D 8.0-8.5	[ND (<7.7)]	[ND (<7.7)]	[ND (<7.7)]	[ND (<7.7)]	[ND (<7.7)]	[ND (<15)]	[ND (<7.7) to ND (<77)]	ND (<79)	**140**	**220**	ND (<79)	ND (<79)	**120**	ND (<79)	ND (<79)
B-12 D 13.5-14.0	ND (<5.6) [ND (<4.6)]	ND (<5.6) [ND (<4.6)]	ND (<5.6) [ND (<4.6)]	ND (<5.6) [ND (<4.6)]	ND (<5.6) [ND (<4.6)]	ND (<11) [ND (<9.2)]	ND (<5.6) to ND (<56) [ND (<4.6) to ND (<46)]	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)
B-13 D 5.5-6.0	[ND (<5.5)]	[ND (<5.5)]	[ND (<5.5)]	[ND (<5.5)]	[ND (<5.5)]	[ND (<11)]	[ND (<5.5) to ND (<55)]	ND (<5.5)	ND (<5.5)	ND (<5.5)	ND (<5.5)	ND (<5.5)	ND (<5.5)	ND (<5.5)	ND (<5.5)
B-13 D 8.0-8.5	ND (<18) [ND (<5.7)] H	ND (<18) [ND (<5.7)] H	ND (<18) [ND (<5.7)] H	ND (<18) [ND (<5.7)] H	ND (<18) [ND (<5.7)] H	ND (<35) [ND (<11)] H	ND (<18) to ND (<180) [ND (<5.7) to ND (<57)] H	ND (<14)	ND (<14)	ND (<14)	ND (<14)	ND (<14)	ND (<14)	ND (<14)	ND (<14)
B-3 D 8.0-8.5[1]	ND (<5.8) [ND (<5.3)] H	ND (<5.8) [ND (<5.3)] H	ND (<5.8) [ND (<5.3)] H	ND (<5.8) [ND (<5.3)] H	ND (<5.8) [ND (<5.3)] H	ND (<12) [ND (<11)] H	ND (<5.8) to ND (<58) [ND (<5.3) to ND (<53)] H	ND (<6.2)	ND (<6.2)	ND (<6.2)	ND (<6.2)	ND (<6.2)	ND (<6.2)	ND (<6.2)	ND (<6.2)
B-13 D 13.5-14.0	ND (<5.6) [ND (<4.8)] H	ND (<5.6) [ND (<4.8)] H	ND (<5.6) [ND (<4.8)] H	ND (<5.6) [ND (<4.8)] H	ND (<5.6) [ND (<4.8)] H	ND (<11) [ND (<9.6)] H	ND (<5.6) to ND (<56) [ND (<4.8) to ND (<48)] H	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)
B-14 D 5.5-6.0	ND (<5.5) [ND (<5.5)] H	ND (<5.5) [ND (<5.5)] H	ND (<5.5) [ND (<5.5)] H	ND (<5.5) [ND (<5.5)] H	ND (<5.5) [ND (<5.5)] H	ND (<11) [ND (<11)] H	ND (<5.5) to ND (<55) [ND (<5.5) to ND (<55)] H	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)	ND (<5.9)
B-3 D 5.5-6.0[2]	ND (<6.2) [ND (<5.2)] H	ND (<6.2) [ND (<5.2)] H	ND (<6.2) [ND (<5.2)] H	ND (<6.2) [ND (<5.2)] H	ND (<6.2) [ND (<5.2)] H	ND (<12) [ND (<10)] H	ND (<6.2) to ND (<62) [ND (<5.2) to ND (<52)] H	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)
B-14 D 8.0-8.5	ND (6.4) [ND (<10)] H	ND (6.4) [ND (<10)] H	ND (6.4) [ND (<10)] H	ND (6.4) [ND (<10)] H	ND (6.4) [ND (<10)] H	**14** [ND (<21)] H	ND (<6.4) to ND (<64) [ND (<10) to ND (<100)] H	ND (<6.6)	ND (<6.6)	**12**	**13**	ND (<6.6)	ND (<6.6)	**10**	ND (<6.6)
B-14 D 10-10.5	ND (<6.1) [ND (<6.8)] H	ND (<6.1) [ND (<6.8)] H	ND (<6.1) [ND (<6.8)] H	ND (<6.1) [ND (<6.8)] H	ND (<6.1) [ND (<6.8)] H	ND (<12) [ND (<14)] H	ND (<6.1) to ND (<61) [ND (<6.8) to ND (<68)] H	ND (<6.3)	ND (<6.3)	ND (<6.3)	ND (<6.3)	ND (<6.3)	ND (<6.3)	ND (<6.3)	ND (<6.3)
B-3 D 10.0-10.5[3]	ND (<5.8) [ND (<6.9)] H	ND (<5.8) [ND (<6.9)] H	ND (<5.8) [ND (<6.9)] H	ND (<5.8) [ND (<6.9)] H	ND (<5.8) [ND (<6.9)] H	ND (<12) [ND (<14)] H	ND (<5.8) to ND (<58) [ND (<6.9) to ND (<69)] H	ND (<6.0)	**54**	**160**	**200**	**210**	**180**	**180**	ND (<6.0)
B-14 D 14.0-14.5	ND (<5.5) [ND (<4.6)] H	ND (<5.5) [ND (<4.6)] H	ND (<5.5) [ND (<4.6)] H	ND (<5.5) [ND (<4.6)] H	ND (<5.5) [ND (<4.6)] H	ND (<11) [ND (<9.2)] H	ND (<5.5) to ND (<55) [ND (<4.6) to ND (<46)] H	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)	ND (<5.8)
B-15 D 5.5-6.0	ND (<6.8) [ND (<6.0)] H	ND (<6.8) [ND (<6.0)] H	ND (<6.8) [ND (<6.0)] H	ND (<6.8) [ND (<6.0)] H	ND (<6.8) [ND (<6.0)] H	ND (<14) [ND (<12)] H	ND (<6.8) to ND (<68) [ND (<6.0) to ND (<60)] H	NA	NA	NA	NA	NA	NA	NA	NA

Table 1:
Soil Organic Analytical Results

837 Industrial Road,
San Carlos, CA

Sample ID	Sample Date	Field Point	Sample Depth	pH	TPHg	TPHd	TPHmo	PCBs		Volatile Organic Compounds, VOCs [8]														Polyaromatic Hydrocarbons, PAHs							
								PCB-1260	Other PCBs	Acetone	2-Butanone (MEK)	Carbon disulfide	4-Isopropyl-toluene	Naphthalene	PCE	Toluene	TCE	CFC-113	1,2,4-TMB	1,3,5-TMB	Xylenes, Total	Other VOCs [6]	Naphthalene	Phenanthrene	Chrysene	Benzo[a] pyrene	Benzo[b] fluoranthene	Fluoranthene	Pyrene	Other PAHs
			ft bfs	SU	mg/Kg	mg/Kg	mg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg	µg/Kg
B-15 D 8.0-8.5 (4)	01/20/11	B-15	8.0 to 8.5	NA	NA	NA	NA	NA	NA	ND (<57) [ND (<47)] H	ND (<57) [ND (<47)] H	ND (<5.7) [ND (<4.7)] H	ND (<5.7) [ND (<4.7)] H	ND (<11) [ND (<9.4)] H	ND (<5.7) **[68]** H	ND (<5.7) [ND (<4.7)] H	ND (<5.7) **[220]** H	ND (<5.7) [ND (<4.7)] H	ND (<5.7) [ND (<4.7)] H	ND (<5.7) [ND (<4.7)] H	ND (<11) [ND (<9.4)] H	ND (<5.7) to ND (<57) [ND (<4.7) to ND (<47)] H	NA	NA	NA	NA	NA	NA	NA	NA
MW-1D6.0	06/04/12	MW-1	6.0 to 6.5	7.64	ND (<0.34)	**3.5**	ND (<65)	ND (<64)	ND (<64)	ND (<68)	ND (<68)	ND (<6.8)	ND (<6.8)	ND (<14)	ND (<6.8)	ND (<6.8)	ND (<6.8)	ND (<6.8)	ND (<6.8)	ND (<6.8)	ND (<14)	ND (<6.8) to ND (<68)	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)	ND (<6.4)
MW-1D7.5	06/04/12	MW-1	7.5 to 8.0	7.73	ND (<0.31)	**18**	ND (<77)	**260**	ND (<75)	**81**	ND (<63)	ND (<6.3)	ND (<6.3)	ND (<13)	ND (<6.3)	ND (<6.3)	ND (<6.3)	ND (<6.3)	ND (<6.3)	ND (<6.3)	ND (<13)	ND (<6.3) to ND (<63)	ND (<7.7)	**9.9**	**9.3**	ND (<7.7)	**12**	**16**	**14**	ND (<7.7)
MW-1D8.5	06/04/12	MW-1	8.5 to 9.0	8.70	ND (<0.23)	**1.8**	ND (<60)	ND (<61)	ND (<61)	ND (<45)	ND (<45)	ND (<4.5)	ND (<4.5)	ND (<9.0)	ND (<4.5)	ND (<4.5)	ND (<4.5)	ND (<4.5)	ND (<4.5)	ND (<4.5)	ND (<9.0)	ND (<4.5) to ND (<45)	ND (<6.1)	ND (<6.1)	ND (<6.1)	ND (<6.1)	ND (<6.1)	ND (<6.1)	ND (<6.1)	ND (<6.1)
MW-1D20 (5)	06/04/12	MW-1	8.0 to 8.5	7.53	ND (<0.37)	**5.5**	ND (<65)	ND (<65)	ND (<65)	**140**	ND (<74)	ND (<7.4)	ND (<7.4)	ND (<15)	ND (<7.4)	ND (<7.4)	ND (<7.4)	ND (<7.4)	ND (<7.4)	ND (<7.4)	ND (<15)	ND (<7.4) to ND (<74)	ND (<6.5)	ND (<6.5)	ND (<6.5)	ND (<6.5)	ND (<6.5)	ND (<6.5)	ND (<6.5)	ND (<6.5)
Environmental Risk Screening Levels (7)																															
OEHHA CHHSLs (Commercial/Industrial Land Use)					NE	NE	NE	300*	300*	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	130*	NE	NE	NE	NE
OEHHA CHHSLs (Residential Land Use)					NE	NE	NE	89	89	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	38	NE	NE	NE	NE
U.S. EPA Region 9 RSLs (Industrial Soil)					NE	NE	NE	740	Varies by compound	630,000,000	200,000,000	3,700,000*	NE	18,000	110,000	45,000,000	6,400	180,000,000*	260,000*	10,000,000*	2,700,000*	Varies by compound	18,000	NE	210,000	210	2,100	22,000,000	17,000,000	Varies by compound
U.S. EPA Region 9 RSLs (Residential Soil)					NE	NE	NE	220	Varies by compound	61,000,000	28,000,000	820,000	NE	3,600	22,000	5,000,000	910	43,000,000	62,000	780,000	630,000	Varies by compound	3,600	NE	15,000	15	150	2,300,000	1,700,000	Varies by compound
DTSC HERO PRGs (Industrial Soil)					NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	1,300	NE	NE	NE	NE	69,700	NE	Varies by compound	NE	NE	13,000	NE	NE	NE	NE	Varies by compound
DTSC HERO PRGs (Residential Soil)					NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	480	NE	NE	NE	NE	21,300	NE	Varies by compound	NE	NE	3,800	NE	NE	NE	NE	Varies by compound
RWQCB ESLs (Table A-1, Residential or Unrestricted Land Use, Groundwater Potential Source of Drinking Water, Shallow Soil)					100	100	100	220	220	500	4,500	NE	NE	1,200	550	2,900	460	NE	NE	NE	2,300	Varies by compound	1,200	11,000	3,800	38	380	40,000	85,000	Varies by compound
RWQCB ESLs (Table A-2, Commercial/Industrial Land Use, Groundwater Potential Source of Drinking Water, Shallow Soil)					500*	110*	500*	740	740	500*	4,500*	NE	NE	1,200*	700*	2,900*	460*	NE	NE	NE	2,300	Varies by compound	1,200*	11,000*	13,000*	130	1,300*	40,000*	85,000*	Varies by compound
RWQCB ESLs (Table C-1, Residential or Unrestricted Land Use, Groundwater Potential Source of Drinking Water, Deep Soil)					500	110	500	220	220	500	4,500	NE	NE	1,200	550	2,900	460	NE	NE	NE	2,300	Varies by compound	1,200	11,000	3,800	38	380	60,000	85,000	Varies by compound
RWQCB ESLs (Table C-2, Commercial/Industrial Land Use, Groundwater Potential Source of Drinking Water, Deep Soil)					770	110	1,000	740	740	500	4,500	NE	NE	1,200	700	2,900	460	NE	NE	NE	2,300	Varies by compound	1,200	11,000	13,000	130	1,300	60,000	85,000	Varies by compound

Table Notes:

General:

Depth: Sample depth in feet below top of floor surface, feet bfs
µg/kg: Micrograms per kilogram, 09/09 data reported as wet weight, 11/2010 and 01/2011 data reported as dry-weight corrected
mg/kg: Milligrams per kilogram, 09/09 data reported as wet weight, 11/2010 and 01/2011 data reported as dry-weight corrected
ND (<2.5): Not detected at or above the laboratory reporting limit
NE: Not established
NA: Not analyzed

TPH: Total petroleum hydrocarbons
TPHg: Gasoline range organics (C5-C12)
TPHd: Diesel range organics (C10-C28)
TPHmo: Motor oil range organics (C24-C36)
PAHs: Polyaromatic Hydrocarbons by EPA Method 8270C
PCBs: Polychlorinated Biphenyls by EPA Method 8082

VOCs: Volatile Organic Compounds by EPA Method 8260B
CFC-113: 1,1,2-trichloro-1,2,2-trifluoroethane
PCE: Tetrachloroethene
TCE: Trichloroethene
1,2,4-TMB: 1,2,4-Trimethylbenzene
1,3,5-TMB: 1,3,5-Trimethylbenzene

Detailed:

(1) Sample B-3 D 8.0-8.5 is a duplicate sample of B-13 D 8.0-8.5
(2) Sample B-3 D 5.5-6.0 is a duplicate sample of B-14 D 5.5-6.0
(3) Sample B-3 D 10.0-10.5 is a duplicate sample of B-14 D 10-10.5; B-3 D 10.0-10.5 also contained, Acenaphthylene (42 µg/Kg), Anthracene (35 µg/Kg), Benzo[a]anthracene (160 µg/Kg), Benzo[k]fluoranthene (83 µg/Kg), Benzo[g,h,I]perylene (76 µg/Kg), Indeno[1,2,3-cd]pyrene (82 µg/Kg), Dibenz(a,h)anthracene (27 µg/Kg).
(4) Sample B-15 D 8.0-8.5 also contained, cis-1,2-Dichloroethene (63 µg/Kg) and Vinyl chloride (110 µg/Kg). Commercial RSLs and ESLs for cis-1,2-Dichloroethene (2,000,000 ug/kg, 190 ug/kg) and Vinyl Chloride (1700 ug/kg, 85 ug/kg).
(5) Sample MW-1D20 is a duplicate sample of MW-1D7.5
(6) VOCs sampled but not detected above laboratory reporting limits. Reporting limits varied as indicated in parentheses. For reporting limits for specific VOCs, refer to the lab reports from each sampling event (referenced in report text).
(7) **Environmental Risk Screening Levels**

OEHHA CHHSLs: California Human Health Screening Levels (CHHSLs) published by the California Environmental Protection Agency (CAL-EPA, January 2005, revised for Lead in September 2009):
"Use of California Human Health Screening Levels (CHHSLs) in Evaluation of Contaminated Properties."
Developed by the Office of Environmental Health Hazard Assessment (OEHHA), CHHSLs used to screen sites for human health concerns where chemical releases have occurred.

EPA Region 9 RSLs: Regional Screening Levels (RSLs) published by the Region 9, United States Environmental Protection Agency (USEPA, October 2004, November 2010, May 2013, November 2013):
RSLs provided are chemical-specific concentrations for individual contaminants in soil that may warrant further investigation or site cleanup.

DTSC HERO: Table 1. US EPA Region 9 Preliminary Remediation Goals (PRGs) (2004) and "Cal-Modified" 2004 US EPA Region 9 PRGs, California Department of Toxic Substances Control Office of Human and Ecological Risk, Human Health Risk Assessment Note Number: 3, May 21, 2013)

RWQCB ESLs: Environmental Screening Levels (ESLs) were taken from the San Francisco Bay Region, Regional Water Quality Control Board (RWQCB-SF):
"*Screening for Environmental Concerns at Sites With Contaminated Soil and Groundwater* ," Interim Final, November 2007, May 2008, Feb 2013, May 2013, December 2013.
For the purpose of this document, soil refers to any unlithified material in the unsaturated zone that is situated above the capillary fringe of the shallowest saturated unit.
"Shallow soil" defined as less than or equal to three (3) meters below ground surface. "Deep Soils" defined as greater than three (3) meters below ground surface. ESLs provided for scenario where groundwater IS considered a current or potential drinking water resource.
In the convention of the RWQCB, ESLs should be compared to chemical concentrations in soil reported on a dry-weight basis.

(8) **VOC Results from 2010 Investigation**
For most samples from the 2010 GEI investigation, results are provided from two different method analyses. The top result represents analysis by EPA Method 8260B of unpreserved soil.
The bottom result (presented in brackets) represents analysis by EPA Method 8260B, with soil preparation by Method 5035. These samples were analyzed beyond their specified hold time, as noted by the 'H' in the results.

H Sample was prepped or analyzed beyond the specified holding time.
[ ] EPA Method 8260B with preparation 5035.
81 **Bold** font indicates a detection above laboratory reporting limits
81 Highlighted gray indicates reported value is above the yellow shaded residential screening level
89 Highlighted yellow indicates the residential screening level used to highlight data gray

Table 2.
Groundwater Organic Analytical Results

Sample ID	Sample Date	Field Point	pH	PCBs	Total Petroleum Hydrocarbons, TPH			Volatile Organic Compounds, VOCs													Polyaromatic Hydrocarbons, PAHs		
					TPHg	TPHd	TPHmo	MTBE	CCl4	Chloroform	1,1-DCA	1,2-DCA	1,1-DCE	cis-1,2-DCE	PCE	TCE	CFC-11	CFC-113	Vinyl Chloride	Other VOCs	Naphthalene	Fluorene	Other PAHs
			SU	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
DP-02-WSP 2	09/28/09	WSP-2	8.16	ND (<0.53)	**130**	ND (<64)	ND (<380)	**1.7**	ND (<0.50)	**8.4**	**1.6**	**23**	**3.6**	**11**	**68**	**99**	**44**	**51**	**1.9**	ND (<0.50 to <50)	ND (<0.10)	ND (<0.10)	ND (<0.10)
DP-04-WSP 3 (1)	09/28/09	WSP-3	7.41	ND (<0.52)	**310**	**21,000**	**62,000**	ND (<0.50)	ND (<0.50)	**11**	ND (<0.50)	**21**	**0.97**	**3.2**	**310**	**24**	**30**	**19**	**0.83**	ND (<0.50 to <50)	ND (<0.11)	ND (<0.11)	ND (<0.11)
DP-04-WSP 4 (2)	09/28/09	WSP-4	7.49	ND (<0.62)	ND (<50)	ND (<72)	ND (<430)	ND (<0.50)	ND (<0.50)	**4.6**	ND (<0.50)	**4.7**	ND (<0.50)	ND (<0.50)	**29**	**0.65**	ND (<1.0)	ND (<0.50)	ND (<0.50)	ND (<0.50 to <50)	ND (<0.10)	ND (<0.10)	ND (<0.10)
B-5	11/22/10	B-5	7.39	ND (<0.55)	**250**	ND (<53)	ND (<320)	**1.9**	ND (<0.50)	**9.1**	**1.5**	**22**	**3.1**	**11**	**150**	**110**	**44**	**52**	**1.8**	ND (<0.50 to <50)	ND (<0.11)	**0.19**	ND (<0.11)
B-6	11/23/10	B-6	7.52	ND (<0.52)	**230**	ND (<52)	ND (<310)	**1.4**	ND (<0.50)	**9.1**	**1.4**	**23**	**3.0**	**9.9**	**120**	**93**	**44**	**50**	**1.6**	ND (<0.50 to <50)	ND (<0.10)	ND (<0.10)	ND (<0.10)
B-7	11/23/10	B-7	7.34	ND (<0.54)	**170**	ND (<51)	ND (<310)	**0.91**	**1.5**	**9.9**	**0.94**	**19**	**1.9**	**6.7**	**120**	**56**	**27**	**30**	**1.1**	ND (<0.50 to <50)	ND (<0.10)	**0.10**	ND (<0.10)
B-4 (8)	11/23/10	B-7	7.36	ND (<0.52)	**230**	ND (<52)	ND (<310)	**0.82**	**2.9**	**11**	**0.93**	**20**	**2.0**	**6.9**	**180**	**65**	**31**	**36**	**1.0**	ND (<0.50 to <50)	ND (<0.10)	**0.11**	ND (<0.10)
B-8	11/22/10	B-8	7.30	ND (<0.54)	**82**	ND (<51)	ND (<300)	ND (<0.50)	**48**	**21**	ND (<0.50)	**5.2**	ND (<0.50)	ND (<0.50)	**61**	**1.3**	ND (<1.0)	ND (<0.50)	ND (<0.50)	ND (<0.50 to <50)	ND (<0.11)	ND (<0.11)	ND (<0.11)
B-9	11/22/10	B-9	7.48 H	ND (<0.52)	ND (<50)	ND (<55)	ND (<330)	ND (<0.50)	**9.4**	**6.8**	ND (<0.50)	**4.9**	ND (<0.50)	ND (<0.50)	**52**	**0.56**	ND (<1.0)	ND (<0.50)	ND (<0.50)	ND (<0.50 to <50)	ND (<0.11)	ND (<0.11)	ND (<0.11)
B-10	11/22/10	B-10	7.48 H	ND (<0.59)	ND (<50)	ND (<55)	ND (<330)	ND (<0.50)	**2.3**	**3.1**	ND (<0.50)	**4.1**	ND (<0.50)	ND (<0.50)	**4.6**	**0.52**	ND (<1.0)	ND (<0.50)	ND (<0.50)	ND (<0.50 to <50)	ND (<0.11)	ND (<0.11)	ND (<0.11)
B-11	11/22/10	B-11	7.56	ND (<0.52)	**51**	ND (<53)	ND (<320)	ND (<0.50)	**9.9**	**6.8**	ND (<0.50)	**4.8**	ND (<0.50)	ND (<0.50)	**55**	**0.55**	ND (<1.0)	ND (<0.50)	ND (<0.50)	ND (<0.50 to <50)	ND (<0.14)	ND (<0.14)	ND (<0.14)
B-12	11/23/10	B-12	7.26	ND (<0.56)	ND (<250)	ND (<52)	ND (<310)	ND (<0.50)	**2.6**	**13**	ND (<0.50)	**11**	ND (<0.50)	**1.1**	**170**	**9.5**	**12**	**7.0**	ND (<0.50)	ND (<0.50 to <50)	**0.10**	ND (<0.10)	ND (<0.10)
B-13	11/23/10	B-13	7.49	ND (<0.52)	ND (<1,000)	ND (<51)	ND (<310)	ND (<10)	ND (<0.50)	**11**	**1.0**	**25**	**2.4**	**7.4**	**730**	**59**	**53**	**42**	**1.3**	ND (<0.50 to <50)	ND (<0.10)	ND (<0.10)	ND (<0.10)
B-14	11/23/10	B-14	7.54	ND (<0.53)	**220**	ND (<48)	ND (<290)	**1.2**	ND (<0.50)	**8.8**	**1.2**	**22**	**2.3**	**8.3**	**150**	**57**	**27**	**31**	**1.2**	ND (<0.50 to <50)	ND (<0.10)	ND (<0.10)	ND (<0.10)
B-15	01/20/11	B-15	NA	NA	ND (<2,500)	NA	NA	ND (<0.50)	ND (<0.50)	**2.7**	ND (<0.50)	**14**	ND (<0.50)	**1.1**	**1,600**	**9.5**	**11**	**2.7**	ND (<0.50)	ND (<0.50 to <50)	NA	NA	NA
B-2 (9)	01/20/11	B-15	NA	NA	ND (<2,500)	NA	NA	ND (<0.50)	ND (<0.50)	**2.7**	ND (<0.50)	**13**	ND (<0.50)	**1.1**	**1,700**	**10**	**14**	**3.5**	**0.52**	ND (<0.50 to <50)	NA	NA	NA
B-16 (3)	01/20/11	B-16	NA	NA	ND (<50)	NA	NA	**12**	**1.4**	**1.7**	ND (<0.50)	**7.7**	**0.59**	**2.3**	ND (<0.50)	**28**	ND (<1.0)	ND (<0.50)	ND (<0.50)	ND (<0.50 to <50)	NA	NA	NA
B-17	01/20/11	B-17	NA	NA	ND (<50)	NA	NA	ND (<0.50)	ND (<0.50)	ND (<1.0)	ND (<0.50)	**5.8**	ND (<0.50)	**1.1**	ND (<0.50)	ND (<0.50)	ND (<1.0)	ND (<0.50)	**4.9**	ND (<0.50 to <50)	NA	NA	NA
MW-1-GW	06/19/12	MW-1	NA	ND (<0.53)	**200**	ND (<52)	ND (<100)	**1.2**	**5.7**	**14**	**0.78**	**19**	**1.7**	**6.0**	**150**	**49**	**24**	**28**	**1.0**	ND (<0.50 to <50)	ND (<0.11)	ND (<0.11)	ND (<0.11)
MW-1A-GW (7)	06/19/12	MW-1	NA	ND (<0.52)	**200**	ND (<52)	ND (<100)	**1.3**	**5.0**	**14**	**0.79**	**18**	**1.8**	**5.7**	**140**	**49**	**24**	**28**	**1.1**	ND (<0.50 to <50)	ND (<0.10)	ND (<0.10)	ND (<0.10)
Environmental Risk Screening Levels (ESLs) (4)																							
Table F-1a ESLs for groundwater, where groundwater IS a current or potential source of drinking water				0.014	100	100	100	5	0.5	80	5	0.5	6	6	5	5	_	_	0.5	Varies by compound	6.1	3.9	Varies by compound
Table E-1 ESLs for groundwater, for Evaluation of Potential Vapor Intrusion				NE	NE	NE	NE	100,000	48	1,700	NE	1,000	130,000	26,000	640	1,300	_	_	18	Varies by compound	1,600	NE	NE
Maximum Contaminant Levels (MCLs) (5)																							
California Primary MCLs for Drinking Water				0.5	NE	NE	NE	13	0.5	NE	5	0.5	6	6	5	5	150	1,200	0.5	Varies by compound	NE	NE	Varies by compound
US EPA MCLs for Drinking Water				0.5	NE	NE	NE	NE	5	NE	NE	5	7	70	5	5	NE	NE	2	Varies by compound	NE	NE	Varies by compound
Regional Screening Levels (RSLs) (6)																							
USEPA Region 9 RSLs for Tap Water				Varies by compound	NE	NE	NE	12	0.39	0.19	2.4	0.15	260	28	9.7	0.44	1,100	53,000	0.015	Varies by compound	0.14	220	Varies by compound

Table Notes:

General:

µg/L: Micrograms per liter
ND (<1): Not detected at or above the laboratory reporting limit
NA: Not analyzed
NE: Not established

TPH: Total petroleum hydrocarbons
TPHg: Gasoline range organics (C5-C12)
TPHd: Desiel range organics (C10-C28)
TPHmo: Motor oil range organics (C24-C36)
VOCs: Volatile organic compounds (VOCs) by EPA Method 8260B
PAHs: Polyaromatic Hydrocarbons (PAHs) by EPA Method 8270C
PCBs: Polychlorinated Biphenyls (PCBs) by EPA Method 8082

MTBE: methyl-tert-butyl ether
cis-1,2-DCE: cis-1,2-Dichloroethene
1,2-DCA: 1,2-Dichloroethane
1,1-DCE: 1,1-Dichloroethene
1,1-DCA: 1,1-Dichloroethane

PCE: Tetrachloroethene
TCE: Trichloroethene
CCl4: Carbon tetrachloride
CFC-11: Trichlorofluoromethane
CFC-113: 1,1,2-Trichloro-1,2,2-trifluoroethane

Detailed:

1 Sample WSP-3 also contained, Toluene (0.56 µg/L), Phenanthrene (0.18 µg/L), Chrysene (0.30 µg/L), Fluoranthene (0.14 µg/L). Table F-1a ESLs for Toluene (40 ug/l), Phenanthrene (4.6 ug/l), Chrysene (0.35 ug/l), Fluoranthene (8 ug/l).
2 Sample WSP-4 also contained, Toluene (0.79 µg/L). Table F-1a ESLs for Toluene (40 ug/l)
3 Sample B-16 also contained, trans-1,2-Dichloroethene (0.51 µg/L). Table F-1a ESLs for trans-1,2-Dichloroethene (10 ug/l).
4 **Environmental Risk Screening Levels**
Environmental Screening Levels (ESLs) were taken from the San Francisco Bay Region, Regional Water Quality Control Board (RWQCB-SF):
"*Screening for Environmental Concerns at Sites With Contaminated Soil and Groundwater* ," Interim Final, November 2007, May 2008, Feb 2013, May 2013, December 2013.
ESLs for TPHg correspond to TPH (gasolines)
Table F-1a ESLs correspond to groundwater where groundwater IS a current or potential source of drinking water.
Table E-1 ESLs correspond to groundwater for Evaluation of Potential Vapor Intrusion at a Commercial/Industrial Land Use site.
5 Primary Maximum Contaminant Levels (MCLs) for Drinking Water per California Code of Regulations (CCR), Title 22, Chapter 15, Article 5, Section 64444.
6 Regional Screening Levels (RSLs) Tapwater Supporting Table published by the Region 9, United States Environmental Protection Agency (USEPA, October 2004, November 2010, May 2013, November 2013).
7 MW-1A-GW is a duplicate sample of MW-1-GW.
8 B-4 is a duplicate sample of B-7
9 B-2 is a duplicate sample of B-15
H Sample was prepped or analyzed beyond the specified holding time.

290 **Bold** font indicates a detection above laboratory reporting limits
290 Highlight value indicates reported value is above one or more environmental screening levels
0.5 Highlighted yellow indicates the screening level used to highlight data gray

Sample ID	Sample Date	Sample Depth	Boring	Cadmium	Chromium	Lead	Nickel	Zinc
		ft bfs		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
DP-01(6.5-7.5)-WSP1	9/28/2009	6.5 to 7.5	WSP-1	ND (<0.32)	**170**	**8.4**	**470**	**38**
DP-02(12.5-13.5)-WSP1	9/28/2009	12.5 to 13.5	WSP-1	**0.98**	**36**	**870**	**34**	**57**
DP-03(15-16)-WSP1	9/28/2009	15.0 to 16.0	WSP-1	ND (<0.32)	**41**	**4.4**	**44**	**30**
DP-03(12.5-13.5)-WSP2	9/28/2009	12.5 to 13.5	WSP-2	ND (<0.32)	**86**	**110**	**150**	**57**
DP-01(8.5-9.5)-WSP3	9/28/2009	8.5 to 9.5	WSP-3	ND (<0.30)	**43**	**54**	**65**	**32**
DP-02(12.5-13.5)-WSP3	9/28/2009	12.5 to 13.5	WSP-3	ND (<0.32)	**35**	**54**	**46**	**26**
DP-03(15-16)-WSP3	9/28/2009	15.0 to 16.0	WSP-3	ND (<0.31)	**37**	**4.0**	**42**	**28**
DP-01(9-10)-WSP4	9/28/2009	9.0 to 10.0	WSP-4	ND (<0.30)	**64**	**20**	**61**	**44**
DP-02(12.5-13.5)-WSP4	9/28/2009	12.5 to 13.5	WSP-4	ND (<0.31)	**82**	**24**	**110**	**40**
DP-03(15-16)-WSP4	9/28/2009	15.0 to 16.0	WSP-4	ND (<0.33)	**45**	**4.9**	**50**	**33**
B-5 D 5.5-6.0	11/22/10	5.5 to 6.0	B-5	ND (<0.67)	**760**	**6.9**	**1,700**	**46**
B-5 D 7.5-8.0	11/22/10	7.5 to 8.0	B-5	ND (<0.68)	**270**	**26**	**740**	**49**
B-5 D 16-16.5	11/22/10	16.0 to 16.5	B-5	ND (<0.59)	**66**	**8.0**	**91**	**47**
B-6 D 3.5-4.0	11/23/10	3.5 to 4.0	B-6	ND (<0.66)	**120**	**16**	**180**	**52**
B-6 D 5.5-6.0	11/23/10	5.5 to 6.0	B-6	ND (<0.72)	**800**	**6.8**	**2,200**	**53**
B-6 D 7.5-8.0	11/23/10	7.5 to 8.0	B-6	ND (<0.68)	**83**	**180**	**120**	**54**
B-6 D 12.5-13.0	11/23/10	12.5 to 13.0	B-6	ND (<0.58)	**44**	**5.5**	**51**	**32**
B-7 D 5.5-6.0	11/23/10	5.5 to 6.0	B-7	ND (<0.61)	**480**	**7.6**	**1,100**	**49**
B-7 D 7.5-8.0	11/23/10	7.5 to 8.0	B-7	**0.85**	**92**	**27**	**78**	**92**
B-7 D 11.5-12.0	11/23/10	11.5 to 12.0	B-7	ND (<0.57)	**71**	**7.4**	**65**	**39**
B-7 D 8.5-9.0	11/23/10	8.5 to 9.0	B-7	ND (<0.63)	**77**	**13**	**78**	**46**
B-8 D 5.5-6.0	11/22/10	5.5 to 6.0	B-8	ND (<0.59)	**60**	**4.7**	**86**	**52**
B-8 D 7.5-8.0	11/22/10	7.5 to 8.0	B-8	ND (<0.80)	**96**	**13**	**60**	**68**
B-8 D 13.5-14.0	11/22/10	13.5 to 14.0	B-8	ND (<0.56)	**57**	**8.1**	**83**	**40**
B-9 D 5.0-5.5	11/22/10	5.0 to 5.5	B-9	ND (<0.57)	**360**	**7.3**	**900**	**44**
B-9 D 7.5-8.0	11/22/10	7.5 to 8.0	B-9	ND (<0.75)	**81**	**140**	**67**	**59**
B-9 D 13.5-14.0	11/22/10	13.5 to 14.0	B-9	ND (<0.58)	**56**	**6.7**	**56**	**36**
Background References [(1)]								
Scott (1995)*				NE	51.28 (30.5 to 72)	11.43 (6.8 to 16.1)	73.53 (46.4 to 101)	65.27 (47.7 to 82.8)
Bradford et al (1996)**				0.73 (0.05 to 1.70)	49 (23 to 1,579)	21.1 (12.4 to 97.1)	41 (9 to 509)	122 (88 to 236)
Environmental Risk Screening Levels [(2)]								
OEHHA CHHSLs (Residential Land Use)				1.7	100,000 [(3)]	80	1,600	23,000
OEHHA CHHSLs (Commercial/Industrial Land Use)				7.5	100,000 [(3)]	320	16,000	100,000
DTSC HERO PRGs (Residential Soil)				4.0	NE	80	NE	NE
DTSC HERO PRGs (Industrial Soil)				5.1	NE	320	NE	NE

Sample ID	Sample Date	Sample Depth	Boring	Cadmium	Chromium	Lead	Nickel	Zinc
		ft bfs		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
B-10 D 5.5-6.0	11/22/10	5.5 to 6.0	B-10	ND (<0.67)	**430**	**9.2**	**980**	**46**
B-10 D 8.0-8.5	11/22/10	8.0 to 8.5	B-10	ND (<0.69)	**73**	**11**	**72**	**47**
B-10 D 13.5-14.0	11/22/10	13.5 to 14.0	B-10	ND (<0.58)	**44**	**5.2**	**44**	**29**
B-11 D 6.0-6.5	11/22/10	6.0 to 6.5	B-11	ND (<0.58)	**78**	**11**	**130**	**48**
B-11 D 7.5-8.0	11/22/10	7.5 to 8.0	B-11	**1.4**	**110**	**280**	**55**	**110**
B-11 D 16.0-16.5	11/22/10	16.0 to 16.5	B-11	ND (<0.55)	**53**	**5.8**	**53**	**32**
B-12 D 5.5-6.0	11/23/10	5.5 to 6.0	B-12	ND (<0.57)	**240**	**9.5**	**770**	**40**
B-12 D 8.0-8.5	11/23/10	8.0 to 8.5	B-12	ND (<0.80)	**87**	**110**	**84**	**80**
B-12 D 13.5-14.0	11/23/10	13.5 to 14.0	B-12	ND (<0.59)	**49**	**5.8**	**60**	**35**
B-13 D 5.5-6.0	11/23/10	5.5 to 6.0	B-13	ND (<0.53)	**320**	**6.1**	**1,100**	**33**
B-13 D 8.0-8.5	11/23/10	8.0 to 8.5	B-13	**0.80**	**61**	**24**	**49**	**50**
B-3 D 8.0-8.5[(5)]	11/23/10	8.0 to 8.5	B-13	ND (<0.61)	**51**	**8.8**	**50**	**54**
B-13 D 13.5-14.0	11/23/10	13.5 to 14.0	B-13	ND (<0.57)	**43**	**6.7**	**50**	**35**
B-14 D 5.5-6.0	11/23/10	5.5 to 6.0	B-14	ND (<0.59)	**240**	**8.4**	**570**	**42**
B-3 D 5.5-6.0[(6)]	11/23/10	5.5 to 6.0	B-14	ND (<0.65)	**460**	**4.4**	**1,400**	**49**
B-14 D 8.0-8.5	11/23/10	8.0 to 8.5	B-14	**0.63**	**66**	**330**	**65**	**88**
B-14 D 10-10.5	11/23/10	10 to 10.5	B-14	ND (<0.60)	**47**	**8.2**	**50**	**31**
B-3 D 10.0-10.5[(7)]	11/23/10	10 to 10.5	B-14	ND (<0.60)	**44**	**5.8**	**48**	**28**
B-14 D 14.0-14.5	11/23/10	14.0 to 14.5	B-14	ND (<0.59)	**39**	**5.6**	**50**	**31**
MW-1D6.0	01/20/11	6.0 to 6.5	MW-1	ND (<0.64)	**180**	NA	**340**	**57**
MW-1D7.5	01/20/11	7.5 to 8.0	MW-1	**1.5**	**110**	NA	**91**	**85**
MW-1D8.5	01/20/11	8.5 to 9.0	MW-1	ND (<0.58)	**53**	NA	**53**	**30**
MW-1D20[(4)]	01/20/11	8.0 to 8.5	MW-1	ND (<0.63)	**95**	NA	**150**	**60**
Sitewide Arithmetic Mean				**0.1232**	**143.7**	**54.2**	**300.82**	**47.66**
Scott (1995)				NE	51.28 (30.5 to 72)	11.43 (6.8 to 16.1)	73.53 (46.4 to 101)	65.27 (47.7 to 82.8)
Bradford et al (1996)				0.73 (0.05 to 1.70)	49 (23 to 1,579)	21.1 (12.4 to 97.1)	41 (9 to 509)	122 (88 to 236)
OEHHA CHHSLs (Residential Land Use)				1.7	100,000 [(3)]	80	1,600	23,000
OEHHA CHHSLs (Commercial/Industrial Land Use)				7.5	100,000 [(3)]	320	16,000	100,000
OEHHA CHHSLs (Residential Land Use)				4.0	NE	80	NE	NE
OEHHA CHHSLs (Commercial/Industrial Land Use)				5.1	NE	320	NE	NE

General Notes:

Sample Depth:	Sample depth in feet below top of floor surface, feet bfs	ND (<1.0):	Not detected at or above the laboratory reporting limit
mg/kg:	Milligrams per kilogram, 09/09 data reported as wet weight, 11/2010 data reported as dry-weight corrected	NE:	Not established
Laboratory/Lab Methods:	TestAmerica Laboratories, Inc., Pleasanton, California (CAELAP #2496); EPA Method 6010B		

Detail Notes:

(1) **References for background metal concentrations as follows:**
Lawrence Berkeley National Laboratory (1995): *"Protocol for Determining Background Concentrations of Metals in Soil at Lawrence Berkeley National Laboratory (LBNL)* ,"
A Joint Effort of Environment, Health and Safety Division, Lawrence Berkeley National Laboratory, University of California, Berkeley, CA. August 1995.

* Scott, Christina M. (1995): *"Background Metal Concentrations in Soils in Northern Santa Clara County, California,"* in: "Recent Geologic Studies in the San Francisco Bay Area,"
Top value represents average concentration from between 104 and 158 samples collected, and is used for comparison to site data. The range of values is presented in parentheses.

** Bradford, G. R., Chang, A. C., Page, A. L., Bakhtar, D., Frampton, J. A. and Wright, H. (1996): *"Background Concentrations of Trace and Major Elements in California Soils,"*
Kearney Foundation Special Report, Kearney Foundation of Soil Science, Division of Agriculture and Natural Resources, University of California, March 1996
Report covers soils over the entire state of California. For Tanklage Square site location, soil #49 from the report was used: Venice soil series from San Joaquin County, "Eric, thermic, Typic Medihemists" soils.
The range shown in parentheses reflects CA-wide range of values.

(2) Environmental Risk Screening Levels
OEHHA CHHSLs: California Human Health Screening Levels (CHHSLs) published by the California Environmental Protection Agency (CAL-EPA, January 2005, revised for Lead in September 2009):
"Use of California Human Health Screening Levels (CHHSLs) in Evaluation of Contaminated Properties."
Developed by the Office of Environmental Health Hazard Assessment (OEHHA), CHHSLs used to screen sites for human health concerns where chemical releases have occurred.
DTSC HERO: Table 1. RSL Calculator Risk-based Concentration Preliminary Remediation Goals (PRGs), California Department of Toxic Substances Control Office of Human and Ecological Risk, Human Health Risk Assessment Note Number: 3, May 21, 2013)

(3) Chromium (III)
(4) Sample MW-1D20 is a duplicate sample of MW-1D7.5
(5) Sample B-3 D 8.0-8.5 is a duplicate sample of B-13 D 8.0-8.5
(6) Sample B-3 D 5.5-6.0 is a duplicate sample of B-14 D 5.5-6.0
(7) Sample B-3 D 10.0-10.5 is a duplicate sample of B-14 D 10-10.5

290	**Bold** font indicates a detection above laboratory reporting limits
81	Highlighted gray indicates reported value is above the reported background concentration range AND the yellow shaded residential screening level
89	Highlighted yellow indicates the residential screening level used to higlight data gray

Table 4.
Groundwater Dissolved Metals Analytical Results

837 Industrial Road, San Carlos, CA

Sample ID	Sample Date	Boring	Cadmium	Chromium	Lead	Nickel	Zinc
			µg/l	µg/l	µg/l	µg/l	µg/l
B-5	11/22/10	B-5	ND (<2.0)	ND (<10)	ND (<5.0)	ND (<10)	ND (<20)
B-6	11/22/10	B-6	ND (<2.0)	ND (<10)	ND (<5.0)	ND (<10)	**22**
B-7	11/23/10	B-7	ND (<2.0)	ND (<10)	ND (<5.0)	ND (<10)	**23**
B-7 DUP (B-4)	11/23/10	B-7	ND (<2.0)	ND (<10)	ND (<5.0)	ND (<10)	**23**
B-8	11/22/10	B-8	ND (<2.0)	**21**	ND (<5.0)	**33**	ND (<20)
B-9	11/22/10	B-9	ND (<2.0)	ND (<10)	ND (<5.0)	ND (<10)	ND (<20)
B-10	11/22/10	B-10	ND (<2.0)	ND (<10)	ND (<5.0)	ND (<10)	ND (<20)
B-11	11/22/10	B-11	ND (<2.0)	ND (<10)	ND (<5.0)	ND (<10)	ND (<20)
B-12	11/23/10	B-12	ND (<2.0)	ND (<10)	ND (<5.0)	ND (<10)	**21**
B-13	11/23/10	B-13	ND (<2.0)	ND (<10)	ND (<5.0)	ND (<10)	**23**
B-14	11/23/10	B-14	ND (<2.0)	ND (<10)	ND (<5.0)	ND (<10)	**21**
MW-1-GW	06/19/12	MW-1	ND (<2.0)	ND (<10)	NA	ND (<10)	ND (<20)
MW-1A-GW (1)	06/19/12	MW-1	ND (<2.0)	ND (<10)	NA	ND (<10)	ND (<20)
Environmental Screening Levels (2)							
RWQCB ESLs (Table F-1a, Groundwater Potential Source of Drinking Water)			0.25	180 (4)	2.5	8.2	81
California MCLs			5 (3)	50 (3)	15 (5)	100 (3)	NE

General Notes: Laboratory/Lab Methods: TestAmerica Laboratories, Inc., Pleasanton, California (CAELAP #2496); EPA Method 6010B

µg/l Micrograms per liter (parts per billion equivalent)
ND (<1.0): Not detected at or above the laboratory reporting limit
NA: Not analyzed

Detail Notes:

(1) Sample MW-1A-GW is a duplicate sample of MW-1-GW.

(2) **Environmental Risk Screening Levels**
RWQCB E Environmental Screening Levels (ESLs) were taken from the San Francisco Bay Region, Regional Water Quality Control Board (RWQCB-SF):
Screening for Environmental Concerns at Sites With Contaminated Soil and Groundwater, Interim Final, November 2007, May 2008, Feb 2013, May 2013, December 2013.

California Maximum Contaminant Levels (MCLs) in Drinking Water. California Code of Regulation Title 22. Division 4. Environmental Health Chapter 15. Domestic Water Quality and Monitoring Regulations.

(3) Primary MCL
(4) Chromium (III)
(5) Regulatory Action Level

23 **Bold** font indicates a detection above laboratory reporting limits
7.5 Highlighted yellow indicates the screening level used to highlight data gray

APPENDIX B

PHOTOGRAPHS OF SUMP AND COLLECTION SYSTEM

Photos of Concrete Covered Trench and Access Plates

8.21.2013

Sump with concrete plate, located in electrical room

Concrete covered trench with access plate (Suite D)

Access plate (Suite D)

Access plaste (Suite D)

Access plate with tar-like substance visible in trench (Suite D)

APPENDIX C

U.S. ENVIRONMENTAL PROTECTION AGENCY FORM 7710-53

USEPA

United States
Environmental Protection Agency
Washington, DC 20460

Form Approved
OMB No. 2070-0112

Notification of PCB Activity

Return To:

Document Control Officer (5305P)
Office of Solid Waste
U.S. Environmental Protection Agency
1200 Pennsylvania Ave., N.W.
Washington, DC 20460-0001

For Official Use Only

1. Name of Facility	Name of Owner Facility	2. EPA Identification Number (if already assigned under RCRA)

3. Facility Mailing Address (Street or PO Box, City, State, & Zip Code)	4. Location of Facility (No. Street, City, State, & Zip Code)

5. Installation Contact (Name and Title)

Telephone Number (Area Code and Number)

6. Type of PCB Activity (Mark 'X' in appropriate box. See Instructions.)

- ☐ A. Generator w/onsite storage facility
- ☐ B. Storer (Commercial)
- ☐ C. Transporter
- ☐ D. R&D/Treatability
- ☐ E. Approved Disposer
- ☐ F. Scrap Metal Recovery Oven/Smelter, High Efficiency Boilers

7. Certification

Under civil and criminal penalties of law for the making or submission of false or fraudulent statements or representations (18 U.S.C. 1001 and 15 U.S.C. 2615), I certify that the information contained in or accompanying this document is true, accurate, and complete. As to the identified section(s) of this document for which I cannot personally verify truth and accuracy, I certify as a company official having supervisory responsibility for the persons who, acting under my direct instructions, made the verification that this information is true, accurate, and complete.

Signature	Name and Official Title (Type of Print)	Date Signed

Paperwork Reduction Act Notice

The annual public burden for this collection of information is estimated to average 0.57 hours per response. This estimate includes time for reading instructions, searching existing data sources, gathering and maintaining the needed data, and completing and reviewing collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden to: Director, Collection Strategies Division, U.S. Environmental Protection Agency (mail code 2822), 1200 Pennsylvania Ave., N.W., Washington, D.C. 20460-0001. Include the OMB number identified above in any correspondence. Do not send the completed form to this address. The actual information or form should be submitted in accordance with the instructions accompanying the form, or as specified in the corresponding regulations.

APPENDIX D

INTRUSIVE EARTHWORK GUIDANCE PLAN

INTRUSIVE EARTHWORK GUIDANCE PLAN

TABLE OF CONTENTS

1.0 GENERAL ..... D-ii
1.1 Introduction D-1
1.2 Background Information D-1

2.0 REGULATED ACTIVITIES D-2
2.1 Regulated Activities D-2

3.0 REGULATED ACTIVITIES REQUIREMENTS D-2

4.0 GUIDANCE FOR CONTRACTOR DEVELOPMENT OF HEALTH AND SAFETY PLAN D-3
4.1 Introduction D-3
4.2 Key Personnel D-3
4.3 Hazard Assessment D-3
4.4 Safety Training D-3
4.5 Personal Protective Equipment D-4
4.6 Medical Monitoring Program D-4
4.7 Air Monitoring D-4
4.8 Site Control D-5
4.9 Dust Control D-5
4.10 Decontamination D-6
4.10.1 Personal Decontamination D-6
4.10.2 Equipment Decontamination D-6
4.11 Soil Management D-6
4.11.1 Management of Excavated Soil D-6
4.11.2 Management of Apparently Clean Soil D-7
4.11.3 Management of Suspect Soil D-7
4.11.4 Excess and Suspect Soil Stockpile Sampling and Analysis D-7
4.11.5 Management of Groundwater D-7

5.0 REFERENCES D-8

APPENDIX A – AGREEMENT AND ACKNOWLEDGMENT STATEMENT

1.0 GENERAL

1.1 Introduction

This Intrusive Earthwork Guidance Plan (plan), including additional soil management procedures, was prepared by PES Environmental, Inc. (PES) to manage intrusive earthwork that may occur at an indefinite future date at 837 Industrial Road (the site) within Tanklage Square. The site is located at 837 Industrial Road in San Carlos, California.

This guidance document is not intended to be utilized as a site Health and Safety Plan (HSP). For future regulated intrusive earthwork (refer to Section 2.0), the Contractor shall develop its own site HSP. In addition, this plan does not address potential future redevelopment of the site, such as building demolition, mass grading, and new building construction.

This document has been developed to provide: (1) a description of regulated activities to which this plan applies; (2) an overview of subsurface conditions at the site; (3) procedures to be followed prior to commencement of regulated activities; (4) guidance for Contractor development of Health and Safety Plans; and (5) soil management procedures so that potentially hazardous materials, if encountered, are handled, managed and disposed in accordance with applicable regulatory requirements.

1.2 Background Information

The 837 Industrial Road site has been undergoing groundwater monitoring (via well MW-1) and conducting O&M for soil and tar-like materials containing diesel, motor oil, polychlorinated biphenyls (PCBs), polyaromatic hydrocarbons (PAHs), and metals discovered at the site in 2008. The material has also been identified to have a pH of 1.8.

The tar-like material is understood to be limited in horizontal extent to the immediate vicinity of the trenched area in the northeast portion of the building on the subject property, and limited to a maximum vertical depth of 14 feet (GEI, 2014) and is currently managed via an onsite sump and recovery trench system. Recovered material requires management and disposal as hazardous waste. A Final RAW was approved by DTSC on October 29, 2014.
The selected remedy for the RAW includes: leaving contamination in-place beneath the building slab and asphalt paving; a restrictive covenant will be recorded for the subject property; and ongoing O&M operations will be conducted.

A listing of prior environmental documents for the site is provided in Section 5.0.

2.0 REGULATED ACTIVITIES

This plan has been developed to provide procedures to follow to protect the public and workers involved in potential subgrade construction, maintenance, repair, inspection or other activity involving subgrade work ("regulated activities"). Regulated activities are described below.

2.1 Regulated Activities

The following subgrade activities constitute regulated work under this plan.

- **Subsurface Construction or Repair** – any activity occurring beneath the grade level of existing pavement or concrete;
- **Deep Landscaping Work** – any activity related to landscaping that extends lower than 18 inches or more beneath existing grade;
- **Utility Line Work** – any subterranean inspection, excavation, or repair of electrical, telephone, water, sanitary sewer, storm drains or other utilities occurring within or outside of existing vaults;
- **Sub-Slab Work** – any work performed beneath the slab of the site building, or any work which requires breaching the existing slab;
- **Environmental Investigations –** any subsurface air, soil or groundwater sampling activities, groundwater monitoring well installation or destruction activities or other activities which may expose workers or the public to subsurface media; or
- **Other** – other subgrade activities not expressly listed above.

3.0 REGULATED ACTIVITIES REQUIREMENTS

Prior to commencement of any regulated activities, the following tasks must be completed:

- All contractors and subcontractors of either the owner, tenants, or another party causing regulated activities at the site, shall read this plan and sign the Agreement and Acknowledgment Statement (Appendix B) to certify that they have read, understood and agreed to abide by its provisions;
- Review applicable environmental documents and investigations pertaining to the site;
- Location of subsurface utilities will be verified with Underground Safety Alert (USA) or a private contractor; and
- The personnel or subcontractor performing such work will be required to develop a health and safety plan in accordance with the hazardous material regulations found in

the California Occupational Safety and Health Administration (CAL-OSHA), Title 8 of the California Code of Regulations (CCR), Section 5192 (Hazardous Waste Operations and Emergency Response (HAZWOPER).

Compliance with this plan is required of all personnel, subcontractors, etc. associated with the regulated activities mentioned above.

4.0 GUIDANCE FOR CONTRACTOR DEVELOPMENT OF HEALTH AND SAFETY PLAN

All contractors and subcontractors will act in accordance with applicable federal, State, regional, and local regulations during all phases of the project. Applicable regulations include but are not limited to CAL-OSHA, 8 CCR 5192.

The Contractor's Health and Safety Plan (HSP) should include, but not be limited to, the following components.

4.1 Introduction

The main purpose of the introduction is to describe the site, the specific area of the site that the Contractor's Health and Safety Plan will encompass, and its applicability to operations.

4.2 Key Personnel

This section should include names, descriptions of responsibilities, and ways of contact for key personnel involved with the project.

4.3 Hazard Assessment

Hazard assessment is a methodology used to identify inherent or potential hazards which may be encountered in the work environment associated with accomplishing a project. The hazard assessment should include the identification of an operation or a job to be assessed, a break down of the project, identification of the hazards associated with each task, and determination of the necessary controls for the hazards.

4.4 Safety Training

The environmental conditions of the site shall be disclosed to all construction workers and subcontractors who will be engaged in earthwork activates including soil excavation, dewatering, and other subsurface activities where contact with potentially contaminated soil and/or groundwater is possible. It is the individual contractor/subcontractor's responsibility to provide additional site-specific construction safety training. For construction activities, additional safety meetings must be held at least once every 10 working days and may include

a discussion of site work plans, personal protective equipment, site rules, site hazards, trenching/shoring, and the requirements of the Contractor's Health and Safety Plan.

4.5 Personal Protective Equipment

The **minimum** acceptable level of personal protection equipment (PPE) for this site is Modified level D, and includes:

- Normal work uniform;
- Tyvek suit (if working within an electrical/plumbing trench or interceptor/vault excavation, or if handling/working with potentially contaminated soils is necessary);
- Nitrile gloves (when handling potentially contaminated soil);
- Boots/shoes with steel shank and approved toe protection. Chemical resistant (PVC or neoprene) boots or overboots are necessary when working in exposed soils (i.e., within trench or interceptor excavation) or when handling potentially contaminated soil; and
- ANSI approved industrial safety glasses and hardhat.

However, the Contractor should make the appropriate personal protective equipment selection based on the specific project requirements and site hazards.

4.6 Medical Monitoring Program

All construction personnel engaged in regulated subsurface work will be required to be medically qualified prior to donning a respirator should respiratory protection become necessary. If site conditions vary drastically from those anticipated in the plan, other medical surveillance procedures may become necessary, as required.

4.7 Air Monitoring

To the extent feasible, the presence of airborne contaminants will be evaluated through the use of sampling equipment. Information gathered will be used to ensure the adequacy of the levels of protection being employed at the site, and may be used as the basis for upgrading or downgrading levels of Personal Protection, at the discretion of the Contractor's Health & Safety representative and/or Manager.

The following air sampling equipment may be utilized for site monitoring by the Contractor's Health & Safety Representative:

- Photo-Ionization Detector (PID) – organic vapors (alternatively, a FID may also be utilized for this purpose); and

- LEL/O_2 Meter.

The PID and/or FID will serve as the primary instrument for personal exposure monitoring for organic vapors. The instrument will need to be utilized to characterize potential employee exposure and the need for equipment upgrades/downgrades.

During initial excavation activities monitoring should be conducted for explosive atmospheres using an LEL/O_2 monitor. In addition to the petroleum hydrocarbons, fill materials of the site could present methane or other flammable vapor issue.

Monitoring will be conducted to evaluate the potential for exposure to site personnel during initial operations. Continuous monitoring should be performed during operations that have not been characterized. After initial site screening, monitoring shall be conducted periodically and when site conditions might be altered (i.e. weather, drilling, new area of excavation, etc.).

Results of monitoring information shall be recorded including time, date, location, operations, and any other conditions that may contribute to potential hazards. All maintenance and calibration information shall be maintained on-site. The monitoring equipment will be calibrated in accordance with the manufacturer's specifications, and the records of such maintained with the plan and/or project file.

4.8 Site Control

The site control program is used to control movement of people and equipment in order to minimize worker exposure to hazardous substances. Site work zones, site communication procedures, safe work practices, and a site map should be included.

4.9 Dust Control

Dust control measures will be, at a minimum, consistent with standard construction practices. These will include, but are not limited to, the following:

- Watering of active soil construction areas to prevent visible dust plumes from migrating outside of the site limits;
- Misting or spraying while loading transportation vehicles;
- Minimizing drop heights while loading transportation vehicles; and
- Using tarpaulins or other effective covers for trucks carrying soils that travel on public roads.

Subsurface activities shall immediately cease should airborne dust become visible, and will not recommence until the area is adequately moistened such that no visible dust will be generated.

If visible dust is continually being generated, additional measures (e.g., dust monitoring) may be required.

4.10 Decontamination

All personnel and/or equipment leaving a potentially contaminated area are subject to decontamination procedures. If applicable, general decontamination procedures for personnel and equipment are outlined below.

4.10.1 Personal Decontamination

All personnel leaving areas where existing soil (below existing AC, concrete and associated base rock) has been exposed must follow decontamination procedures as outlined in the Contractor's Health and Safety Plan.

4.10.2 Equipment Decontamination

Equipment utilized in the areas of exposed soil (instruments, samples, tools, backhoes, other construction equipment) will be decontaminated prior to leaving the earthwork areas as outlined in the Contractor's Health and Safety Plan.

All contaminated articles and waste decontamination materials shall be containerized, labeled, and disposed of properly.

4.11 Soil Management

For projects where waste soil will be produced, **a soil management plan (SMP) shall be included**. The soil management objectives are designed to: (1) reduce the potential for exposure of construction workers at the site, neighboring workers and/or pedestrians, and future users of the site to soil potentially containing chemical residuals; and (2) ensure that soil that is removed from the site is disposed at an appropriately-permitted disposal facility.
All soil management and handling activities shall be conducted in accordance with applicable federal, state and local regulations.

Prior to initiating work, the site HSP and SMP shall be submitted to DTSC for notification and approval.

4.11.1 Management of Excavated Soil

Soil excavated during construction activities shall be evaluated in the field using sensory and monitoring equipment for evidence of chemical contamination (i.e. staining, odors, discoloration, elevated VOC readings, etc.).

4.11.2 Management of Apparently Clean Soil

If field evaluation activities do not suggest the presence of contamination, the soil shall be stockpiled and may be reused onsite as backfill at the excavation site. If an overage of "clean" soil remains at the end of the project requiring removal from the site, appropriate soil characterization for waste disposal purposes shall be conducted.

4.11.3 Management of Suspect Soil

Excavated soil exhibiting characteristics suggesting potential contamination shall be stockpiled onsite within a designated fenced enclosure. The soil shall be placed on and covered with plastic sheeting. Characterization samples shall be collected. Pending results of the stockpile characterization, appropriate handling and management alternatives shall be evaluated (i.e. reuse onsite or offsite as fill material or disposal at an appropriately permitted facility).

4.11.4 Excess and Suspect Soil Stockpile Sampling and Analysis

Excavated soil suspected to contain chemical residuals and/or requiring off hauling (regardless of the potential for contamination), shall be sampled to evaluate appropriate handling and management alternatives. Soil sampling shall be conducted on a minimum frequency of one discrete sample per approximately 50 cubic yards of soil or a higher frequency if otherwise required to comply with applicable regulations.

The chemical analyses to be conducted shall be determined on the basis of the destination of the material (i.e., landfill, offsite backfill area, etc.) and/or the suspected contaminant(s) (based on field evaluation techniques and/or historic sampling data relevant to the specific portion of the site from which the material was excavated).

Additionally, and as required by 40 CFR Part 761 and described in the Operations and Management Plan, proper recordkeeping for wastes containing PCBs must be maintained by the Contractor and provided to the owner or designee.

4.11.5 Management of Groundwater

For projects where groundwater may be encountered, the groundwater shall be managed. If groundwater is encountered and requires pumping from excavations, the groundwater should be pumped into appropriate containers and samples should be obtained for analysis to determine waste classification and disposal/recycling options. The chemical analyses to be conducted shall be determined on the basis of the suspected contaminant.

5.0 REFERENCES

California Environmental Protection Agency, Department of Toxic Substances Control (DTSC), 2014. *Approval Letter for Final Removal Action Workplan, 837 Industrial Road, San Carlos, California*. October 29.

Green Environment Incorporated (GEI), 2011. *Expanded Site Investigation 837 Industrial Road, San Carlos, CA*. March 2.

GEI, 2013. *Groundwater Monitoring Report, June 2012 – March 2013, 837 Industrial Road, San Carlos, Ca*. April 30.

GEI, 2014. *Final Removal Action Workplan, 837 Industrial Road, San Carlos, CA*. October 24.

WSP Environment & Energy, 2010. *Soil And Groundwater Investigation Workplan, Tanklage Construction Co., Inc.837 Industrial Road, San Carlos, California*. May 21.

U.S. Department of Energy, Division of Environment, Safety and Health, 1998. *Health and Safety Guidelines*. (http:/www.eh.doe.gov/docs/hasp/links.html)

APPENDIX A

AGREEMENT AND ACKNOWLEDGMENT STATEMENT

APPENDIX A

AGREEMENT AND ACKNOWLEDGMENT STATEMENT

837 Industrial Road
San Carlos, California

Intrusive Earthwork Guidance Plan Agreement

All project personnel and subcontractors are required to sign the following agreement prior to conducting work at the site.

1. I have read and fully understand the plan and my individual responsibilities.

2. I agree to abide by the provisions of the plan.

Name	Signature
Company	Date
Name	Signature
Company	Date
Name	Signature
Company	Date
Name	Signature
Company	Date

(Add additional sheets if necessary)

APPENDIX E

2012 REVISED GROUNDWATER MONITORING WELL INSTALLATION PLAN (PREPARED BY GEI)

GEI Green Environment inc
www.greenenvironment.com

1659C Industrial Road
San Carlos, CA 94070
T 650.508.8018
F 650.508.8005

REVISED GROUNDWATER MONITORING WELL INSTALLATION AND SAMPLING WORK PLAN

837 INDUSTRIAL ROAD
TANKLAGE SQUARE
SAN CARLOS, CALIFORNIA

GEI PROJECT: B10655

JANUARY 20, 2012

Susan Forker
GEI Project Manager

Ross Tinline
Professional Geologist #5860

Table of Contents

1.0 INTRODUCTION 1
1.1 Site Description 1
1.2 Pertinent History 1
1.3 Results of Investigations to Date 2
1.4 Scope of Work 3
2.0 PRE-FIELD ACTIVITIES 3
3.0 MONITORING WELL INSTALLATION AND DEVELOPMENT 4
3.1 Well Installation 4
3.2 Well Development 5
4.0 SOIL AND GROUNDWATER SAMPLING ACTIVITIES 5
4.1 Soil Sampling Procedures 5
4.2 Groundwater Sampling Procedures 6
4.3 Sample Handling and Preservation 8
4.3.1 Sample Analyses 8
4.3.2 Sample Packing and Shipment 8
4.4 Waste Disposal 9
5.0 PROPOSED MONITORING SCHEDULE 9
6.0 QUALITY ASSURANCE PROJECT PLAN 9
6.1 Laboratory Analyses 9
6.2 Chain of Custody and Records Management 9
6.3 Field Quality Control Procedures 10
6.4 Lab Quality Control Procedures 10
7.0 REPORTING 10
8.0 REFERENCES 11

FIGURES

Figure 1 Vicinity Map
Figure 2 Proposed Groundwater Monitoring Well Location

TABLES

Table 1 Soil Sample Analysis Details
Table 2 Groundwater Sample Analysis Details
Table 3 Analyte Quantitation Limits
Table 4 QA/QC Sample Collection and Analysis Summary

APPENDICES

Appendix A Health and Safety Plan
Appendix B Example Field Forms
Appendix C TAL-SF Quality Assurance Manual

1.0 INTRODUCTION

Green Environment inc. (GEI) has prepared this *Revised Groundwater Monitoring Well Installation and Sampling Work Plan* on behalf of the Tanklage Family Partnership I (Tanklage), owner of the commercial/industrial property located at 837 Industrial Road in San Carlos, California (*subject property*). This revised Work Plan was prepared in response to comments received from the California Department of Toxic Substances Control (DTSC) by letter dated December 21, 2011, upon DTSC review of GEI's *Groundwater Monitoring Well Installation Work Plan, 837 Industrial Road, Tanklage Square, San Carlos, California*, dated November 29, 2011.

1.1 Site Description

The *subject property* is located in a commercial/industrial area of eastern San Carlos bounded by Industrial Road to the southwest and Highway 101 to the northeast. A site location map is provided in **Figure 1**. The *subject property* consists of one (1) single story commercial building of approximately 22,000 square feet located at the southwestern side of an approximate eight acre industrial park, known as Tanklage Square, developed by Tanklage in the late 1970's. Tanklage Square includes six (6) commercial/industrial buildings (**Figure 2**). The *subject property* building at 837 Industrial Road is divided into eight (8) units (A-H), leased to several commercial businesses.

1.2 Pertinent History

On December 23, 2008 on behalf of Tanklage, GEI collected a sample of a "semi-solid, black tar-like" substance and a sample of the overlying water that was observed within a sump inside an electrical room at the *subject property*. Laboratory analysis indicated that the tar-like substance contained acetone, polyaromatic hydrocarbons (PAHs) including phenanthrene, chrysene, benzo[g,h,i]perylene, fluoranthene, pyrene, diesel range organic compounds, motor oil range organic compounds, and polychlorinated biphenyls (PCBs). Chromium, nickel, zinc and lead were also detected in the tar-like substance. The pH of the tar-like substance was 1.7. The overlying water sample did not contain detectable concentrations of volatile organic compounds (VOCs) or gasoline range organic compounds (GRO). Low concentrations of metals were detected in the water that had a pH of 2.4. An initial soil and groundwater investigation was performed on the *subject property* by WSP Environment & Energy (WSP) on September 28, 2009 to delineate the lateral and vertical extent of the "tar-like" substance inside the *subject property* building. In October 2009, Tanklage entered into a Voluntary Cleanup Agreement with the Department of Toxic Substances Control (DTSC). DTSC requested an additional investigation be performed at

the *subject property* to expand the soil and groundwater investigation and delineate the lateral and vertical extent of the "tar-like" substance encountered in the initial investigation. In response, WSP prepared a *Soil and Groundwater Investigation Work Plan* on May 21, 2010, which was revised on July 21, 2010 to incorporate comments received from DTSC. The proposed work was completed by GEI in general accordance with the WSP July 21, 2010 *Work Plan* from November, 2010 through January, 2011, and GEI prepared an *Expanded Site Investigation Report* (GEI, March 2, 2011) presenting results. Based on the findings of the site investigations completed to date, and subsequent correspondence between DTSC, GEI and Tanklage, DTSC requested that one (1) groundwater monitoring well be installed on the *subject property* to monitor groundwater conditions downgradient of subsurface contaminants discovered at the eastern side of the *subject property* building.

1.3 Results of Investigations to Date

Soil and groundwater investigations performed by WSP in September 2009 (WSP, July 21, 2010), and GEI in November 2010 and January 2011 (GEI, March 2, 2011), have determined the extent of the tar-like substance on the *subject property*. The tar-like substance has to date only been observed in Boring WSP-1 between 12.5 and 14.2 feet below top surface (bts) and within a trench constructed to route the substance to a collection sump **(Figure 2)**.

VOCs in soil are not significant and their limited presence does not appear to be significantly impacting groundwater. VOCs in groundwater however are pervasive, though at relatively low and widespread concentrations. In general the concentrations are higher on the south side of the *subject property* where up to 1,700 micrograms per liter (ug/L) of tetrachloroethylene (PCE) was reported. GRO has been detected in *subject property* groundwater at concentrations slightly exceeding the Regional Water Quality Control Board (RWQCB) Environmental Screening Level (ESL) for sites where groundwater is a current or potential source of drinking water. A significant source for the GRO has not been discovered on the *subject property*.

Diesel range organics (DRO) and motor oil range organics (MRO) have been detected in a majority of soil samples from 6.5 to 8.5 feet bts located proximal to the trench and previous borings WSP-1 and WSP-3 **(Figure 2)**. No DRO or MRO have been detected in any groundwater samples collected on the *subject property*. PAHs and PCBs have been detected in soil samples generally consistent with elevated extractable petroleum hydrocarbons. Consistent with the DRO and MRO findings, PAHs and PCBs have not significantly impacted groundwater.

Certain metals have been detected in soil above apparent background concentrations, though groundwater is not significantly impacted with metals.

1.4 Scope of Work

Based on the findings of the *subject property* investigations completed to date, and subsequent correspondence between DTSC, GEI and Tanklage, DTSC requested that one (1) groundwater monitoring well be installed on the *subject property* to monitor groundwater conditions downgradient of subsurface contaminants discovered at the eastern side of the *subject property* building.

GEI proposes one (1) downgradient groundwater monitoring well be installed and monitored on a quarterly basis for one (1) year, to evaluate groundwater quality over time.

2.0 PRE-FIELD ACTIVITIES

Prior to the field activities, the following tasks will be completed by GEI.

- This Work Plan and a Subsurface Drilling Application and permit fee will be submitted to the San Mateo County Groundwater Protection Program (SMCoGPP) to obtain a permit for the well installation.
- The proposed groundwater monitoring well location will be identified and marked in white paint.
- *Underground Service Alert* will be contacted at least 72 hours prior to the planned date of the field work to mark public utilities at the well location.
- A private utility locating company will be contracted to clear the well location.
- The field work will be scheduled with Tanklage, *subject property* tenants, SMCoGPP and DTSC (see **Section 5.0** for proposed schedule).
- The site specific health and safety plan (HSP) prepared for this project (**Appendix A**) will be reviewed with GEI employees and subcontractors who will be performing the field work.

3.0 MONITORING WELL INSTALLATION AND DEVELOPMENT

3.1 Well Installation

The proposed well (MW-1) will be completed in the auto parking area just east of the *subject property* building at 837 Industrial Road, inferred downgradient from subsurface chemical impacted areas inside the *subject property* building. The proposed groundwater monitoring well location is shown in **Figure 2**. The following is a summary description of the boring and well installation activities.

Under the supervision of a Professional Geologist, a licensed drilling contractor will advance a 6- or 8-inch diameter soil boring with a truck-mounted drill rig equipped with continuous flight, hollow-stem augers. Soil samples will be collected at significant changes in lithology, and at 5-foot intervals at a minimum, and will be screened in the field using a flame ionization detector (FID). Soil sampling activities are discussed in **Section 4.1.**

The groundwater monitoring well will be designed and constructed in accordance with SMCoGPP guidelines. When the boring is completed, a 2-inch diameter groundwater monitoring well will be constructed within the borehole. Flush thread jointed, Schedule 40, polyvinyl chloride (PVC) casing of 2-inch diameter will be placed down the hollow stem of the augers to the base of the boring. The well will be constructed to approximately eight (8) to ten (10) feet below the depth of static-encountered groundwater, after first encountering groundwater at the anticipated depth of approximately fifteen (15) feet bts. The bottom five (5) feet of the well will be constructed using 0.01-inch slotted PVC well casing. The remaining casing section will be solid and non-slotted. It is anticipated that the well will be screened from approximately twelve (12) to seventeen (17) feet bts. The proposed well will then be capped by affixing a slip cap to the bottom of the well casing, and a locking cap will be placed at the top of the well casing. This well construction is based on the lithology observed at nearby borings B-6 and B-7, and groundwater observations at nearby boring B-5. Boring B-5 was initially advanced to ten (10) feet bts and left overnight with a screened casing inserted in the borehole. However the boring did not generate groundwater when left overnight. Upon subsequent advancement to eighteen (18) feet bts, groundwater rose to a depth of 7.7 feet bts, indicating semi-confining conditions.

The monitoring well will be filter-packed with clean Monterey silica sand throughout the screened interval. Specification of the filter material will be determined based on lithology encountered during drilling and will likely consist of one of the following: No. 3 Monterey Sand, No. 2/12 Lonestar Sand, and/or No. 2/16 Lonestar Sand. The filter-pack material will be installed through the annular spacing between the monitoring well pipe and the auger to

infill the annular space between the well pipe and bore-hole as the augers are raised; the filter-pack material will extend a minimum of one (1) foot above the top of the screened interval. A 2 to 3 feet thick layer of bentonite pellets will be placed and hydrated above the filter material to provide an annular seal, and the remainder of the boring will be filled with neat cement to within one foot of grade. The volume of annular materials used during well construction will be recorded on a well completion log. The well casing will be enclosed inside a watertight cast iron or aluminum traffic-rated box installed in concrete even with, or elevated slightly above, the surface of the parking lot. An example of a well completion log is provided in **Appendix B**.

A licensed surveyor will be retained to survey the well casing relative to mean sea level in accordance with Geotracker requirements.

3.2 Well Development

Well development will be conducted no sooner than 48 hours following well construction, to allow the annular materials to set. The well (MW-1) will be developed until a minimum of ten (10) well volumes have been purged (if recharge rates permit) and the discharged water appears clear of sediment. If necessary, a surge block will be used during purging to remove sediments from the screened interval. Specific electrical conductance (SEC), temperature, and pH of the groundwater will be recorded throughout the development process. The well development will continue until the SEC, temperature, and pH of the discharged water have stabilized (i.e., SEC readings are within 3%, temperature is within 0.2 degrees Celcius [ºC], and pH is within 0.1). Depth to water measurements will be recorded prior to and following the well development activities. An example well development log is provided in **Appendix B**.

4.0 SOIL AND GROUNDWATER SAMPLING ACTIVITIES

4.1 Soil Sampling Procedures

Previous borings B-6 and B-7 (proximal to the proposed well location) encountered elevated FID measurements at approximately eight (8) feet below top surface (bts). Borings B-6 and B-7 first encountered groundwater at approximately 14 or 15.5 feet bts within a permeable sand unit; groundwater then stabilized at approximately 8 feet bts. Therefore, continuous core is proposed to be collected between five (5) feet bts and the bottom of the borehole, anticipated to be between sixteen (16) and eighteen (18) feet bts, for logging, field observation, and FID measurements. Continuous sampling will be conducted using a 1.5- or 2- foot split-spoon sampler. After coring to the initial sampling depth of five (5) feet bts,

the sampler will be attached to the drilling rods and driven to its maximum length or until refusal (no progress for 50 blows per six inches). The sampler will be retrieved and the soil core will be screened with an FID. If a sample is to be collected for potential laboratory analysis, VOC samples will be collected prior to logging the soil to minimize volatilization. The soil core will then be logged by a professional geologist using the Unified Soil Classification System (USCS), and remaining samples will be collected into the appropriate containers (**Table 1**). The sampler will be decontaminated after each use and driven to the next depth interval, and the process repeated.

Soil samples will be collected for potential laboratory analysis during boring activities prior to monitoring well installation. Discrete samples will be collected from the soils recovered inside the split-spoon sampler and transferred into the appropriate sample containers. Laboratory analyses and appropriate sample containers and preservation chemicals, where appropriate, are presented in **Table 1**. Soil samples will be submitted for laboratory analysis if elevated FID readings are recorded, or if the field geologist observes an odor or visible staining associated with a sample interval.

For FID screening, a small amount of soil from each interval will be placed in an individual zipper-style plastic bag (e.g., Ziploc®), labeled with location and depth, sealed, and disturbed by shaking to allow volatilization to occur. After waiting a minimum of ten (10) minutes, the bag will be opened slightly and the headspace will be screened for total hydrocarbons by inserting the tip of the FID probe inside the plastic bag. The highest FID reading following insertion of the probe into the plastic bag will be recorded on the soil boring log. An example boring log is included in **Appendix B**.

4.2 Groundwater Sampling Procedures

At least 72 hours after well development, an initial groundwater sample will be collected from the well for laboratory analyses. The procedure will consist of purging the well using a low-stress (low-flow, minimal drawdown) method, as recommended by SMCoGPP. The purpose of the low-stress method is to minimize the amount of impact the purging process has on the groundwater chemistry during sample collection and to minimize the volume of water that is being purged and disposed.

Prior to placing the pump in the well, a water level reading will be collected using a Solinst® or equivalent water level meter capable of collecting readings accurate to within 0.01 inches. The reading will be taken from the measured top of casing (TOC) point of the well as indicated by the licensed surveyor. If the TOC location is not marked, it is assumed to be the northernmost point on the well casing. Total well depth will also be measured at

this time by allowing the probe tip of the water level meter to descend until it reaches the bottom of the well. A reading will then be collected by the same procedure as the water level reading.

The well will be purged by use of a GeoTech GeoControl PRO bladder pump system. The system consists of a portable, multi-control air compressor, a bottom-loading stainless steel pump housing, and dedicated, disposable bladders and tubing. Prior to well sampling, historical soil and groundwater data from the *subject property* will be reviewed, along with the construction details of the groundwater monitoring well. This information will be used to determine the depth that the pump should be set and from which a sample will be collected. The pump should be set so that the intake is positioned at the approximate mid-point of the well screen.

The pump uses compressed air to displace water. The use of a bladder in the pump housing allows the water to be displaced without being exposed to the compressed atmospheric air. Air discharged from the pump will be conveyed via tubing to the air compressor. A check valve in the pump housing prevents discharged water from flowing back into the pump and well. The pump's water discharge line will be connected to a flow-through cell containing the probe of a YSI 556 MPS meter. The meter measures the following parameters during purging: dissolved oxygen (DO), oxidation-reduction potential (ORP), total dissolved solids (TDS), temperature, specific electrical conductance (SEC), and pH. The pump will be operated to allow a minimal drawdown in each well (optimally less than 0.33 foot) until the water quality parameters stabilize and sample collection is complete.

During purging, a minimum of one tubing volume (including the volume of water in the pump and flow-through cell) will be purged prior to recording the water-quality parameters. Water-quality indicator parameters and water level will then be monitored and recorded on a groundwater sampling form (example in **Appendix B**). Sampling will occur after the water-quality parameters have stabilized for three (3) consecutive readings. Stabilization criteria are as follows: within 0.2 degrees Celcius (ºC) for temperature, 0.1 for pH, three percent (3%) for SEC, 10 millivolts (mV) for ORP, and 0.3 milligrams per liter (mg/L) for DO (DTSC, 2008). For sampling, the pumping rate will be maintained or reduced slightly (0.2 to 0.5 liter per minute) in order to minimize the disturbance of the water column. The pump's tubing will be disconnected from the flow-through cell so that the samples will be collected directly from the pump's discharge tubing. Water will be discharged into proper laboratory-supplied sample containers, promptly sealed, labeled and placed in a field cooler for preservation. Laboratory analyses and appropriate sample containers and preservation chemicals, where appropriate, are presented in **Table 2.** The sample containers will be submitted to a California-certified laboratory along with chain of custody documentation.

After sampling is complete, the pump will be removed from the monitoring well and disassembled for decontamination. Final depth to water and total well depth will be recorded prior to closing the well.

All field measuring equipment, including but not limited to the FID and YSI 556 MPS meter, will be calibrated to appropriate standards, and calibration readings will be recorded on a field instrument calibration log, included in **Appendix B**. Calibration will be conducted at the beginning of each work day.

4.3 Sample Handling and Preservation

4.3.1 Sample Analyses

GEI will direct a California-certified laboratory to perform the following chemical analyses on a normal lab turnaround time for soil samples collected during drilling (if applicable), and for groundwater samples collected following well installation.

- VOCs and total petroleum hydrocarbons (TPH) as gasoline (TPHg) by Environmental Protection Agency (EPA) Method 8260B;
- Total extractable petroleum hydrocarbons (TEPH) as diesel (TEPHd) and TEPH as motor oil (TEPHmo) by EPA Method 8015M with a silica gel cleanup;
- PAHs by EPA Method 8270 SIM;
- PCBs by EPA Method 8082;
- Dissolved cadmium, chromium, nickel and zinc by EPA Method 6010B;
- TDS (groundwater only) by EPA Method 2540D;
- pH (groundwater only) by ASTM 9045C; and
- moisture content (soil only).

4.3.2 Sample Packing and Shipment

All samples submitted for laboratory analysis will be labeled with an indelible marker, and labels will contain the following information: site location, sample identification, date and time of sample collection, and name of sample collector. Samples will immediately be placed in a cooler with ice to comply with preservation requirements. A chain of custody will be completed and will document the possession and handling of all samples from the time of field collection through laboratory analysis.

Samples will be transported in coolers with ice by a TAL-SF courier, with proper chain of custody documentation.

4.4 Waste Disposal

Soil cuttings, decon water and purge water generated from soil boring and groundwater monitoring well installation and sampling activities will be placed inside DOT approved drums, labeled appropriately and placed for temporary storage at the *subject property*. These drums will be characterized for proper off-site disposal.

5.0 PROPOSED MONITORING SCHEDULE

The proposed schedule for well installation, development, and sampling is as follows.

- Well installation: by February 29, 2012.
- Well development and initial groundwater sampling: by March 9, 2012.
- Periodic groundwater sampling: June 2012, September 2012, December 2012.

6.0 QUALITY ASSURANCE PROJECT PLAN

6.1 Laboratory Analyses

Soil and groundwater samples will be submitted with chain of custody documentation to TestAmerica Laboratories, Inc. of Pleasanton, California (TAL-San Francisco). TAL-San Francisco is certified with the California Department of Health Services Environmental Laboratory Accreditation Program, ELAP #2496. All samples will be analyzed for VOCs, TPHg, TEPHd, TEPHmo, PAHs, PCBs, and select dissolved metals. In addition, groundwater samples will be analyzed for TDS and pH, and soil samples will be analyzed for soil moisture content for reporting results as dry weight concentrations. Laboratory analyses, EPA methods, container types, preservation requirements and holding times are provided in **Tables 1** and **2**. Reporting limits (RLs), method detection limits (MDLs), and units for each compound are summarized in **Table 3**.

6.2 Chain of Custody and Records Management

The sampler will complete a chain of custody with all samples collected, including QA/QC samples. An example chain of custody form is provided in **Appendix B**. The chain of custody will provide information regarding possession and handling of each sample from the time of sample collection through laboratory analysis.

6.3 Field Quality Control Procedures

Quality assurance/quality control (QA/QC) in the field is achieved by the collection and analysis of quality assurance blanks, including trip blanks, equipment rinsate blanks, temperature blanks, and duplicate samples. A summary of QA/QC samples to be collected during this investigation is presented in **Table 4**.

Trip blanks will be provided by TAL-SF and will be shipped with the appropriate bottleware for VOC analysis prior to the sampling event, to assess possible contamination introduced by field conditions. The trip blanks will not be opened by field staff and will remain sealed until removed by the laboratory upon receipt of samples.

An equipment rinsate blank will be collected by the sampler by pouring de-ionized water through the sampling equipment and into the appropriate sample containers following decontamination of the sampling equipment. The purpose of this blank is to verify the effectiveness of decontamination procedures.

A temperature blank will be included in each cooler of samples shipped to the lab for analysis, and will be checked upon receipt to confirm that samples are at or below the required temperature of 6ºC.

One (1) duplicate soil sample and one (1) duplicate groundwater sample will be collected and submitted to the laboratory. Duplicate samples will be collected using the same sampling techniques, preservatives, and containers, as their parent samples. The duplicate sample identifications will not indicate to the lab the parent sample with which they are associated.

6.4 Lab Quality Control Procedures

The TAL-SF quality assurance manual (QAM) is provided in **Appendix C**.

7.0 REPORTING

A report detailing the results of the groundwater well installation, development and one (1) year of quarterly sampling will be prepared and submitted to Tanklage and DTSC by January 31, 2013.

8.0 REFERENCES

DTSC. *Representative Sampling of Groundwater for Hazardous Substances, Guidance Manual for Groundwater Investigations.* July, 1995. Revised February, 2008.

DTSC. Letter re: *Well Installation Work Plan, Dated November 29, 2011, Tanklage Square, 837 Industrial Road, San Carlos, California*. December 21, 2011.

Green Environment inc. (GEI). *Expanded Site Investigation Report, 837 Industrial Road, San Carlos, California.* March 2, 2011.

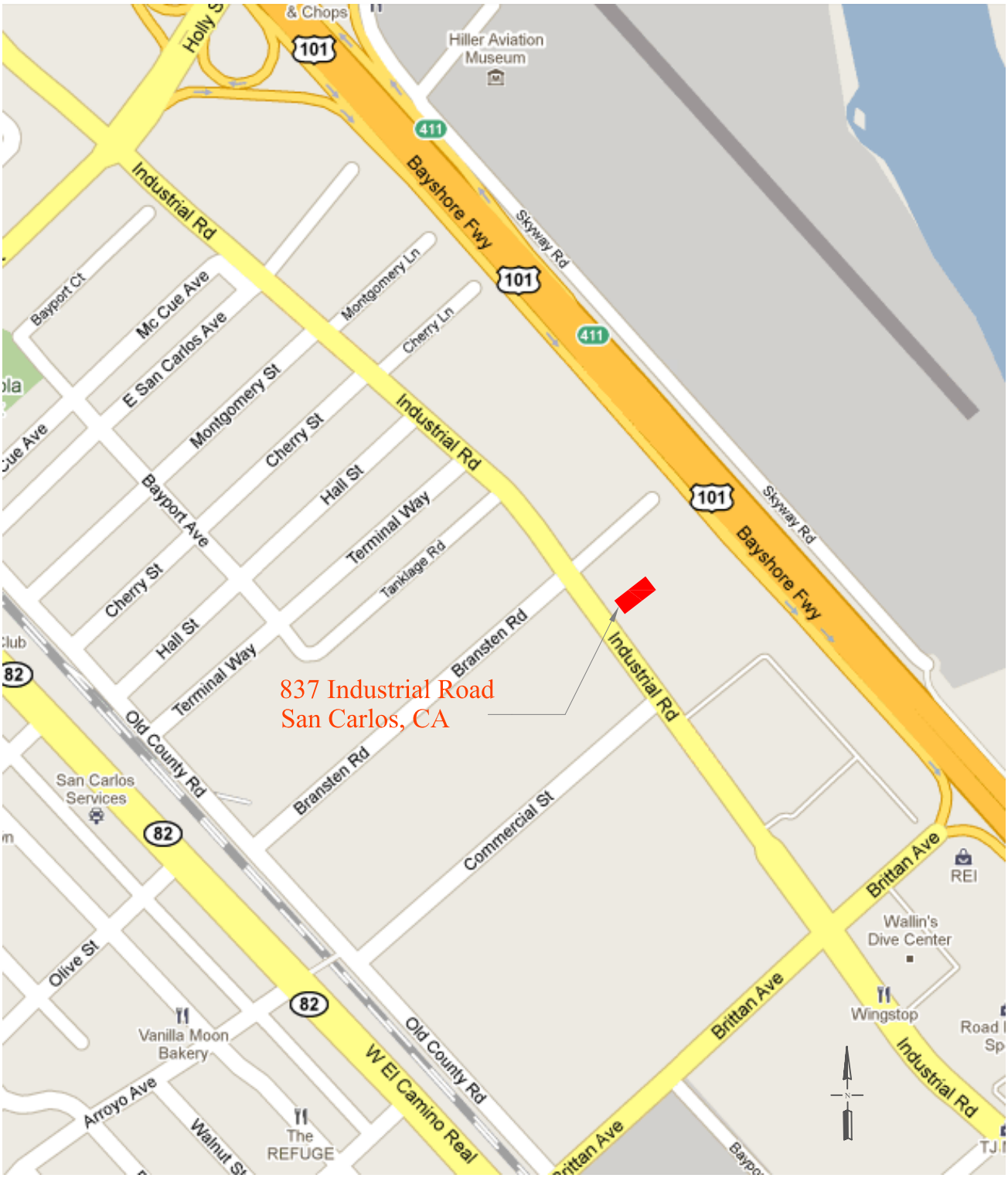
Green Environment inc. (GEI). *Groundwater Monitoring Well Installation Work Plan, 837 Industrial Road, Tanklage Square, San Carlos, California.* November 29, 2011.

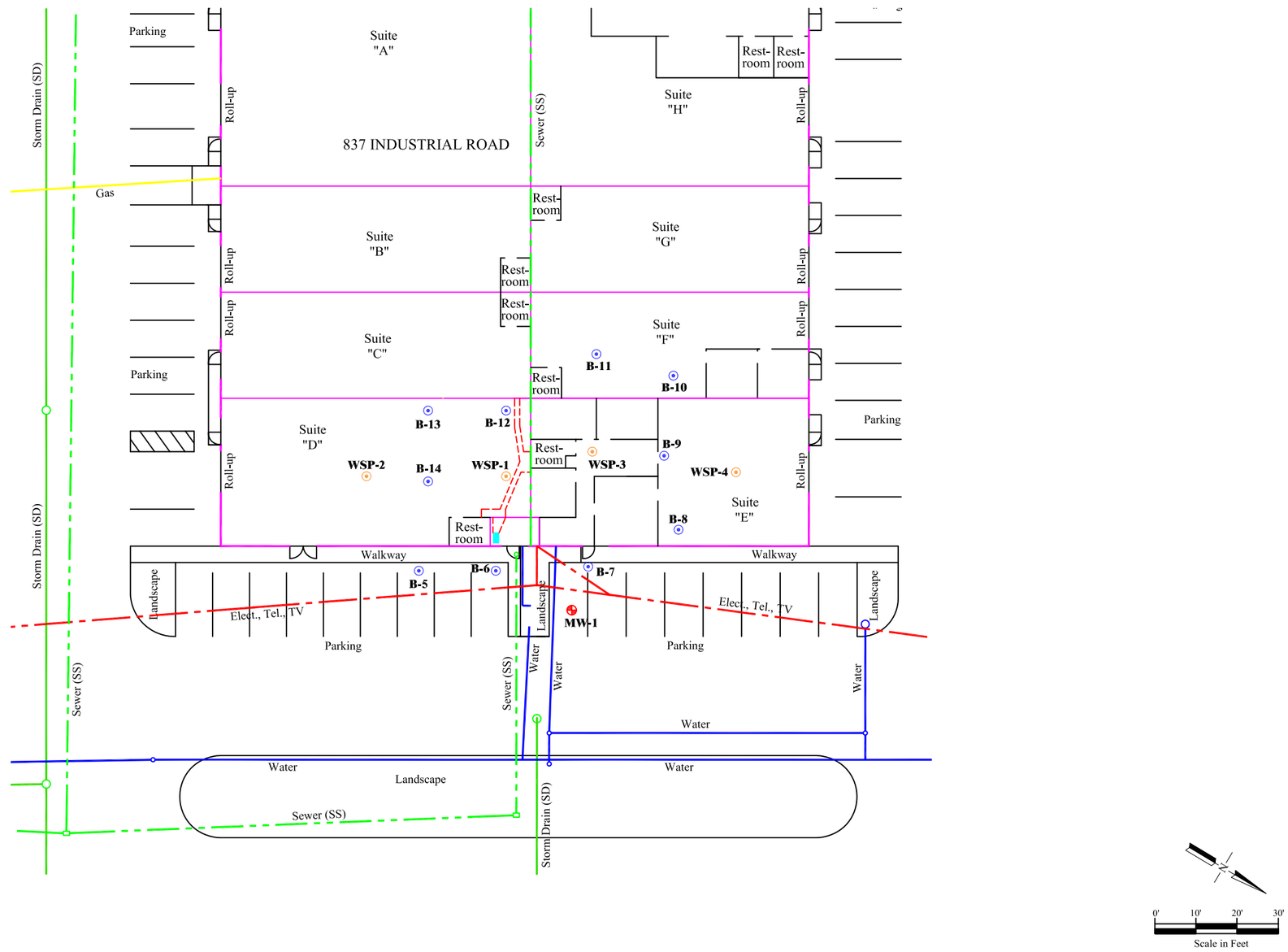
WSP Environment & Energy. *Soil and Groundwater Investigation Work Plan, Tanklage Construction Co., Inc., 837 Industrial Road, San Carlos, California Final*. May 21, 2010. Revised July 21, 2010.

FIGURES

Vicinity Map

Figure 1





Legend:

- **WSP-1** Soil boring (WSP, 09/28/09)
- **B-5** Soil boring (GEI, 11/22/10, 11/23/10)
- **B-15** Soil boring (GEI, 01/20/11)
- Covered Trench
- Sump box
- MW-1 Proposed groundwater monitoring well (GEI)

Underground utilities:

- Gas
- Water
- Elect., Tel., Cable TV
- Storm Drain (SD)
- Sewer (SS)

GEI Green Environment inc
www.greenenvironment.com

Drawing Name: SITE PLAN WITH PROPOSED GROUNDWATER MONITORING WELL

Address: 837 Industrial Road
San Carlos, California

Drawn by:	KA
Date:	11/22/11
Scale:	1" = 30'-0"
Job #	B10655
Figure #	FIGURE 2

TABLES

Table 1. Soil Sample Analysis Details

Analyte	Method Number	Sample Container	Sample Preservative	Hold Time
Volatile organic compounds (VOCs)	SW 846	3 x 40mL VOA	2 w/UPBW 1 w/MeOH 4°C	48 hours
Total petroleum hydrocarbons as gasoline (TPHg)				
Total extractable petroleum hydrocarbons as diesel (TEPHd) with a silica gel cleanup	EPA 8015M	1 x 8-oz glass jar or a brass or steel sample tube	4°C	14 days
TEPH as motor oil (TEPHmo) with a silica gel cleanup	EPA 8015M			
Polyaromatic hydrocarbons (PAHs)	EPA 8270SIM			
Polychlorinated biphenyls (PCBs)	EPA 8082	1 x 8-oz glass jar or a brass or steel sample tube	4°C	7 days
Dissolved cadmium, chromium, nickel, and zinc	EPA 6010B			6 months
Total dissolved solids (TDS)	EPA 2540D			7 days
Soil moisture				

Notes:

UPBW = ultra pure blank water

MeOH = methanol

Table 2. Groundwater Sample Analysis Details

Analyte	Method Number	Sample Container	Sample Preservative	Hold Time
Volatile organic compounds (VOCs)	EPA 8260B	3 x 40mL VOA	HCl, 4°C	14 days
Total petroleum hydrocarbons as gasoline (TPHg)	EPA 8260B			
Total extractable petroleum hydrocarbons as diesel (TEPHd) with a silical gel cleanup	EPA 8015M	1 x 1L amber	4°C	7 days
TEPH as motor oil (TEPHmo) with a silica gel cleanup	EPA 8015M			
Polyaromatic hydrocarbons (PAHs)	EPA 8270SIM	1 x 1L amber	4°C	7 days
Polychlorinated biphenyls (PCBs)	EPA 8082	1 x 1L amber	pH 5-8, 4°C	7 days
Dissolved cadmium, chromium, nickel, and zinc	EPA 6010B	1 x 500mL poly	HNO3, 4°C	6 months
Total dissolved solids (TDS)	EPA 2540D	1 x 250mL poly	4°C	7 days
pH	ASTM 9045C	1 x 250mL poly	None	Immediately

Notes:

HCl = Hydrochloric acid

HNO3 = nitric acid

Table 3. Analyte Quantitation Limits

Analysis Group Description	Method Description	Method Code
soil	Metals (ICP)	6010B

Analyte Description	CAS Number	RL - Limit	MDL - Limit	Units
Antimony	7440-36-0	0.5	0.083	mg/Kg
Arsenic	7440-38-2	1	0.085	mg/Kg
Barium	7440-39-3	0.5	0.071	mg/Kg
Beryllium	7440-41-7	0.1	0.0325	mg/Kg
Cadmium	7440-43-9	0.125	0.0124	mg/Kg
Chromium	7440-47-3	0.5	0.053	mg/Kg
Cobalt	7440-48-4	0.2	0.02	mg/Kg
Copper	7440-50-8	1.5	0.7121	mg/Kg
Lead	7439-92-1	0.5	0.105	mg/Kg
Molybdenum	7439-98-7	0.5	0.064	mg/Kg
Nickel	7440-02-0	0.5	0.051	mg/Kg
Selenium	7782-49-2	1	0.15	mg/Kg
Silver	7440-22-4	0.25	0.0505	mg/Kg
Thallium	7440-28-0	0.5	0.145	mg/Kg
Vanadium	7440-62-2	0.5	0.068	mg/Kg
Zinc	7440-66-6	1.5	0.635	mg/Kg

soil	Preparation, Metals	3050B
soil	Mercury (CVAA)	7471A

Analyte Description	CAS Number	RL - Limit	MDL - Limit	Units
Mercury	7439-97-6	0.01	0.0025	mg/Kg

soil	Preparation, Mercury	7471A_Prep
soil	Volatile Organic Compounds (GC/MS)	8260B_LL

Analyte Description	CAS Number	RL - Limit	MDL - Limit	Units
Methyl tert-butyl ether	1634-04-4	5	1.2	ug/Kg
Acetone	67-64-1	50	24	ug/Kg
Benzene	71-43-2	5	0.34	ug/Kg
Dichlorobromomethane	75-27-4	5	0.38	ug/Kg
Bromobenzene	108-86-1	5	0.4	ug/Kg
Chlorobromomethane	74-97-5	20	0.38	ug/Kg
Bromoform	75-25-2	5	0.36	ug/Kg
Bromomethane	74-83-9	10	0.49	ug/Kg
2-Butanone (MEK)	78-93-3	50	21	ug/Kg
n-Butylbenzene	104-51-8	5	0.42	ug/Kg
sec-Butylbenzene	135-98-8	5	0.43	ug/Kg
tert-Butylbenzene	98-06-6	5	0.34	ug/Kg
Carbon disulfide	75-15-0	5	0.46	ug/Kg
Carbon tetrachloride	56-23-5	5	0.45	ug/Kg
Chlorobenzene	108-90-7	5	0.35	ug/Kg
Chloroethane	75-00-3	10	0.45	ug/Kg
Chloroform	67-66-3	5	0.34	ug/Kg
Chloromethane	74-87-3	10	0.49	ug/Kg
2-Chlorotoluene	95-49-8	5	0.34	ug/Kg
4-Chlorotoluene	106-43-4	5	0.34	ug/Kg
Chlorodibromomethane	124-48-1	5	0.34	ug/Kg
1,2-Dichlorobenzene	95-50-1	5	0.6	ug/Kg
1,3-Dichlorobenzene	541-73-1	5	0.35	ug/Kg
1,4-Dichlorobenzene	106-46-7	5	0.71	ug/Kg
1,3-Dichloropropane	142-28-9	5	0.39	ug/Kg
1,1-Dichloropropene	563-58-6	5	0.34	ug/Kg
1,2-Dibromo-3-Chloropropane	96-12-8	5	0.6	ug/Kg
Ethylene Dibromide	106-93-4	5	1.43	ug/Kg
Dibromomethane	74-95-3	10	0.35	ug/Kg
Dichlorodifluoromethane	75-71-8	10	0.79	ug/Kg
1,1-Dichloroethane	75-34-3	5	0.34	ug/Kg
1,2-Dichloroethane	107-06-2	5	0.34	ug/Kg
1,1-Dichloroethene	75-35-4	5	0.36	ug/Kg
cis-1,2-Dichloroethene	156-59-2	5	0.37	ug/Kg
trans-1,2-Dichloroethene	156-60-5	5	0.54	ug/Kg
1,2-Dichloropropane	78-87-5	5	0.34	ug/Kg
cis-1,3-Dichloropropene	10061-01-5	5	0.34	ug/Kg
trans-1,3-Dichloropropene	10061-02-6	5	0.34	ug/Kg
Ethylbenzene	100-41-4	5	0.36	ug/Kg
Hexachlorobutadiene	87-68-3	5	0.59	ug/Kg
2-Hexanone	591-78-6	50	10	ug/Kg
Isopropylbenzene	98-82-8	5	0.52	ug/Kg

4-Isopropyltoluene	99-87-6	5	0.41	ug/Kg
Methylene Chloride	75-09-2	10	1.34	ug/Kg
4-Methyl-2-pentanone (MIBK)	108-10-1	50	10	ug/Kg
Naphthalene	91-20-3	10	0.8	ug/Kg
N-Propylbenzene	103-65-1	5	0.37	ug/Kg
Styrene	100-42-5	5	0.34	ug/Kg
1,1,1,2-Tetrachloroethane	630-20-6	5	0.34	ug/Kg
1,1,2,2-Tetrachloroethane	79-34-5	5	0.49	ug/Kg
Tetrachloroethene	127-18-4	5	0.44	ug/Kg
Toluene	108-88-3	5	0.52	ug/Kg
1,2,3-Trichlorobenzene	87-61-6	5	0.74	ug/Kg
1,2,4-Trichlorobenzene	120-82-1	5	0.55	ug/Kg
1,1,1-Trichloroethane	71-55-6	5	0.54	ug/Kg
1,1,2-Trichloroethane	79-00-5	5	0.37	ug/Kg
Trichloroethene	79-01-6	5	0.34	ug/Kg
Trichlorofluoromethane	75-69-4	5	0.56	ug/Kg
1,2,3-Trichloropropane	96-18-4	5	0.51	ug/Kg
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	5	2.081	ug/Kg
1,2,4-Trimethylbenzene	95-63-6	5	0.39	ug/Kg
1,3,5-Trimethylbenzene	108-67-8	5	0.34	ug/Kg
Vinyl acetate	108-05-4	50	1.06	ug/Kg
Vinyl chloride	75-01-4	5	0.53	ug/Kg
m-Xylene & p-Xylene	179601-23-1	5	0.67	ug/Kg
o-Xylene	95-47-6	5	0.34	ug/Kg
Xylenes, Total	1330-20-7	10	0.52	ug/Kg
4-Bromofluorobenzene	460-00-4	5	0.1	ug/Kg
1,2-Dichloroethane-d4 (Surr)	17060-07-0	5	0.1	ug/Kg
Toluene-d8 (Surr)	2037-26-5	5	0.1	ug/Kg
2,2-Dichloropropane	594-20-7	5	0.34	ug/Kg
Gasoline Range Organics (GRO)-C5-C12	STL00349	250	100	ug/Kg

soil	Purge and Trap	5030B_SolidNAC
soil	Diesel Range Organics (DRO) (GC)	8015B_DRO

Analyte Description	CAS Number	RL - Limit	MDL - Limit	Units
Diesel Range Organics [C10-C28]	STL00143	1	0.34	mg/Kg
Motor Oil Range Organics [C24-C36]	STL00158	50	1.7	mg/Kg
Capric Acid (Surr)	334-48-5	1		mg/Kg
p-Terphenyl	92-94-4	1		mg/Kg

soil	Microwave Extraction	3546_SGC
soil	Polychlorinated Biphenyls (PCBs) by Gas Chromatography	8082

Analyte Description	CAS Number	RL - Limit	MDL - Limit	Units
PCB-1016	12674-11-2	50	1.8	ug/Kg
PCB-1221	11104-28-2	50	1.8	ug/Kg
PCB-1232	11141-16-5	50	1.8	ug/Kg
PCB-1242	53469-21-9	50	1.8	ug/Kg
PCB-1248	12672-29-6	50	1.8	ug/Kg
PCB-1254	11097-69-1	50	1.8	ug/Kg
PCB-1260	11096-82-5	50	5.3	ug/Kg
Tetrachloro-m-xylene	877-09-8	50		ug/Kg
DCB Decachlorobiphenyl	2051-24-3	50		ug/Kg

soil	Microwave Extraction	3546
soil	Semivolatile Organic Compounds (GC/MS SIM)	8270C_SIM

Analyte Description	CAS Number	RL - Limit	MDL - Limit	Units
Acenaphthene	83-32-9	5	1.413	ug/Kg
Acenaphthylene	208-96-8	5	1.2	ug/Kg
Anthracene	120-12-7	5	0.975	ug/Kg
Benzo[a]anthracene	56-55-3	5	0.744	ug/Kg
Benzo[a]pyrene	50-32-8	5	0.925	ug/Kg
Benzo[b]fluoranthene	205-99-2	5	1.068	ug/Kg
Benzo[g,h,i]perylene	191-24-2	5	2.137	ug/Kg
Benzo[k]fluoranthene	207-08-9	5	1.034	ug/Kg
Chrysene	218-01-9	5	0.71	ug/Kg
Dibenz(a,h)anthracene	53-70-3	5	1.772	ug/Kg
Fluoranthene	206-44-0	5	0.707	ug/Kg
Fluorene	86-73-7	5	1.068	ug/Kg
Indeno[1,2,3-cd]pyrene	193-39-5	5	2.12	ug/Kg
Naphthalene	91-20-3	5	1.772	ug/Kg
Phenanthrene	85-01-8	5	0.707	ug/Kg

Pyrene	129-00-0	5	0.834	ug/Kg
2-Fluorobiphenyl	321-60-8	5		ug/Kg
Terphenyl-d14	1718-51-0	5		ug/Kg

soil	Microwave Extraction	3546
Water RLs and MDLs	Metals (ICP)	6010B

Analyte Description	CAS Number	RL - Limit	MDL - Limit	Units
Antimony	7440-36-0	0.01	0.0027	mg/L
Arsenic	7440-38-2	0.01	0.0026	mg/L
Barium	7440-39-3	0.005	0.0014	mg/L
Beryllium	7440-41-7	0.002	0.00033	mg/L
Cadmium	7440-43-9	0.0025	0.0013	mg/L
Chromium	7440-47-3	0.01	0.0015	mg/L
Cobalt	7440-48-4	0.002	0.0012	mg/L
Copper	7440-50-8	0.02	0.0015	mg/L
Lead	7439-92-1	0.005	0.0023	mg/L
Molybdenum	7439-98-7	0.01	0.0023	mg/L
Nickel	7440-02-0	0.01	0.0008	mg/L
Selenium	7782-49-2	0.02	0.0071	mg/L
Silver	7440-22-4	0.005	0.0012	mg/L
Thallium	7440-28-0	0.01	0.0035	mg/L
Vanadium	7440-62-2	0.01	0.0007	mg/L
Zinc	7440-66-6	0.02	0.0096	mg/L

Water RLs and MDLs	Preparation, Total Metals	3010A
Water RLs and MDLs	Mercury (CVAA)	7470A

Analyte Description	CAS Number	RL - Limit	MDL - Limit	Units
Mercury	7439-97-6	0.0002	0.0001	mg/L

Water RLs and MDLs	Preparation, Mercury	7470A_Prep
Water RLs and MDLs	Diesel Range Organics (DRO) (GC)	8015B_DRO

Analyte Description	CAS Number	RL - Limit	MDL - Limit	Units
Diesel Range Organics [C10-C28]	STL00143	50	24	ug/L
Motor Oil Range Organics [C24-C36]	STL00158	100	37	ug/L
Capric Acid (Surr)	334-48-5	50	24	ug/L
p-Terphenyl	92-94-4	50	24	ug/L

Water RLs and MDLs	Liquid-Liquid Extraction (Separatory Funnel)	3510C_SGC
Water RLs and MDLs	Polychlorinated Biphenyls (PCBs) by Gas Chromatography	8082

Analyte Description	CAS Number	RL - Limit	MDL - Limit	Units
PCB-1016	12674-11-2	0.5	0.06	ug/L
PCB-1221	11104-28-2	0.5	0.06	ug/L
PCB-1232	11141-16-5	0.5	0.06	ug/L
PCB-1242	53469-21-9	0.5	0.06	ug/L
PCB-1248	12672-29-6	0.5	0.06	ug/L
PCB-1254	11097-69-1	0.5	0.06	ug/L
PCB-1260	11096-82-5	0.5	0.028	ug/L
Tetrachloro-m-xylene	877-09-8	0.5		ug/L
DCB Decachlorobiphenyl	2051-24-3	0.5		ug/L

Water RLs and MDLs	Liquid-Liquid Extraction (Separatory Funnel)	3510C
Water RLs and MDLs	Semivolatile Organic Compounds (GC/MS SIM)	8270C_SIM

Analyte Description	CAS Number	RL - Limit	MDL - Limit	Units
Naphthalene	91-20-3	0.1	0.03	ug/L
Acenaphthene	83-32-9	0.1	0.035	ug/L
Acenaphthylene	208-96-8	0.1	0.035	ug/L
Fluorene	86-73-7	0.1	0.031	ug/L
Phenanthrene	85-01-8	0.1	0.024	ug/L
Anthracene	120-12-7	0.1	0.029	ug/L
Benzo[a]anthracene	56-55-3	0.1	0.027	ug/L
Chrysene	218-01-9	0.1	0.031	ug/L
Benzo[a]pyrene	50-32-8	0.1	0.023	ug/L
Benzo[b]fluoranthene	205-99-2	0.1	0.03	ug/L
Benzo[k]fluoranthene	207-08-9	0.1	0.034	ug/L
Benzo[g,h,i]perylene	191-24-2	0.1	0.022	ug/L
Indeno[1,2,3-cd]pyrene	193-39-5	0.1	0.027	ug/L
Fluoranthene	206-44-0	0.1	0.028	ug/L
Pyrene	129-00-0	0.1	0.035	ug/L
Naphthalene-d8	1146-65-2	0.1		ug/L

Acenaphthene-d10	15067-26-2	0.1		ug/L
Phenanthrene-d10	1517-22-2	0.1		ug/L
Chrysene-d12	1719-03-5	0.1		ug/L
Perylene-d12	1520-96-3	0.1		ug/L
2-Fluorobiphenyl	321-60-8	0.1		ug/L
Terphenyl-d14	1718-51-0	0.1		ug/L
DFTPP	5074-71-5	0.1		ug/L
Nitrobenzene-d5	4165-60-0	0.1		ug/L
p-Terphenyl-d14	1718-51-0			
Dibenz(a,h)anthracene	53-70-3	0.1	0.026	ug/L
2,4,6-Tribromophenol	118-79-6	0.1	0.023	ug/L

Water RLs and MDLs	Liquid-Liquid Extraction (Separatory Funnel)	3510C
Water RLs and MDLs	Solids, Total Dissolved (TDS)	2540C_Calcd

Analyte Description	CAS Number	RL - Limit	MDL - Limit	Units
Total Dissolved Solids	STL00242	10	8.4	mg/L

Water RLs and MDLs	pH	9040B

Analyte Description	CAS Number	RL - Limit	MDL - Limit	Units
pH	STL00204	0.1		

Water RLs and MDLs	Volatile Organic Compounds (GC/MS)	8260B_LL

Analyte Description	CAS Number	RL - Limit	MDL - Limit	Units
Methyl tert-butyl ether	1634-04-4	0.5	0.069	ug/L
Acetone	67-64-1	50	3.7	ug/L
Benzene	71-43-2	0.5	0.25	ug/L
Dichlorobromomethane	75-27-4	0.5	0.2	ug/L
Bromobenzene	108-86-1	1	0.2	ug/L
Chlorobromomethane	74-97-5	1	0.073	ug/L
Bromoform	75-25-2	1	0.5	ug/L
Bromomethane	74-83-9	1	0.489	ug/L
2-Butanone (MEK)	78-93-3	50	8.38	ug/L
n-Butylbenzene	104-51-8	1	0.1	ug/L
sec-Butylbenzene	135-98-8	1	0.166	ug/L
tert-Butylbenzene	98-06-6	1	0.2	ug/L
Carbon disulfide	75-15-0	5	1	ug/L
Carbon tetrachloride	56-23-5	0.5	0.072	ug/L
Chlorobenzene	108-90-7	0.5	0.13	ug/L
Chloroethane	75-00-3	1	0.119	ug/L
Chloroform	67-66-3	1	0.2	ug/L
Chloromethane	74-87-3	1	0.189	ug/L
2-Chlorotoluene	95-49-8	0.5	0.2	ug/L
4-Chlorotoluene	106-43-4	0.5	0.2	ug/L
Chlorodibromomethane	124-48-1	0.5	0.1	ug/L
1,2-Dichlorobenzene	95-50-1	0.5	0.21	ug/L
1,3-Dichlorobenzene	541-73-1	0.5	0.2	ug/L
1,4-Dichlorobenzene	106-46-7	0.5	0.16	ug/L
1,3-Dichloropropane	142-28-9	1	0.17	ug/L
1,1-Dichloropropene	563-58-6	0.5	0.2	ug/L
1,2-Dibromo-3-Chloropropane	96-12-8	1	0.21	ug/L
Ethylene Dibromide	106-93-4	0.5	0.075	ug/L
Dibromomethane	74-95-3	0.5	0.067	ug/L
Dichlorodifluoromethane	75-71-8	0.5	0.067	ug/L
1,1-Dichloroethane	75-34-3	0.5	0.067	ug/L
1,2-Dichloroethane	107-06-2	0.5	0.077	ug/L
1,1-Dichloroethene	75-35-4	0.5	0.2	ug/L
cis-1,2-Dichloroethene	156-59-2	0.5	0.071	ug/L
trans-1,2-Dichloroethene	156-60-5	0.5	0.07	ug/L
1,2-Dichloropropane	78-87-5	0.5	0.2	ug/L
cis-1,3-Dichloropropene	10061-01-5	0.5	0.07	ug/L
trans-1,3-Dichloropropene	10061-02-6	0.5	0.17	ug/L
Ethylbenzene	100-41-4	0.5	0.07	ug/L
Hexachlorobutadiene	87-68-3	1	0.273	ug/L
2-Hexanone	591-78-6	50	2.678	ug/L
Isopropylbenzene	98-82-8	0.5	0.2	ug/L
4-Isopropyltoluene	99-87-6	1	0.075	ug/L
Methylene Chloride	75-09-2	5	1	ug/L
4-Methyl-2-pentanone (MIBK)	108-10-1	50	4.457	ug/L
Naphthalene	91-20-3	1	0.221	ug/L
N-Propylbenzene	103-65-1	1	0.2	ug/L

Styrene	100-42-5	0.5	0.075	ug/L
1,1,1,2-Tetrachloroethane	630-20-6	0.5	0.067	ug/L
1,1,2,2-Tetrachloroethane	79-34-5	0.5	0.074	ug/L
Tetrachloroethene	127-18-4	0.5	0.2	ug/L
Toluene	108-88-3	0.5	0.17	ug/L
1,2,3-Trichlorobenzene	87-61-6	1	0.212	ug/L
1,2,4-Trichlorobenzene	120-82-1	1	0.13	ug/L
1,1,1-Trichloroethane	71-55-6	0.5	0.2	ug/L
1,1,2-Trichloroethane	79-00-5	0.5	0.107	ug/L
Trichloroethene	79-01-6	0.5	0.2	ug/L
Trichlorofluoromethane	75-69-4	1	0.067	ug/L
1,2,3-Trichloropropane	96-18-4	0.5	0.087	ug/L
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	0.5	0.091	ug/L
1,2,4-Trimethylbenzene	95-63-6	0.5	0.2	ug/L
1,3,5-Trimethylbenzene	108-67-8	0.5	0.172	ug/L
Vinyl acetate	108-05-4	10	0.603	ug/L
Vinyl chloride	75-01-4	0.5	0.2	ug/L
m-Xylene & p-Xylene	179601-23-1	1	0.4	ug/L
o-Xylene	95-47-6	0.5	0.2	ug/L
Xylenes, Total	1330-20-7	1	0.488	ug/L
4-Bromofluorobenzene	460-00-4	0.5		ug/L
1,2-Dichloroethane-d4 (Surr)	17060-07-0	0.5		ug/L
Toluene-d8 (Surr)	2037-26-5	0.5		ug/L
2,2-Dichloropropane	594-20-7	0.5	0.17	ug/L
Gasoline Range Organics (GRO)-C5-C12	STL00349	50	21	ug/L

Water RLs and MDLs	Purge and Trap	5030B

Table 4. QA/QC Sample Collection and Analysis Summary

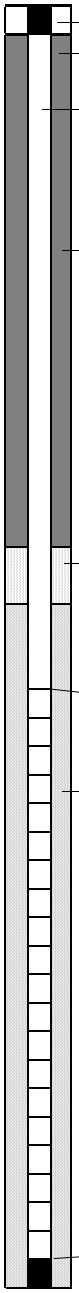
QA/QC Sample Type	Frequency	Analysis	Method
Equipment rinsate blank	1 per day	TEPHd, TEPHmo	8015M
Trip blank	1 per cooler	VOCs	8260B
Temperature blank	1 per cooler	Temperature	NA
Duplicate soil sample	1 per 10 samples	VOCs, TPHg, TEPHd, TEPHmo, PAHs, PCBs, Cd, Cr, Ni, Zn, and pH	8260B/SW 846, 8015M, 6010B, 8270SIM, 8082, and 9045C
Duplicate groundwater sample	1 per 10 samples	VOCs, TPHg, TEPHd, TEPHmo, PAHs, PCBs, Cd, Cr, Ni, Zn, and pH	8260B, 8015M, 6010B, 8270SIM, 8082, and 9045C

APPENDICES

Appendix B – Example Field Forms

WELL COMPLETION FORM

Project:	**Drill Dates:**
Site:	**Drill Times:**
Driller:	**Hole Depth:**
Drill Rig:	**Logged By:**



Monument/Vault _____

Borehole diameter _____

Casing diameter _____

Casing type _____

Grout type _____

Materials _____

Seal type _____

Materials _____

Top of screen _____

Screen diameter / type _____

Filter top _____ bottom _____

Filter materials _____

Bottom of screen _____

Borehole depth _____

Well location: _____

Static water level: _____ **Date/time:** _____

Notes / comments: _____

Monitoring Well Development Form

Project Number: _____

Project Location: _____

Date: _____

Well ID: _____

Field Personnel: _____

_____

Initial DTW: _____

Total Depth: _____

Well diameter: _____

Well volume: _____

Volume Calcs	
Diameter	Multiplier
2	0.163
3	0.367
4	0.652
6	1.468
8	2.610

Pump: _____

Water quality meter: _____

Time	DTW	Temp. [deg. C]	pH	Conductivity [µS/cm]	D.O. [mg/L]	ORP [mV]	TDS	Volume Purged [gal]	Notes

Total volume purged: _____

DTW after sampling: _____

Notes: _____

GEI Green Environment inc
www.greenenvironment.com

Log of Boring: _____

Project:	**Drill Dates:**
Site:	**Drill Times:**
Driller:	**Hole Depth:**
Drill Method:	**Hole Diameter:**
Well Install:	**Logged By:**

Depth, feet bgs	Sample Collected	Field PID	Temp Well	Sample Interval	USCS	Description
0						Top Surface:
2						
4						
6						
8						
10						
12						
14						
16						
18						
20						
22						
24						

Low-Flow Monitoring Well Sampling Sheet

Project Number: _____

Well ID: _____

Project Location: _____

Sampling Personnel: _____

Date: _____

Initial DTW: _____

Total Depth: _____

Well diameter: _____

Well volume: _____

Three purge volumes: _____

Volume Calcs	
Diameter	Multiplier
2	0.163
3	0.367
4	0.652
6	1.468
8	2.610

Pump: _____

Water quality meter: _____

Sampling method: _____

Flow rate: _____

Pump depth: _____

Time	DTW	Temp. [deg. C]	pH	Conductivity [µS/cm]	D.O. [mg/L]	ORP [mV]	TDS	Volume Purged [gal]	Notes

Sample ID: _____

Total volume purged: _____

Sample Time: _____

DTW after sampling: _____

Analyses: _____

Notes: _____

FIELD INSTRUMENT CALIBRATION LOG

Project Name _____

Project Number _____

Date/Time	Equipment Name	Equipment Number	Standards Used	Equipment Readings	Calibration Successful?	Initials

San Francisco
1220 Quarry Lane

Pleasanton, CA 94566
phone 925.484.1919 fax 925.600.3002

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

Client Contact	**Project Manager:**	**Site Contact:**	**Date:**	COC No:
Green Environment, inc.	**Tel/Fax:**	**Lab Contact:**	**Carrier: TAL-SF**	_____ of _____ COCs
1659C Industrial Road	**Analysis Turnaround Time**			Job No.
San Carlos, CA 94070	Calendar (C) or Work Days (W) _____			
650-508-8018	TAT if different from Below _____			
650-508-5008	☐ 2 weeks			SDG No.
Project Name:	☐ 1 week			
Site:	☐ 2 days			
P O #	☐ 1 day			

Sample Identification	**Sample Date**	**Sample Time**	**Sample Type**	**Matrix**	**# of Cont.**	**Filtered Sample**																			Sample Specific Notes:
		:																							
		:																							
		:																							
		:																							
		:																							
		:																							
		:																							
		:																							
		:																							
		:																							
		:																							
		:																							

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification
☐ *Non-Hazard* ☐ *Flammable* ☐ *Skin Irritant* *Poison B* ☐ *Unknown* ☐

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For _____ Months*

Special Instructions/QC Requirements & Comments:

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:

Appendix C – TAL-SF Quality Assurance Manual

Cover Page:

Quality Assurance Manual

TestAmerica San Francisco
1220 Quarry Lane
Pleasanton, CA 94566
Tel No. 925-484-1919
Fax No. 925-600-3002

www.testamericainc.com

Copyright Information:
This documentation has been prepared by TestAmerica Laboratories, Inc. and its affiliates ("TestAmerica"), solely for their own use and the use of their customers in evaluating their qualifications and capabilities in connection with a particular project. The user of this document agrees by its acceptance to return it to TestAmerica upon request and not to reproduce, copy, lend, or otherwise disclose its contents, directly or indirectly, and not to use it for any other purpose other than that for which it was specifically provided. The user also agrees that where consultants or other outside parties are involved in the evaluation process, access to these documents shall not be given to said parties unless those parties also specifically agree to these conditions.

THIS DOCUMENT CONTAINS VALUABLE CONFIDENTIAL AND PROPRIETARY INFORMATION. DISCLOSURE, USE OR REPRODUCTION OF THESE MATERIALS WITHOUT THE WRITTEN AUTHORIZATION OF TESTAMERICA IS STRICTLY PROHIBITED. THIS UNPUBLISHED WORK BY TESTAMERICA IS PROTECTED BY STATE AND FEDERAL LAW OF THE UNITED STATES. IF PUBLICATION OF THIS WORK SHOULD OCCUR THE FOLLOWING NOTICE SHALL APPLY:

©COPYRIGHT 2010 TESTAMERICA LABORATORIES, INC. ALL RIGHTS RESERVED.

Facility Distribution No. _____ **Distributed To:_____**

Title Page:

Quality Assurance Manual
Approval Signatures

Laboratory Director – Peter Moreton	Date: 10/18/2010
Melissa A Brewer	
Quality Manager - Melissa Brewer	Date: 10/18/2010

SECTION 2

TABLE OF CONTENTS

Section No.	Title	ISO/IEC 17025:2005 Reference	Page No.	Effective Date
-	COVER PAGE		COVER	10/30/2010
1.0	TITLE PAGE		1-1	10/30/2010
2.0	TABLE OF CONTENTS		2-1	10/30/2010
3.0	INTRODUCTION (NELAC 5.1 - 5.3)		3-1	10/30/2010
3.1	Introduction And Compliance References	4.1.2; 4.2.4	3-1	10/30/2010
3.2	Terms And Definitions	4.2.4	3-1	10/30/2010
3.3	Scope / Fields Of Testing	4.1.2; 4.2.4	3-2	10/30/2010
3.4	Management Of The Manual	4.2.1; 4.2.7; 4.3.3.2; 4.3.3.3	3-2	10/30/2010
4.0	ORGANIZATION AND MANAGEMENT (NELAC 5.4.1)		4-1	10/30/2010
4.1	Overview	4.1.1; 4.1.3; 4.1.5; 4.2.Z2	4-1	10/30/2010
4.2	Roles And Responsibilities	4.1.3; 4.1.5; 4.1.Z1; 4.1.6; 4.2.1; 4.2.Z2; 4.2.6; 5.2.4	4-1	10/30/2010
4.3	Deputies	4.1.5; 4.2.Z2	4-9	10/30/2010
5.0	QUALITY SYSTEM (NELAC 5.4.2)		5-1	10/30/2010
5.1	Quality Policy Statement	4.1.5; 4.2.2; 4.2.3	5-1	10/30/2010
5.2	Ethics And Data Integrity	4.1.5; 4.2.2	5-1	10/30/2010
5.3	Quality System Documentation	4.2.2; 4.2.5	5-2	10/30/2010
5.4	Qa/Qc Objectives For The Measurement Of Data	4.1.5; 4.2.2	5-3	10/30/2010
5.5	Criteria For Quality Indicators		5-4	10/30/2010
5.6	Statistical Quality Control		5-5	10/30/2010
5.7	Quality System Metrics		5-5	10/30/2010
6.0	DOCUMENT CONTROL (NELAC 5.4.3)	4.2.7; 4.3.1; 4.3.2.2; 4.3.3.3; 4.3.3.4	6-1	10/30/2010
6.1	Overview		6-1	10/30/2010
6.2	Document Approval And Issue	4.3.2.1; 4.3.2.2; 4.3.2.3; 4.3.3.1	6-1	10/30/2010
6.3	Procedures For Document Control Policy	4.3.2.1; 4.3.2.2; 4.3.3.1	6-2	10/30/2010

Section No.	Title	ISO/IEC 17025:2005 Reference	Page No.	Effective Date
6.4	Obsolete Documents	4.3.2.1; 4.3.2.2	6-2	10/30/2010
7.0	SERVICE TO THE CLIENT (NELAC 5.4.7)	4.4.1; 4.4.2; 4.4.3; 4.4.4	7-1	10/30/2010
7.1	Overview	4.4.5; 5.7.1	7-1	10/30/2010
7.2	Review Sequence And Key Personnel	4.4.5	7-2	10/30/2010
7.3	Documentation	5.7.1	7-3	10/30/2010
7.4	Special Services	4.7.1; 4.7.2	7-4	10/30/2010
7.5	Client Communication	4.7.1; 4.7.2	7-4	10/30/2010
7.6	Reporting	4.7.1; 4.7.2	7-4	10/30/2010
7.7	Client Surveys	4.7.1; 4.7.2	7-4	10/30/2010
8.0	SUBCONTRACTING OF TESTS (NELAC 5.4.5)	4.4.3; 4.5.4	8-1	10/30/2010
8.1	Overview	4.5.1; 4.5.2; 4.5.3; 5.3.1	8-1	10/30/2010
8.2	Qualifying And Monitoring Subcontractors	4.5.1; 4.5.2; 4.5.3	8-1	10/30/2010
8.3	Oversight And Reporting		8-3	10/30/2010
8.4	Contingency Planning		8-4	10/30/2010
9.0	PURCHASING SERVICES AND SUPPLIES (NELAC 5.4.6)	4.6.1	9-1	10/30/2010
9.1	Overview	4.6.2; 4.6.3; 4.6.4	9-1	10/30/2010
9.2	Glassware		9-1	10/30/2010
9.3	Reagents, Standards & Supplies	4.6.2; 4.6.3; 4.6.4	9-1	10/30/2010
9.4	Purchase Of Equipment/Instruments/Software		9-3	10/30/2010
9.5	Services		9-4	10/30/2010
9.6	Suppliers		9-4	10/30/2010
10.0	COMPLAINTS (NELAC 5.4.8)	4.8	10-1	10/30/2010
10.1	Overview		10-1	10/30/2010
10.2	External Complaints		10-1	10/30/2010
10.3	Internal Complaints		10-2	10/30/2010
10.4	Management Review		10-2	10/30/2010
11.0	CONTROL OF NON-CONFORMING WORK (NELAC 5.4.9)	4.9.1; 5.10.Z.10	11-1	10/30/2010
11.1	Overview	4.9.1; 4.11.3; 4.11.5	11-1	10/30/2010
11.2	Responsibilities And Authorities	4.9.1; 4.11.3; 4.11.5	11-1	10/30/2010

Section No.	Title	ISO/IEC 17025:2005 Reference	Page No.	Effective Date
11.3	Evaluation Of Significance And Actions Taken	4.9.1; 4.11.3; 4.11.5	11-2	10/30/2010
11.4	Prevention Of Nonconforming Work	4.9.2; 4.11.2	11-2	10/30/2010
11.5	Method Suspension/Restriction (Stop Work Procedures)	4.9.1; 4.9.2; 4.11.5	11-2	10/30/2010
12.0	CORRECTIVE ACTION (NELAC 5.4.10)		12-1	10/30/2010
12.1	Overview	4.9.2; 4.11.1; 4.11.2	12-1	10/30/2010
12.2	General	4.11.2; 4.11.3	12-1	10/30/2010
12.3	Closed Loop Corrective Action Process	4.11.2; 4.11.3; 4.11.4; 4.12.2	12-2	10/30/2010
12.4	Technical Corrective Actions		12-3	10/30/2010
12.5	Basic Corrections	4.11.1; 4.13.2.3	12-4	10/30/2010
13.0	PREVENTIVE ACTION (NELAC 5.4.11)	4.10; 4.12.1; 4.12.2	13-1	10/30/2010
13.1	Overview	4.15.1; 4.15.2	13-1	10/30/2010
13.2	Management Of Change		13-2	10/30/2010
14.0	CONTROL OF RECORDS (NELAC 5.4.12)	4.2.7; 4.13.1.1	14-1	10/30/2010
14.1	Overview	4.13.1.1; 4.13.1.2; 4.13.1.3; 4.13.1.4; 4.13.2.1; 4.13.2.2; 4.13.2.3	14-1	10/30/2010
14.2	Technical And Analytical Records	4.13.2.2; 4.13.2.3	14-4	10/30/2010
14.3	Laboratory Support Activities		14-5	10/30/2010
14.4	Administrative Records		14-6	10/30/2010
14.5	Records Management, Storage And Disposal		14-6	10/30/2010
15.0	AUDITS (NELAC 5.4.13)		15-1	10/30/2010
15.1	Internal Audits	4.14.1; 4.14.2; 4.14.3; 5.9.1; 5.9.A.15	15-1	10/30/2010
15.2	External Audits	4.14.2; 4.14.3; 4.14.4	15-3	10/30/2010
15.3	Audit Findings		15-3	10/30/2010
16.0	MANAGEMENT REVIEWS (NELAC 5.4.14)	4.1.6; 4.15.1; 4.15.2	16-1	10/30/2010
16.1	Quality Assurance Report		16-1	10/30/2010
16.2	Annual Management Review	4.2.2	16-1	10/30/2010
16.3	Potential Integrity Related Managerial Reviews		16-2	10/30/2010
17.0	PERSONNEL (NELAC 5.5.2)	5.2.1	17-1	10/30/2010
17.1	Overview	5.2.2; 5.2.3; 5.2.5	17-1	10/30/2010

Section No.	Title	ISO/IEC 17025:2005 Reference	Page No.	Effective Date
17.2	Education And Experience Requirements For Technical Personnel	5.2.1; 5.2.3; 5.2.4	17-1	10/30/2010
17.3	Training	5.2.5	17-3	10/30/2010
17.4	Data Integrity And Ethics Training Program		17-4	10/30/2010
18.0	ACCOMMODATIONS AND ENVIRONMENTAL CONDITIONS (NELAC 5.5.3)		18-1	10/30/2010
18.1	Overview	5.3.1; 5.3.3; 5.3.4; 5.3.5	18-1	10/30/2010
18.2	Environment	5.3.1; 5.3.2; 5.3.3; 5.3.4; 5.3.5	18-1	10/30/2010
18.3	Work Areas	5.3.3; 5.3.4; 5.3.5	18-2	10/30/2010
18.4	Floor Plan		18-2	10/30/2010
18.5	Building Security	5.3.4	18-2	10/30/2010
19.0	TEST METHODS AND METHOD VALIDATION (NELAC 5.5.4)	5.4.1	19-1	10/30/2010
19.1	Overview	5.4.1; 5.4.5.1	19-1	10/30/2010
19.2	Standard Operating Procedures (Sops)	4.3.3.1; 5.4.2	19-1	10/30/2010
19.3	Laboratory Methods Manual		19-1	10/30/2010
19.4	Selection Of Methods	5.4.1; 5.4.2; 5.4.3; 5.4.4; 5.4.5.1; 5.4.5.2; 5.4.5.3	19-2	10/30/2010
19.5	Laboratory Developed Methods And Non-Standard Methods	5.4.2; 5.4.4; 5.4.5.2; 5.4.5.3; 5.4.Z.3	19-4	10/30/2010
19.6	Validation Of Methods	5.4.2; 5.4.4; 5.4.5.2; 5.4.5.3; 5.4.Z.3	19-5	10/30/2010
19.7	Method Detection Limits (Mdl)/ Limits Of Detection (Lod)	5.4.Z.3	19-7	10/30/2010
19.8	Instrument Detection Limits (Idl)		19-7	10/30/2010
19.9	Verification Of Detection And Reporting Limits		19-7	10/30/2010
19.10	Retention Time Windows		19-8	10/30/2010
19.11	Evaluation Of Selectivity		19-8	10/30/2010
19.12	Estimation Of Uncertainty Of Measurement	5.1.1; 5.1.2; 5.4.6.1; 5.4.6.2; 5.4.6.3; 5.4.Z.4	19-8	10/30/2010
19.13	Sample Reanalysis Guidelines	5.9.1	19-9	10/30/2010

Section No.	Title	ISO/IEC 17025:2005 Reference	Page No.	Effective Date
19.14	Control Of Data	5.4.7.1; 5.4.7.2; 5.9.1;	19-9	10/30/2010
20.0	EQUIPMENT (AND CALIBRATIONS) (NELAC 5.5.5)	5.5.4; 5.5.5; 5.5.Z.5; 5.5.6; 5.5.Z.6	20-1	10/30/2010
20.1	Overview	5.5.1; 5.5.2; 5.5.3; 5.5.5; 5.5.10; 5.6.1; 5.6.Z.8	20-1	10/30/2010
20.2	Preventive Maintenance	5.5.1; 5.5.3; 5.5.7; 5.5.9; 5.6.1; 5.6.Z.8	20-1	10/30/2010
20.3	Support Equipment	5.5.10; 5.5.11; 5.6.2.1.2; 5.6.2.2.1; 5.6.2.2.2	20-2	10/30/2010
20.4	Instrument Calibrations	5.5.8; 5.5.Z.6; 5.5.10; 5.6.1; 5.6.Z.8; 5.6.3.1	20-5	10/30/2010
20.5	Gc/Ms Tuning		20-7	10/30/2010
20.6	Gc/Ms Tuning		20-8	10/30/2010
21.0	MEASUREMENT TRACEABILITY (NELAC 5.5.6)		21-1	10/30/2010
21.1	Overview	5.6.2.1.2; 5.6.2.2.2; 5.6.3.1	21-1	10/30/2010
21.2	Nist-Traceable Weights And Thermometers	5.6.3.1; 5.6.3.2	21-1	10/30/2010
21.3	Reference Standards / Materials	5.6.3.1; 5.6.3.2; 5.6.3.3; 5.6.3.4; 5.9.1	21-1	10/30/2010
21.4	Documentation And Labeling Of Standards, Reagents, And Reference Materials		21-2	10/30/2010
22.0	SAMPLING (NELAC 5.5.7)		22-1	10/30/2010
22.1	Overview	5.7.1; 5.7.3	22-1	10/30/2010
22.2	Sampling Containers		22-1	10/30/2010
22.3	Definition Of Holding Time		22-1	10/30/2010
22.4	Sampling Containers, Preservation Requirements, Holding Times		22-2	10/30/2010
22.5	Sample Aliquots / Subsampling	5.7.1	22-2	10/30/2010
23.0	HANDLING OF SAMPLES (NELAC 5.5.8)	5.8.1	23-1	10/30/2010
23.1	Chain Of Custody (Coc)	5.7.2; 5.8.4; 5.9.1	23-1	10/30/2010

Section No.	Title	ISO/IEC 17025:2005 Reference	Page No.	Effective Date
23.2	Sample Receipt	5.8.2; 5.8.3	23-2	10/30/2010
23.3	Sample Acceptance Policy		23-2	10/30/2010
23.4	Hazardous Samples **And Foreign Soils**	5.8.4	23-4	10/30/2010
23.5	Hazardous Samples And Foreign Soils		23-4	10/30/2010
23.6	Sample Shipping	5.8.2	23-4	10/30/2010
23.7	Sample Disposal		23-5	10/30/2010
24.0	ASSURING THE QUALITY OF TEST RESULTS (NELAC 5.5.9)		24-1	10/30/2010
24.1	Overview	5.9.2	24-1	10/30/2010
24.2	Controls	5.9.2	24-1	10/30/2010
24.3	Negative Controls	5.9.2	24-1	10/30/2010
24.4	Positive Controls	5.9.2	24-2	10/30/2010
24.5	Sample Matrix Controls	5.9.2	24-4	10/30/2010
24.6	Acceptance Criteria (Control Limits)		24-4	10/30/2010
24.7	Additional Procedures To Assure Quality Control		24-7	10/30/2010
25.0	REPORTING RESULTS (NELAC 5.5.10)		25-1	10/30/2010
25.1	Overview	5.10.1; 5.10.2; 5.10.8	25-1	10/30/2010
25.2	Test Reports	5.10.1; 5.10.2; 5.10.3.1; 5.10.3.2; 5.10.5; 5.10.6; 5.10.7; 5.10.8	25-1	10/30/2010
25.3	Reporting Level Or Report Type	5.10.1; 5.10.7; 5.10.8	25-3	10/30/2010
25.4	Supplemental Information For Test	5.10.1; 5.10.3.1; 5.10.5	25-4	10/30/2010
25.5	Environmental Testing Obtained From Subcontractors	5.10.1; 5.10.6	25-5	10/30/2010
25.6	Client Confidentiality	4.1.5; 5.10.7	25-6	10/30/2010
25.7	Format Of Reports	5.10.8	25-6	10/30/2010
25.8	Amendments To Test Reports	5.10.9; 5.10.Z.10	25-6	10/30/2010
25.9	Policies On Client Requests For Amendments	5.9.1; 5.10.Z.10	25-7	10/30/2010

LIST OF TABLES

Table No.	Title	ISO/IEC 17025:2005 Reference	Page	Effective Date
12-1	Example - General Corrective Action Procedures	4.11.2; 4.13.2.3	12-6	10/30/2010
14-1	Example - Record Index	4.13.1.1	14-1	10/30/2010
14-2	Example - Special Record Retention Requirements		14-3	10/30/2010
15-1	Types of Internal Audits and Frequency	4.14.1	15-1	10/30/2010
20-1	Example - Laboratory Instrumentation	5.5.4; 5.5.5	20-8	10/30/2010
20-2	Example – Schedule of Routine Maintenance		20-13	10/30/2010
24-1	Example – Negative Controls		24-1	10/30/2010
24-2	Sample Matrix Control		24-4	10/30/2010

LIST OF FIGURES

Figure No.	Title	ISO/IEC 17025:2005 Reference	Page	Effective Date
4-1	Corporate and Laboratory Organizational Chart	4.1.3; 4.1.5; 4.2.Z2	4-10	10/30/2010
12-1	Example – Corrective Action Report		12-5	10/30/2010
19-1	Example – Demonstration of Capability Documentation		19-15	10/30/2010
19-2	Work Flow		19-18	10/30/2010
23-1	Example – Chain of Custody		23-6	10/30/2010
23-2	Example – Sample Acceptance Policy		23-7	10/30/2010
23-3	Example – Cooler Receipt Form	5.8.3	23-10	10/30/2010

LIST OF APPENDICES

Appendix No.	Title	Page	Effective Date
1	Laboratory Floor Plan	Appendix 1-1	10/30/2010
2	Glossary / Acronyms	Appendix 2-1	10/30/2010
3	Laboratory Certifications, Accreditations, Validations	Appendix 3-1	10/30/2010

REFERENCED CORPORATE SOPs AND POLICIES

SOP / Policy Reference	Title
CA-Q-S-001	Solvent and Acid Lot Testing and Approval
CA-Q-S-002	Acceptable Manual Integration Practices
CA-Q-S-004	Method Compliance & Data Authenticity Audits
CA-Q-S-006	Detection Limits
CA-Q-S-008	Management Systems Review
CW-Q-S-001	Corporate Document Control and Archiving
CW-Q-S-002	Writing a Standard Operating Procedure (SOPs)
CA-L-S-001	Internal Investigation of Potential Data Discrepancies and Determination for Data Recall
CA-L-S-002	Subcontracting Procedures
CA-L-P-001	Ethics Policy
CA-L-P-002	Contract Compliance Policy
CW-F-P-002	Authorization Matrix
CW-F-P-004	Procurement and Contracts Policy
CA-C-S-001	Work Sharing Process
CA-T-P-001	Qualified Products List
CW-F-S-007	Controlled Purchases Policy
CW-F-S-018	Vendor Selection
CA-Q-M-002	Corporate Quality Management Plan
CW-E-M-001	Corporate Environmental Health & Safety Manual

REFERENCED LABORATORY SOPs

SOP Reference	Title
SF-QA-1203	SOP Management and Preparation (Sec. 3.4.1 and 19.2)
SF-QA-1201	Preventive and Corrective Action Procedures (Sec .10.1)
SF-QA-1700	General Analyst Training (Sec. 19.4.2)
SF-QA-1218	MDLs (Sec. 19.7)
SF-SV-0506	Semivolatile Organic Compounds by GC/MS (Sec. 19.14.1)
SF-QA-0725	Subsampling (Sec. 22.5)
SF-SC-0202	Sample Receipt and Login (Sec. 23.2.1.3)

SECTION 3

INTRODUCTION *(NELAC 5.1 - 5.3)*

3.1 INTRODUCTION AND COMPLIANCE REFERENCES

TestAmerica San Francisco's Quality Assurance Manual (QAM) is a document prepared to define the overall policies, organization objectives and functional responsibilities for achieving TestAmerica's data quality goals. The laboratory maintains a local perspective in its scope of services and client relations and maintains a national perspective in terms of quality.

The QAM has been prepared to assure compliance with the 2003 National Environmental Laboratory Accreditation Conference (NELAC) standards. In addition, the policies and procedures outlined in this manual are compliant with TestAmerica's Corporate Quality Management Plan (CQMP, document number CA-Q-M-002) and the various accreditation and certification programs listed in Appendix 3. The CQMP provides a summary of TestAmerica's quality and data integrity system. It contains requirements and general guidelines under which all TestAmerica facilities shall conduct their operations.

The QAM has been prepared to be consistent with the requirements of the following documents:

- EPA SW-846, *Test Methods for the Evaluation of Solid Waste, 3rd Edition,* September 1986; Update I, July 1992; Update II, September 1994; and Update III, December 1996.
- Federal Register, 40 CFR Parts 136, 141, 172, 173, 178, 179 and 261.
- APHA, *Standard Methods for the Examination of Water and Wastewater,* 18th, 19th, 20th and 21st/ On-line Editions.

3.2 TERMS AND DEFINITIONS

A Quality Assurance Program is a company-wide system designed to ensure that data produced by the laboratory conforms to the standards set by state and/or federal regulations. The program functions at the management level through company goals and management policies, and at the analytical level through Standard Operating Procedures (SOPs) and quality control. The TestAmerica program is designed to minimize systematic error, encourage constructive, documented problem solving, and provide a framework for continuous improvement within the organization.

Refer to Appendix 2 for the Glossary/Acronyms.

3.3 SCOPE / FIELDS OF TESTING

The laboratory analyzes a broad range of environmental and industrial samples every month. Sample matrices vary among air, effluent water, groundwater, hazardous waste, sludge and soils. The Quality Assurance Program contains specific procedures and methods to test samples of differing matrices for chemical and physical parameters. The Program also contains guidelines on maintaining documentation of analytical process, reviewing results, servicing clients and tracking samples through the laboratory. The technical and service requirements of all requests to provide analyses are thoroughly evaluated before commitments are made to accept the work. Measurements are made using published reference methods or methods developed and validated by the laboratory.

The methods covered by this manual include the most frequently requested methodologies needed to provide analytical services in the United States and its territories. The specific list of test methods used by the laboratory can be found in Appendix 3. The approach of this manual is to define the minimum level of quality assurance and quality control necessary to meet requirements. All methods performed by the laboratory shall meet these criteria as appropriate. In some instances, quality assurance project plans (QAPPs), project specific data quality objectives (DQOs) or local regulations may require criteria other than those contained in this manual. In these cases, the laboratory will abide by the requested criteria following review and acceptance of the requirements by the Laboratory Director and the Quality Assurance (QA) Manager. In some cases, QAPPs and DQOs may specify less stringent requirements. The Laboratory Director and the QA Manager must determine if it is in the lab's best interest to follow the less stringent requirements.

3.4 MANAGEMENT OF THE MANUAL

3.4.1 Review Process

This manual is reviewed annually by senior laboratory management to assure that it reflects current practices and meets the requirements of the laboratory's clients and regulators as well as the CQMP. Occasionally, the manual may need changes in order to meet new or changing regulations and operations. The QA Manager will review the changes in the normal course of business and incorporate changes into revised sections of the document. All updates will be reviewed by the senior laboratory management staff. The laboratory updates and approves such changes according to our document control procedures (refer to SOP No. SF-QA-1203; SOP Management and Preparation)

Laboratory-specific QAM changes are approved and documented through the laboratory's Management of Change process (SOP No. CA-Q-S-003; Management of Change).

SECTION 4

ORGANIZATION AND MANAGEMENT *(NELAC 5.4.1)*

4.1 OVERVIEW

TestAmerica San Francisco is a local operating unit of TestAmerica Laboratories, Inc.. The organizational structure, responsibilities and authorities of the corporate staff of TestAmerica Laboratories, Inc. are presented in the CQMP. The laboratory has day-to-day independent operational authority overseen by corporate officers (e.g., President, Chief Operating Officer, Corporate Quality Assurance, etc.). The laboratory operational and support staff work under the direction of the Laboratory Director. The organizational structure for both Corporate & TestAmerica [San Francisco] is presented in Figure 4-1.

4.2 ROLES AND RESPONSIBILITIES

In order for the Quality Assurance Program to function properly, all members of the staff must clearly understand and meet their individual responsibilities as they relate to the quality program. The following descriptions briefly define each role in its relationship to the Quality Assurance Program.

4.2.1 Quality Assurance Program

The responsibility for quality lies with every employee of the laboratory. All employees have access to the QAM, are trained to this manual, and are responsible for upholding the standards therein. Each person carries out his/her daily tasks in a manner consistent with the goals and in accordance with the procedures in this manual and the laboratory's SOPs. Role descriptions for Corporate personnel are defined in the CQMP. This manual is specific to the operations of TestAmerica's San Francisco laboratory.

4.2.2 Laboratory Director

TestAmerica San Francisco's Laboratory Director is responsible for the overall quality, safety, financial, technical, human resource and service performance of the whole laboratory and reports to their respective GM. The Laboratory Director provides the resources necessary to implement and maintain an effective and comprehensive Quality Assurance and Data Integrity Program.

Specific responsibilities include, but are not limited to:

- Ensures that all analysts and supervisors have the appropriate education and training to properly carry out the duties assigned to them and ensures that this training has been documented.
- Ensures that personnel are free from any commercial, financial and other undue pressures which might adversely affect the quality of their work.
- Ensures TestAmerica's human resource policies are adhered to and maintained.
- Ensures that sufficient numbers of qualified personnel are employed to supervise and perform the work of the laboratory.

- Ensures that appropriate corrective actions are taken to address analyses identified as requiring such actions by internal and external performance or procedural audits. Procedures that do not meet the standards set forth in the QAM or laboratory SOPs may be temporarily suspended by the Laboratory Director.
- Reviews and approves all SOPs prior to their implementation and ensures all approved SOPs are implemented and adhered to.
- Pursues and maintains appropriate laboratory certification and contract approvals.
- Ensures client specific reporting and quality control requirements are met.
- Captains the management team, consisting of the QA Manager, the Department Managers, and the Client Services Manager as direct reports.

4.2.3 Quality Assurance (QA) Manager

The QA Manager has responsibility and authority to ensure the continuous implementation of the quality system.

- The QA Manager reports directly to the Laboratory Director and has access to Corporate QA for advice and resources. This position is able to evaluate data objectively and perform assessments without outside (i.e., managerial) influence. Corporate QA may be used as a resource in dealing with regulatory requirements, certifications and other quality assurance related items. The QA Manager directs the activities of the QA officers to accomplish specific responsibilities, which include, but are not limited to:
- Having functions independent from laboratory operations for which he/she has quality assurance oversight.
- Maintaining and updating the QAM.
- Monitoring and evaluating laboratory certifications; scheduling proficiency testing samples.
- Monitoring and communicating regulatory changes that may affect the laboratory to management.
- Training and advising the laboratory staff on quality assurance/quality control procedures that are pertinent to their daily activities.
- Having a general knowledge of the analytical test methods for which data audit/review is performed (and/or having the means of getting this information when needed).
- Arranging for or conducting internal audits on quality systems and the technical operation.
- The laboratory QA Manager will maintain records of all ethics-related training, including the type and proof of attendance.
- Maintain, improve, and evaluate the corrective action database and the corrective and preventive action systems.
- Notifying laboratory management of deficiencies in the quality system and ensuring corrective action is taken. Procedures that do not meet the standards set forth in the QAM or laboratory SOPs are temporarily suspended following the procedures outlined in Section 12.
- Monitoring standards of performance in quality control and quality assurance.

- Coordinating of document control of SOPs, MDLs, control limits, and miscellaneous forms and information.
- Review a percentage of all final data reports for internal consistency. Review of Chain of Custody (COC), correspondence with the analytical request, batch QC status, completeness of any corrective action statements, 5% of calculations, format, holding time, sensibility and completeness of the project file contents.
- Review of external audit reports and data validation requests.
- Follow-up with audits to ensure client QAPP requirements are met.
- Establishment of reporting schedule and preparation of various quality reports for the Laboratory Director, clients and/or Corporate QA.
- Development of suggestions and recommendations to improve quality systems.
- Research of current state and federal requirements and guidelines.
- Captains the QA team to enable communication and to distribute duties and responsibilities.
- Evaluates the thoroughness and effectiveness of training and implements changes as needed.
- Ensure Communication & monitor standards of performance to ensure that systems are in place to produce the level of quality as defined in this document.

4.2.4 Employee Health and Safety Coordinator

The EH&S Coordinator is responsible for administering the EH&S program that provides a safe, healthy working environment for all employees and the environment. The Employee Health and Safety Coordinator (EH&S Coordinator) reports directly to the Laboratory Director and the corporate Environmental Health and Safety Director. He/She monitors all areas for unsafe conditions, acts, and potential hazards. Specific responsibilities include, but are not limited to:

- Staying current with the hazardous waste regulations.
- Continuing training on hazardous waste issues.
- Reviewing and updating annually the addendum to the Hazardous Waste Contingency Plan in the Environmental Health & Safety Manual.
- Auditing the staff with regard to compliance with the Hazardous Waste Contingency Plan
- Contacting the hazardous waste subcontractors for review of procedures and opportunities for minimization of waste.
- Conduct ongoing, necessary safety training and conduct new employee safety orientation.
- Assist in implementing the Chemical Hygiene/Safety Manual.
- Administer dispersal of all Material Safety Data Sheet (MSDS) information.
- Perform regular chemical hygiene and housekeeping instruction.
- Give instruction on proper labeling and practice.
- Serve as chairman of the laboratory safety committee.
- Provide and train personnel on protective equipment.

- Oversee the inspection and maintenance of general safety equipment – fire extinguishers, safety showers, eyewash fountains, etc. and ensure prompt repairs as needed.
- Supervise and schedule fire drills and emergency evacuation drills.
- Determine what initial and subsequent exposure monitoring, if necessary to determine potential employee exposure to chemicals used in the laboratory.
- When determined necessary, conduct exposure monitoring assessments.
- Determine when a complaint of possible over-exposure is "reasonable" and should be referred for medical consultation.
- Complete, follow-up, and finalize incident reports.
- Assist in the internal and external coordination of the medical consultation/monitoring program conducted by TestAmerica's medical consultants.

4.2.5 Waste Disposal Technician

The Waste Disposal Technician is responsible for proper disposal of spent chemicals, process waste, and unused laboratory samples used in the laboratory according to corporate, federal, state, and local guidelines. The Waste Disposal Technician reports to the Hazardous Waste Specialist and EH&S Coordinator. The duties consist of:

- Packaging hazardous waste for transport per DOT, RCRA and TSCA guidelines
- Identifying waste streams and maintaining satellite accumulation areas
- Packages expired chemicals for shipment or disposal
- Tracks volume of waste generated for reporting to corporate and EPA
- Prepares and tracks implementation of the Waste Minimization Plan
- Empties satellite containers into bulk containers and returns to the laboratory for reuse

4.2.6 Department Manager

Department Managers report to the Operations Manager. At TestAmerica San Francisco there are two levels of Department Managers (I or II). The level designation is based on the level of experience. Each one is responsible to:

- Ensure that analysts in their department adhere to applicable SOPs and the QA Manual. They perform frequent SOP and QA Manual review to determine if analysts are in compliance and if new, modified, and optimized measures are feasible and should be added to these documents.
- With regard to analysts, participates in the selection, training, development of performance objectives and standards of performance, appraisal (measurement of objectives), scheduling, counseling, discipline, and motivation of analysts and documents these activities in accordance with systems developed by the QA and Personnel Departments. They evaluate staffing sufficiency and overtime needs. Training consists of familiarization with SOP, QC, Safety, and computer systems.

- Encourage the development of analysts to become cross-trained in various methods and/or operate multiple instruments efficiently while performing maintenance and documentation, self-supervise, and function as a department team.
- Provide guidance to analysts in resolving problems encountered daily during sample prep/analysis in conjunction with the Laboratory Director, Technical Manager, and/or QA Manager. Each is responsible for 100% of the data review and documentation, non-conformance and CPAR issues, the timely and accurate completion of performance evaluation samples and MDLs, for his department.
- Ensure all logbooks are maintained, current, and properly labeled or archived.
- Report all non-conformance conditions to the Laboratory Director, Technical Manager, and/or QA Manager.
- Ensure that preventive maintenance is performed on instrumentation as detailed in the QA Manual or SOPs. He/she is responsible for developing and implementing a system for preventive maintenance, troubleshooting, and repairing or arranging for repair of instruments.
- Maintain adequate and valid inventory of reagents, standards, spare parts, and other relevant resources required to perform daily analysis.
- Achieve optimum turnaround time on analyses and compliance with holding times.
- Conduct efficiency and cost control evaluations on an ongoing basis to determine optimization of labor, supplies, overtime, first-run yield, capacity (designed vs. demonstrated), second- and third-generation production techniques/instruments, and long-term needs for budgetary planning.
- Develop, implement, and enhance calibration programs.
- Provide written responses to external and internal audit issues.

4.2.7 Laboratory Analysts

Laboratory analysts are responsible for conducting analysis and performing all tasks assigned to them by the group leader or supervisor. The Analyst position at TestAmerica San Francisco is divided into levels. These levels range from Analyst I to Analyst V. The level designation is based on experience, expertise, and responsibilities. The responsibilities of the analysts are listed below:

- Perform analyses by adhering to analytical and quality control protocols prescribed by current SOPs, this QA Manual, and project-specific plans honestly, accurately, timely, safely, and in the most cost-effective manner.
- Document standard and sample preparation, instrument calibration and maintenance, data calculations, sample matrix effects, and any observed non-conformance on worklists, benchsheets, lab notebooks and/or the Non-Conformance Database
- Report all non-conformance situations, instrument problems, matrix problems and QC failures, which might affect the reliability of the data, to their supervisor, the Technical Manager, and/or the QA Manager or Laboratory Director.
- Perform 100% review of the data generated prior to entering and submitting for secondary level review.

- Suggest method improvements to their supervisor, the Laboratory Director, and the QA Manager. These improvements, if approved, will be incorporated. Ideas for the optimum performance of their assigned area, for example, through the proper cleaning and maintenance of the assigned instruments and equipment, are encouraged.
- Work cohesively as a team in their department to achieve the goals of accurate results, optimum turnaround time, cost effectiveness, cleanliness, complete documentation, and personal knowledge of environmental analysis.

4.2.8 Laboratory Technician

Laboratory Technicians are responsible for the preparation of samples and performing all tasks assigned to them by the group leader or supervisor. The Laboratory Technician position at TestAmerica San Francisco is divided into three levels. These levels are Laboratory Technician I, Laboratory Technician II, and Laboratory Technician III. The level designation is based on experience, expertise, and responsibilities. The responsibilities of the Laboratory Technician are listed below:

- Retrieving samples from Sample Control for analysis
- Performing sample preparation by adhering to analytical and quality control protocols prescribed by current SOPs, this QA Manual, and project-specific plans honestly, accurately, timely, safely, and in the most cost-effective manner.
- Documenting standard and sample preparation, sample matrix effects, and any observed non-conformance on worklists, benchsheets, lab notebooks and/or the Non-Conformance Database
- Report all non-conformance situations, sample preparation problems, matrix problems and QC failures, which might affect the reliability of the data, to their supervisor, the Technical Manager, and/or the QA Manager or Laboratory Director.
- Work cohesively as a team in their department to achieve the goals of accurate results, optimum turnaround time, cost effectiveness, cleanliness, complete documentation, and personal knowledge of environmental analysis.

4.2.9 Sample Control Manager

The Sample Control Manager reports to the Client Services Manager. The responsibilities are outlined below:

- Direct the logging of incoming samples into the LIMS
- Ensure the verification of data entry from login
- Provide daily assessments of sample receipts
- Monitor the preparation and shipment of bottle kits to clients
- Oversee the receipt, log in, and storage of samples
- Schedules couriers for sample pickup from customer sites
- Maintain the inventory control system
- Maintain bottle and cooler inventory

4.2.10 Sample Control Technician

The Sample Control Technician reports to the Sample Control Manager. The Sample Control Technician position at TestAmerica San Francisco is divided into levels. These levels range from Sample Control Technician I to Sample Control Technician IV. The level designation is based on experience and responsibilities of the Technician. The Sample Control Technician responsibilities include the following:

- Receive and unload samples or consignments in accordance with DOT regulations
- Verify samples against the Chain of Custody (COC)
- Log in sample into the LIMS to assign a lot number for tracking purposes and distribute the paperwork to the Project Managers and Department Managers
- Label samples with lot number assigned and deliver the samples to the appropriate labs for analysis daily
- Monitor freezer and cooler temperatures daily to confirm that the readings are within SOP guidelines
- Packing in-house samples for shipment to other laboratories
- Ship all subcontracted samples to designated lab in accordance with DOT regulations as needed
- Receiving and distributing incoming supplies
- Preparing and shipping bottle sampling kits to clients or on-site crews

4.2.11 Courier

The Courier reports to the Sample Control Manager and the Client Services Manager. The Courier's duties include the following:

- Picking up and delivering samples and reports to clients and the laboratory
- Receiving and signing the chain of custody for samples
- Preparing and shipping bottle sampling kits to clients or on-site crews
- Performing preventative maintenance on company vehicles
- Preparing and shipping bottle sampling kits to clients or on-site crews
- Packing in-house samples for shipment to other laboratories

4.2.12 Client Services Manager

The Client Services Manager reports to the Laboratory Director and serves as the interface between the laboratory's technical departments and the laboratory's clients. The staff consists of the Project Management team. With the overall goal of total client satisfaction, the functions of this position are outlined below:

- Technical training and growth of the Project Management team

- Technical liaison for the Project Management team
- Human resource management of the Project Management team
- Responsible to ensure that clients receive the proper sampling supplies
- Accountable for response to client inquiries concerning sample status
- Responsible for assistance to clients regarding the resolution of problems concerning COC
- Ensuring that client specifications, when known, are met by communicating project and quality assurance requirements to the laboratory
- Notifying the supervisors of incoming projects and sample delivery schedules
- Accountable to clients for communicating sample progress in daily status meeting with agreed-upon due dates
- Responsible for discussing with client any project-related problems, resolving service issues, and coordinating technical details with the laboratory staff
- Responsible for staff familiarization with specific quotes, sample log-in review, and final report completeness
- Monitor the status of all data package projects in-house to ensure timely and accurate delivery of reports
- Inform clients of data package-related problems and resolve service issues
- Coordinate requests for sample containers and other services (data packages)

4.2.13 Project Manager

The Project Managers report to the Client Services Manager and serve as liaisons between the laboratory and its clients. At TestAmerica San Francisco there are two levels of Project Managers (I or II). The level designation is based on experience, expertise, and responsibilities. The Project Manager's responsibilities include:

- Ensuring client specifications are met by communicating project and quality assurance requirements to the laboratory
- Notifying laboratory personnel of incoming projects and sample delivery schedules
- Monitoring the status of all projects in-house to ensure timely delivery of reports
- Informing clients of project-related problems, resolving service issues and coordinating technical issues with the laboratory staff
- Coordinating client requests for sample containers and other services
- Scheduling sample pick-ups from client offices or project sites and notifying the laboratory staff of incoming samples.
- Coordinating subcontract work
- Assisting clients in procuring the proper sampling supplies
- Responding to client inquiries concerning sample status
- Assisting clients with resolution of problems concerning Chains-of-Custody

4.2.14 Project Management Assistant

The Project Management Assistant reports to the Project Management Manager and designated Project Manager. The Project Management Assistant assists the Project Manager in servicing the client's needs and communicating those needs to the laboratory. The Project Management Assistant's responsibilities include:

- Collating data reports, expanded deliverables, data packages and electronic data deliverables (EDD's) for delivery to clients.
- Writing case narratives accompanying data packages to communicate anomalies to clients
- Entering data from subcontracted laboratories
- Proof reading and filing data reports received from the laboratory
- Assisting Project Managers in changing compound lists, TAT, and setting up tables in Word or Excel
- Monitoring report due dates for timely delivery
- Generating credit or debit invoices to ensure proper payment
- Copying and paginating reports

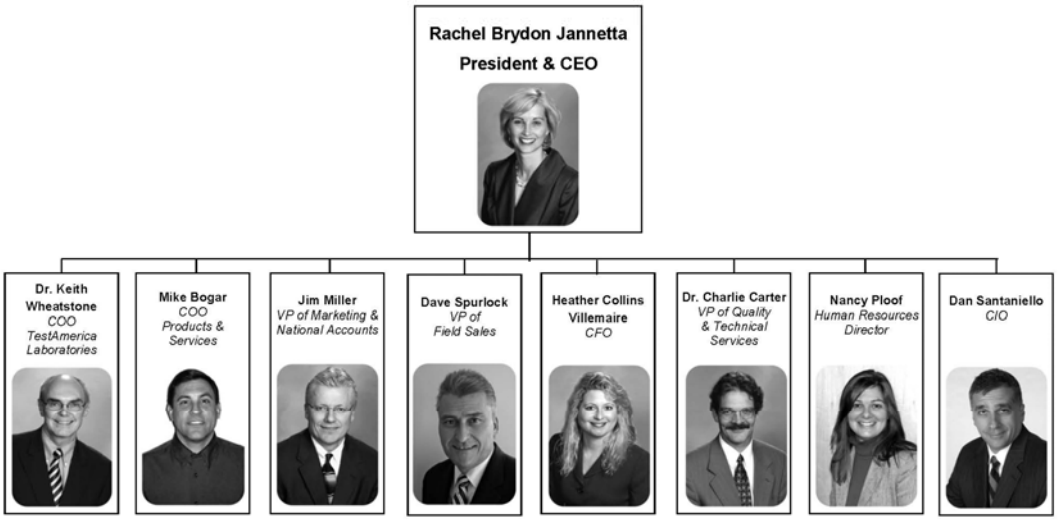
4.3 DEPUTIES

The following table defines who assumes the responsibilities of key personnel in their absence:

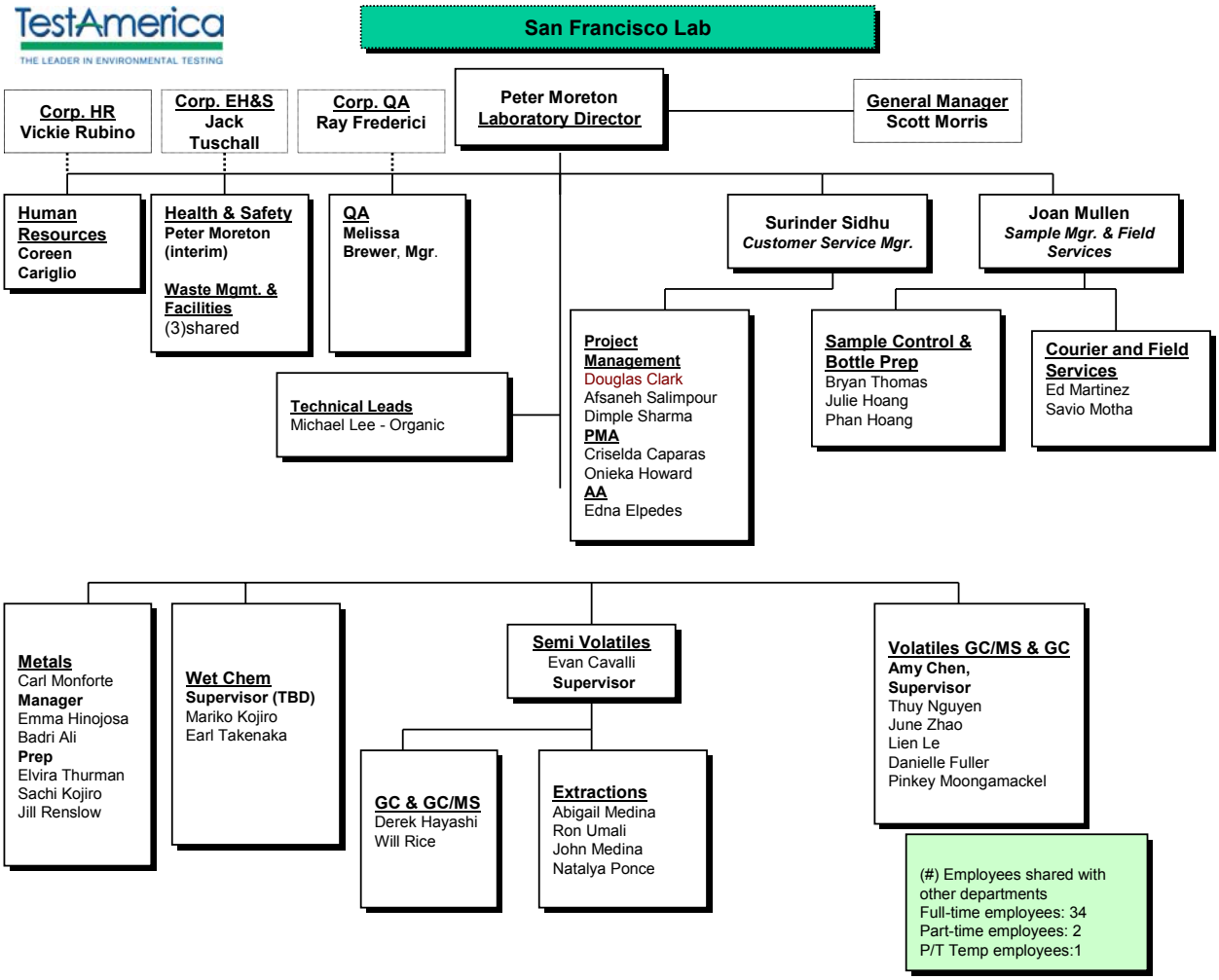
Key Personnel	Deputy	Comment
Laboratory Director	Client Services Manager	
QA Manager	Laboratory Director	
EHS Coordinator	Laboratory Director	
Client Services Manager	Laboratory Director & PMs	

Figure 4-1.
Corporate and Laboratory Organization Charts

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING



June 2010


TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
San Francisco Lab
Corp. HR
Vickie Rubino
Corp. EH&S
Jack Tuschall
Corp. QA
Ray Frederici
Peter Moreton
Laboratory Director
General Manager
Scott Morris
Human Resources
Coreen Cariglio
Health & Safety
Peter Moreton (interim)
Waste Mgmt. & Facilities
(3)shared
QA
Melissa Brewer, Mgr.
Surinder Sidhu
Customer Service Mgr.
Joan Mullen
Sample Mgr. & Field Services
Technical Leads
Michael Lee - Organic
Project Management
Douglas Clark
Afsaneh Salimpour
Dimple Sharma
PMA
Criselda Caparas
Onieka Howard
AA
Edna Elpedes
Sample Control & Bottle Prep
Bryan Thomas
Julie Hoang
Phan Hoang
Courier and Field Services
Ed Martinez
Savio Motha
Metals
Carl Monforte
Manager
Emma Hinojosa
Badri Ali
Prep
Elvira Thurman
Sachi Kojiro
Jill Renslow
Wet Chem
Supervisor (TBD)
Mariko Kojiro
Earl Takenaka
Semi Volatiles
Evan Cavalli
Supervisor
GC & GC/MS
Derek Hayashi
Will Rice
Extractions
Abigail Medina
Ron Umali
John Medina
Natalya Ponce
Volatiles GC/MS & GC
Amy Chen,
Supervisor
Thuy Nguyen
June Zhao
Lien Le
Danielle Fuller
Pinkey Moongamackel
(#) Employees shared with other departments
Full-time employees: 34
Part-time employees: 2
P/T Temp employees:1

SECTION 5

QUALITY SYSTEM *(NELAC 5.4.2)*

5.1 QUALITY POLICY STATEMENT

It is TestAmerica's Policy to:

- Provide data of known quality to its clients by adhering to approved methodologies, regulatory requirements and the QA/QC protocols.
- Effectively manage all aspects of the laboratory and business operations by the highest ethical standards.
- Continually improve systems and provide support to quality improvement efforts in laboratory, administrative and managerial activities. TestAmerica recognizes that the implementation of a quality assurance program requires management's commitment and support as well as the involvement of the entire staff.
- Provide clients with the highest level of professionalism and the best service practices in the industry.

Every staff member at the laboratory plays an integral part in quality assurance and is held responsible and accountable for the quality of their work. It is, therefore, required that all laboratory personnel are trained and agree to comply with applicable procedures and requirements established by this document.

5.2 ETHICS AND DATA INTEGRITY

TestAmerica is committed to ensuring the integrity of its data and meeting the quality needs of its clients. The elements of TestAmerica's Ethics and Data Integrity Program include:

- An Ethics Policy (Corporate Policy No. CA-L-P-001) and Employee Ethics Statements.
- Ethics and Compliance Officers (ECOs).
- A Training Program.
- Self-governance through disciplinary action for violations.
- A Confidential mechanism for anonymously reporting alleged misconduct and a means for conducting internal investigations of all alleged misconduct. (Corporate SOP No. CA-L-S-001.)
- Procedures and guidance for recalling data if necessary (Corporate SOP No. CA-L-S-001).
- Effective external and internal monitoring system that includes procedures for internal audits (Section 15).
- Produce results, which are accurate and include QA/QC information that meets client pre-defined Data Quality Objectives (DQOs).
- Present services in a confidential, honest and forthright manner.

- Provide employees with guidelines and an understanding of the Ethical and Quality Standards of our Industry.
- Operate our facilities in a manner that protects the environment and the health and safety of employees and the public.
- Obey all pertinent federal, state and local laws and regulations and encourage other members of our industry to do the same.
- Educate clients as to the extent and kinds of services available.
- Assert competency only for work for which adequate personnel and equipment are available and for which adequate preparation has been made.
- Promote the status of environmental laboratories, their employees, and the value of services rendered by them.

5.3 QUALITY SYSTEM DOCUMENTATION

The laboratory's Quality System is communicated through a variety of documents.

- Quality Assurance Manual – Each laboratory has a lab specific quality assurance manual.
- Corporate SOPs and Policies - Corporate SOPs and Policies are developed for use by all relevant laboratories. They are incorporated into the laboratory's normal SOP distribution, training and tracking system. Corporate SOPs may be general or technical.
- Work Instructions - A subset of procedural steps, tasks or forms associated with an operation of a management system (e.g., checklists, preformatted bench sheets, forms).
- Laboratory SOPs – General and Technical
- Corporate Quality Policy Memorandums
- Laboratory QA/QC Policy Memorandums

5.3.1 Order of Precedence

In the event of a conflict or discrepancy between policies, the order of precedence is as follows:

- Corporate Quality Policy Memorandum
- Corporate Quality Management Plan (CQMP)
- Corporate SOPs and Policies
- Laboratory QA/QC Policy Memorandum
- Laboratory Quality Assurance Manual (QAM)
- Laboratory SOPs and Policies
- Other (Work Instructions (WI), memos, flow charts, etc.)

Note: The laboratory has the responsibility and authority to operate in compliance with regulatory requirements of the jurisdiction in which the work is performed. Where the CQMP conflicts with those regulatory requirements, the regulatory requirements of the jurisdiction shall hold primacy. The laboratory's (QAM) shall take precedence over the CQMP in those cases.

5.4 QA/QC OBJECTIVES FOR THE MEASUREMENT OF DATA

Quality Assurance (QA) and Quality Control (QC) are activities undertaken to achieve the goal of producing data that accurately characterize the sites or materials that have been sampled. Quality Assurance is generally understood to be more comprehensive than Quality Control. Quality Assurance can be defined as the integrated system of activities that ensures that a product or service meets defined standards.

Quality Control is generally understood to be limited to the analyses of samples and to be synonymous with the term *"analytical quality control"*. QC refers to the routine application of statistically based procedures to evaluate and control the accuracy of results from analytical measurements. The QC program includes procedures for estimating and controlling precision and bias and for determining reporting limits.

Request for Proposals (RFPs) and Quality Assurance Project Plans (QAPP) provide a mechanism for the client and the laboratory to discuss the data quality objectives in order to ensure that analytical services closely correspond to client needs. The client is responsible for developing the QAPP. In order to ensure the ability of the laboratory to meet the Data Quality Objectives (DQOs) specified in the QAPP, clients are advised to allow time for the laboratory to review the QAPP before being finalized. Additionally, the laboratory will provide support to the client for developing the sections of the QAPP that concern laboratory activities.

Historically, laboratories have described their QC objectives in terms of precision, accuracy, representativeness, comparability, completeness, selectivity and sensitivity (PARCCSS).

5.4.1 Precision

The laboratory objective for precision is to meet the performance for precision demonstrated for the methods on similar samples and to meet data quality objectives of the EPA and/or other regulatory programs. Precision is defined as the degree of reproducibility of measurements under a given set of analytical conditions (exclusive of field sampling variability). Precision is documented on the basis of replicate analysis, usually duplicate or matrix spike (MS) duplicate samples.

5.4.2 Accuracy

The laboratory objective for accuracy is to meet the performance for accuracy demonstrated for the methods on similar samples and to meet data quality objectives of the EPA and/or other regulatory programs. Accuracy is defined as the degree of bias in a measurement system. Accuracy may be documented through the use of laboratory control samples (LCS) and/or MS. A statement of accuracy is expressed as an interval of acceptance recovery about the mean recovery.

5.4.3 Representativeness

The laboratory objective for representativeness is to provide data which is representative of the sampled medium. Representativeness is defined as the degree to which data represent a characteristic of a population or set of samples and is a measurement of both analytical and field sampling precision. The representativeness of the analytical data is a function of the procedures used in procuring and processing the samples. The representativeness can be

documented by the relative percent difference between separately procured, but otherwise identical samples or sample aliquots.

The representativeness of the data from the sampling sites depends on both the sampling procedures and the analytical procedures. The laboratory may provide guidance to the client regarding proper sampling and handling methods in order to assure the integrity of the samples.

5.4.4 Comparability

The comparability objective is to provide analytical data for which the accuracy, precision, representativeness and reporting limit statistics are similar to these quality indicators generated by other laboratories for similar samples, and data generated by the laboratory over time.

The comparability objective is documented by inter-laboratory studies carried out by regulatory agencies or carried out for specific projects or contracts, by comparison of periodically generated statements of accuracy, precision and reporting limits with those of other laboratories.

5.4.5 Completeness

The completeness objective for data is 90% (or as specified by a particular project), expressed as the ratio of the valid data to the total data over the course of the project. Data will be considered valid if they are adequate for their intended use. Data usability will be defined in a QAPP, project scope or regulatory requirement. Data validation is the process for reviewing data to determine its usability and completeness. If the completeness objective is not met, actions will be taken internally and with the data user to improve performance. This may take the form of an audit to evaluate the methodology and procedures as possible sources for the difficulty or may result in a recommendation to use a different method.

5.4.6 Selectivity

Selectivity is defined as: The capability of a test method or instrument to respond to a target substance or constituent in the presence of non-target substances. Target analytes are separated from non-target constituents and subsequently identified/detected through one or more of the following, depending on the analytical method: extractions (separation), digestions (separation), interelement corrections (separation), use of matrix modifiers (separation), specific retention times (separation and identification), confirmations with different columns or detectors (separation and identification), specific wavelengths (identification), specific mass spectra (identification), specific electrodes (separation and identification), etc..

5.4.7 Sensitivity

Sensitivity refers to the amount of analyte necessary to produce a detector response that can be reliably detected (Method Detection Limit) or quantified (Reporting Limit).

5.5 CRITERIA FOR QUALITY INDICATORS

The laboratory maintains a *Quality Control Limit Summary that contains tables* that summarize the precision and accuracy acceptability limits for performed analyses. This summary includes

an effective date, is updated each time new limits are generated and are managed by the laboratory's QA department. Unless otherwise noted, limits within these tables are laboratory generated. Some acceptability limits are derived from US EPA methods when they are required. Where US EPA method limits are not required, the laboratory has developed limits from evaluation of data from similar matrices. Criteria for development of control limits is contained in Section 24.

5.6 STATISTICAL QUALITY CONTROL

Statistically-derived precision and accuracy limits are required by selected methods (such as SW-846) and programs [such as the Ohio Voluntary Action Plan (VAP)]. The laboratory routinely utilizes statistically-derived limits to evaluate method performance and determine when corrective action is appropriate. The analysts are instructed to use the current limits in the laboratory (dated and approved by the Technical Director and QA Manager) and entered into the Laboratory Information Management System (LIMS). The Quality Assurance department maintains an archive of all limits used within the laboratory LIMS, under Control Chart Logs. If a method defines the QC limits, the method limits are used.

If a method requires the generation of historical limits, the lab develops such limits from recent data in the QC database of the LIMS following the guidelines described in Section 24. All calculations and limits are documented and dated when approved and effective. On occasion, a client requests contract-specified limits for a specific project.

Surrogate recoveries are determined for a specific time period as defined above. The resulting ranges are entered in LIMS.

Current QC limits are entered and maintained in the LIMS analyte database. As sample results and the related QC are entered into LIMS, the sample QC values are compared with the limits in LIMS to determine if they are within the acceptable range. The analyst then evaluates if the sample needs to be rerun or re-extracted/rerun or if a comment should be added to the report explaining the reason for the QC outlier.

5.6.1 QC Charts

As the QC limits are calculated, QC charts are generated showing warning and control limits for the purpose of evaluating trends. The QA Manager evaluates these to determine if adjustments need to be made or for corrective actions to methods. All findings are documented and kept on file.

5.7 QUALITY SYSTEM METRICS

In addition to the QC parameters discussed above, the entire Quality System is evaluated on a monthly basis through the use of specific metrics (refer to Section 16). These metrics are used to drive continuous improvement in the laboratory's Quality System.

SECTION 6

DOCUMENT CONTROL *(NELAC 5.4.3)*

6.1 OVERVIEW

The QA Department is responsible for the control of documents used in the laboratory to ensure that approved, up-to-date documents are in circulation and out-of-date (obsolete) documents are archived or destroyed. The following documents, at a minimum, must be controlled:

- Laboratory Quality Assurance Manual
- Laboratory Standard Operating Procedures (SOP)
- Laboratory Policies
- Work Instructions and Forms
- Corporate Policies and Procedures distributed outside the intranet

Corporate Quality posts Corporate Manuals, SOPs, Policies, Work Instructions, White Papers and Training Materials on the company intranet site. These Corporate documents are only considered controlled when they are read on the intranet site. Printed copies are considered uncontrolled unless the laboratory physically distributes them as controlled documents. A detailed description of the procedure for issuing, authorizing, controlling, distributing, and archiving Corporate documents is found in Corporate SOP No. CW-Q-S-001, Corporate Document Control and Archiving. The laboratory's internal document control procedure is defined in SOP No. SF-QA-1203.

The laboratory QA Department also maintains access to various references and document sources integral to the operation of the laboratory. This includes reference methods and regulations. Instrument manuals (hard or electronic copies) are also maintained by the laboratory.

The laboratory maintains control of records for raw analytical data and supporting records such as audit reports and responses, logbooks, standard logs, training files, MDL studies, Proficiency Testing (PT) studies, certifications and related correspondence, and corrective action reports. Raw analytical data consists of bound logbooks, instrument printouts, any other notes, magnetic media, electronic data and final reports.

6.2 DOCUMENT APPROVAL AND ISSUE

The pertinent elements of a document control system for each document include a unique document title and number, the number of pages of the item, the effective date, revision number and the laboratory's name. The QA personnel are responsible for the maintenance of this system.

Controlled documents are authorized by the QA Department. In order to develop a new document, a manager submits an electronic draft to the QA Department for suggestions and approval before use. Upon approval, QA personnel add the identifying version information to the document and retains the official document on file. The official document is provided to all applicable operational units (may include electronic access). Controlled documents are

identified as such and records of their distribution are kept by the QA Department. Document control may be achieved by either electronic or hardcopy distribution.

The QA Department maintains a list of the official versions of controlled documents.

Quality System Policies and Procedures will be reviewed at a minimum of every two years and revised as appropriate. Changes to documents occur when a procedural change warrants.

6.3 PROCEDURES FOR DOCUMENT CONTROL POLICY

For changes to the QA Manual, refer to SOP No. SF-QA-1203. Uncontrolled copies must not be used within the laboratory. Previous revisions and back-up data are stored by the QA department. Electronic copies are stored on the Public server in the QA folder for the applicable revision.

For changes to SOPs, refer to SOP No. CW-Q-S-002, Writing a Standard Operating Procedure SOP. The SOP identified above also defines the process of changes to SOPs.

Forms, worksheets, work instructions and information are organized by department in the QA office. Electronic versions are kept on a hard drive in the QA department.

6.4 OBSOLETE DOCUMENTS

All invalid or obsolete documents are removed, or otherwise prevented from unintended use. The laboratory has specific procedures as described above to accomplish this. In general, obsolete documents are collected from employees according to distribution lists and are marked obsolete on the cover or destroyed. At least one copy of the obsolete document is archived according to SOP No. SF-QA-1203.

SECTION 7

SERVICE TO THE CLIENT *(NELAC 5.4.7)*

7.1 OVERVIEW

The laboratory has established procedures for the review of work requests and contracts, oral or written. The procedures include evaluation of the laboratory's capability and resources to meet the contract's requirements within the requested time period. All requirements, including the methods to be used, must be adequately defined, documented and understood. For many environmental sampling and analysis programs, testing design is site or program specific and does not necessarily "fit" into a standard laboratory service or product. It is the laboratory's intent to provide both standard and customized environmental laboratory services to our clients.

A thorough review of technical and QC requirements contained in contracts is performed to ensure project success. The appropriateness of requested methods, and the lab's capability to perform them must be established. Projects, proposals and contracts are reviewed for adequately defined requirements and the laboratory's capability to meet those requirements. Alternate test methods that are capable of meeting the clients' requirements may be proposed by the lab. A review of the lab's capability to analyze non-routine analytes is also part of this review process.

All projects, proposals and contracts are reviewed for the client's requirements in terms of compound lists, test methodology requested, sensitivity (detection and reporting levels), accuracy, and precision requirements (% Recovery and RPD). The reviewer ensures that the laboratory's test methods are suitable to achieve these regulatory and client requirements and that the laboratory holds the appropriate certifications and approvals to perform the work. The laboratory and any potential subcontract laboratories must be certified, as required, for all proposed tests.

The laboratory must determine if it has the necessary physical, personnel and information resources to meet the contract, and if the personnel have the expertise needed to perform the testing requested. Each proposal is checked for its impact on the capacity of the laboratory's equipment and personnel. As part of the review, the proposed turnaround time will be checked for feasibility.

Electronic or hard copy deliverable requirements are evaluated against the laboratory's capacity for production of the documentation.

If the laboratory cannot provide all services but intends to subcontract such services, whether to another TestAmerica facility or to an outside firm, this will be documented and discussed with the client prior to contract approval. (Refer to Section 8 for Subcontracting Procedures.)

The laboratory informs the client of the results of the review if it indicates any potential conflict, deficiency, lack of accreditation, or inability of the lab to complete the work satisfactorily. Any discrepancy between the client's requirements and the laboratory's capability to meet those requirements is resolved in writing before acceptance of the contract. It is necessary that the contract be acceptable to both the laboratory and the client. Amendments initiated by the client and/or TestAmerica, are documented in writing.

All contracts, QAPPs, Sampling and Analysis Plans (SAPs), contract amendments, and documented communications become part of the project record.

The same contract review process used for the initial review is repeated when there are amendments to the original contract by the client, and the participating personnel are informed of the changes.

7.2 REVIEW SEQUENCE AND KEY PERSONNEL

Appropriate personnel will review the work request at each stage of evaluation.

For routine projects and other simple tasks, a review by the Project Manager (PM) is considered adequate. The PM confirms that the laboratory has any required certifications, that it can meet the clients' data quality and reporting requirements and that the lab has the capacity to meet the clients turn around needs. It is recommended that, where there is a sales person assigned to the account, an attempt should be made to contact that sales person to inform them of the incoming samples.

For new, complex or large projects, the proposed contract is given to the National Account Director, who will decide which lab will receive the work based on the scope of work and other requirements, including certification, testing methodology, and available capacity to perform the work. The contract review process is outlined in TestAmerica's Corporate SOP No. CA-L-P-002**,** Contract Compliance Policy.

This review encompasses all facets of the operation. The scope of work is distributed to the appropriate personnel, as needed based on scope of contract, to evaluate all of the requirements shown above (not necessarily in the order below).

- Legal & Contracts Director
- General Manager
- The Laboratory Project Management Manager
- The Laboratory Operations Manager
- Laboratory and/or Corporate Technical Directors
- Laboratory and/or Corporate Information Technology Managers
- Regional and/or National Account representatives
- Laboratory and/or Corporate Quality
- Laboratory and/or Corporate Environmental Health and Safety Managers
- The Laboratory Director reviews the formal laboratory quote and makes final acceptance for their facility.

The National Account Director, Legal Contracts Director, or local account representative then submits the final proposal to the client.

In the event that one of the above personnel is not available to review the contract, his or her back-up will fulfill the review requirements.

The Legal & Contracts Director maintains copies of all signed contracts, as well as the lab's Project Manager Assistant.

7.3 DOCUMENTATION

Appropriate records are maintained for every contract or work request. All stages of the contract review process are documented and include records of any significant changes. This information is archived with the lab's Project Manager Assistant.

The contract will be distributed to and maintained by the appropriate sales/marketing personnel and the Regional Account Manager. A copy of the contract and formal quote will be filed with the laboratory PM and the Lab Director.

Records are maintained of pertinent discussions with a client relating to the client's requirements or the results of the work during the period of execution of the contract. The PM keeps a phone log of conversations with the client.

7.3.1 Project-Specific Quality Planning

Communication of contract specific technical and QC criteria is an essential activity in ensuring the success of site specific testing programs. To achieve this goal, the laboratory assigns a PM to each client. It is the PM's responsibility to ensure that project-specific technical and QC requirements are effectively evaluated and communicated to the laboratory personnel before and during the project. QA department involvement may be needed to assist in the evaluation of custom QC requirements.

PM's are the primary client contact and they ensure resources are available to meet project requirements. Although PM's do not have direct reports or staff in production, they coordinate opportunities and work with laboratory management and supervisory staff to ensure available resources are sufficient to perform work for the client's project. Project management is positioned between the client and laboratory resources.

Prior to work on a new project, the dissemination of project information and/or project opening meetings may occur to discuss schedules and unique aspects of the project. Items to be discussed may include the project technical profile, turnaround times, holding times, methods, analyte lists, reporting limits, deliverables, sample hazards, or other special requirements. The PM introduces new projects to the laboratory staff through project kick-off meetings or to the supervisory staff during production meetings. These meetings provide direction to the laboratory staff in order to maximize production and client satisfaction, while maintaining quality. In addition, project notes may be associated with each sample batch as a reminder upon sample receipt and analytical processing.

During the project, any change that may occur within an active project is agreed upon between the client/regulatory agency and the PM/laboratory. These changes (e.g., use of a non-standard method or modification of a method) and approvals must be documented prior to implementation. Documentation pertains to any document, e.g., letter, e-mail, variance, contract addendum, which has been signed by both parties.

Such changes are also communicated to the laboratory during production meetings. Such changes are updated to the project notes and are introduced to the managers at these meetings. The laboratory staff is then introduced to the modified requirements via the PM or the individual laboratory Department Manager. After the modification is implemented into the laboratory process, documentation of the modification is made in the case narrative of the data report(s).

The laboratory strongly encourages client visits to the laboratory and for formal/informal information sharing session with employees in order to effectively communicate ongoing client needs as well as project specific details for customized testing programs.

7.4 SPECIAL SERVICES

The laboratory cooperates with clients and their representatives to monitor the laboratory's performance in relation to work performed for the client. It is the laboratory's goal to meet all client requirements in addition to statutory and regulatory requirements. The laboratory has procedures to ensure confidentiality to clients (Section 15 and 25).

The laboratory's standard procedures for reporting data are described in Section 25. Special services are also available and provided upon request. These services include:

- Reasonable access for our clients or their representatives to the relevant areas of the laboratory for the witnessing of tests performed for the client.
- Assist client-specified third party data validators as specified in the client's contract.
- Supplemental information pertaining to the analysis of their samples. Note: An additional charge may apply for additional data/information that was not requested prior to the time of sample analysis or previously agreed upon.

7.5 CLIENT COMMUNICATION

Project managers are the primary communication link to the clients. They shall inform their clients of any delays in project completion as well as any non-conformances in either sample receipt or sample analysis. Project management will maintain ongoing client communication throughout the entire client project.

Laboratory Directors and Department Managers are available to discuss any technical questions or concerns that the client may have.

7.6 REPORTING

The laboratory works with our clients to produce any special communication reports required by the contract.

7.7 CLIENT SURVEYS

The laboratory assesses both positive and negative client feedback. The results are used to improve overall laboratory quality and client service.

TestAmerica's Sales and Marketing teams periodically develop lab and client specific surveys to assess client satisfaction.

SECTION 8

SUBCONTRACTING OF TESTS *(NELAC 5.4.5)*

8.1 OVERVIEW

For the purpose of this quality manual, the phrase subcontract laboratory refers to a laboratory external to the TestAmerica laboratories. The phrase "work sharing" refers to internal transfers of samples between the TestAmerica laboratories. The term outsourcing refers to the act of subcontracting tests.

When contracting with our clients, the laboratory makes commitments regarding the services to be performed and the data quality for the results to be generated. When the need arises to outsource testing for our clients because project scope, changes in laboratory capabilities, capacity or unforeseen circumstances, we must be assured that the subcontractors or work sharing laboratories understand the requirements and will meet the same commitments we have made to the client. Refer to TestAmerica's Corporate SOP's on Subcontracting Procedures (CA-L-S-002) and the Work Sharing Process (CA-C-S-001).

When outsourcing analytical services, the laboratory will assure, to the extent necessary, that the subcontract or work sharing laboratory maintains a program consistent with the requirements of this document and the requirements specified in the client's Quality Assurance Project Plan (QAPP). All QC guidelines specific to the client's analytical program are transmitted to the subcontractor and agreed upon before sending the samples to the subcontract facility. Additionally, work requiring accreditation will be placed with an appropriately accredited laboratory. The laboratory performing the subcontracted work will be identified in the final report.

Project Managers (PMs) for the Export Lab are responsible for obtaining client approval prior to outsourcing any samples. The laboratory will advise the client of a subcontract or work sharing arrangement in writing and when possible approval from the client shall be retained in the project folder.

Note: In addition to the client, some regulating agencies, such as the US Army Corps of Engineers and the USDA, require notification prior to placing such work.

8.2 QUALIFYING AND MONITORING SUBCONTRACTORS

Whenever a PM becomes aware of a client requirement or laboratory need where samples must be outsourced to another laboratory, the other laboratory(s) shall be selected based on the following:

- The first priority is to attempt to place the work in a qualified TestAmerica laboratory;
- Firms specified by the client for the task (Documentation that a subcontractor was designated by the client must be maintained with the project file. This documentation can be as simple as placing a copy of an e-mail from the client in the project folder);
- Firms listed as pre-qualified and currently under a subcontract with TestAmerica: A listing of all approved subcontracting laboratories and supporting documentation is available on the TestAmerica intranet site. Verify necessary accreditation, where applicable, (e.g., on the

subcontractors NELAC, A2LA accreditation or State Certification).

- Firms identified in accordance with the company's Small Business Subcontracting program as small, women-owned, veteran-owned and/or minority-owned businesses;
- NELAC or A2LA accredited laboratories.
- In addition, the firm must hold the appropriate certification to perform the work required.

All TestAmerica laboratories are pre-qualified for work sharing provided they hold the appropriate accreditations, can adhere to the project/program requirements, and the client approved sending samples to that laboratory. The client must provide acknowledgement that the samples can be sent to that facility (an e-mail is sufficient documentation or if acknowledgement is verbal, the date, time, and name of person providing acknowledgement must be documented). The originating laboratory is responsible for communicating all technical, quality, and deliverable requirements as well as other contract needs. (Corporate SOP No. CA-C-S-001, Work Sharing Process).

When the potential sub-contract laboratory has not been previously approved, PMs may nominate a laboratory as a subcontractor based on need. The decision to nominate a laboratory must be approved by the Laboratory Director. The Laboratory Director requests that the QA Manager begin the process of approving the subcontract laboratory as outlined in Corporate SOP No. CA-L-S-002, Subcontracting Procedures. The client must provide acknowledgement that the samples can be sent to that facility (an e-mail is sufficient documentation or if acknowledgement is verbal, the date, time, and name of person providing acknowledgement must be documented).

8.2.1 Once the appropriate accreditation and legal information is received by the laboratory, it is evaluated for acceptability (where applicable) and forwarded to Corporate Contracts for formal contracting with the laboratory. They will add the lab to the approved list on the intranet site along with the associate documentation and notify the finance group for JD Edwards.

8.2.2 The client will assume responsibility for the quality of the data generated from the use of a subcontractor they have requested the lab to use. The qualified subcontractors on the intranet site are known to meet minimal standards. TestAmerica does not certify laboratories. The subcontractor is on our approved list and can only be recommended to the extent that we would use them.

8.2.3 The status and performance of qualified subcontractors will be monitored periodically by the Corporate Contracts and/or Quality Departments. Any problems identified will be brought to the attention of TestAmerica's Corporate Finance or Corporate Quality personnel.

- Complaints shall be investigated. Documentation of the complaint, investigation and corrective action will be maintained in the subcontractor's file on the intranet site. Complaints are posted using the Vendor Performance Report.
- Information shall be updated on the intranet when new information is received from the subcontracted laboratories.
- Subcontractors in good standing will be retained on the intranet listing. The QA Manager will

notify all TestAmerica laboratories, Corporate Quality and Corporate Contracts if any laboratory requires removal from the intranet site. This notification will be posted on the intranet site and e-mailed to all Lab Directors/Managers, QA Managers and Sales Personnel.

8.3 OVERSIGHT AND REPORTING

The PM must request that the selected subcontractor be presented with a subcontract, if one is not already executed between the laboratory and the subcontractor. The subcontract must include terms which flow down the requirements of our clients, either in the subcontract itself or through the mechanism of work orders relating to individual projects. A standard subcontract and the Lab Subcontractor Vendor Package (posted on the intranet) can be used to accomplish this, and the Legal & Contracts Director can tailor the document or assist with negotiations, if needed. The PM responsible for the project must advise and obtain client consent to the subcontract as appropriate, and provide the scope of work to ensure that the proper requirements are made a part of the subcontract and are made known to the subcontractor.

Prior to sending samples to the subcontracted laboratory, the PM confirms their certification status to determine if it's current and scope-inclusive. For TestAmerica laboratories, certifications can be viewed on the company's TotalAccess Database.

The Sample Control department is responsible for ensuring compliance with QA requirements and applicable shipping regulations when shipping samples to a subcontracted laboratory.

All subcontracted samples must be accompanied by a Chain of Custody (COC). A copy of the original COC sent by the client must be included with all samples subbed within TestAmerica.

Through communication with the subcontracted laboratory, the PM monitors the status of the subcontracted analyses, facilitates successful execution of the work, and ensures the timeliness and completeness of the analytical report.

Non-NELAC accredited work must be identified in the subcontractor's report as appropriate. If NELAC accreditation is not required, the report does not need to include this information.

Reports submitted from subcontractor laboratories are not altered and are included in their original form in the final project report. This clearly identifies the data as being produced by a subcontractor facility. If subcontract laboratory data is incorporated into the laboratories EDD (i.e., imported), the report must explicitly indicate which lab produced the data for which methods and samples.

Note: The results submitted by a TestAmerica work sharing laboratory may be transferred electronically and the results reported by the TestAmerica work sharing lab are identified on the final report. The report must explicitly indicate which lab produced the data for which methods and samples. The final report must include a copy of the completed COC for all work sharing reports.

8.4 CONTINGENCY PLANNING

The Laboratory Director may waive the full qualification of a subcontractor process temporarily to meet emergency needs. In the event this provision is utilized, the QA Manager will be required to verify certifications. The comprehensive approval process must then be initiated within 30 calendar days of subcontracting.

SECTION 9

PURCHASING SERVICES AND SUPPLIES *(NELAC 5.4.6)*

9.1 OVERVIEW

Evaluation and selection of suppliers and vendors is performed, in part, on the basis of the quality of their products, their ability to meet the demand for their products on a continuous and short term basis, the overall quality of their services, their past history, and competitive pricing. This is achieved through evaluation of objective evidence of quality furnished by the supplier, which can include certificates of analysis, recommendations, and proof of historical compliance with similar programs for other clients. To ensure that quality critical consumables and equipment conform to specified requirements, which may affect quality, all purchases from specific vendors are approved by a member of the supervisory or management staff. Capital expenditures are made in accordance with TestAmerica's Corporate Controlled Purchases Procedure, SOP No. CW-F-S-007.

Contracts will be signed in accordance with TestAmerica's Corporate Authorization Matrix Policy, Policy No. CW-F-P-002. Request for Proposals (RFP's) will be issued where more information is required from the potential vendors than just price. Process details are available in TestAmerica's Corporate Procurement and Contracts Policy (Policy No. CW-F-P-004). RFP's allow TestAmerica to determine if a vendor is capable of meeting requirements such as supplying all of the TestAmerica facilities, meeting required quality standards and adhering to necessary ethical and environmental standards. The RFP process also allows potential vendors to outline any additional capabilities they may offer.

9.2 GLASSWARE

Glassware used for volumetric measurements must be Class A or verified for accuracy according to laboratory procedure. Pyrex (or equivalent) glass should be used where possible. For safety purposes, thick-wall glassware should be used where available.

9.3 REAGENTS, STANDARDS & SUPPLIES

Purchasing guidelines for equipment and reagents must meet the requirements of the specific method and testing procedures for which they are being purchased. Solvents and acids are pre-tested in accordance with TestAmerica's Corporate SOP on Solvent & Acid Lot Testing & Approval, SOP No. CA-Q-S-001.

9.3.1 Purchasing

Chemical reagents, solvents, glassware, and general supplies are ordered as needed to maintain sufficient quantities on hand. Materials used in the analytical process must be of a known quality. The wide variety of materials and reagents available makes it advisable to specify recommendations for the name, brand, and grade of materials to be used in any determination. This information is contained in the method SOP. The analyst completes a Purchase Order Form when requesting reagents, standards, or supplies. The analyst may also check the item out of the on-site consignment system that contains items approved for laboratory use.

The analyst must provide the item description, package size, catalogue page number, and the quantity needed. If an item being ordered is not the exact item requested, approval must be obtained from the Laboratory Director prior to placing the order. The Client Services Assistant places the order.

9.3.2 Receiving

It is the responsibility of the Sample Control and the Client Services Assistant to receive the shipment. It is the responsibility of the analyst who ordered the materials to date the material when received. Once the ordered reagents or materials are received, the analyst compares the information on the label or packaging to the original order to ensure that the purchase meets the quality level specified. Material Safety Data Sheets (MSDSs) are available online through the Company's intranet website. Anyone may review these for relevant information on the safe handling and emergency precautions of on-site chemicals.

9.3.3 Specifications

All methods in use in the laboratory specify the grade of reagent that must be used in the procedure. If the quality of the reagent is not specified, it may be assumed that it is not significant in that procedure and, therefore, any grade reagent may be used. It is the responsibility of the analyst to check the procedure carefully for the suitability of grade of reagent.

Chemicals must not be used past the manufacturer's expiration date and must not be used past the expiration time noted in a method SOP. If expiration dates are not provided, the laboratory may contact the manufacturer to determine an expiration date.

The laboratory assumes a five year expiration date on inorganic dry chemicals unless noted otherwise by the manufacturer or by the reference source method. Chemicals should not be used past the manufacturer's or SOPs expiration date unless 'verified' (refer to item 3 listed below).

- An expiration date can not be extended if the dry chemical is discolored or appears otherwise physically degraded, the dry chemical must be discarded.

- Expiration dates can be extended if the dry chemical is found to be satisfactory based on acceptable performance of quality control samples (Continuing Calibration Verification (CCV), Blanks, Laboratory Control Sample (LCS), etc.).

- If the dry chemical is used for the preparation of standards, the expiration dates can be extended 6 months if the dry chemical is compared to an unexpired independent source in performing the method and the performance of the dry chemical is found to be satisfactory. The comparison must show that the dry chemical meets CCV limits. The comparison studies are maintained in the QA Data Validation Folder.

Wherever possible, standards must be traceable to national or international standards of measurement or to national or international reference materials. Records to that effect are available to the user.

Compressed gases in use are checked for pressure and secure positioning daily. The minimum total pressure must be 500 psig or the tank must be replaced. The quality of the gases must meet method or manufacturer specification or be of a grade that does not cause any analytical interference.

Water used in the preparation of standards or reagents must have a specific conductivity of less than 1- mmho/cm (or specific resistivity of greater than 1.0 megaohm-cm) at 25°C. The specific conductivity is checked and recorded daily. If the water's specific conductivity is greater than the specified limit, the Facility Manager and appropriate Department Managers/Supervisors must be notified immediately in order to notify all departments, decide on cessation (based on intended use) of activities, and make arrangements for correction.

The laboratory may purchase reagent grade (or other similar quality) water for use in the laboratory. This water must be certified "clean" by the supplier for all target analytes or otherwise verified by the laboratory prior to use. This verification is documented.

Standard lots are verified before first time use if the laboratory switches manufacturers or has historically had a problem with the type of standard.

Purchased VOA vials must be certified clean and the certificates must be maintained. If uncertified VOA vials are purchased, all lots must be verified clean prior to use. This verification must be maintained.

Records of manufacturer's certification and traceability statements are maintained in the LIMS. These records include date of receipt, lot number (when applicable), and expiration date (when applicable). Incorporation of the item into the record indicates that the analyst has compared the new certificate with the previous one for the same purpose and that no difference is noted, unless approved and so documented by the Laboratory Director or QA Manager.

9.3.4 Storage

Reagent and chemical storage is important from the aspects of both integrity and safety. Light-sensitive reagents may be stored in brown-glass containers. Storage conditions are per the Corporate Environmental Health & Safety Manual (Corp. Doc. No. CW-E-M-001) and method SOPs or manufacturer instructions.

9.4 PURCHASE OF EQUIPMENT/INSTRUMENTS/SOFTWARE

When a new piece of equipment is needed, either for additional capacity or for replacing inoperable equipment, the analyst or supervisor makes a supply request to the Laboratory Director. If he agrees with the request, the procedures outlined in TestAmerica's Corporate Policy No. CA-T-P-001, Qualified Products List, are followed. A decision is made as to which piece of equipment can best satisfy the requirements. The appropriate written requests are completed and purchasing places the order.

Upon receipt of a new or used piece of equipment, an identification name is assigned and added to the equipment list. IT must also be notified so that they can synchronize the instrument for back-ups. Its capability is assessed to determine if it is adequate or not for the

specific application. For instruments, a calibration curve is generated, followed by MDLs, Demonstration of Capabilities (DOCs), and other relevant criteria (refer to Section 19). For software, its operation must be deemed reliable and evidence of instrument verification must be retained by the QA Department. Software certificates supplied by the vendors are filed with the QA Manager. The manufacturer's operation manual is retained at the bench.

9.5 SERVICES

Service to analytical instruments (except analytical balances) is performed on an as needed basis. Routine preventative maintenance is discussed in Section 20. The need for service is determined by analysts and/or Department Managers. The service providers that perform the services are approved by the Department Managers and Laboratory Director.

9.6 SUPPLIERS

TestAmerica selects vendors through a competitive proposal / bid process, strategic business alliances or negotiated vendor partnerships (contracts). This process is defined in the Corporate Finance documents on Vendor Selection (SOP No. CW-F-S-018) and Procurement & Contracts Policy (Policy No. CW-F-P-004). The level of control used in the selection process is dependent on the anticipated spending amount and the potential impact on TestAmerica business. Vendors that provide test and measuring equipment, solvents, standards, certified containers, instrument related service contracts or subcontract laboratory services shall be subject to more rigorous controls than vendors that provide off-the-shelf items of defined quality that meet the end use requirements. The JD Edwards purchasing system includes all suppliers/vendors that have been approved for use.

Evaluation of suppliers is accomplished by ensuring the supplier ships the product or material ordered and that the material is of the appropriate quality. This is documented by signing off on packing slips or other supply receipt documents. The purchasing documents contain the data that adequately describe the services and supplies ordered.

Any issues of vendor performance are to be reported immediately by the laboratory staff to the Corporate Purchasing Group by completing a Vendor Performance Report.

The Corporate Purchasing Group will work through the appropriate channels to gather the information required to clearly identify the problem and will contact the vendor to report the problem and to make any necessary arrangements for exchange, return authorization, credit, etc.

As deemed appropriate, the Vendor Performance Reports will be summarized and reviewed to determine corrective action necessary, or service improvements required by vendors

The laboratory has access to a listing of all approved suppliers of critical consumables, supplies and services. This information is provided through the JD Edwards purchasing system.

9.6.1 New Vendor Procedure

TestAmerica employees who wish to request the addition of a new vendor must complete a J.D. Edwards Vendor Add Request Form.

New vendors are evaluated based upon criteria appropriate to the products or services provided as well as their ability to provide those products and services at a competitive cost. Vendors are also evaluated to determine if there are ethical reasons or potential conflicts of interest with TestAmerica employees that would make it prohibitive to do business with them as well as their financial stability. The QA Department and/or the Laboratory Director are consulted with vendor and product selection that have an impact on quality.

SECTION 10

COMPLAINTS *(NELAC 5.4.8)*

10.1 OVERVIEW

The laboratory considers an effective client complaint handling processes to be of significant business and strategic value. Listening to and documenting client concerns captures 'client knowledge' that enables our operations to continually improve processes and client satisfaction. An effective client complaint handling process also provides assurance to the data user that the laboratory will stand behind its data, service obligations and products.

A client complaint is any expression of dissatisfaction with any aspect of our business services (e.g., communications, responsiveness, data, reports, invoicing and other functions) expressed by any party, whether received verbally or in written form. Client inquiries, complaints or noted discrepancies are documented, communicated to management, and addressed promptly and thoroughly.

The laboratory has procedures for addressing both external and internal complaints with the goal of providing satisfactory resolution to complaints in a timely and professional manner.

The nature of the complaint is identified, documented and investigated, and an appropriate action is determined and taken. In cases where a client complaint indicates that an established policy or procedure was not followed, the QA Department must evaluate whether a special audit must be conducted to assist in resolving the issue. A written confirmation or letter to the client, outlining the issue and response taken is recommended as part of the overall action taken.

The process of complaint resolution and documentation utilizes the procedures outlined in Section 12 (Corrective Actions) and is documented following SOP SF-QA-1201.

10.2 EXTERNAL COMPLAINTS

An employee that receives a complaint initiates the complaint resolution process by first documenting the complaint according to the corrective action system in SOP SF-QA-1201.

Complaints fall into two categories: correctable and non-correctable. An example of a correctable complaint would be one where a report re-issue would resolve the complaint. An example of a non-correctable complaint would be one where a client complains that their data was repeatedly late. Non-correctable complaints should be reviewed for preventive action measures to reduce the likelihood of future occurrence and mitigation of client impact.

The general steps in the complaint handling process are:

- Receiving and Documenting Complaints
- Complaint Investigation and Service Recovery
- Process Improvement

The laboratory shall inform the initiator of the complaint of the results of the investigation and the corrective action taken, if any.

10.3 INTERNAL COMPLAINTS

Internal complaints include, but are not limited to: errors and non-conformances, training issues, internal audit findings, and deviations from methods. Corrective actions may be initiated by any staff member who observes a nonconformance and shall follow the procedures outlined in Section 12. In addition, Corporate Management, Sales and Marketing and IT may initiate a complaint by contacting the laboratory or through the corrective action system described in Section 12.

10.4 MANAGEMENT REVIEW

The number and nature of client complaints is reported by the QA Manager to the laboratory and QA Director in the QA Monthly report. Monitoring and addressing the overall level and nature of client complaints and the effectiveness of the solutions is part of the Annual Management Review (Section 16).

SECTION 11

CONTROL OF NON-CONFORMING WORK *(NELAC 5.4.9)*

11.1 OVERVIEW

When data discrepancies are discovered or deviations and departures from laboratory SOPs, policies and/or client requests have occurred, corrective action is taken immediately. First, the laboratory evaluates the significance of the nonconforming work. Then, a corrective action plan is initiated based on the outcome of the evaluation. If it is determined that the nonconforming work is an isolated incident, the plan could be as simple as adding a qualifier to the final results and/or making a notation in the case narrative. If it is determined that the nonconforming work is a systematic or improper practices issue, the corrective action plan could include a more in depth investigation and a possible suspension of an analytical method. In all cases, the actions taken are documented using the laboratory's corrective action system (refer to Section 12).

Due to the frequently unique nature of environmental samples, sometimes departures from documented policies and procedures are needed. When an analyst encounters such a situation, the problem is presented to the supervisor for resolution. The supervisor may elect to discuss it with the Laboratory Director or QA Manager to decide on a logical course of action. Once an approach is agreed upon, the analyst documents it using the laboratories corrective action system described in Section 12. This information can then be supplied to the client in the form of a footnote or a case narrative with the report.

Project Management may encounter situations where a client may request that a special procedure be applied to a sample that is not standard lab practice. Based on a technical evaluation, the lab may accept or opt to reject the request based on technical or ethical merit. An example might be the need to report a compound that the lab does not normally report. The lab would not have validated the method for this compound following the procedures in Section 19. The client may request that the compound be reported based only on the calibration. Such a request would need to be approved by the Laboratory Director and QA Manager, documented and included in the project folder. Deviations **must** also be noted on the final report with a statement that the compound is not reported in compliance with NELAC (or the analytical method) requirements and the reason. Data being reported to a non-NELAC state would need to note the change made to how the method is normally run.

11.2 RESPONSIBILITIES AND AUTHORITIES

TestAmerica's Corporate SOP entitled *Internal Investigation of Potential Data Discrepancies and Determination for Data Recall* (SOP No. CA-L-S-001), outlines the general procedures for the reporting and investigation of data discrepancies and alleged incidents of misconduct or violations of TestAmerica's data integrity policies as well as the policies and procedures related to the determination of the potential need to recall data.

Under certain circumstances, the Laboratory Director, a Lab Supervisor, or a member of the QA team may authorize departures from documented procedures or policies. The departures may be a result of procedural changes due to the nature of the sample; a one-time procedure for a client; QC failures with insufficient sample to reanalyze, etc.. In most cases, the client will be informed of the departure prior to the reporting of the data. Any departures must be well

documented using the laboratory's corrective action procedures. This information may also be documented in logbooks and/or data review checklists as appropriate. Any impacted data must be referenced in a case narrative and/or flagged with an appropriate data qualifier.

Any misrepresentation or possible misrepresentation of analytical data discovered by any laboratory staff member must be reported to facility Senior Management within 24-hours. The Senior Management staff is comprised of the Laboratory Director, the QA Manager, and the Department Managers. The reporting of issues involving alleged violations of the company's Data Integrity or Manual Integration procedures must be conveyed to an Ethics and Compliance Officer (ECO), Director of Quality & Client Advocacy and the laboratory's Quality Director within 24 hours of discovery.

Whether an inaccurate result was reported due to calculation or quantitation errors, data entry errors, improper practices, or failure to follow SOPs, the data must be evaluated to determine the possible effect.

The Laboratory Director, QA Manager, ECOs, Corporate Quality, the COO, General Managers and the Quality Directors have the authority and responsibility to halt work, withhold final reports, or suspend an analysis for due cause as well as authorize the resumption of work.

11.3 EVALUATION OF SIGNIFICANCE AND ACTIONS TAKEN

For each nonconforming issue reported, an evaluation of its significance and the level of management involvement needed is made. This includes reviewing its impact on the final data, whether or not it is an isolated or systematic issue, and how it relates to any special client requirements.

TestAmerica's Corporate Data Investigation & Recall Procedure (SOP No. CA-L-S-001) distinguishes between situations when it would be appropriate for laboratory management to make the decision on the need for client notification (written or verbal) and data recall (report revision) and when the decision must be made with the assistance of the ECO's and Corporate Management. Laboratory level decisions are documented and approved using the laboratory's standard nonconformance/corrective action reporting in lieu of the data recall determination form contained in TestAmerica's Corporate SOP No. CA-L-S-001.

11.4 PREVENTION OF NONCONFORMING WORK

If it is determined that the nonconforming work could recur, further corrective actions must be made following the laboratory's corrective action system. On a monthly basis, the QA Department evaluates non-conformances to determine if any nonconforming work has been repeated multiple times. If so, the laboratory's corrective action process may be followed.

11.5 METHOD SUSPENSION/RESTRICTION (STOP WORK PROCEDURES)

In some cases, it may be necessary to suspend/restrict the use of a method or target compound which constitutes significant risk and/or liability to the laboratory. Suspension/restriction procedures can be initiated by any of the persons noted in Section 11.2, Paragraph 5.

Prior to suspension/restriction, confidentiality will be respected, and the problem with the required corrective and preventive action will be stated in writing and presented to the Laboratory Director.

The Laboratory Director shall arrange for the appropriate personnel to meet with the QA Manager as needed. This meeting shall be held to confirm that there is a problem, that suspension/restriction of the method is required and will be concluded with a discussion of the steps necessary to bring the method/target or test fully back on line. In some cases, that may not be necessary if all appropriate personnel have already agreed there is a problem and there is agreement on the steps needed to bring the method, target or test fully back on line.

The QA Manager will also initiate a corrective action report as described in Section 12 if one has not already been started. A copy of any meeting notes and agreed upon steps should be faxed or e-mailed by the laboratory to the appropriate General Manager and member of Corporate QA. This fax/e-mail acts as notification of the incident.

After suspension/restriction, the lab will hold all reports to clients pending review. No faxing, mailing or distributing through electronic means may occur. The report must not be posted for viewing on the internet. It is the responsibility of the Laboratory Director to hold all reporting and to notify all relevant laboratory personnel regarding the suspension/restriction (e.g., Project Management, Log-in, etc…). Clients will NOT generally be notified at this time. Analysis may proceed in some instances depending on the non-conformance issue.

Within 72 hours, the QA Manager will determine if compliance is now met and reports can be released, OR determine the plan of action to bring work into compliance, and release work. A team, with all principals involved (Laboratory Director, QA Manager, Supervisor) can devise a start-up plan to cover all steps from client notification through compliance and release of reports. Project Management, and the Directors of Client Services and Sales and Marketing must be notified if clients must be notified or if the suspension/restriction affects the laboratory's ability to accept work. The QA Manager must approve start-up or elimination of any restrictions after all corrective action is complete. This approval is given by final signature on the completed corrective action report.

SECTION 12

CORRECTIVE ACTION *(NELAC 5.4.10)*

12.1 OVERVIEW

A major component of TestAmerica's Quality Assurance (QA) Program is the problem investigation and feedback mechanism designed to keep the laboratory staff informed on quality related issues and to provide insight to problem resolution. When nonconforming work or departures from policies and procedures in the quality system or technical operations are identified, the corrective action procedure provides a systematic approach to assess the issues, restore the laboratory's system integrity, and prevent reoccurrence. Corrective actions are documented using Non-Conformance Memos (NCM) and Corrective Action Reports (CAR) (refer to Figure 12-1).

12.2 GENERAL

Problems within the quality system or within analytical operations may be discovered in a variety of ways, such as QC sample failures, internal or external audits, proficiency testing (PT) performance, client complaints, staff observation, etc..

The purpose of a corrective action system is to:

- Identify non-conformance events and assign responsibility(s) for investigating.
- Resolve non-conformance events and assign responsibility for any required corrective action.
- Identify Systematic Problems before they become serious.
- Identify and track client complaints and provide resolution.

12.2.1 Non-Conformance Memo (NCM) - is used to document the following types of corrective actions:

- Deviations from an established procedure or SOP
- QC outside of limits (non-matrix related)
- Isolated reporting / calculation errors
- Client complaints

12.2.2 Corrective Action Report (CAR) - is used to document the following types of corrective actions:

- Questionable trends that are found in the monthly review of NCMs.
- Issues found while reviewing NCMs that warrant further investigation.
- Internal and external audit findings.
- Failed or unacceptable PT results.
- Corrective actions that cross multiple departments in the laboratory.
- Systematic reporting / calculation errors

- Health and Safety violations.

12.3 CLOSED LOOP CORRECTIVE ACTION PROCESS

Any employee in the company can initiate a corrective action. There are four main components to a closed-loop corrective action process once an issue has been identified: Cause Analysis, Selection and Implementation of Corrective Actions (both short and long term), Monitoring of the Corrective Actions, and Follow-up.

12.3.1 Cause Analysis

- Upon discovery of a non-conformance event, the event must be defined and documented. An NCM or CAR must be initiated, someone is assigned to investigate the issue and the event is investigated for cause. Table 12-1 provides some general guidelines on determining responsibility for assessment.
- The cause analysis step is the key to the process as a long term corrective action cannot be determined until the cause is determined.
- If the cause is not readily obvious, the Supervisor, Laboratory Director, or QA Manager is consulted.

12.3.2 Selection and Implementation of Corrective Actions

- Where corrective action is needed, the laboratory shall identify potential corrective actions. The action(s) most likely to eliminate the problem and prevent recurrence are selected and implemented. Responsibility for implementation is assigned.
- Corrective actions shall be to a degree appropriate to the magnitude of the problem identified through the cause analysis.
- Whatever corrective action is determined to be appropriate, the laboratory shall document and implement the changes. The NCM or CAR is used for this documentation.

12.3.3 Root Cause Analysis

Root Cause Analysis is a class of problem solving (investigative) methods aimed at identifying the basic or causal factor(s) that underlie variation in performance or the occurrence of a significant failure. The root cause may be buried under seemingly innocuous events, many steps preceding the perceived failure. At first glance, the immediate response is typically directed at a symptom and not the cause. Typically, root cause analysis would be best with three or more incidents to triangulate a weakness.

Systematically analyze and document the Root Causes of the more significant problems that are reported. Identify, track, and implement the corrective actions required to reduce the likelihood of recurrence of significant incidents. Trend the Root Cause data from these incidents to identify Root Causes that, when corrected, can lead to dramatic improvements in performance by eliminating entire classes of problems.

Identify the one event associated with problem and ask why this event occurred. Brainstorm the root causes of failures by asking why events occurred or conditions existed; and then why the cause occurred 5 consecutive times until you get to the root cause. For each of these sub

events or causes, ask why it occurred. Repeat the process for the other events associated with the incident.

Root cause analysis does not mean the investigation is over. Look at technique, or other systems outside the normal indicators. Often creative thinking will find root causes that ordinarily would be missed, and continue to plague the laboratory or operation.

12.3.4 Monitoring of the Corrective Actions

- The Department Manager/Supervisor and QA Manager are responsible to ensure that the corrective action taken was effective.
- Ineffective actions are documented and re-evaluated until acceptable resolution is achieved. Department Managers are accountable to the Laboratory Director to ensure final acceptable resolution is achieved and documented appropriately.
- Each NCM and CAR is entered into a database for tracking purposes and a monthly summary of all corrective actions is reviewed to aid in ensuring that the corrective actions have taken effect.
- The QA Manager reviews monthly NCMs and CARs for trends. Highlights are included in the QA monthly report (refer to Section 16). If a significant trend develops that adversely affects quality, an audit of the area is performed and corrective action implemented.
- Any out-of-control situations that are not addressed acceptably at the laboratory level may be reported to the Corporate Quality Director by the QA Manager, indicating the nature of the out-of-control situation and problems encountered in solving the situation.

12.3.5 Follow-up Audits

- Follow-up audits may be initiated by the QA Manager and shall be performed as soon as possible when the identification of a nonconformance casts doubt on the laboratory's compliance with its own policies and procedures, or on its compliance with state or federal requirements.
- These audits often follow the implementation of the corrective actions to verify effectiveness. An additional audit would only be necessary when a critical issue or risk to business is discovered.

(Also refer to Section 15.1.4, Special Audits.)

12.4 TECHNICAL CORRECTIVE ACTIONS

In addition to providing acceptance criteria and specific protocols for technical corrective actions in the method SOPs, the laboratory has general procedures to be followed to determine when departures from the documented policies and procedures and quality control have occurred (refer to Section 11). The documentation of these procedures is through the use of an NCM or CAR.

Table 12-1 includes examples of general technical corrective actions. For specific criteria and corrective actions, refer to the analytical methods or specific method SOPs. The laboratory may also maintains Work Instructions on these items that are available upon request.

Table 12-1 provides some general guidelines for identifying the individual(s) responsible for assessing each QC type and initiating corrective action. The table also provides general guidance on how a data set should be treated if associated QC measurements are unacceptable. Specific procedures are included in Method SOPs, Work Instructions, QAM Sections 19 and 20. All corrective actions are reviewed monthly, at a minimum, by the QA Manager and highlights are included in the QA monthly report.

To the extent possible, samples shall be reported only if all quality control measures are acceptable. If the deficiency does not impair the usability of the results, data will be reported with an appropriate data qualifier and/or the deficiency will be noted in the case narrative. Where sample results may be impaired, the Project Manager is notified by an NCM and appropriate corrective action (e.g., reanalysis) is taken and documented.

12.5 BASIC CORRECTIONS

When mistakes occur in records, each mistake shall be crossed-out, [not obliterated (e.g. no white-out)], and the correct value entered alongside. All such corrections shall be initialed (or signed) and dated by the person making the correction. In the case of records stored electronically, the original “uncorrected” file must be maintained intact and a second “corrected” file is created.

This same process applies to adding additional information to a record. All additions made later than the initial must also be initialed (or signed) and dated. When corrections are due to reasons other than obvious transcription errors, the reason for the corrections (or additions) shall also be documented.

Figure 12-1.
Example - Corrective Action Report

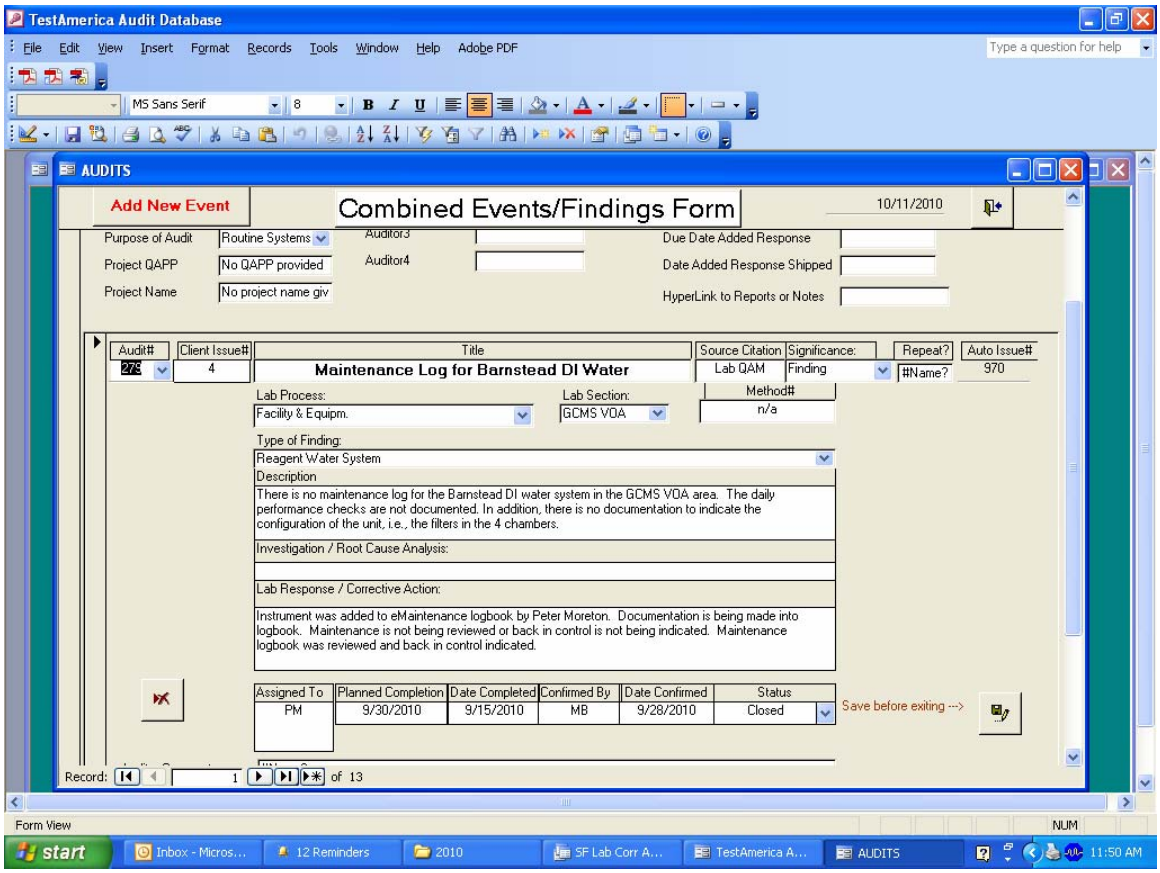


Table 12-1.

Example – General Corrective Action Procedures

QC Activity ***(Individual Responsible for Initiation/Assessment)***	**Acceptance Criteria**	**Recommended Corrective Action**
Initial Instrument Blank *(Analyst)*	- Instrument response < MDL.	- Prepare another blank. - If same response, determine cause of contamination: reagents, environment, instrument equipment failure, etc..
Initial Calibration Standards *(Analyst, Supervisor)*	- Correlation coefficient > 0.99 or standard concentration value. - % Recovery within acceptance range. - See details in Method SOP.	- Reanalyze standards. - If still unacceptable, remake standards and recalibrate instrument.
Independent Calibration Verification (Second Source) *(Analyst, Supervisor)*	- % Recovery within control limits.	- Remake and reanalyze standard. - If still unacceptable, then remake calibration standards or use new primary standards and recalibrate instrument.
Continuing Calibration Standards *(Analyst, Data Reviewer)*	% Recovery within control limits.	- Reanalyze standard. - If still unacceptable, then recalibrate and rerun affected samples.
Matrix Spike / Matrix Spike Duplicate (MS/MSD) *(Analyst, Data Reviewer)*	- % Recovery within limits documented in the LIMS	- If the acceptance criteria for duplicates or matrix spikes are not met because of matrix interferences, the acceptance of the analytical batch is determined by the validity of the LCS. - If the LCS is within acceptable limits the batch is acceptable. - The results of the duplicates, matrix spikes and the LCS are reported with the data set.
Laboratory Control Sample (LCS) *(Analyst, Data Reviewer)*	- % Recovery within limits specified in the LIMS	- Batch must be re-prepared and re-analyzed. Note: If there is insufficient sample or the holding time cannot be met, contact client and report with flags.
Surrogates *(Analyst, Data Reviewer)*	- % Recovery within limits of method or within three standard deviations of the historical mean.	- Individual sample must be repeated. Place comment in LIMS.
Method Blank (MB_ *(Analyst, Data Reviewer)*	< Reporting Limit [1]	- Reanalyze blank. - If still positive, determine source of contamination. If necessary, reprocess (i.e. digest or extract) entire sample batch. Report blank results.

QC Activity ***(Individual Responsible for Initiation/Assessment)***	**Acceptance Criteria**	**Recommended Corrective Action**
Proficiency Testing (PT) Samples *(QA Manager, Department Manager/Supervisor)*	- Criteria supplied by PT Supplier.	- Any failures or warnings must be investigated for cause. Failures may result in the need to repeat a PT sample to show the problem is corrected.
Internal / External Audits *(QA Manager, Department Manager/Supervisor, Laboratory Director/Manager)*	- Defined in Quality System documentation such as SOPs, QAM, etc..	- Non-conformances must be investigated through CAR system and necessary corrections must be made.
Reporting / Calculation Errors (Depends on issue – possible individuals include: Analysts, Data Reviewers, Project Managers, Department Manager/ Supervisor, QA Manager, Corporate QA, Corporate Management)	- SOP CA-L-S-001, Internal Investigation of Potential Data Discrepancies and Determination for Data Recall.	- Corrective action is determined by type of error. Follow the procedures in SOP CA-L-S-001.
Client Complaints *(Project Managers, Lab Director/Manager, Sales and Marketing)*	-	- Corrective action is determined by the type of complaint. For example, a complaint regarding an incorrect address on a report will result in the report being corrected and then follow-up must be performed on the reasons the address was incorrect (e.g., database needs to be updated).
QA Monthly Report (Refer to Section 16 for an example) (QA Manager, Lab Director/Manager, Department Supervisors/Managers)	- QAM, SOPs.	- Corrective action is determined by the type of issue. For example, CARs for the month are reviewed and possible trends are investigated.

QC Activity ***(Individual Responsible for Initiation/Assessment)***	**Acceptance Criteria**	**Recommended Corrective Action**
Health and Safety Violation (Safety Officer, Lab Director/Manager, Department Supervisor/Manager)	- Environmental Health and Safety (EHS) Manual.	- Non-conformance is investigated and corrected through CAR system.

Note:

1. Except as noted below for certain compounds, the method blank should be below the detection limit. Concentrations up to five times the reporting limit will be allowed for the ubiquitous laboratory and reagent contaminants: methylene chloride, toluene, acetone, 2-butanone and phthalates **provided** they appear in similar levels in the reagent blank and samples. This allowance presumes that the detection limit is significantly below any regulatory limit to which the data are to be compared and that blank subtraction will not occur.

SECTION 13

PREVENTIVE ACTION *(NELAC 5.4.11)*

13.1 OVERVIEW

The laboratory's preventive action programs improve, or eliminate potential causes of nonconforming product and/or nonconformance to the quality system. This preventive action process is a proactive continuous process improvement activity that can be initiated through feedback from clients, employees, business providers, and affiliates. The QA Department has the overall responsibility to ensure that the preventive action process is in place, and that relevant information on actions is submitted for management review.

Dedicating resources to an effective preventive action system emphasizes the laboratory's commitment to its Quality Program. It is beneficial to identify and address negative trends before they develop into complaints, problems and corrective actions. Additionally, customer service and satisfaction can be improved through continuous improvements to laboratory systems.

Opportunities for improvement may be discovered during management reviews, the QA Metrics Report, internal or external audits, proficiency testing performance, client complaints, staff observation, etc..

The monthly QA Metrics Report shows performance indicators in all areas of the quality system. These areas include revised reports, corrective actions, audit findings, internal auditing and data authenticity audits, client complaints, PT samples, holding time violations, SOPs, ethics training, etc. These metrics are used to help evaluate quality system performance on an ongoing basis and provide a tool for identifying areas for improvement.

The laboratory's corrective action process is integral to implementation of preventive actions. A critical piece of the corrective action process is the implementation of actions to prevent further occurrence of a non-compliance event. Historical review of corrective action provides a valuable mechanism for identifying preventive action opportunities.

13.1.1 The following elements are part of a preventive action system:

- Identification of an opportunity for preventive action.
- Process for the preventive action.
- Define the measurements of the effectiveness of the process once undertaken.
- Execution of the preventive action.
- Evaluation of the plan using the defined measurements.
- Verification of the effectiveness of the preventive action.
- Close-Out by documenting any permanent changes to the Quality System as a result of the Preventive Action. Documentation of Preventive Action is incorporated into the monthly QA reports, corrective action process and management review.

13.1.2 Any Preventive Actions undertaken or attempted shall be taken into account during the Annual Management Review (Section 16). A highly detailed recap is not required; a simple recount of success and failure within the preventive action program will provide management a measure for evaluation.

13.2 MANAGEMENT OF CHANGE

The Management of Change process is designed to manage significant events and changes that occur within the laboratory. Through these procedures, the potential risks inherent with a new event or change are identified and evaluated. The risks are minimized or eliminated through pre-planning and the development of preventive measures. The types of changes covered under this system include: Facility Changes, Major Accreditation Changes, Addition or Deletion to Division's Capabilities or Instrumentation, Key Personnel Changes and Laboratory Information Management System (LIMS) changes.

SECTION 14

CONTROL OF RECORDS *(NELAC 5.4.12)*

The laboratory maintains a record system appropriate to its needs and that complies with applicable standards or regulations as required. The system produces unequivocal, accurate records that document all laboratory activities. The laboratory retains all original observations, calculations and derived data, calibration records and a copy of the analytical report for a minimum of five years after it has been issued.

14.1 OVERVIEW

The laboratory has established procedures for identification, collection, indexing, access, filing, storage, maintenance and disposal of quality and technical records. A record index is listed in Table 14-1. Quality records are maintained by the QA department in a database, which is backed up as part of the regular laboratory backup. Records are of two types; either electronic or hard copy paper formats depending on whether the record is computer or hand generated (some records may be in both formats). Technical records are maintained by the IT Department.

Table 14-1. Record Index[1]

	Record Types [1]:	**Retention Time:**
Technical Records	- Raw Data - Logbooks[2] - Standards - Certificates - Analytical Records - Lab Reports	5 Years from analytical report issue*
Official Documents	- Quality Assurance Manual (QAM) - Work Instructions - Policies - SOPs - Policy Memorandums - Manuals	5 Years from document retirement date*
QA Records	- Internal & External Audits/Responses - Certifications - Corrective/Preventive Actions - Management Reviews - Method & Software Validation / Verification Data - Data Investigation	5 Years from archival* **Data Investigation:** 5 years or the life of the affected raw data storage whichever is greater (beyond 5 years if ongoing project or pending investigation)
Project Records	- Sample Receipt & COC Documentation - Contracts and Amendments - Correspondence - QAPP -SAP - Telephone Logbooks - Lab Reports	5 Years from analytical report issue*

	Record Types [1]:	**Retention Time:**
Administrative Records	Finance and Accounting	10 years
	EH&S Manual, Permits, Disposal Records	7 years
	Employee Handbook	Indefinitely
	Personnel files, Employee Signature & Initials, Administrative Training Records (e.g., Ethics)	7 Years (HR Personnel Files must be maintained indefinitely)
	Administrative Policies Technical Training Records	7 years

[1] Record Types encompass hardcopy and electronic records.
[2] Examples of Logbook types: Maintenance, Instrument Run, Preparation (standard and samples), Standard and Reagent Receipt, Archiving, Balance Calibration, Temperature (hardcopy or electronic records).
* Exceptions listed in Table 14-2.

14.1.1 All records are stored and retained in such a way that they are secure and readily retrievable at the laboratory facility or the Access Data Storage Facility that provides a suitable environment to prevent damage or deterioration and to prevent loss**.** All records shall be protected against fire, theft, loss, environmental deterioration, and vermin. In the case of electronic records, electronic or magnetic sources, storage media are protected from deterioration caused by magnetic fields and/or electronic deterioration.

Access to the data is limited to laboratory and company employees**.** Records archived off-site are stored in a secure location where a record is maintained of any entry into the storage facility. Whether on-site or off-site storage is used, logs are maintained in each storage box to note removal and return of records. Retention of records are maintained on-site at the laboratory for at least two months after their generation and moved offsite for the remainder of the required storage time. Records are maintained for a minimum of five years unless otherwise specified by a client or regulatory requirement.

For raw data and project records, record retention shall be calculated from the date the project report is issued. For other records, such as Controlled Documents, QA, or Administrative Records, the retention time is calculated from the date the record is formally retired. Records related to the programs listed in Table 14-2 have lengthier retention requirements and are subject to the requirements in Section 14.1.3.

14.1.2 Programs with Longer Retention Requirements

Some regulatory programs have longer record retention requirements than the standard record retention time. These are detailed in Table 14-2 with their retention requirements. In these cases, the longer retention requirement is enacted. If special instructions exist such that client data cannot be destroyed prior to notification of the client, the container or box containing that data is marked as to who to contact for authorization prior to destroying the data.

Table 14-2. Example: Special Record Retention Requirements

Program	[1]Retention Requirement
Drinking Water – All States	10 years (project records)
Drinking Water Lead and Copper Rule	12 years (project records)

[1]Note: Extended retention requirements must be noted with the archive documents or addressed in facility-specific records retention procedures.

14.1.3 The laboratory has procedures to protect and back-up records stored electronically and to prevent unauthorized access to or amendment of these records. All analytical data is maintained as hard copy or in a secure readable electronic format. For analytical reports that are maintained as copies in PDF format, refer to Section 19.14.1 for more information, as well as SOP SF-IT-0001.

14.1.4 The record keeping system allows for historical reconstruction of all laboratory activities that produced the analytical data, as well as rapid recovery of historical data (Records stored off site should be accessible within 2 days of a request for such records). The history of the sample from when the laboratory took possession of the samples must be readily understood through the documentation. This shall include inter-laboratory transfers of samples and/or extracts.

- The records include the identity of personnel involved in sampling, sample receipt, preparation, or testing. All analytical work contains the initials (at least) of the personnel involved. The laboratory's copy of the COC is stored with the invoice and the work order sheet generated by the LIMS. The chain of custody would indicate the name of the sampler. If any sampling notes are provided with a work order, they are kept with this package.

- All information relating to the laboratory facilities equipment, analytical test methods, and related laboratory activities, such as sample receipt, sample preparation, or data verification are documented.

- The record keeping system facilitates the retrieval of all working files and archived records for inspection and verification purposes (e.g., set format for naming electronic files, set format for what is included with a given analytical data set. Reports are recorded by job number (location 720- then a sequential number); data is associated with a preparation batch number and an analytical batch number. Instrument data is stored sequentially by instrument. A given day's analyses are maintained in the order of the analysis. Run logs are maintained for each instrument or method; a copy of each day's run long or instrument sequence is stored with the data to aid in re-constructing an analytical sequence. Where an analysis is performed without an instrument, bound logbooks or bench sheets are used to record and file data. Standard and reagent information is entered into the LIMS for each method as required.

- Changes to hardcopy records shall follow the procedures outlined in Section 12 and 19. Changes to electronic records in LIMS or instrument data are recorded in audit trails.

- The reason for a signature or initials on a document is clearly indicated in the records such as “sampled by,” “prepared by,” “reviewed by”, or “analyzed by”.

- All generated data except those that are generated by automated data collection systems, are recorded directly, promptly and legibly in permanent dark ink.

- Hard copy data may be scanned into PDF format for record storage as long as the scanning process can be verified in order to ensure that no data is lost and the data files and storage media must be tested to verify the laboratory’s ability to retrieve the information prior to the destruction of the hard copy that was scanned.

- Also refer to Section 19.14.1 ‘Computer and Electronic Data Related Requirements’**.**

14.2 TECHNICAL AND ANALYTICAL RECORDS

14.2.1 The laboratory retains records of original observations, derived data and sufficient information to establish an audit trail, calibration records, staff records and a copy of each analytical report issued, for a minimum of five years unless otherwise specified by a client or regulatory requirement. The records for each analysis shall contain sufficient information to enable the analysis to be repeated under conditions as close as possible to the original. The records shall include the identity of laboratory personnel responsible for the sampling, performance of each analysis and reviewing results.

14.2.2 Observations, data and calculations are recorded real-time and are identifiable to the specific task.

14.2.3 Changes to hardcopy records shall follow the procedures outlined in Section 12 and 19. Changes to electronic records in LIMS or instrument data are recorded in audit trails.

The essential information to be associated with analysis, such as strip charts, tabular printouts, computer data files, analytical notebooks, and run logs, include:

- laboratory sample ID code**;**
- Date of analysis; Time of Analysis is also required if the holding time is seventy-two (72) hours or less, or when time critical steps are included in the analysis (e.g., drying times, incubations, etc.); instrumental analyses have the date and time of analysis recorded as part of their general operations. Where a time critical step exists in an analysis, location for such a time is included as part of the documentation in a specific logbook or on a benchsheet.
- Instrumentation identification and instrument operating conditions/parameters. Operating conditions/parameters are typically recorded in instrument maintenance logs where available.
- analysis type**;**
- all manual calculations and manual integrations**;**
- analyst's or operator's initials/signature**;**

- sample preparation including cleanup, separation protocols, incubation periods or subculture, ID codes, volumes, weights, instrument printouts, meter readings, calculations, reagents;
- test results;
- standard and reagent origin, receipt, preparation, and use;
- calibration criteria, frequency and acceptance criteria;
- data and statistical calculations, review, confirmation, interpretation, assessment and reporting conventions;
- quality control protocols and assessment;
- electronic data security, software documentation and verification, software and hardware audits, backups, and records of any changes to automated data entries; and
- Method performance criteria including expected quality control requirements. These are indicated both in the LIMS and on specific analytical report formats.

14.3 LABORATORY SUPPORT ACTIVITIES

In addition to documenting all the above-mentioned activities, the following are retained QA records and project records (previous discussions in this section relate where and how these data are stored):

- all original raw data, whether hard copy or electronic, for calibrations, samples and quality control measures, including analysts' work sheets and data output records (chromatograms, strip charts, and other instrument response readout records);
- a written description or reference to the specific test method used which includes a description of the specific computational steps used to translate parametric observations into a reportable analytical value;
- copies of final reports;
- archived SOPs;
- correspondence relating to laboratory activities for a specific project;
- all corrective action reports, audits and audit responses;
- proficiency test results and raw data; and
- results of data review, verification, and cross-checking procedures

14.3.1 Sample Handling Records

Records of all procedures to which a sample is subjected while in the possession of the laboratory are maintained. These include but are not limited to records pertaining to:

- sample preservation including appropriateness of sample container and compliance with holding time requirement;
- sample identification, receipt, acceptance or rejection and login;
- sample storage and tracking including shipping receipts, sample transmittal / COC forms;

and

- procedures for the receipt and retention of samples, including all provisions necessary to protect the integrity of samples.

14.4 ADMINISTRATIVE RECORDS

The laboratory also maintains the administrative records in either electronic or hard copy form. Refer to Table 14-1.

14.5 RECORDS MANAGEMENT, STORAGE AND DISPOSAL

14.5.1 All records (including those pertaining to test equipment), certificates and reports are safely stored, held secure and in confidence to the client. Certification related records are available upon request.

14.5.2 All information necessary for the historical reconstruction of data is maintained by the laboratory. Records that are stored only on electronic media must be supported by the hardware and software necessary for their retrieval.

14.5.3 Records that are stored or generated by computers or personal computers have hard copy, write-protected backup copies, or an electronic audit trail controlling access**.**

14.5.4 The laboratory has a record management system (a.k.a., document control) for control of laboratory notebooks, instrument logbooks, standards logbooks, and records for data reduction, validation, storage and reporting. Laboratory notebooks are issued on a per analysis basis, and are numbered sequentially. All data are recorded sequentially within a series of sequential notebooks. Bench sheets are filed sequentially. Standards are maintained in the LIMS – no logbooks are used to record that data**.** Records are considered archived when noted as such in the records management system (a.k.a., document control.)

14.5.5 Transfer of Ownership

In the event that the laboratory transfers ownership or goes out of business, the laboratory shall ensure that the records are maintained or transferred according to client's instructions. Upon ownership transfer, record retention requirements shall be addressed in the ownership transfer agreement and the responsibility for maintaining archives is clearly established. In addition, in cases of bankruptcy, appropriate regulatory and state legal requirements concerning laboratory records must be followed. In the event of the closure of the laboratory, all records will revert to the control of the corporate headquarters. Should the entire company cease to exist, as much notice as possible will be given to clients and the accrediting bodies who have worked with the laboratory during the previous 5 years of such action.

14.5.6 Records Disposal

14.5.6.1 Records are removed from the archive and destroyed after 5 years unless otherwise specified by a client or regulatory requirement. On a project specific or program basis, clients may need to be notified prior to record destruction. Records are destroyed in a manner that ensures their confidentiality such as shredding, mutilation or incineration. (Refer to Tables 14-1 and 14-2).

14.5.6.2 Electronic copies of records must be destroyed by erasure or physically damaging off-line storage media so no records can be read.

14.5.6.3 If a third party records management company is hired to dispose of records, a "Certificate of Destruction" is required.

SECTION 15

AUDITS *(NELAC 5.4.13)*

15.1 INTERNAL AUDITS

Internal audits are performed to verify that laboratory operations comply with the requirements of the lab's quality system and with the external quality programs under which the laboratory operates. Audits are planned and organized by the QA staff. Personnel conducting the audits should be independent of the area being evaluated. Auditors will have sufficient authority, access to work areas, and organizational freedom necessary to observe all activities affecting quality and to report the assessments to laboratory management and when requested to corporate management.

Audits are conducted and documented as described in the TestAmerica Corporate SOP on performing Internal Audits, SOP No. CA-Q-S-004. The types and frequency of routine internal audits are shown in Table 15-1. Special or ad hoc assessments may be conducted as needed under the direction of the QA staff.

Table 15-1. Types of Internal Audits and Frequency

Description	Performed by	Frequency
Quality Systems	QA Department or Designee	All areas of the laboratory annually
QA Technical Audits - Evaluate raw data versus final reports - Analyst integrity - Data authenticity	QA Department or Designee	All methods within a 2-year period, with at least 15% of methods every quarter
SOP Method Compliance	Department Manager	- All SOPs within a 2-year period - All new analysts or new analyst/methods within 3 months of IDOC
Special	QA Department or Designee	Surveillance or spot checks performed as needed
Performance Testing	Analysts with QA oversight	One successful per year for each or as dictated by regulatory requirements

15.1.1 Annual Quality Systems Audit

An annual quality systems audit is required to ensure compliance to analytical methods and SOPs, the laboratory's Data Integrity and Ethics Policies, client and state requirements, and the effectiveness of the internal controls of the analytical process, including but not limited to data review, quality controls, preventive action and corrective action. The completeness of earlier corrective actions is assessed. The audit is divided into modules for each operating or support area of the lab, and each module is comprehensive for a given area. The area audits may be

done on a rotating schedule throughout the year to ensure adequate coverage of all areas. This schedule may change as situations in the laboratory warrant.

15.1.2 QA Technical Audits

QA technical audits are based on client projects, associated sample delivery groups, and the methods performed. Reported results are compared to raw data to verify the authenticity of results. The validity of calibrations and QC results are compared to data qualifiers, footnotes, and case narratives. Documentation is assessed by examining run logs and records of manual integrations. Manual calculations are checked. Where possible, Audit Miner is used to identify unusual manipulations of the data deserving closer scrutiny. QA technical audits will include all methods within a two-year period.

15.1.3 SOP Method Compliance

Compliance of all SOPs with the source methods and compliance of the operational groups with the SOPs will be assessed by the Department Manager at least every two years. The work of each newly hired analyst is assessed within 3 months of working independently, (e.g., completion of method IDOC). In addition, as analysts add methods to their capabilities, (new IDOC) reviews of the analyst work products will be performed within 3 months of completing the documented training.

15.1.4 Special Audits

Special audits are conducted on an as needed basis, generally as a follow up to specific issues such as client complaints, corrective actions, PT results, data audits, system audits, validation comments, regulatory audits or suspected ethical improprieties. Special audits are focused on a specific issue, and report format, distribution, and timeframes are designed to address the nature of the issue.

15.1.5 Performance Testing

The laboratory participates annually in performance audits conducted through the analysis of PT samples provided by a third party. The laboratory generally participates in the following types of PT studies: Waste Water, Soil/Hazardous Waste and UST sample.

It is TestAmerica's policy that PT samples be treated as typical samples in the production process. Furthermore, where PT samples present special or unique problems, in the regular production process they may need to be treated differently, as would any special or unique request submitted by any client. The QA Manager must be consulted and in agreement with any decisions made to treat a PT sample differently due to some special circumstance.

Written responses to unacceptable PT results are required. In some cases it may be necessary for blind QC samples to be submitted to the laboratory to show a return to control.

15.2 EXTERNAL AUDITS

External audits are performed when certifying agencies or clients conduct on-site inspections or submit performance testing samples for analysis. It is TestAmerica's policy to cooperate fully with regulatory authorities and clients. The laboratory makes every effort to provide the auditors with access to personnel, documentation, and assistance. Laboratory supervisors are responsible for providing corrective actions to the QA Manager who coordinates the response for any deficiencies discovered during an external audit. Audit responses are due in the time allotted by the client or agency performing the audit. When requested, a copy of the audit report and the labs corrective action plan will be forwarded to Corporate Quality.

The laboratory cooperates with clients and their representatives to monitor the laboratory's performance in relation to work performed for the client. The client may only view data and systems related directly to the client's work. All efforts are made to keep other client information confidential.

15.2.1 Confidential Business Information (CBI) Considerations

During on-site audits, auditors may come into possession of information claimed as business confidential. A business confidentiality claim is defined as "a claim or allegation that business information is entitled to confidential treatment for reasons of business confidentiality or a request for a determination that such information is entitled to such treatment." When information is claimed as business confidential, the laboratory must place on (or attach to) the information at the time it is submitted to the auditor, a cover sheet, stamped or typed legend or other suitable form of notice, employing language such as "trade secret", "proprietary" or "company confidential". Confidential portions of documents otherwise non-confidential must be clearly identified. CBI may be purged of references to client identity by the responsible laboratory official at the time of removal from the laboratory. However, sample identifiers may not be obscured from the information. Additional information regarding CBI can be found in within the 2003 NELAC standards.

15.3 AUDIT FINDINGS

Audit findings are documented using the corrective action process and database. The laboratory's corrective action responses for both types of audits may include action plans that could not be completed within a predefined timeframe. In these instances, a completion date must set and agreed to by operations management and the QA Manager.

Developing and implementing corrective actions to findings is the responsibility of the Department Manager where the finding originated. Findings that are not corrected by specified due dates are reported monthly to management in the QA monthly report. . When requested, a copy of the audit report and the lab's corrective action plan will be forwarded to Corporate Quality.

If any audit finding casts doubt on the effectiveness of the operations or on the correctness or validity of the laboratory's test results, the laboratory shall take timely corrective action, and shall notify clients in writing if the investigations show that the laboratory results have been affected. Once corrective action is implemented, a follow-up audit is scheduled to ensure that the problem has been corrected.

Clients must be notified promptly in writing, of any event such as the identification of defective measuring or test equipment that casts doubt on the validity of results given in any test report or amendment to a test report. The investigation must begin within 24-hours of discovery of the problem and all efforts are made to notify the client within two weeks after the completion of the investigation.

SECTION 16

MANAGEMENT REVIEWS *(NELAC 5.4.14)*

16.1 QUALITY ASSURANCE REPORT

A comprehensive QA Report shall be prepared each month by the laboratory's QA Department and forwarded to the Laboratory Director, Operation Manager, their Quality Director as well as the General Manager. All aspects of the QA system are reviewed to evaluate the suitability of policies and procedures. During the course of the year, the Laboratory Director, General Manager or Corporate QA may request that additional information be added to the report.

On a monthly basis, Corporate QA compiles information from all the monthly laboratory reports. The Corporate Quality Directors prepare a report that includes a compilation of all metrics and notable information and concerns regarding the QA programs within the laboratories. The report also includes a listing of new regulations that may potentially impact the laboratories. This report is presented to the Senior Management Team and General Managers.

16.2 ANNUAL MANAGEMENT REVIEW

The senior lab management team (Laboratory Director and QA Manager) conducts a review annually of its quality systems and LIMS to ensure its continuing suitability and effectiveness in meeting client and regulatory requirements and to introduce any necessary changes or improvements. It will also provide a platform for defining quality goals & objectives. Corporate Operations and Corporate QA personnel is be included in this meeting at the discretion of the Laboratory Director. The LIMS review consists of examining any audits, complaints or concerns that have been raised through the year that are related to the LIMS. The laboratory will summarize any critical findings that can not be solved by the lab and report them to Corporate IT.

This management systems review (Corporate Work Instruction No. CA-Q-S-008 & Work Instruction No. CA-Q-WI-020) uses information generated during the preceding year to assess the "big picture" by ensuring that routine actions taken and reviewed on a monthly basis are not components of larger systematic concerns. The monthly review should keep the quality systems current and effective, therefore, the annual review is a formal senior management process to review specific existing documentation. Significant issues from the following documentation are compiled or summarized by the QA Manager prior to the review meeting:

- Matters arising from the previous annual review.
- Prior Monthly QA Reports issues.
- Laboratory QA Metrics.
- Review of report reissue requests.
- Review of client feedback and complaints.
- Issues arising from any prior management or staff meetings.
- Minutes from prior senior lab management meetings. Issues that may be raised from these meetings include:

  - Adequacy of staff, equipment and facility resources.
  - Adequacy of policies and procedures.
  - Future plans for resources and testing capability and capacity.

- The annual internal double blind PT program sample performance (if performed),
- Compliance to the Ethics Policy and Data Integrity Plan. Including any evidence/incidents of inappropriate actions or vulnerabilities related to data Integrity.

A report is generated by the QA Manager and management. The report is distributed to the appropriate General Manager and the Quality Director. The report includes, but is not limited to:

- The date of the review and the names and titles of participants.
- A reference to the existing data quality related documents and topics that were reviewed.
- Quality system or operational changes or improvements that will be made as a result of the review [e.g., an implementation schedule including assigned responsibilities for the changes (Action Table)].

Changes to the quality systems requiring update to the laboratory QA Manual shall be included in the next revision of the QA Manual.

16.3 POTENTIAL INTEGRITY RELATED MANAGERIAL REVIEWS

Potential integrity issues (data or business related) must be handled and reviewed in a confidential manner until such time as a follow-up evaluation, full investigation, or other appropriate actions have been completed and issues clarified. TestAmerica's Corporate Data Investigation/Recall SOP shall be followed (SOP No. CA-L-S-001). All investigations that result in finding of inappropriate activity are documented and include any disciplinary actions involved, corrective actions taken, and all appropriate notifications of clients.

TestAmerica's COO, VP of Client & Technical Services, General Managers and Quality Directors receive a monthly report from the Director of Quality & Client Advocacy summarizing any current data integrity or data recall investigations. The General Manager's are also made aware of progress on these issues for their specific labs.

SECTION 17

PERSONNEL *(NELAC 5.5.2)*

17.1 OVERVIEW

The laboratory's management believes that its highly qualified and professional staff is the single most important aspect in assuring a high level of data quality and service. The staff consists of professionals and support personnel as outlined in the organization chart in Figure 4-1.

All personnel must demonstrate competence in the areas where they have responsibility. Any staff that is undergoing training shall have appropriate supervision until they have demonstrated their ability to perform their job function on their own. Staff shall be qualified for their tasks based on appropriate education, training, experience and/or demonstrated skills as required.

The laboratory employs sufficient personnel with the necessary education, training, technical knowledge and experience for their assigned responsibilities.

All personnel are responsible for complying with all QA/QC requirements that pertain to the laboratory and their area of responsibility. Each staff member must have a combination of experience and education to adequately demonstrate a specific knowledge of their particular area of responsibility. Technical staff must also have a general knowledge of lab operations, test methods, QA/QC procedures and records management.

Laboratory management is responsible for formulating goals for lab staff with respect to education, training and skills and ensuring that the laboratory has a policy and procedures for identifying training needs and providing training of personnel. The training shall be relevant to the present and anticipated responsibilities of the lab staff.

The laboratory only uses personnel that are employed by or under contract to, the laboratory. Contracted personnel, when used, must meet competency standards of the laboratory and work in accordance to the laboratory's quality system.

17.2 EDUCATION AND EXPERIENCE REQUIREMENTS FOR TECHNICAL PERSONNEL

The laboratory makes every effort to hire analytical staffs that possess a college degree (AA, BA, BS) in an applied science with some chemistry in the curriculum. Exceptions can be made based upon the individual's experience and ability to learn. Selection of qualified candidates for laboratory employment begins with documentation of minimum education, training, and experience prerequisites needed to perform the prescribed task. Minimum education and training requirements for TestAmerica employees are outlined in job descriptions and are generally summarized for analytical staff in the table below.

The laboratory maintains job descriptions for all personnel who manage, perform or verify work affecting the quality of the environmental testing the laboratory performs. Job Descriptions are located on the TestAmerica intranet site's Human Resources web-page (Also see Section 4 for position descriptions/responsibilities).

Experience and specialized training are occasionally accepted in lieu of a college degree (basic lab skills such as using a balance, colony counting, aseptic or quantitation techniques, etc., are also considered).

As a general rule for analytical staff:

Specialty	Education	Experience
Extractions, Digestions, some electrode methods (pH, DO, Redox, etc.), or Titrimetric and Gravimetric Analyses	H.S. Diploma	On the job training (OJT)
CVAA, Single component or short list Chromatography (e.g., Fuels, BTEX-GC, IC)	A college degree in an applied science or 2 years of college and at least 1 year of college chemistry	Or 2 years prior analytical experience is required
ICP, ICPMS, Long List or complex chromatography (e.g., Pesticides, PCB, Herbicides, HPLC, etc.), GCMS	A college degree in an applied science or 2 years of college chemistry	or 5 years of prior analytical experience
Spectra Interpretation	A college degree in an applied science or 2 years of college chemistry	And 2 years relevant experience Or 5 years of prior analytical experience
Technical Directors/Department Managers – **General**	Bachelors Degree in an applied science or engineering with 24 semester hours in chemistry An advanced (MS, PhD.) degree may substitute for one year of experience	And 2 years experience in environmental analysis of representative analytes for which they will oversee
Technical Director – **Wet Chem** only (no advanced instrumentation)	Associates degree in an applied science or engineering or 2 years of college with 16 semester hours in chemistry	And 2 years relevant experience
Technical Director - Microbiology	Bachelors degree in applied science with at least 16 semester hours in general microbiology and biology An advanced (MS, PhD.) degree may substitute for one year of experience	And 2 years of relevant experience

When an analyst does not meet these requirements, they can perform a task under the direct supervision of a qualified analyst, peer reviewer or Department Manager, and are considered an analyst in training. The person supervising an analyst in training is accountable for the quality of the analytical data and must review and approve data and associated corrective actions.

17.3 TRAINING

The laboratory is committed to furthering the professional and technical development of employees at all levels.

Orientation to the laboratory's policies and procedures, in-house method training, and employee attendance at outside training courses and conferences all contribute toward employee proficiency. Below are examples of various areas of required employee training:

Required Training	Time Frame	Employee Type
Environmental Health & Safety	Prior to lab work	All
Ethics – New Hires	1 week of hire	All
Ethics – Comprehensive	90 days of hire	All
Data Integrity	30 days of hire	Technical and PMs
Quality Assurance	90 days of hire	All
Ethics – Comprehensive Refresher	Annually	All
Initial Demonstration of Capability (DOC)	Prior to unsupervised method performance	Technical

The laboratory maintains records of relevant authorization/competence, education, professional qualifications, training, skills and experience of technical personnel (including contracted personnel) as well as the date that approval/authorization was given. These records are kept on file at the laboratory. Also refer to "Demonstration of Capability" in Section 19.

The training of technical staff is kept up to date by:

- Each employee must have documentation in their training file that they have read, understood and agreed to follow the most recent version of the laboratory QA Manual and SOPs in their area of responsibility. This documentation is updated as SOPs are updated.
- Documentation from any training courses or workshops on specific equipment, analytical techniques or other relevant topics are maintained in their training file.
- Documentation of proficiency (refer to Section 19).
- An Ethics Agreement signed by each staff member (renewed each year) and evidence of annual ethics training.
- A Confidentiality Agreement signed by each staff member signed at the time of employment.
- Human Resources maintains documentation and attestation forms on employment status & records; benefit programs; timekeeping/payroll; and employee conduct (e.g., ethics). This information is maintained in the employee's secured personnel file.

17.4 DATA INTEGRITY AND ETHICS TRAINING PROGRAM

Establishing and maintaining a high ethical standard is an important element of a Quality System. Ethics and data integrity training is integral to the success of TestAmerica and is provided for each employee at TestAmerica. It is a formal part of the initial employee orientation within 1 week of hire followed by technical data integrity training within 30 days, comprehensive training within 90 days, and an annual refresher for all employees. Senior management at each facility performs the ethics training for their staff.

In order to ensure that all personnel understand the importance TestAmerica places on maintaining high ethical standards at all times; TestAmerica has established a Corporate Ethics Policy (Policy No. CA-L-P-001) and an Ethics Statement. All initial and annual training is documented by signature on the signed Ethics Statement demonstrating that the employee has participated in the training and understands their obligations related to ethical behavior and data integrity.

Violations of this Ethics Policy will not be tolerated. Employees who violate this policy will be subject to disciplinary actions up to and including termination. Criminal violations may also be referred to the Government for prosecution. In addition, such actions could jeopardize TestAmerica's ability to do work on Government contracts, and for that reason, TestAmerica has a Zero Tolerance approach to such violations.

Employees are trained as to the legal and environmental repercussions that result from data misrepresentation. Key topics covered in the presentation include:

- Organizational mission and its relationship to the critical need for honesty and full disclosure in all analytical reporting.
- Ethics Policy
- How and when to report ethical/data integrity issues. Confidential reporting.
- Record keeping.
- Discussion regarding data integrity procedures.
- Specific examples of breaches of ethical behavior (e.g. peak shaving, altering data or computer clocks, improper macros, etc., accepting/offering kickbacks, illegal accounting practices, unfair competition/collusion)
- Internal monitoring. Investigations and data recalls.
- Consequences for infractions including potential for immediate termination, debarment, or criminal prosecution.
- Importance of proper written narration / data qualification by the analyst and project manager with respect to those cases where the data may still be usable but are in one sense or another partially deficient.

Additionally, a data integrity hotline (1-800-736-9407) is maintained by TestAmerica and administered by the Corporate Quality Department.

SECTION 18

ACCOMMODATIONS AND ENVIRONMENTAL CONDITIONS *(NELAC 5.5.3)*

18.1 OVERVIEW

The laboratory is a 21,000 ft^2 secure laboratory facility with controlled access and designed to accommodate an efficient workflow and to provide a safe and comfortable work environment for employees. All visitors sign in and are escorted by laboratory personnel. Access is controlled by various measures.

The laboratory is equipped with structural safety features. Each employee is familiar with the location, use, and capabilities of general and specialized safety features associated with their workplace. The laboratory provides and requires the use of protective equipment including safety glasses, protective clothing, gloves, etc., OSHA and other regulatory agency guidelines regarding required amounts of bench and fume hood space, lighting, ventilation (temperature and humidity controlled), access, and safety equipment are met or exceeded.

Traffic flow through sample preparation and analysis areas is minimized to reduce the likelihood of contamination. Adequate floor space and bench top area is provided to allow unencumbered sample preparation and analysis space. Sufficient space is also provided for storage of reagents and media, glassware, and portable equipment. Ample space is also provided for refrigerated sample storage before analysis and archival storage of samples after analysis. Laboratory HVAC and deionized water systems are designed to minimize potential trace contaminants.

The laboratory is separated into specific areas for sample receiving, sample preparation, volatile organic sample analysis, non-volatile organic sample analysis, inorganic sample analysis and administrative functions.

18.2 ENVIRONMENT

Laboratory accommodation, test areas, energy sources, lighting are adequate to facilitate proper performance of tests. The facility is equipped with heating, ventilation, and air conditioning (HVAC) systems appropriate to the needs of environmental testing performed at this laboratory.

The environment in which these activities are undertaken does not invalidate the results or adversely affect the required accuracy of any measurements.

The laboratory provides for the effective monitoring, control and recording of environmental conditions that may affect the results of environmental tests as required by the relevant specifications, methods, and procedures. Such environmental conditions include humidity, voltage, temperature, and vibration levels in the laboratory.

When any of the method or regulatory required environmental conditions change to a point where they may adversely affect test results, analytical testing will be discontinued until the environmental conditions are returned to the required levels.

Environmental conditions of the facility housing the computer network and LIMS are regulated to protect against raw data loss.

18.3 WORK AREAS

There is effective separation between neighboring areas when the activities therein are incompatible with each other. Examples include:

- Volatile organic chemical handling areas, including sample preparation and waste disposal, and volatile organic chemical analysis areas.

Access to and use of all areas affecting the quality of analytical testing is defined and controlled by secure access to the laboratory building as described below in the Building Security section.

Adequate measures are taken to ensure good housekeeping in the laboratory and to ensure that any contamination does not adversely affect data quality. These measures include regular cleaning to control dirt and dust within the laboratory.

Work areas are available to ensure an unencumbered work area. Work areas include:

- Access and entryways to the laboratory.
- Sample receipt areas.
- Sample storage areas.
- Chemical and waste storage areas.
- Data handling and storage areas.
- Sample processing areas.
- Sample analysis areas.

18.4 FLOOR PLAN

A floor plan can be found in Appendix 1.

18.5 BUILDING SECURITY

Building keys and alarm codes are distributed to employees as necessary.

Visitors to the laboratory sign in and out in a visitor's logbook. A visitor is defined as any person who visits the laboratory who is not an employee of the laboratory. In addition to signing into the laboratory, the Environmental, Health and Safety Manual contains requirements for visitors and vendors. There are specific safety forms that must be reviewed and signed.

Visitors (with the exception of company employees) are escorted by laboratory personnel at all times, or the location of the visitor is noted in the visitor's logbook.

Signs are posted in the laboratory designating employee only areas - "Authorized employees beyond this point".

SECTION 19

TEST METHODS AND METHOD VALIDATION *(NELAC 5.5.4)*

19.1 OVERVIEW

The laboratory uses methods that are appropriate to meet our clients' requirements and that are within the scope of the laboratory's capabilities. These include sampling, handling, transport, storage and preparation of samples, and, where appropriate, an estimation of the measurement of uncertainty as well as statistical techniques for analysis of environmental data.

Instructions are available in the laboratory for the operation of equipment as well as for the handling and preparation of samples. All instructions, Standard Operating Procedures (SOPs), reference methods and manuals relevant to the working of the laboratory are readily available to all staff. Deviations from published methods are documented (with justification) in the laboratory's approved SOPs. SOPs are submitted to clients for review at their request. Significant deviations from published methods require client approval and regulatory approval where applicable.

19.2 STANDARD OPERATING PROCEDURES (SOPS)

The laboratory maintains SOPs that accurately reflect all phases of the laboratory such as assessing data integrity, corrective actions, handling customer complaints as well as all analytical methods and sampling procedures. The method SOPs are derived from the most recently promulgated/approved, published methods and are specifically adapted to the laboratory facility. Modifications or clarifications to published methods are clearly noted in the SOPs. All SOPs are controlled in the laboratory.

- All SOPs contain a revision number, effective date, and appropriate approval signatures. Controlled copies are available to all staff.
- Procedures for writing an SOP are incorporated by reference to TestAmerica's Corporate SOP entitled 'Writing a Standard Operating Procedure', No. CW-Q-S-002.
- SOPs are reviewed at a minimum of every 2 years and where necessary, revised to ensure continuing suitability and compliance with applicable requirements.

19.3 LABORATORY METHODS MANUAL

For each test method, the laboratory shall have available the published referenced method as well as the laboratory developed SOP.

Note: If more stringent standards or requirements are included in a mandated test method or regulation than those specified in this manual, the laboratory shall demonstrate that such requirements are met. If it is not clear which requirements are more stringent, the standard from the method or regulation is to be followed. Any exceptions or deviations from the referenced methods or regulations are noted in the specific analytical SOP.

The laboratory maintains an SOP Index for both technical and non-technical SOPs. Technical SOPs are maintained to describe a specific test method. Non-technical SOPs are maintained to describe functions and processes not related to a specific test method.

19.4 SELECTION OF METHODS

Since numerous methods and analytical techniques are available, continued communication between the client and laboratory is imperative to assure the correct methods are utilized. Once client methodology requirements are established, this and other pertinent information is summarized by the Project Manager. These mechanisms ensure that the proper analytical methods are applied when the samples arrive for log-in. For non-routine analytical services (e.g., special matrices, non-routine compound lists), the method of choice is selected based on client needs and available technology. The methods selected should be capable of measuring the specific parameter of interest, in the concentration range of interest, and with the required precision and accuracy.

19.4.1 Sources of Methods

Routine analytical services are performed using standard EPA-approved methodology. In some cases, modification of standard approved methods may be necessary to provide accurate analyses of particularly complex matrices. When the use of specific methods for sample analysis is mandated through project or regulatory requirements, only those methods shall be used.

When clients do not specify the method to be used or methods are not required, the methods used will be clearly validated and documented in an SOP and available to clients and/or the end user of the data.

The analytical methods used by the laboratory are those currently accepted and approved by the U. S. EPA and the state or territory from which the samples were collected. Reference methods include:

- *Standard Methods for the Examination of Water and Wastewater, 18^{t}, 19th, 20th, 21st/on-line edition; Eaton, A.D. Clesceri, L.S. Greenberg, A.E. Eds; American Water Works Association, Water Pollution Control Federation, American Public Health Association: Washington, D.C.*
- *Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW846), Third Edition, September 1986, Final Update I, July 1992, Final Update IIA, August 1993, Final Update II, September 1994; Final Update IIB, January 1995; Final Update III, December 1996.*
- *Annual Book of ASTM Standards, American Society for Testing & Materials (ASTM), Philadelphia, PA.)*
- *Code of Federal Regulations (CFR) 40, Parts 136, 141, 172, 173, 178, 179 and 261*

The laboratory reviews updated versions to all the aforementioned references for adaptation based upon capabilities, instrumentation, etc., and implements them as appropriate. As such, the laboratory strives to perform only the latest versions of each approved method as regulations allow or require.

Other reference procedures for non-routine analyses may include methods established by specific states (e.g., Underground Storage Tank methods), ASTM or equipment manufacturers.

Sample type, source, and the governing regulatory agency requiring the analysis will determine the method utilized.

The laboratory shall inform the client when a method proposed by the client may be inappropriate or out of date. After the client has been informed, and they wish to proceed contrary to the laboratory's recommendation, it will be documented.

19.4.2 Demonstration of Capability

Before the laboratory may institute a new method and begin reporting results, the laboratory shall confirm that it can properly operate the method. In general, this demonstration does not test the performance of the method in real world samples, but in an applicable and available clean matrix sample. If the method is for the testing of analytes that are not conducive to spiking, demonstration of capability may be performed on quality control samples.

19.4.2.1 A demonstration of capability (General Analyst Training SOP SF-QA-1700) is performed whenever there is a change in instrument type (e.g., new instrumentation), method or personnel.

19.4.2.2 The initial demonstration of capability must be thoroughly documented and approved by the Laboratory Director and QA Manager prior to independently analyzing client samples. All associated documentation must be retained in accordance with the laboratories archiving procedures.

19.4.2.3 The laboratory must have an approved SOP, demonstrate satisfactory performance, and conduct an MDL study (when applicable). There may be other requirements as stated within the published method or regulations (i.e., retention time window study).

Note: In some instances, a situation may arise where a client requests that an unusual analyte be reported using a method where this analyte is not normally reported. If the analyte is being reported for regulatory purposes, the method must meet all procedures outlined within this QA Manual (SOP, MDL, and Demonstration of Capability). If the client states that the information is not for regulatory purposes, the result may be reported as long as the following criteria are met:

- The instrument is calibrated for the analyte to be reported using the criteria for the method and ICV/CCV criteria are met (unless an ICV/CCV is not required by the method or criteria are per project DQOs).
- The laboratory's nominal or default reporting limit (RL) is equal to the quantitation limit (QL), must be at or above the lowest non-zero standard in the calibration curve and must be reliably determined. Project RLs are client specified reporting levels which may be higher than the QL. Results reported below the QL must be qualified as estimated values. Also see Section 19.6.1.3, Relationship of Limit of Detection (LOD) to Quantitation Limit (QL).
- The client request is documented and the lab informs the client of its procedure for working with unusual compounds. The final report must be footnoted: *Reporting Limit based on the low standard of the calibration curve.*

19.4.3 Initial Demonstration of Capability (IDOC) Procedures

19.4.3.1 The spiking standard used must be prepared independently from those used in instrument calibration.

19.4.3.2 The analyte(s) shall be diluted in a volume of clean matrix sufficient to prepare four aliquots at the concentration specified by a method or the laboratory SOP.

19.4.3.3 At least four aliquots shall be prepared (including any applicable clean-up procedures) and analyzed according to the test method (either concurrently or over a period of days).

19.4.3.4 Using all of the results, calculate the mean recovery in the appropriate reporting units and the standard deviations for each parameter of interest.

19.4.3.5 When it is not possible to determine the mean and standard deviations, such as for presence, absence and logarithmic values, the laboratory will assess performance against criteria described in the Method SOP.

19.4.3.6 Compare the information obtained above to the corresponding acceptance criteria for precision and accuracy in the test method (if applicable) or in laboratory generated acceptance criteria (LCS or interim criteria) if there is no mandatory criteria established. If any one of the parameters do not meet the acceptance criteria, the performance is unacceptable for that parameter.

19.4.3.7 When one or more of the tested parameters fail at least one of the acceptance criteria, the analyst must proceed according to either option listed below:

- Locate and correct the source of the problem and repeat the test for all parameters of interest beginning with 19.4.3.3 above.
- Beginning with 19.4.3.3 above, repeat the test for all parameters that failed to meet criteria. Repeated failure, however, will confirm a general problem with the measurement system. If this occurs, locate and correct the source of the problem and repeat the test for all compounds of interest beginning with 19.4.3.1 above.

Note: Results of successive LCS analyses can be used to fulfill the DOC requirement.

A certification statement (refer to Figure 19-1 as an example) shall be used to document the completion of each initial demonstration of capability. A copy of the certification is archived in the analyst's training folder.

Methods on line prior to the effective date of this Section shall be updated to the procedures outlined above as new analysts perform their demonstration of capability. A copy of the new record will replace that which was used for documentation in the past. At a minimum, the precision and accuracy of four mid-level laboratory control samples must have been compared to the laboratory's quality control acceptance limits.

19.5 LABORATORY DEVELOPED METHODS AND NON-STANDARD METHODS

Any new method developed by the laboratory must be fully defined in an SOP and validated by qualified personnel with adequate resources to perform the method. Method specifications and the relation to client requirements must be clearly conveyed to the client if the method is a non-standard method (not a published or routinely accepted method). The client must also be in agreement to the use of the non-standard method.

19.6 VALIDATION OF METHODS

Validation is the confirmation by examination and the provision of objective evidence that the particular requirements for a specific intended use are fulfilled.

All non-standard methods, laboratory designed/developed methods, standard methods used outside of their scope, and major modifications to published methods must be validated to confirm they are fit for their intended use. The validation will be as extensive as necessary to meet the needs of the given application. The results are documented with the validation procedure used and contain a statement as to the fitness for use.

19.6.1 Method Validation and Verification Activities for All New Methods

While method validation can take various courses, the following activities can be required as part of method validation. Method validation records are designated QC records and are archived accordingly.

19.6.1.1 Determination of Method Selectivity

Method selectivity is the demonstrated ability to discriminate the analyte(s) of interest from other compounds in the specific matrix or matrices from other analytes or interference. In some cases to achieve the required selectivity for an analyte, a confirmation analysis is required as part of the method.

19.6.1.2 Determination of Method Sensitivity

Sensitivity can be both estimated and demonstrated. Whether a study is required to estimate sensitivity depends on the level of method development required when applying a particular measurement system to a specific set of samples. Where estimations and/or demonstrations of sensitivity are required by regulation or client agreement, such as the procedure in 40 CFR Part 136 Appendix B, under the Clean Water Act, these shall be followed.

19.6.1.3 Relationship of Limit of Detection (LOD) to the Quantitation Limit (QL)

An important characteristic of expression of sensitivity is the difference in the LOD and the QL. The LOD is the minimum level at which the presence of an analyte can be reliably concluded. The QL is the minimum concentration of analyte that can be quantitatively determined with acceptable precision and bias. For most instrumental measurement systems, there is a region where semi-quantitative data is generated around the LOD (both above and below the estimated MDL or LOD) and below the QL. In this region, detection of an analyte may be confirmed but quantification of the analyte is unreliable within the accuracy and precision guidelines of the measurement system. When an analyte is detected below the QL, and the presence of the analyte is confirmed by meeting the qualitative identification criteria for the analyte, the analyte can be reliably reported, but the amount of the analyte can only be

estimated. If data is to be reported in this region, it must be done so with a qualification that denotes the semi-quantitative nature of the result.

19.6.1.4 Determination of Interferences

A determination that the method is free from interferences in a blank matrix is performed.

19.6.1.5 Determination of Range

Where appropriate to the method, the quantitation range is determined by comparison of the response of an analyte in a curve to established or targeted criteria. Generally the upper quantitation limit is defined by highest acceptable calibration concentration. The lower quantitation limit or QL cannot be lower than the lowest non-zero calibration level, and can be constrained by required levels of bias and precision.

19.6.1.6 Determination of Accuracy and Precision

Accuracy and precision studies are generally performed using replicate analyses, with a resulting percent recovery and measure of reproducibility (standard deviation, relative standard deviation) calculated and measured against a set of target criteria.

19.6.1.7 Documentation of Method

The method is formally documented in an SOP. If the method is a minor modification of a standard laboratory method that is already documented in an SOP, an SOP Attachment describing the specific differences in the new method is acceptable in place of a separate SOP.

19.6.1.8 Continued Demonstration of Method Performance

Continued demonstration of Method Performance is addressed in the SOP. Continued demonstration of method performance is generally accomplished by batch specific QC samples such as LCS, method blanks or PT samples.

19.7 METHOD DETECTION LIMITS (MDL)/ LIMITS OF DETECTION (LOD)

Method detection limits (MDL) are initially determined in accordance with 40 CFR Part 136, Appendix B or alternatively by other technically acceptable practices that have been accepted by regulators. MDL is also sometimes referred to as Limit of Detection (LOD). The MDL theoretically represents the concentration level for each analyte within a method at which the Analyst is 99% confident that the true value is not zero. The MDL is determined for each analyte initially during the method validation process and updated as required in the analytical methods, whenever there is a significant change in the procedure or equipment, or based on project specific requirements (refer to 19.7.10). Generally, the analyst prepares at least seven replicates of solution spiked at one to five times the estimated method detection limit (most often at the lowest standard in the calibration curve) into the applicable matrix with all the analytes of interest. Each of these aliquots is extracted (including any applicable clean-up procedures) and analyzed in the same manner as the samples. Where possible, the seven replicates should be analyzed over 2-4 days to provide a more realistic MDL. To allow for some flexibility, this low level standard may be analyzed every batch or every week or some other frequency rather than doing the study all at once. In addition, a larger number of data points may be used if the appropriate t-value multiplier is used.

Refer to the Corporate SOP No. CA-Q-S-006 or the laboratory's SOP SF-QA-1218 for details on the laboratory's MDL process.

19.8 INSTRUMENT DETECTION LIMITS (IDL)

19.8.1 The IDL is sometimes used to assess the reasonableness of the MDLs or in some cases required by the analytical method or program requirements. IDLs are most used in metals analyses but may be useful in demonstration of instrument performance in other areas.

19.8.2 IDLs are calculated to determine an instrument's sensitivity independent of any preparation method. IDLs are calculated either using 7 replicate spike analyses, like MDL but without sample preparation, or by the analysis of 10 instrument blanks and calculating 3 x the absolute value of the standard deviation.

19.8.3 If IDL is > than the MDL, it may be used as the reported MDL.

19.9 VERIFICATION OF DETECTION AND REPORTING LIMITS

19.9.1 Once an MDL is established, it must be verified, on each instrument, by analyzing a quality control sample (prepared as a sample) at approximately 2-3 times the calculated MDL for single analyte analyses (e.g. most wet chemistry methods, Atomic Absorption, etc.) and 1-4 times the calculated MDL for multiple analyte methods (e.g. GC, GCMS, ICP, etc.). The analytes must be qualitatively identified. This verification does not apply to methods that are not readily spiked (e.g. pH, turbidity, etc.) or where the lab does not report to the MDL. If the MDL

does not verify, then the lab will not report to the MDL, or redevelop their MDL or use the level where qualitative identification is established. MDLs must be verified at least annually .

19.9.2 When the laboratory establishes a quantitation limit, it must be initially verified by the analysis of a low level standard or QC sample at 1-2 the reporting limit and annually thereafter. The annual requirement is waved for methods that have an annually verified MDL. The laboratory will comply with any regulatory requirements.

19.10 RETENTION TIME WINDOWS

Most organic analyses and some inorganic analyses use chromatography techniques for qualitative and quantitative determinations. For every chromatography analysis or as specific in the reference method, each analyte will have a specific time of elution from the column to the detector. This is known as the analyte's retention time. The variance in the expected time of elution is defined as the retention time window. As the key to analyte identification in chromatography, retention time windows must be established on every column for every analyte used for that method. These records are kept with the files associated with an instrument for later quantitation of the analytes. Complete details are available in the laboratory SOPs.

19.11 EVALUATION OF SELECTIVITY

The laboratory evaluates selectivity by following the checks within the applicable analytical methods, which include mass spectral tuning, second column confirmation, ICP interelement interference checks, chromatography retention time windows, sample blanks, spectrochemical, atomic absorption or fluorescence profiles, co-precipitation evaluations and specific electrode response factors.

19.12 ESTIMATION OF UNCERTAINTY OF MEASUREMENT

19.12.1 Uncertainty is "a parameter associated with the result of a measurement, that characterizes the dispersion of the values that could reasonably be attributed to the measurand" (as defined by the International Vocabulary of Basic and General Terms in Metrology, ISO Geneva, 1993, ISBN 92-67-10175-1). Knowledge of the uncertainty of a measurement provides additional confidence in a result's validity. Its value accounts for all the factors which could possibly affect the result, such as adequacy of analyte definition, sampling, matrix effects and interferences, climatic conditions, variances in weights, volumes, and standards, analytical procedure, and random variation. Some national accreditation organizations require the use of an "expanded uncertainty": the range within which the value of the measurand is believed to lie within at least a 95% confidence level with the coverage factor k=2.

19.12.2 Uncertainty is not error. Error is a single value, the difference between the true result and the measured result. On environmental samples, the true result is never known. The measurement is the sum of the unknown true value and the unknown error. Unknown error is a combination of systematic error, or bias, and random error. Bias varies predictably, constantly, and independently from the number of measurements. Random error is unpredictable, assumed to be Gaussian in distribution, and reducible by increasing the number of measurements.

19.12.3 The minimum uncertainty associated with results generated by the laboratory can be determined by using the Laboratory Control Sample (LCS) accuracy range for a given analyte. The LCS limits are used to assess the performance of the measurement system since they take into consideration all of the laboratory variables associated with a given test over time (except for variability associated with the sampling and the variability due to matrix effects). The percent recovery of the LCS is compared either to the method-required LCS accuracy limits or to the statistical, historical, in-house LCS accuracy limits.

19.12.4 To calculate the uncertainty for the specific result reported, multiply the result by the decimal of the lower end of the LCS range percent value for the lower end of the uncertainty range, and multiply the result by the decimal of the upper end of the LCS range percent value for the upper end of the uncertainty range. These calculated values represent a 99%-certain range for the reported result. As an example, suppose that the result reported is 1.0 mg/l, and the LCS percent recovery range is 50 to 150%. The uncertainty range would be 0.5 to 1.5 mg/l, which could also be written as 1.0 +/- 0.5 mg/l.

19.12.5 In the case where a well recognized test method specifies limits to the values of major sources of uncertainty of measurement (e.g., 524.2, 525, etc.) and specifies the form of presentation of calculated results, no further discussion of uncertainty is required.

19.13 SAMPLE REANALYSIS GUIDELINES

Because there is a certain level of uncertainty with any analytical measurement, a sample reanalysis may result in either a higher or lower value from an initial sample analysis. There are also variables that may be present (e.g., sample homogeneity, analyte precipitation over time, etc.) that may affect the results of a reanalysis. Based on the above comments, the laboratory will reanalyze samples at a client's request with the following caveats. Client specific Contractual Terms & Conditions for reanalysis protocols may supercede the following items.

- Homogenous samples: If a reanalysis agrees with the original result to within the RPD limits for MS/MSD or Duplicate analyses, or within $\pm$ 1 reporting limit for samples $\leq$ 5x the reporting limit, the original analysis will be reported. At the client's request, both results may be reported on the same report but not on two separate reports.

- If the reanalysis does not agree (as defined above) with the original result, then the laboratory will investigate the discrepancy and reanalyze the sample a third time for confirmation if sufficient sample is available.

- Any potential charges related to reanalysis are discussed in the contract terms and conditions or discussed at the time of the request. The client will typically be charged for reanalysis unless it is determined that the lab was in error.

- Due to the potential for increased variability, reanalysis may not be applicable to Non-homogenous, Encore, and Sodium Bisulfate preserved samples.

19.14 CONTROL OF DATA

The laboratory has policies and procedures in place to ensure the authenticity, integrity, and accuracy of the analytical data generated by the laboratory.

19.14.1 Computer and Electronic Data Related Requirements

The three basic objectives of our computer security procedures and policies are shown below. More detail is outlined in SOP SF-IT-1218. The laboratory is currently running TALS which is a custom in-house developed LIMS system that has been highly customized to meet the needs of the laboratory. It is referred to as LIMS for the remainder of this section. The LIMS utilizes .NET, which is an industry standard relational database platform. It is referred to as Database for the remainder of this section.

19.14.1.1 Maintain the Database Integrity: Assurance that data is reliable and accurate through data verification (review) procedures, password-protecting access, anti-virus protection, data change requirements, as well as an internal LIMS permissions procedure.

- LIMS Database Integrity is achieved through data input validation, internal user controls, and data change requirements.
- Spreadsheets and other software developed in-house must be verified with documentation through hand calculations prior to use.

19.14.1.2 Ensure Information Availability: Protection against loss of information or service is ensured through scheduled back-ups, stable file server network architecture, secure storage of media, line filter, Uninterruptible Power Supply (UPS), and maintaining older versions of software as revisions are implemented.

19.14.1.3 Maintain Confidentiality: Ensure data confidentiality through physical access controls when electronically transmitting data.

19.14.2 Data Reduction

The complexity of the data reduction depends on the analytical method and the number of discrete operations involved (e.g., extractions, dilutions, instrument readings and concentrations). The analyst calculates the final results from the raw data or uses appropriate computer programs to assist in the calculation of final reportable values.

For manual data entry, e.g., Wet Chemistry, the data is reduced by the analyst and then verified by the Department Manager or alternate analyst prior to updating the data in LIMS. The spreadsheets, or any other type of applicable documents, are signed by both the analyst and alternate reviewer to confirm the accuracy of the manual entry(s).

Manual integration of peaks will be documented and reviewed and the raw data will be flagged in accordance with the TestAmerica Corporate SOP No. CA-Q-S-002, *Acceptable Manual Integration Practices*.

Analytical results are reduced to appropriate concentration units specified by the analytical method, taking into account factors such as dilution, sample weight or volume, etc. Blank correction will be applied only when required by the method or per manufacturer's indication; otherwise, it should not be performed. Calculations are independently verified by appropriate laboratory staff. Calculations and data reduction steps for various methods are summarized in the respective analytical SOPs or program requirements.

19.14.2.1 All raw data must be retained in the worklist folder, computer file (if appropriate), and/or runlog. All criteria pertinent to the method must be recorded. The documentation is recorded at the time observations or calculations are made and must be signed or initialed/dated (month/day/year). It must be easily identifiable who performed which tasks if multiple people were involved.

19.14.2.2 In general, concentration results are reported in milligrams per liter (mg/l) or micrograms per liter (µg/l) for liquids and milligrams per kilogram (mg/kg) or micrograms per kilogram (µg/kg) for solids. For values greater than 10,000 mg/l, results can be reported in percent, i.e., 10,000 mg/l = 1**%.** Units are defined in each lab SOP.

19.14.2.3 In reporting, the analyst or the instrument output records the raw data result using values of known certainty plus one uncertain digit. If final calculations are performed external to LIMS, the results should be entered in LIMS with at least three significant figures. In general, results are reported to 2 significant figures on the final report.

19.14.2.4 For those methods that do not have an instrument printout or an instrumental output compatible with the LIMS System, the raw results and dilution factors are entered directly into LIMS by the analyst, and the software calculates the final result for the analytical report. LIMS has a defined significant figure criterion for each analyte.

19.14.2.5 The laboratory strives to import data directly from instruments or calculation spreadsheets to ensure that the reported data are free from transcription and calculation errors. For those analyses with an instrumental output compatible with the LIMS, the raw results and dilution factors are transferred into LIMS electronically after reviewing the quantitation report, and removing unrequested or poor spectrally-matched compounds.

19.14.3 Logbook / Worksheet Use Guidelines

Logbooks and worksheets are filled out 'real time' and have enough information on them to trace the events of the applicable analysis/task. (e.g. calibrations, standards, analyst, sample ID, date, time on short holding time tests, temperatures when applicable, calculations are traceable, etc.)

- Corrections are made following the procedures outlined in Section 12.
- Logbooks are controlled by the QA department. A record is maintained of all logbooks in the lab.
- Unused portions of pages must be "Z"'d out, signed and dated.
- Worksheets are created with the approval of the Laboratory Director/QA Manager at the facility. The QA Manager controls all worksheets following the procedures in Section 6.

19.14.4 Review / Verification Procedures

Review procedures are outlined in several SOPs e.g. Sample Control, Data Review, Project Management to ensure that reported data are free from calculation and transcription errors, that QC parameters have been reviewed and evaluated before data is reported. The laboratory also

has an SOP discussing Manual Integrations to ensure the authenticity of the data (SOP SF-QA-1204). The general review concepts are discussed below, more specific information can be found in the SOPs.

19.14.4.1 The data review process at the laboratory starts at the Sample Control level. Sample Control personnel review chain-of-custody forms and input the sample information and required analyses into a computer LIMS. The Project Managers perform final review of the chain-of-custody forms and inputted information.

19.14.4.2 The next level of data review occurs with the Analysts. As results are generated, analysts review their work to ensure that the results generated meet QC requirements and relevant EPA methodologies. The Analysts transfer the data into the LIMS and add data qualifiers if applicable. To ensure data compliance, a different analyst performs a second level of review. Second level review is accomplished by checking reported results against raw data and evaluating the results for accuracy. During the second level review, blank runs, QA/QC check results, initial and continuing calibration results, laboratory control samples, sample data, qualifiers and spike information are evaluated. Where calibration is not required on a daily basis, secondary review of the initial calibration results may be conducted at the time of calibration. Approximately 15% of all sample data from manual methods and from automated methods, all GC/MS spectra and all manual integrations are reviewed. Manual integrations are also electronically reviewed utilizing auditing software to help ensure compliance to ethics and manual integration policies. Issues that deem further review include the following:

- QC data are outside the specified control limits for accuracy and precision
- Reviewed sample data does not match with reported results
- Unusual detection limit changes are observed
- Samples having unusually high results
- Samples exceeding a known regulatory limit
- Raw data indicating some type of contamination or poor technique
- Inconsistent peak integration
- Transcription errors
- Results outside of calibration range

19.14.4.3 Unacceptable analytical results may require reanalysis of the samples. Any problems are brought to the attention of the Laboratory Director, Project Manager, Quality Assurance Director/Manager or Supervisor for further investigation. Corrective action is initiated whenever necessary.

19.14.4.4 The results are then entered or directly transferred into the computer database and a hard copy (or .pdf) is printed for the client.

19.14.4.5 As a final review prior to the release of the report, the Project Manager reviews the results for appropriateness and completeness. This review and approval ensures

that client requirements have been met and that the final report has been properly completed. The process includes, but is not limited to, verifying that chemical relationships are evaluated, COC is followed, cover letters/ narratives are present, flags are appropriate, and project specific requirements are met.

19.14.4.6 Any project that requires a data package is subject to a tertiary data review for transcription errors and acceptable quality control requirements. The Project Manager then signs the final report. When complete, the report is sent out to the client.

19.14.4.7 A visual summary of the flow of samples and information through the laboratory, as well as data review and validation, is presented in Figure 19-2.

19.14.5 Manual Integrations

Computerized data systems provide the analyst with the ability to re-integrate raw instrument data in order to optimize the interpretation of the data. Though manual integration of data is an invaluable tool for resolving variations in instrument performance and some sample matrix problems, when used improperly, this technique would make unacceptable data appear to meet quality control acceptance limits. Improper re-integrations lead to legally indefensible data, a poor reputation, or possible laboratory decertification. Because guidelines for re-integration of data are not provided in the methods and most methods were written prior to widespread implementation of computerized data systems, the laboratory trains all analytical staff on proper manual integration techniques using TestAmerica's Corporate SOP (CA-Q-S-002) as the guideline for our internal SOP SF-QA-1204, entitled Manual Integration.

19.14.5.1 The analyst must adjust baseline or the area of a peak in some situations, for example when two compounds are not adequately resolved or when a peak shoulder needs to be separated from the peak of interest. The analyst must use professional judgment and common sense to determine when manual integrating is required. Analysts are encouraged to ask for assistance from a senior analyst or manager when in doubt.

19.14.5.2 Analysts shall not increase or decrease peak areas to for the sole purpose of achieving acceptable QC recoveries that would have otherwise been unacceptable. The intentional recording or reporting of incorrect information (or the intentional omission of correct information) is against company principals and policy and is grounds for immediate termination.

19.14.5.3 Client samples, performance evaluation samples, and quality control samples are all treated equally when determining whether or not a peak area or baseline should be manually adjusted.

19.14.5.4 All manual integrations receive a second level review. Manual integrations must be indicated on an expanded scale "after" chromatograms such that the integration performed can be easily evaluated during data review. Expanded scale "before" chromatograms are also required for all manual integrations on QC parameters (calibrations, calibration verifications, laboratory control samples, internal standards, surrogates, etc.) unless the laboratory has another documented corporate approved

procedure in place that can demonstrate an active process for detection and deterrence of improper integration practices.

Figure 19-1.
Example - Demonstration of Capability Documentation

TRAINING DOCUMENTATION
DEMONSTRATION OF CAPABILITY

Laboratory: TestAmerica San Francisco
Address: 1220 Quarry Lane
Pleasanton, CA 94566
Analyst: Allen Wan

Date: 5/13/2010
Matrix: Water
Method(s):

Preparation Method(s):

Analytical SOP Document Control: SF-WC-0750
Preparation SOP Document Control:
Method Description: Chromium, Hexavalent (IC)

We, the undersigned, CERTIFY that:
1. The analysts identified above, using the cited test method(s), which is in use at this facility for the analyses of samples under the National Environmental Laboratory Accreditation Program and/or other state and federal programs have completed the Demonstration of Capability.
2. The test method(s) was performed by the analyst(s) identified on this certification.
3. A copy of test method(s) and laboratory-specific SOPs are available for all personnel on-site.
4. The data associated with the demonstration of capability are true, accurate, complete and self-explanatory.
5. All raw data necessary to reconstruct and validate these analyses have been retained at the facility. The associated information is organized and available for review.

Technical Director	Signature	Date
Peter Moreton	Digitally signed by Peter Moreton DN: cn=Peter Moreton, c=US, o=TestAmerica, ou=Administration, email=peter.moreton@testamericainc.com Date: 2010.09.02 05:53:01 -07'00'	

Quality Assurance Officer	Signature	Date
Melissa Brewer	Digitally signed by Melissa Brewer DN: cn=Melissa Brewer, c=US, o=TestAmerica, ou=Quality Assurance Reason: I have reviewed this document Date: 2010.06.01 09:26:32 -07'00'	

Page 1 of 2

TRAINING DOCUMENTATION

ANALYST DEMONSTRATION OF CAPABILITY

Method
Method Desc: Chromium, Hexavalent (IC)
Analyst: Allen Wan

Laboratory: TestAmerica San Francisco
Limit Group: Cr 6+ 7199

Cr (VI)
All values within Control limits

Current Limits Recovery LCL	Current Limits Recovery UCL	Current Limits Precision Std Dev	Current Limits RPD RPD	Current Limits RPD Units
85	115		20	%

Demonstration of Capability Recovery Mean	Demonstration of Capability Precision Std Dev	Demonstration of Capability RPD Mean	Demonstration of Capability RPD Units	
98.11	2.36198	4.011	%	Pass

Analysis Dates: 3/11/2010 to 3/29/2010

Laboratory ID	Anal Date	Batch	Smp	Analyst	Prep Analyst	Result	Units	Spike Amount	% Rec	% D	In Rec Limits?
LCS 720-67799/3	03/11/2010	67799	3	Wan, Allen		4.852	ug/L	4.99849	97		Pass
LCSD 720-67799/4	03/11/2010	67799	4	Wan, Allen		4.991	ug/L	4.99849	100	3	Pass
LCS 720-68898/3	03/29/2010	68898	3	Wan, Allen		4.763	ug/L	4.99849	95		Pass
LCSD 720-68898/4	03/29/2010	68898	4	Wan, Allen		5.012	ug/L	4.99849	100	5	Pass

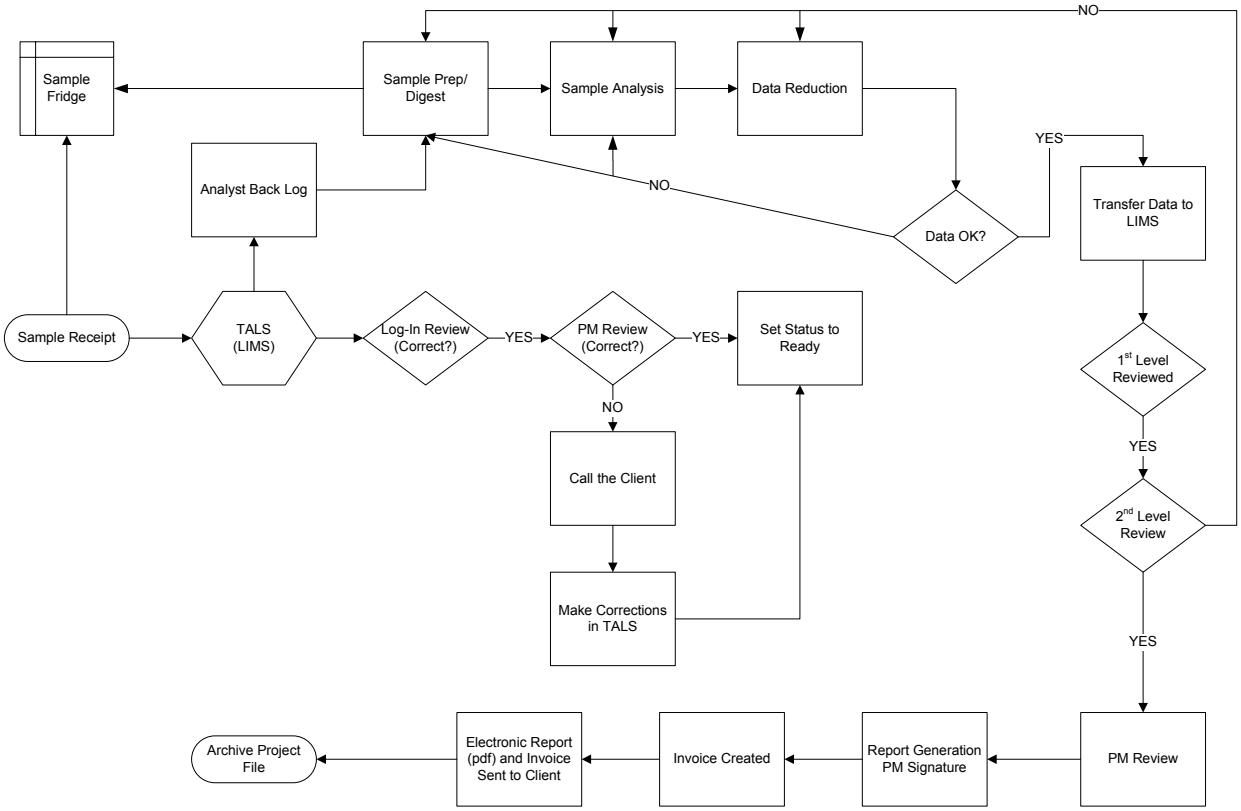
Precision = standard deviation of percent recoveries of spiked control samples.

5/13/2010

Page 1 of 1

Page 2 of 2

Figure 19-2
Example: Work Flow



EQUIPMENT (AND CALIBRATIONS) *(NELAC 5.5.5)*

20.1 OVERVIEW

The laboratory purchases the most technically advanced analytical instrumentation for sample analyses. Instrumentation is purchased on the basis of accuracy, dependability, efficiency and sensitivity. Each laboratory is furnished with all items of sampling, preparation, analytical testing and measurement equipment necessary to correctly perform the tests for which the laboratory has capabilities. Each piece of equipment is capable of achieving the required accuracy and complies with specifications relevant to the method being performed. Before being placed into use, the equipment (including sampling equipment) is calibrated and checked to establish that it meets its intended specification. The calibration routines for analytical instruments establish the range of quantitation. Calibration procedures are specified in laboratory SOPs. A list of laboratory instrumentation is presented in Table 20-1.

Equipment is only operated by authorized and trained personnel. Manufacturers instructions for equipment use are readily accessible to all appropriate laboratory personnel.

20.2 PREVENTIVE MAINTENANCE

20.2.1 The laboratory follows a well-defined maintenance program to ensure proper equipment operation and to prevent the failure of laboratory equipment or instrumentation during use. This program of preventive maintenance helps to avoid delays due to instrument failure.

20.2.2 Routine preventive maintenance procedures and frequency, such as cleaning and replacements, should be performed according to the procedures outlined in the manufacturer's manual. Qualified personnel must also perform maintenance when there is evidence of degradation of peak resolution, a shift in the calibration curve, loss of sensitivity, or failure to continually meet one of the quality control criteria.

20.2.3 Table 20-2 lists examples of scheduled routine maintenance. It is the responsibility of each Department Manager to ensure that instrument maintenance logs are kept for all equipment in his/her department. Preventative maintenance procedures may be / are also outlined in analytical SOPs or instrument manuals. (Note: for some equipment, the log used to monitor performance is also the maintenance log. Multiple pieces of equipment may share the same log as long as it is clear as to which instrument is associated with an entry.)

20.2.4 Instrument maintenance logs are controlled and are used to document instrument problems, instrument repair and maintenance activities. Maintenance logs shall be kept for all major pieces of equipment. Instrument maintenance logs may also be used to specify instrument parameters.

20.2.4.1 Documentation must include all major maintenance activities such as contracted preventive maintenance and service and in-house activities such as the replacement of electrical components, lamps, tubing, valves, columns, detectors, cleaning and adjustments.

20.2.4.2 Each entry in the instrument log includes the Analyst's initials, the date, a detailed description of the problem (or maintenance needed/scheduled), a detailed explanation

of the solution or maintenance performed, and a verification that the equipment is functioning properly (state what was used to determine a return to control. e.g. CCV run on *'date'* was acceptable, or instrument recalibrated on 'date' with acceptable verification, etc.) must also be documented in the instrument records.

20.2.4.3 When maintenance or repair is performed by an outside agency, service receipts detailing the service performed must be scanned into the eMaintenance folder.

20.2.5 If an instrument requires repair (subjected to overloading or mishandling, gives suspect results, or otherwise has shown to be defective or outside of specified limits) it shall be taken out of operation and tagged as out-of-service or otherwise isolated until such a time as the repairs have been made and the instrument can be demonstrated as operational by calibration and/or verification or other test to demonstrate acceptable performance. The laboratory shall examine the effect of this defect on previous analyses.

20.2.6 In the event of equipment malfunction that cannot be resolved, service shall be obtained from the instrument vendor manufacturer, or qualified service technician, if such a service can be tendered. If on-site service is unavailable, arrangements shall be made to have the instrument shipped back to the manufacturer for repair. Back up instruments, which have been approved, for the analysis shall perform the analysis normally carried out by the malfunctioning instrument. If the back up is not available and the analysis cannot be carried out within the needed timeframe, the samples shall be subcontracted.

20.2.7 If an instrument is sent out for service or transferred to another facility, it must be recalibrated and verified (including new initial MDL study) prior to return to lab operations.

20.3 SUPPORT EQUIPMENT

This section applies to all devices that may not be the actual test instrument, but are necessary to support laboratory operations. These include but are not limited to: balances, ovens, refrigerators, freezers, water baths, field sampling devices, temperature measuring devices, thermal/pressure sample preparation devices and volumetric dispensing devices if quantitative results are dependent on their accuracy, as in standard preparation and dispensing or dilution into a specified volume. All raw data records associated with the support equipment are retained to document instrument performance.

20.3.1 Weights and Balances

The accuracy of the balances used in the laboratory is checked every working day, before use. All balances are placed on stable counter tops.

Each balance is checked prior to initial serviceable use with at least two certified ASTM type 1 weights spanning its range of use (weights that have been calibrated to ASTM type 1 weights may also be used for daily verification). ASTM type 1 weights used only for calibration of other weights (and no other purpose) are inspected for corrosion, damage or nicks at least annually and if no damage is observed, they are calibrated at least every 5 years by an outside calibration laboratory. Any weights (including ASTM Type 1) used for daily balance checks or other purposes are recalibrated/recertified annually to NIST standards (this may be done internally if laboratory maintains "calibration only" ASTM type 1 weights).

All balances are serviced annually by a qualified service representative, who supplies the laboratory with a certificate that identifies traceability of the calibration to the NIST standards.

All of this information is recorded in logs, and the recalibration/recertification certificates are kept on file.

20.3.2 pH, Conductivity, and Turbidity Meters

The pH meters used in the laboratory are accurate to ± 0.1 pH units, and have a scale readability of at least 0.05 pH units. The meters automatically compensate for the temperature, and are calibrated with at least two working range buffer solutions before each use.

Conductivity meters are also calibrated before each use with a known standard to demonstrate the meters do not exceed an error of 1% or one umhos/cm.

Turbidity meters are also calibrated before each use. All of this information is documented in logs.

Consult pH and Conductivity, and Turbidity SOPs for further information.

20.3.3 Thermometers

All thermometers are calibrated on an annual basis with a NIST-traceable thermometer. IR thermometers, digital probes and thermocouples are calibrated quarterly.

The NIST thermometer is recalibrated every five years (unless thermometer has been exposed to temperature extremes or apparent separation of internal liquid) by an approved outside service and the provided certificate of traceability is kept on file. The NIST thermometer(s) have increments of 1 degree and have ranges applicable to method and certification requirements. The NIST traceable thermometer is used for no other purpose than to calibrate other thermometers.

All of this information is documented in logbooks. Monitoring method-specific temperatures, including incubators, heating blocks, water baths, and ovens, is documented in method-specific logbooks. More information on this subject can be found in the SOP SF-QA-1305.

20.3.4 Refrigerators/Freezer Units, Waterbaths, Ovens and Incubators

The temperatures of all refrigerator units and freezers used for sample and standard storage are constantly monitored.

Ovens, waterbaths and incubators are monitored on days of use.

All of this equipment has a unique identification number, and is assigned a unique thermometer for monitoring.

Sample storage refrigerator temperatures are kept between > 0ºC and ≤ 6 ºC.

Specific temperature settings/ranges for other refrigerators, ovens waterbaths, and incubators can be found in method specific SOPs.

All of this information is documented in Daily Temperature Logbooks and method-specific logbooks.

20.3.5 Autopipettors, Dilutors, and Syringes

Mechanical volumetric dispensing devices including burettes (except Class A Glassware) are given unique identification numbers and the delivery volumes are verified gravimetrically, at a minimum, on a quarterly basis. Glass micro-syringes are considered the same as Class A glassware.

For those dispensers that are not used for analytical measurements, a label is / can be applied to the device stating that it is not calibrated. Any device not regularly verified can not be used for any quantitative measurements. See SOP SF-QA-1305.

Micro-syringes are purchased from Hamilton Company. Each syringe is traceable to NIST. The laboratory keeps on file an “Accuracy and Precision Statement of Conformance” from Hamilton attesting established accuracy.

20.3.6 Autoclaves

This facility does not use an autoclave.

20.3.7 Field Sampling Devices (Isco Auto Samplers)

Each Auto Sampler (ISCO) is assigned a unique identification number in order to keep track of the calibration. This number is also recorded on the sampling documentation.

The Auto Sampler is calibrated monthly by setting the sample volume to 100ml and recording the volume received. The results are filed in a logbook/binder. The Auto Sampler is programmed to run three (3) cycles and each of the three cycles is measured into a graduated cylinder to verify 100ml are received.

If the RSD (Relative Standard Deviation) between the 3 cycles is greater than 10%, the procedure is repeated and if the result is still greater than 10%, then the Auto Sampler is taken out of service

until it is repaired and calibration verification criteria can be met. The results of this check are kept in a logbook/binder.

20.4 INSTRUMENT CALIBRATIONS

Calibration of analytical instrumentation is essential to the production of quality data. Strict calibration procedures are followed for each method. These procedures are designed to determine and document the method detection limits, the working range of the analytical instrumentation and any fluctuations that may occur from day to day.

Sufficient raw data records are retained to allow an outside party to reconstruct all facets of the initial calibration. Records contain, but are not limited to, the following: calibration date, method, instrument, analyst(s) initials or signatures, analysis date, analytes, concentration, response, type of calibration (Avg RF, curve, or other calculations that may be used to reduce instrument responses to concentration.)

Sample results must be quantitated from the initial calibration and may not be quantitated from any continuing instrument calibration verification unless otherwise required by regulation, method or program.

If the initial calibration results are outside of the acceptance criteria, corrective action is performed and any affected samples are reanalyzed if possible. If the reanalysis is not possible, any data associated with an unacceptable initial calibration will be reported with appropriate data qualifiers (refer to Section 12).

Note: Instruments are calibrated initially and as needed after that and at least annually (the annual requirement does not apply to Isotope dilution).

20.4.1 CALIBRATION STANDARDS

20.4.1.1 Calibration standards are prepared using the procedures indicated in the Reagents and Standards section of the determinative method SOP.

20.4.1.2 Standards for instrument calibration are obtained from a variety of sources. All standards are traceable to national or international standards of measurement, or to national or international standard reference materials.

20.4.1.3 The lowest concentration calibration standard that is analyzed during an initial calibration must be at or below the stated reporting limit for the method based on the final volume of extract (or sample).

20.4.1.4 The other concentrations define the working range of the instrument/method or correspond to the expected range of concentrations found in actual samples that are also within the working range of the instrument/method. Results of samples not bracketed by initial instrument calibration standards (within calibration range to 3 significant figures) must be reported as having less certainty, e.g., defined qualifiers or flags (additional information may be included in the case narrative). The exception to these rules is ICP methods or other methods where the referenced method does not specify two or more standards.

20.4.1.5 All initial calibrations are verified with a standard obtained from a second source and traceable to a national standard, when available (or vendor certified different lot if a second source is not available). For unique situations, such as air analysis where no other source or lot is available, a standard made by a different analyst would be considered a second source. This verification occurs immediately after the calibration curve has been analyzed, and before the analysis of any samples.

20.4.2 Calibration Verification

The calibration relationship established during the initial calibration must be verified initially and at least daily as specified in the laboratory method SOPs in accordance with the referenced analytical methods and NELAC (2003) standard, Section 5.5.5.10. The process of calibration verification applies to both external standard and internal standard calibration techniques, as well as to linear and non-linear calibration models. Initial calibration verification is with a standard source secondary (second source standard) to the calibration standards, but continuing calibration verifications may use the same source standards as the calibration curve.

Note: The process of calibration verification referred to here is fundamentally different from the approach called "calibration" in some methods. As described in those methods, the calibration factors or response factors calculated during calibration are used to update the calibration factors or response factors used for sample quantitation. This approach, while employed in other EPA programs, amounts to a daily single-point calibration.

All target analytes and surrogates, including those reported as non-detects, must be included in periodic calibration verifications for purposes of retention time confirmation and to demonstrate that calibration verification criteria are being met, i. e., RPD, per NELAC (2003) Standard, Section 5.5.5.10.

All samples must be bracketed by periodic analyses of standards that meet the QC acceptance criteria (e.g., calibration and retention time). The frequency is found in the determinative methods or SOPs.

Generally, the initial calibrations must be verified at the beginning of each 12-hour analytical shift during which samples are analyzed. (Some methods may specify more or less frequent verifications). The 12-hour analytical shift begins with the injection of the calibration verification standard (or the MS tuning standard in MS methods). The shift ends after the completion of the analysis of the last sample, QC, or standard that can be injected within 12 hours of the beginning of the shift.

A continuing instrument calibration verification (CCV) must be repeated at the beginning and, for methods that have quantitation by external calibration models, at the end of each analytical batch. Some methods have more frequent CCV requirements see specific SOPs. Most Inorganic methods require the CCV to be analyzed after ever 10 samples or injections, including matrix or batch QC samples.

Note: If an internal standard calibration is being used (basically GCMS) then bracketing standards are not required, only daily verifications are needed. The results from these

verification standards must meet the calibration verification criteria and the retention time criteria (if applicable).

20.4.3 Verification of Linear and Non-Linear Calibrations

Calibration verification for calibrations involves the calculation of the percent drift or the percent difference of the instrument response between the initial calibration and each subsequent analysis of the verification standard. (These calculations are available in the laboratory method SOPs. Verification standards are evaluated based on the % Difference from the average CF or RF of the initial calibration or based on % Drift or % Recovery if a linear or quadratic curve is used.

Regardless of whether a linear or non-linear calibration model is used, if initial verification criterion is not met, then no sample analyses may take place until the calibration has been verified or a new initial calibration is performed that meets the specifications listed in the method SOPs. If the calibration cannot be verified after the analysis of a single verification standard, then adjust the instrument operating conditions and/or perform instrument maintenance, and analyze another aliquot of the verification standard. If the calibration cannot be verified with the second standard, then a new initial calibration is performed.

- When the acceptance criteria for the calibration verification are exceeded high, i.e., high bias, and there are associated samples that are non-detects, then those non-detects may be reported. Otherwise, the samples affected by the unacceptable calibration verification shall be reanalyzed after a new calibration curve has been established, evaluated and accepted.

- When the acceptance criteria for the calibration verification are exceeded low, i.e., low bias, those sample results may be reported if they exceed a maximum regulatory limit/decision level. Otherwise, the samples affected by the unacceptable verification shall be reanalyzed after a new calibration curve has been established, evaluated and accepted. Alternatively, a reporting limit standard may be analyzed to demonstrate that the laboratory can still support non-detects at their reporting limit.

20.5 TENTATIVELY IDENTIFIED COMPOUNDS (TICS) – GC/MS ANALYSIS

For samples containing components not associated with the calibration standards, a library search may be made for the purpose of tentative identification. The necessity to perform this type of identification will be determined by the purpose of the analyses being conducted. Data system library search routines should not use normalization routines that would misrepresent the library or unknown spectra when compared to each other.

Note: If the TIC compound is not part of the client target analyte list but is calibrated by the laboratory and is both qualitatively and/or quantitatively identifiable, it should not be reported as a TIC. If the compound is reported on the same form as true TICs, it should be qualified and/or narrated that the reported compound is qualitatively and quantitatively (if verification in control) reported compared to a known standard that is in control (where applicable).

For example, the RCRA permit or waste delisting requirements may require the reporting of non-target analytes. Only after visual comparison of sample spectra with the nearest library searches may the analyst assign a tentative identification.

20.6 GC/MS TUNING

Prior to any GCMS analytical sequence, including calibration, the instrument parameters for the tune and subsequent sample analyses within that sequence must be set.

Prior to tuning/auto-tuning the mass spec, the parameters may be adjusted within the specifications set by the manufacturer or the analytical method. These generally don't need any adjustment but it may be required based on the current instrument performance. If the tune verification does not pass it may be necessary to clean the source or perform additional maintenance. Any maintenance is documented in the maintenance log.

Table 20-1. TESTAMERICA SAN FRANCISCO INSTRUMENT LIST

Instrument Type	Manufacturer	Model	Serial Number	Year Put Into Service	Condition
VIAL ROTATOR 1	GLAS COL	099A RD4512	401937	2006	NEW
VIAL ROTATOR 2	GLAS COL	099A RD4512	403329	2006	NEW
ROTOVAP	YAMATO	RE540		1995	NEW
TURBOVAP 1	ZYMARK	TurboVap II	TV9513N6088	1995	NEW
TURBOVAP 3	ZYMARK	TurboVap II	TV9907N8680	1995	NEW
SOLVENT CONCENTRATOR	HORIZON	SPEED-VAP II 9000	020364	<1998	NEW
BOD INCUBATOR	FISHER SCIENTIFIC	NA	NA	<1998	USED
CENTRIFUGE	BECKMAN	TJ-6	1E003	<1998	NEW
DISSOLVED OXYGEN METER	YSI	5100	96J0169AB	<1998	NEW
FURNACE	THERMOLYNE	1400	1049970593922	<1998	NEW
MICROWAVE	CEM	MARS 5	MD7062	<1998	NEW
OVEN	BAXTER	DX 41	196009	<1998	NEW
OVEN	BAXTER	DX 41	2480664	<1998	NEW
OXYGEN PROBE	YSI	5100	96J0169AB	<1998	NEW
BLOCK DIGESTOR	ENVIRONMENTAL EXPRESS	NA	NA	<1998	NEW
BLOCK DIGESTOR	ENVIRONMENTAL EXPRESS	NA	NA	<1998	NEW
BLOCK DIGESTOR	SCP SCIENCE	DIGI BLOCK 3000	3727010168	<1998	NEW

Instrument Type	Manufacturer	Model	Serial Number	Year Put Into Service	Condition
SOLID PHASE EXTRACTOR	HORIZON	SPE-DEX-4790	0289	<1998	NEW
SOLID PHASE EXTRACTOR	HORIZON	SPE-DEX-4790	030453	<1998	NEW
SOLID PHASE EXTRACTOR	HORIZON	SPE-DEX-4790	030452	<1998	NEW
IC AUTOSAMPLER	DIONEX	AS40	00100276	2000	NEW
IC CONDUCTIVITY DETECTOR	DIONEX	CD20	99020211	2000	NEW
IC ENCLOSURE	DIONEX	LC20	00060866	2000	NEW
IC GRADIENT PUMP	DIONEX	GC50	99020245	2000	NEW
ION CHROMATO-GRAPH (IC1)	DIONEX	DX-500	95120541	1993	NEW
ION CHROMATO-GRAPH (IC3)	DIONEX	DX-500	94030530	1993	NEW
ICP – TRACE (ICP2)	THERMO	ICAP 6500	20080211	2008	NEW
ICP – TRACE (ICP3)	THERMO	ICAP 6500	20073305	2007	NEW
ICP MS	PERKIN ELMER	ELAN ICPMS	1560002	1994	NEW
GC ALCOHOLS	VARIAN	3900	276	2001	USED
DIESEL 2 GC DUAL PROSEP LVI & FID	AGILENT	6890N	CN10529055	2005	NEW
DIESEL 3 GC DUAL PROSEP LVI & FID	AGILENT	6890+	US00025094	1998	NEW
DIESEL 5 GC DUAL FID	AGILENT	6890N	US10404027	2004	NEW
DIESEL 6 GC DUAL FID (GCHP_39)	HEWLETT PACKARD	7890	CN10817121	2008	NEW
HP PCB/PEST DUAL ECD	AGILENT	6890N	CN10548123	2006	NEW
PCB 2 ECD	AGILENT 6890N	6890N	US00041222	2001	NEW

Instrument Type	Manufacturer	Model	Serial Number	Year Put Into Service	Condition
GC DUAL UECD (GCHP_36)PEST 4	HEWLETT PACKARD	6890	US10209030	2003	NEW
GC/MS 2100	VARIAN	3900 GC 2100T MSD	735 3958	2002	NEW
GC/MS 3900 A	VARIAN	3900 GC 2100T MSD	901 4308	2003	NEW
GC/MS 3900 C	VARIAN	3900 GC 2100T MSD	4404 100366	2003	NEW
GC/MS 3900 F	VARIAN	3900 GC 2100T MSD	100613 4581	2003	NEW
GC/MS 3900 G	VARIAN	3900 GC 2100T MSD	100615 04580	2003	NEW
GC/MS HP 4	AGILENT	6890N GC 5975 MSD	CN10526015 US52430227	2005	NEW
GC/MS (MS2) HP 6	HEWLETT PACKARD	6890	US00028265	2001	USED
GC/MS (MS11) HP 7	HEWLETT PACKARD	6890	US00007473	2007	USED
GC/MS (MS8) HP 8	HEWLETT PACKARD	6890	US10124027	2001	USED
GC/MS (MS9) HP 9	HEWLETT PACKARD	6890	US10134036	2001	USED
GC/MS (MS12) HP 12	HEWLETT PACKARD	6890	US10146002	2007	NEW
GC/MS SATURN 2K	VARIAN	3800 GC 2000 MSD	5369 4277	2000	NEW
GC/MS HP 3	AGILENT	6890+ GC 5973 MSD	US00020915 US72810642	1998	NEW
GC/MS SVOA HP4 (70MSS04)	HEWLETT PACKARD	6890	US00039046	2000	NEW
AUTOSAMPLER	VARIAN	Archon	14087	2003	NEW
AUTOSAMPLER	VARIAN	Archon	13708	2003	NEW

Instrument Type	Manufacturer	Model	Serial Number	Year Put Into Service	Condition
GC/MS SATURN 2K2	VARIAN	3800 GC 2000 MSD	6543 4565	2000	NEW
AUTOSAMPLER 2100	VARIAN	Archon	13933	2002	NEW
AUTOSAMPLER HP4	VARIAN	Archon	14279	2003	NEW
AUTOSAMPLER C	VARIAN	Archon	13996	2003	NEW
AUTOSAMPLER G	VARIAN	Archon	14431	2003	NEW
AUTOSAMPLER HP5	VARIAN	Archon	14219	2003	NEW
AUTOSAMPLER F	VARIAN	Archon	13997	2003	NEW
AUTOSAMPLER	AGILENT	7694	IT90103523	2005	USED
AUTOSAMPLER (GCHP_36)PEST 4	HEWLETT PACKARD	7683	US20414153	2003	NEW
AUTOSAMPLER (70MSS04) SVOC HP4	HEWLETT PACKARD	7683	US03915326	2000	NEW
AUTOSAMPLER (GCHP_39) DRO 6	HEWLETT PACKARD	7683B	CN81548186	2007	NEW
AUTOSAMPLER/ P&T (MS6) HP 2	OI ANALYTICAL	4552	14413	1994	USED
AUTOSAMPLER/ P&T (MS11) HP 7	OI ANALYTICAL	4552	15155	2007	USED
AUTOSAMPLER/ P&T (MS8) HP 8	OI ANALYTICAL	4552	14162	2006	USED
AUTOSAMPLER/ P&T (MS9) HP 9	OI ANALYTICAL	4552	14161	2001	USED
AUTOSAMPLER/ P&T (MS2) HP12	OI ANALYTICAL	4552	14412	2001	USED
PURGE & TRAP A	TEKMAR	Velocity	US05021002	2003	NEW
PURGE & TRAP F	TEKMAR	3000	96283013	2003	NEW
PURGE & TRAP G	TEKMAR	Velocity	US05189005	2003	NEW
PURGE & TRAP 2100	TEKMAR	3100	US02098011	2002	NEW
PURGE & TRAP C	TEKMAR	Velocity	US03231015	2003	NEW

Instrument Type	Manufacturer	Model	Serial Number	Year Put Into Service	Condition
PURGE & TRAP 2K	TEKMAR	3000	00252003	2003	NEW
PURGE/TRAP (MS2) HP 6	OI ANALYTICAL	4560	K834460500	2001	USED
PURGE/TRAP (MS11) MS 7	OI ANALYTICAL	4560	K841460436	2007	USED
PURGE/TRAP (MS8) HP 8	OI ANALYTICAL	4560	B238068	2001	USED
PURGE/TRAP (MS9) HP 9	OI ANALYTICAL	4560	H406460244	2001	USED
PURGE/TRAP HP12	OI ANALYTICAL	4560	M934460858	<1998	USED
RSK 175	VARIAN	3800 GC	5923	2001	NEW
RSK 175	PERKIN ELMER	Turbo Matrix 40	M41L0508232	2005	NEW
TURBIDIMETER	ORBECO-HELLIGE	965-10	2702	<1998	NEW
TURBIDIMETER	HF SCIENTIFIC	Micro 100	201001099	2010	NEW
CONDUCTIVITY METER	THERMO ORION	115	4100	1995	NEW
PH METER	OAKTON	pH Series 510	335361	2006	NEW
PH/MV METER	ORION	520A	005099	<1998	NEW
PH/MV METER	ORION	520A	003774	<1998	NEW
PH/MV METER	ORION	720A	049858	<1998	NEW
PH/MV METER	ORION	370	016513	<1998	NEW
UV/VIS	HACH	4000	0012V0001097	<1998	NEW
UV-VIS	THERMO ELECTRON	Spectronic 20D+	3DuG282002	2005	NEW
PC TITRATE	MANTECH	PCM-3223-100/SID	190E6173-MS-OC9-786	2010	NEW
IC	METROHM	881 Compact IC Pro	188100010130	2010	NEW
IC	METROHM	881 Compact IC Pro	1881000008142	2010	NEW

Table 20-2. Schedule of Routine Maintenance

INDUCTIVELY COUPLED PLASMA/MASS SPECTROMETER (ICP-MS)

DAILY OR AS NEEDED

- Check disk space delete old files if necessary
- Inspect the torch, glassware, and aerosol injector tube
- Check the nebulizer and the sample capillary tubing.
- Replace pump tubing when worn
- Clean sampler and skimmer cones
- Check the pump oil level

QUARTERLY TO YEARLY

- Clean torch to remove accumulated deposits.
- Check coil for any deformations or buildup and replace if there are any signs of pitting
- Check the nebulizer spray pattern with deionized water and clean or replace the nebulizer as necessary
- Inspect the spray chamber for deposits.
- Change the vacuum pump oil.
- Check pump rollers and remove and clean the pump head if necessary
- Evaluate present and past detection limit studies for instrument performance

SPARE PARTS

- Pump tubing
- Torch
- Teflon Concentric Nebulizer
- Sampler and skimmer cones
- Vacuum pump oil

INDUCTIVELY COUPLED PLASMA

DAILY OR AS NEEDED

- Wavelength and refractor calibration
- Replace pump tubing when worn
- Check the autosampler arm for alignment

QUARTERLY TO YEARLY

- Clean optical windows for maximum wavelength intensity
- Replace water in water cooler
- Check instrument for signs of wear or corrosion from fumes
- Evaluate present and past detection limit studies for instrument performance

SPARE PARTS

- Sample pump tubing
- Torch
- Nebulizer

MERCURY ANALYZER

DAILY OR AS NEEDED

- Inspect or replace pump tubing
- Inspect or clean mixing chamber

SPARE PARTS

- Sample pump tubing

ION CHROMATOGRAPH

DAILY OR AS NEEDED

- Check for leaks around fittings
- Change Filters
- Change Guard Column
- Change Analytical Column
- Change Suppressor

WEEKLY

- Change eluent

SPARE PARTS

- Assorted pump parts
- Ferrules
- Filters for the guard and analytical column

SEMIVOLATILE GAS CHROMATOGRAPH

DAILY OR AS NEEDED

- Inspect for leaks
- Refill solvent rinse vials and empty solvent waste vials

- All gas cylinders are checked and changed if the pressure is less than 500 psi
- Ensure proper peak shape,(gaussian, minimal tailing,no splitting,proper baseline)
- Inlet seals, ferrules and o-rings are checked and if necessary replaced
- Replace injector septa for each inlet

MONTHLY OR AS NEEDED

- FID jet is removed and cleaned
- ECD, Are many negative peaks present?, if so and the signal for the detectors is > 50 consider sending the detector in for cleaning or refoiling.

6 MONTHS

- Wipe test ECD detectors
  - Every 6 months for Agilent ECDs
  - Every 3 years for Varian ECDs
- Change gas tank filters traps

SPARE PARTS

- Graphite and/or graphite/vespel ferrules
- Injector Septa
- Inlet liners
- O-rings
- Gold Seals (SS for PCB)
- Wipe Test Kits
- Column Cutter
- Flow measurement devices
- GC Tools and wrenches
- Electronic leak detector
- Gas Filters

VOLATILE GAS CHROMATOGRAPH

DAILY

- All gas cylinders are checked and changed if the pressure is less than 500 psi
- Ensure proper peak shape,(gaussian, minimal tailing,no splitting,proper baseline)
- Verify DI water reservoir for autosamplers is full, fill if necessary
- Check internal standard and surrogate levels in Archon are okay
- Empty autosampler waste water container

MONTHLY

- Wipe Archon drive rods clean with Isopropanol.
- Calibrate robotics, Archon

- Inspect autosampler probes for hardness build-up, clean if necessary

ANNUALLY (MINIMUM), BEFORE A CALIBRATION OR AS NEEDED

- Perform injection port maintenance, replace o-ring, liner, gold seal washer, clip column
- Replace in-line filters and traps
- Verify correct column flow or linear velocity
- Pressure test injection port EPC unit
- Replace transfer line

SPARE PARTS

- Graphite and/or graphite/vespel ferrules
- Injector Septa
- Inlet liners
- O-rings
- Gold Seals
- Column Cutter
- Flow measurement devices
- GC Tools and wrenches
- Electronic leak detector
- Universal and Hydrocarbon traps
- Methanol

GAS CHROMATOGRAPH/MASS SPECTROMETER

In addition to the Gas Chromatography maintenance identified in the previous section, the following maintenance must be scheduled for the Mass Spectrometry systems:

PERFORMED AS REQUIRED

- Print out PFTBA spectra, confirm peak widths and ion ratios are normal
- Perform air/water leak check
- Replenish rough vacuum pump oil
- Clean ion source or ion trap
- Check diff pump fluid level, change if necessary

SPARE PARTS

- Pump Oil and Filters
- Column Cutter
- GC Tools and wrenches
- Electronic leak detector

SECTION 21

MEASUREMENT TRACEABILITY *(NELAC 5.5.6)*

21.1 OVERVIEW

Traceability of measurements shall be assured using a system of documentation, calibration, and analysis of reference standards. Laboratory equipment that are peripheral to analysis and whose calibration is not necessarily documented in a test method analysis or by analysis of a reference standard shall be subject to ongoing certifications of accuracy. At a minimum, these must include procedures for checking specifications of ancillary equipment: balances, thermometers, temperature, Deionized (DI) and Reverse Osmosis (RO) water systems, automatic pipettes and other volumetric measuring devices. (Refer to Section 20.3). With the exception of Class A Glassware (including glass microliter syringes that have a certificate of accuracy), quarterly accuracy checks are performed for all mechanical volumetric devices. Wherever possible, subsidiary or peripheral equipment is checked against standard equipment or standards that are traceable to national or international standards. Class A Glassware should be routinely inspected for chips, acid etching or deformity. If the Class A glassware is suspect, the accuracy of the glassware will be assessed prior to use.

21.2 NIST-TRACEABLE WEIGHTS AND THERMOMETERS

Reference standards of measurement shall be used for calibration only and for no other purpose, unless it can be shown that their performance as reference standards would not be invalidated.

For NIST-traceable weights and thermometers, the laboratory requires that all calibrations be conducted by a calibration laboratory accredited by A2LA, NVLAP (National Voluntary Laboratory Accreditation Program), APLAC (Asia-Pacific Laboratory Accreditation Cooperation), or EA (European Cooperation for Accreditation). A certificate and scope of accreditation is kept on file at the laboratory.

21.3 REFERENCE STANDARDS / MATERIALS

Reference standards/materials, where commercially available, are traceable to certified reference materials. Commercially prepared standard materials are purchased from vendors accredited by A2LA or NVLAP, with an accompanying Certificate of Analysis that documents the standard purity. If a standard cannot be purchased from a vendor that supplies a Certificate of Analysis, the purity of the standard is documented by analysis. The receipt of all reference standards must be documented. Reference standards are labeled with a unique Standard Identification Number and expiration date. All documentation received with the reference standard is retained as a QC record and references the Standard Identification Number.

All reference, primary and working standards/materials, whether commercially purchased or laboratory prepared, must be checked regularly to ensure that the variability of the standard or material from the 'true' value does not exceed method requirements. The accuracy of calibration standards is checked by comparison with a standard from a second source. In cases where a second standard manufacturer is not available, a vendor certified different lot is acceptable for use as a second source. For unique situations, such as air analysis where no other source or

lot is available, a standard made by a different analyst would be considered a second source. The appropriate Quality Control (QC) criteria for specific standards are defined in laboratory SOPs. In most cases, the analysis of an Initial Calibration Verification (ICV) or LCS (where there is no sample preparation) is used as the second source confirmation. These checks are generally performed as an integral part of the analysis method (e.g. calibration checks, laboratory control samples).

All standards and materials must be stored and handled according to method or manufacturer's requirements in order to prevent contamination or deterioration. Refer to the Corporate Environmental Health & Safety Manual or laboratory SOPs. For safety requirements, please refer to method SOPs and the laboratory Environmental Health and Safety Manual.

21.4 DOCUMENTATION AND LABELING OF STANDARDS, REAGENTS, AND REFERENCE MATERIALS

Reagents must be at a minimum the purity required in the test method. The date of reagent receipt and the expiration date are documented. The lots for most of the common solvents and acids are tested for acceptability prior to company wide purchase. (Refer to TestAmerica's Corporate SOP (CA-Q-S-001), Solvent and Acid Lot Testing and Approval.)

All manufacturer or vendor supplied Certificate of Analysis or Purity must be retained, stored appropriately, and readily available for use and inspection. These records are maintained in the LIMS. Records must be kept of the date of receipt and date of expiration of standards, reagents and reference materials. In addition, records of preparation of laboratory standards, reagents, and reference materials must be retained, stored appropriately, and be readily available for use and inspection. For detailed information on documentation and labeling, please refer to method specific SOPs.

Commercial materials purchased for preparation of calibration solutions, spike solutions, etc.., are usually accompanied with an assay certificate or the purity is noted on the label. If the assay purity is 96% or better, the weight provided by the vendor may be used without correction. If the assay purity is less than 96% a correction will be made to concentrations applied to solutions prepared from the stock commercial material.

21.4.1 All standards, reagents, and reference materials must be labeled in an unambiguous manner. Standards are logged into the laboratory's LIMS system, and are assigned a unique identification number. The following information is typically recorded in the electronic database within the LIMS.

- Standard ID
- Description of Standard
- Department
- Preparer's name
- Final volume and number of vials prepared
- Solvent type and lot number
- Preparation Date
- Expiration Date

- Standard source type (stock or daughter)
- Standard type (spike, surrogate, other)
- Parent standard ID (if applicable)
- Parent Standard Analyte Concentration (if applicable)
- Parent Standard Amount used (if applicable)
- Component Analytes
- Final concentration of each analyte
- Comment box (text field)

Records are maintained electronically for standard and reference material preparation. These records show the traceability to purchased stocks or neat compounds. These records also include method of preparation, date of preparation, expiration date and preparer's name or initials. Preparation procedures are provided in the Method SOPs.

21.4.2 All standards, reagents, and reference materials must be clearly labeled with a minimum of the following information:

- Expiration Date (include prep date for reagents)
- Standard ID from LIMS
- Special Health/Safety warnings if applicable

21.4.3 In addition, the following information may be helpful:

- Date of receipt for commercially purchased items or date of preparation for laboratory prepared items
- Date opened (for multi-use containers, if applicable)
- Description of standard (if different from manufacturer's label or if standard was prepared in the laboratory)
- Concentration (if applicable)
- Initials of analyst preparing standard or opening container

All containers of prepared reagents must include a preparation date, expiration date and an ID number to trace back to preparation.

Procedures for preparation of reagents can be found in the Method SOPs.

Standard ID numbers must be traceable through associated logbooks, worksheets and raw data.

All reagents and standards must be stored in accordance to the following priority: 1) with the manufacturer's recommendations; 2) with requirements in the specific analytical methods as specified in the laboratory SOP.

SECTION 22

SAMPLING *(NELAC 5.5.7)*

22.1 OVERVIEW

The laboratory provides sampling services. Sampling procedures are described in the following SOPs:

- Volatile Organic Sampling
- Well Sampling
- Composite Sampling
- Field pH and Residual Chlorine Analysis
- Soil and Sediment Sampling
- Lead and Copper Tap Water Sampling

22.2 SAMPLING CONTAINERS

The laboratory offers clean sampling containers for use by clients. These containers are obtained from reputable container manufacturers and meet EPA specifications as required. Any certificates of cleanliness that are provided by the supplier are maintained at the laboratory.

22.2.1 Preservatives

Upon request, preservatives are provided to the client in pre-cleaned sampling containers. In some cases containers may be purchased pre-preserved from the container supplier. Whether prepared by the laboratory or bought pre-preserved, the grades of the preservatives are at a minimum:

- Hydrochloric Acid – Reagent ACS (Certified VOA Free) or equivalent
- Methanol – Purge and Trap grade
- Nitric Acid – Instra-Analyzed or equivalent
- Sodium Bisulfate – ACS Grade or equivalent
- Sodium Hydroxide – Instra-Analyzed or equivalent
- Sulfuric Acid – Instra-Analyzed or equivalent
- Sodium Thiosulfate – ACS Grade or equivalent

22.3 DEFINITION OF HOLDING TIME

The date and time of sampling documented on the COC form establishes the day and time zero. As a general rule, when the maximum allowable holding time is expressed in “days” (e.g., 14 days, 28 days), the holding time is based on calendar day measured. Holding times expressed in “hours” (e.g., 6 hours, 24 hours, etc.) are measured from date and time zero. The first day

of holding time ends twenty-four hours after sampling. Holding times for analysis include any necessary reanalysis. However there are some programs that determine holding time compliance based on the date and specific time of analysis compared to the time of sampling regardless of how long the holding time is.

22.4 SAMPLING CONTAINERS, PRESERVATION REQUIREMENTS, HOLDING TIMES

The preservation and holding time criteria specified in the laboratory SOPs are derived from the source documents for the methods. If method required holding times or preservation requirements are not met, the reports will be qualified using a flag, footnote or case narrative. As soon as possible or "ASAP" is an EPA designation for tests for which rapid analysis is advised, but for which neither EPA nor the laboratory have a basis for a holding time.

22.5 SAMPLE ALIQUOTS / SUBSAMPLING

Taking a representative sub-sample from a container is necessary to ensure that the analytical results are representative of the sample collected in the field. The size of the sample container, the quantity of sample fitted within the container, and the homogeneity of the sample need consideration when sub-sampling for sample preparation. It is the laboratory's responsibility to take a representative subsample or aliquot of the sample provided for analysis.

Analysts should handle each sample as if it is potentially dangerous. At a minimum, safety glasses, gloves, and lab coats must be worn when preparing aliquots for analysis.

Guidelines on taking sample aliquots & subsampling are located SOP SF-QA-0725.

SECTION 23

HANDLING OF SAMPLES *(NELAC 5.5.8)*

Sample management procedures at the laboratory ensure that sample integrity and custody are maintained and documented from sampling/receipt through disposal.

23.1 CHAIN OF CUSTODY (COC)

The COC form is the written documented history of any sample and is initiated when bottles are sent to the field, or at the time of sampling. This form is completed by the sampling personnel and accompanies the samples to the laboratory where it is received and stored under the laboratory's custody. The purpose of the COC form is to provide a legal written record of the handling of samples from the time of collection until they are received at the laboratory. It also serves as the primary written request for analyses from the client to the laboratory. The COC form acts as a purchase order for analytical services when no other contractual agreement is in effect. An example of a COC form may be found in Figure 23-1.

23.1.1 Field Documentation

The information the sampler needs to provide at the time of sampling on the container label is:

- Sample identification
- Date and time
- Preservative

During the sampling process, the COC form is completed and must be legible (see Figure 23-1). This form includes information such as:

- Client name, address, phone number and fax number (if available)
- Project name and/or number
- The sample identification
- Date, time and location of sampling
- Sample collectors name
- The matrix description
- The container description
- The total number of each type of container
- Preservatives used
- Analysis requested
- Requested turnaround time (TAT)
- Any special instructions
- Purchase Order number or billing information (e.g. quote number) if available
- The date and time that each person received or relinquished the sample(s), including their signed name.

The samples are stored in a cooler with ice, as applicable, and remain solely in the possession of the client's field technician until the samples are delivered to the laboratory. The sample collector must assure that each container is in his/her physical possession or in his/her view at all times, or stored in such a place and manner to preclude tampering. The field technician relinquishes the samples in writing on the COC form to the sample control personnel at the laboratory or to a TestAmerica courier. Samples are only considered to be received by lab when personnel at the laboratory have physical contact with the samples.

Note: Independent couriers are not required to sign the COC form. The COC is usually kept in the sealed sample cooler.

23.2 SAMPLE RECEIPT

Samples are received at the laboratory by designated sample receiving personnel and a unique laboratory project identification number is assigned. Each sample container shall be assigned a unique sample identification number that is cross-referenced to the client identification number such that traceability of test samples is unambiguous and documented. Each sample container is affixed with a durable sample identification label. Sample acceptance, receipt, tracking and storage procedures are summarized in the following sections. See SOP SF-SC-0202.

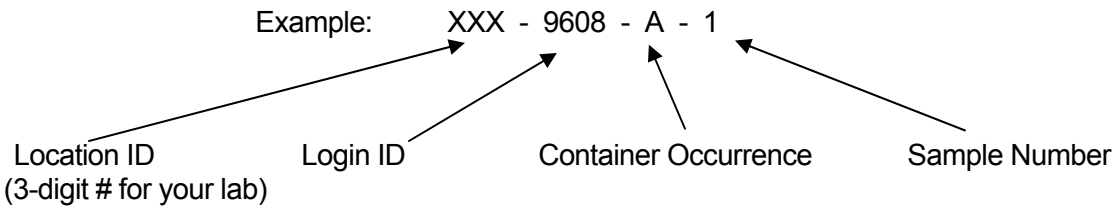
23.2.1 Laboratory Receipt

When samples arrive at the laboratory, sample receiving personnel inspect the coolers and samples. The integrity of each sample must be determined by comparing sample labels or tags with the COC and by visual checks of the container for possible damage. Any non-conformance, irregularity, or compromised sample receipt must be documented on a log-in checklist and brought to the immediate attention of the client. The COC, documentation of any non-conformance, irregularity, or compromised sample receipt, record of client contact, and resulting instructions become part of the project record.

23.2.1.1 Unique Sample Identification

All samples that are processed through the laboratory receive a unique sample identification to ensure that there can be no confusion regarding the identity of such samples at anytime. This system includes identification for all samples, subsamples and subsequent extracts and/or digestates.

The laboratory assigns a unique identification (e.g., Sample ID) code to each sample container received at the laboratory. This Primary ID is made up of the following information (consisting of 4 components):



The above example states that TestAmerica <location> Laboratory (Location XXX). Login ID is 9608 (unique to a particular client/job occurrence). The container code indicates it is the first container ("A") of Sample #1.

If the primary container goes through a prep step that creates a "new" container, then the new container is considered secondary and gets another ID. An example of this being a client sample in a 1-Liter amber bottle is sent through a Liquid/Liquid Extraction and an extraction vial is created from this step. The vial would be a SECONDARY container. The secondary ID has 5 components.

Example: XXX - 9608 - A - 1 - **A** ←——— **Secondary Container Occurrence**

Example: 220-9608-A-1-A, would indicate the PRIMARY container listed above that went through a step that created the 1st occurrence of a Secondary container.

With this system, a client sample can literally be tracked throughout the laboratory in every step from receipt to disposal.

23.3 SAMPLE ACCEPTANCE POLICY

The laboratory has a written sample acceptance policy (Figure 23-2) that clearly outlines the circumstances under which samples shall be accepted or rejected. These include:

- a COC filled out completely;
- samples must be properly labeled;
- proper sample containers with adequate volume for the analysis (Sampling Guide) and necessary QC;
- samples must be preserved according to the requirements of the requested analytical method (Sampling Guide);
- sample holding times must be adhered to (Sampling Guide);
- the project manager will be notified if any sample is received in damaged condition.

Data from samples which do not meet these criteria are flagged and the nature of the variation from policy is defined. A copy of the sample acceptance policy is provided to each client prior to shipment of samples.

23.3.1.1 After inspecting the samples, the sample receiving personnel sign and date the COC form, make any necessary notes of the samples' conditions and store them in appropriate refrigerators or storage locations.

23.3.1.2 Any deviations from these checks that question the suitability of the sample for analysis, or incomplete documentation as to the tests required will be resolved by consultation with the client. If the sample acceptance policy criteria are not met, the laboratory shall either:

- Retain all correspondence and/or records of communications with the client regarding the disposition of rejected samples, or

- Fully document any decision to proceed with sample analysis that does not meet sample acceptance criteria.

Once sample acceptance is verified, the samples are logged into the LIMS according SOP SF-SC-0202.

23.4 SAMPLE STORAGE

In order to avoid deterioration, contamination or damage to a sample during storage and handling, from the time of receipt until all analyses are complete, samples are stored in refrigerators suitable for the sample matrix. Waters for metals analysis are stored at room temperature. In addition, samples to be analyzed for volatile organic parameters are stored in separate refrigerators designated for volatile organic parameters only. Samples are never to be stored with reagents, standards or materials that may create contamination.

To ensure the integrity of the samples during storage, refrigerator blanks are maintained in the volatile sample refrigerators and analyzed every two weeks.

Analysts and technicians retrieve the sample container allocated to their analysis from the designated refrigerator and place them on carts, analyze the sample, and return the remaining sample or empty container to the refrigerator from which it originally came. All unused portions of samples, including empty sample containers, are returned to the secure sample control area. All samples are kept in the refrigerators for 45 days after reporting results, which meets or exceeds most sample holding times. Special arrangements may be made to store samples for longer periods of time. This extended holding period allows additional metal analyses to be performed on the archived sample and assists clients in dealing with legal matters or regulatory issues.

Access to the laboratory is controlled such that sample storage need not be locked at all times unless a project specifically demands it. Samples are accessible to laboratory personnel only. Visitors to the laboratory are prohibited from entering the refrigerator and laboratory areas unless accompanied by an employee of TestAmerica.

23.5 HAZARDOUS SAMPLES AND FOREIGN SOILS

To minimize exposure to personnel and to avoid potential accidents, hazardous and foreign soil samples are stored in an isolated area designated for hazardous waste only. These include all oily or smelly samples and all samples for PCB analysis. All hazardous samples are either returned to the client or disposed of appropriately through a hazardous waste disposal firm that lab-packs all hazardous samples and removes them from the laboratory.

23.6 SAMPLE SHIPPING

In the event that the laboratory needs to ship samples, the samples are placed in a cooler with enough ice to ensure the samples remain just above freezing and at or below 6.0°C during transit. The samples are carefully surrounded by packing material to avoid breakage (yet maintain appropriate temperature). A trip blank is enclosed for those samples requiring water/solid volatile organic analyses (see Note). The chain-of-custody form is signed by the

sample control technician and sent with the shipping paperwork. Samples are generally shipped overnight express or hand-delivered by a TestAmerica courier to maintain sample integrity. All personnel involved with shipping and receiving samples must be trained to maintain the proper chain-of-custody documentation and to keep the samples intact and on ice. The Environmental, Health and Safety Manual contains additional shipping requirements.

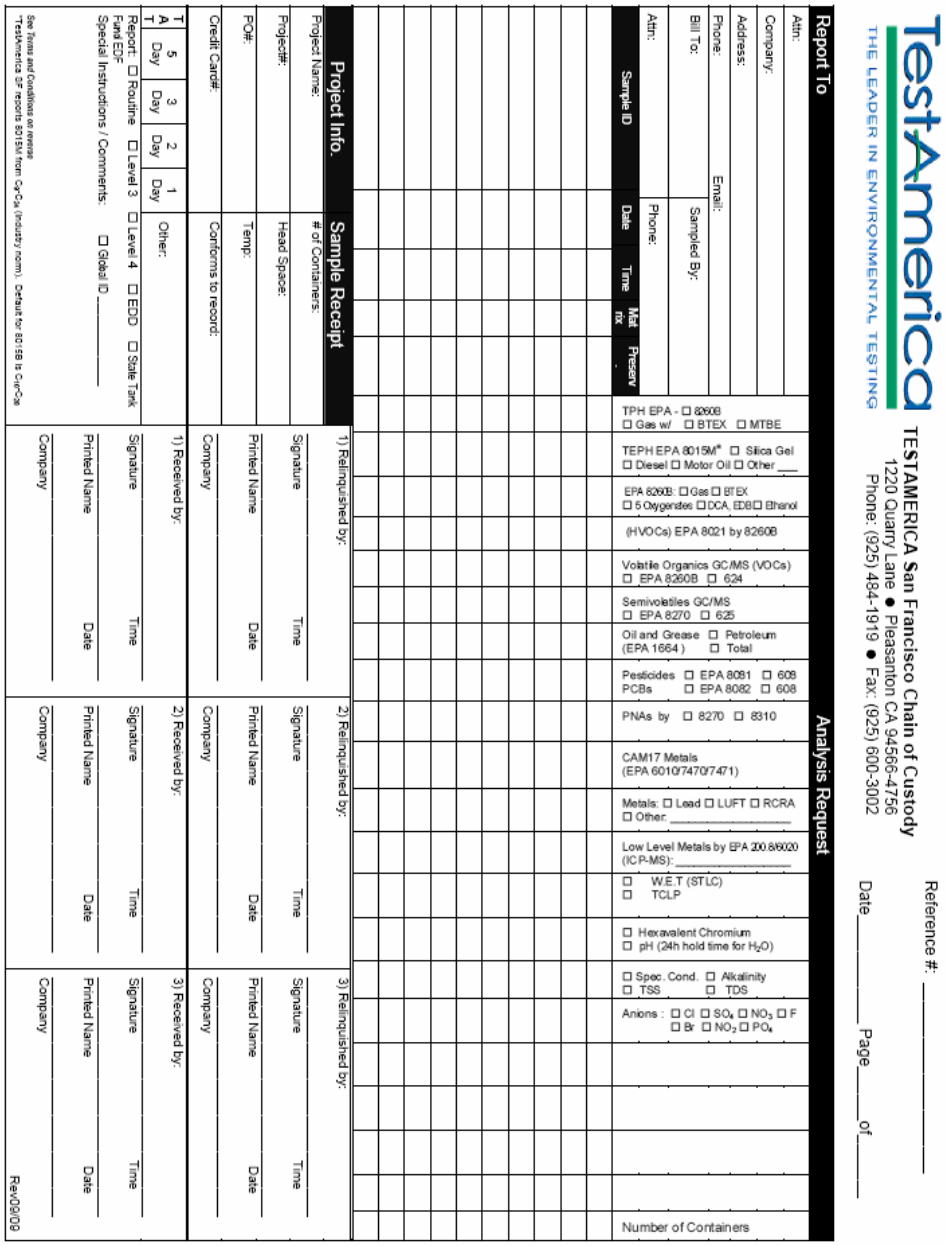
Note: If a client does not request trip blank analysis on the COC or other paperwork, the laboratory will not analyze the trip blanks that were supplied. However, in the interest of good client service, the laboratory will advise the client at the time of sample receipt that it was noted that they did not request analysis of the trip blank; and that the laboratory is providing the notification to verify that they are not inadvertently omitting a key part of regulatory compliance testing.

23.7 SAMPLE DISPOSAL

Samples should be retained for a minimum of 45 days after the project report is sent, however, provisions may be made for earlier disposal of samples once the holding time is exceeded. Some samples are required to be held for longer periods based on regulatory or client requirements (e.g., 60 days after project report is sent). The laboratory must follow the longer sample retention requirements where required by regulation or client agreement. Several possibilities for sample disposal exist: the sample may be consumed completely during analysis, the sample may be returned to the customer or location of sampling for disposal, or the sample may be disposed of in accordance with the laboratory's waste disposal procedures (SOP: SF-QA-1900. All procedures in the laboratory Environmental, Health and Safety Manual are followed during disposal. Samples are normally maintained in the laboratory no longer than two months from receipt unless otherwise requested. Unused portions of samples found or suspected to be hazardous according to state or federal guidelines may be returned to the client upon completion of the analytical work.

Figure 23-1.

Example: Chain of Custody (COC)



TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TESTAMERICA San Francisco Chain of Custody
1220 Quarry Lane ● Pleasanton CA 94566-4756
Phone: (925) 484-1919 ● Fax: (925) 600-3002

Reference #: _____
Date_____ Page____ of____

Report To

Attn:
Company:
Address:
Phone: Email:
Bill To: Sampled By:
Attn: Phone:

Sample ID	Date	Time	Matrix	Preserv.

Analysis Request

- TPH EPA - ☐ 8260B ☐ Gas w/ ☐ BTEX ☐ MTBE
- TEPH EPA 8015M* ☐ Silica Gel ☐ Diesel ☐ Motor Oil ☐ Other ___
- EPA 8260B: ☐ Gas ☐ BTEX ☐ 5 Oxygenates ☐ DCA, EDB ☐ Ethanol
- (HVOCs) EPA 8021 by 8260B
- Volatile Organics GC/MS (VOCs) ☐ EPA 8260B ☐ 624
- Semivolatiles GC/MS ☐ EPA 8270 ☐ 625
- Oil and Grease (EPA 1664) ☐ Petroleum ☐ Total
- Pesticides PCBs ☐ EPA 8081 ☐ 608 ☐ EPA 8082 ☐ 608
- PNAs by ☐ 8270 ☐ 8310
- CAM17 Metals (EPA 6010/7470/7471)
- Metals: ☐ Lead ☐ LUFT ☐ RCRA ☐ Other: _____
- Low Level Metals by EPA 200.8/6020 (ICP-MS): _____
- ☐ W.E.T (STLC) ☐ TCLP
- ☐ Hexavalent Chromium ☐ pH (24h hold time for H_2O)
- ☐ Spec. Cond. ☐ Alkalinity ☐ TSS ☐ TDS
- Anions : ☐ Cl ☐ SO_4 ☐ NO_3 ☐ F ☐ Br ☐ NO_2 ☐ PO_4

Number of Containers

Project Info.

Project Name:
Project#:
PO#:
Credit Card#:

Sample Receipt

# of Containers:
Head Space:
Temp:
Conforms to record:

TAT: 5 Day, 3 Day, 2 Day, 1 Day, Other:
Report: ☐ Routine ☐ Level 3 ☐ Level 4 ☐ EDD ☐ State Tank Fund EDF
Special Instructions / Comments: ☐ Global ID _____

See Terms and Conditions on reverse
*TestAmerica SF reports 8015M from C_8-C_{36} (industry norm). Default for 8015B is C_{10}-C_{36}

	Signature	Time	Printed Name	Date	Company
1) Relinquished by:					
1) Received by:					
2) Relinquished by:					
2) Received by:					
3) Relinquished by:					
3) Received by:					

Rev09/09

Figure 23-2

Example: Sample Acceptance Policy

All incoming work will be evaluated against the criteria listed below. Where applicable, data from any samples that do not meet the criteria listed below will be noted on the laboratory report defining the nature and substance of the variation. In addition the client will be notified either by telephone, fax or e-mail ASAP after the receipt of the samples.

1) Samples must arrive with labels intact with a Chain of Custody filled out completely. The following information must be recorded.
   - *Client name, address, phone number and fax number (if available)*
   - *Project name and/or number*
   - *The sample identification*
   - *Date, time and location of sampling*
   - *The collectors name*
   - *The matrix description*
   - *The container description*
   - *The total number of each type of container*
   - *Preservatives used*
   - *Analysis requested*
   - *Requested turnaround time (TAT)*
   - *Any special instructions*
   - *Purchase Order number or billing information (e.g. quote number) if available*
   - *The date and time that each person received or relinquished the sample(s), including their signed name.*
   - ***The date and time of receipt must be recorded between the last person to relinquish the samples and the person who receives the samples in the lab, and they must be exactly the same.***
   - **Information must be legible**

2) Samples must be properly labeled.
   - Use durable labels (labels provided by TestAmerica are preferred)
   - Include a unique identification number
   - Include sampling date and time & sampler ID
   - Include preservative used.
   - Use indelible ink
   - **Information must be legible**

3) Proper sample containers with adequate volume for the analysis and necessary QC are required for each analysis requested. See Lab Sampling Guide.

4) Samples must be preserved according to the requirements of the requested analytical method (See Sampling Guide**.**
5) Most analytical methods require chilling samples to 4° C (other than water samples for metals analysis). For these methods, the criteria are met if the samples are chilled to below 6° C and above freezing (0°C). For methods with other temperature criteria (e.g. some bacteriological methods require $\leq$ 10 ^{o}C), the samples must arrive within $\pm$ 2° C of the required temperature or within the

method specified range. **Note:** Samples that are hand delivered to the laboratory immediately after collection may not have had time to cool sufficiently. In this case the samples will be considered acceptable as long as there is evidence that the chilling process has begun (arrival on ice).

- Chemical preservation (pH) will be verified prior to analysis and the project manager will be notified immediately if there is a discrepancy. If analyses will still be performed, all affected results will be flagged to indicate improper preservation.

- **FOR WATER SAMPLES TESTED FOR CYANIDE (by Standard Methods or EPA 335)**
  - In the Field: Samples are to be tested for Sulfide using lead acetate paper prior to the addition of Sodium Hydroxide (NaOH). If sulfide is present, the sample must be treated with Cadmium Chloride and filtered prior to the addition of NaOH.

    - If the sulfide test and treatment is not performed in the field, the lab will test the samples for sulfide using lead acetate paper at the time of receipt and if sulfide is present in the sample, the client will be notified and given the option of retaking the sample and treating in the field per the method requirements or the laboratory can analyze the samples as delivered and qualify the results in the final report.

  - It is the responsibility of the client to notify the laboratory if thiosulfate, sulfite, or thiocyanate are known or suspected to be present in the sample. This notification may be on the chain of custody. The samples may need to be subcontracted to a laboratory that performs a UV digestion. If the lab does not perform the UV digestion on samples that contain these compounds, the results must be qualified in the final report.

  - The laboratory must test the sample for oxidizing agents (e.g. Chlorine) prior to analysis and treat according to the methods prior to distillation. (ascorbic acid or sodium arsenite are the preferred choice).

6) Sample Holding Times
   - TestAmerica will make every effort to analyze samples within the regulatory holding time. Samples must be received in the laboratory with enough time to perform the sample analysis. Except for short holding time samples (< 48hr HT) sample must be received with at least 48 hrs (working days) remaining on the holding time for us to ensure analysis.

   - Analyses that are designated as “field” analyses (Odor, pH, Dissolved Oxygen, Disinfectant Residual; a.k.a. Residual Chlorine, and Redox Potential) should be analyzed ASAP by the field sampler prior to delivering to the lab (within 15 minutes). However, if the analyses are to be performed in the laboratory, TestAmerica will make every effort to analyze the samples within 24 hours from receipt of the samples in the testing laboratory. Samples for “field” analyses received after 4:00 pm on Friday or on the weekend will be analyzed no later than the next business day after receipt (Monday unless a holiday). Samples will remain refrigerated and sealed until the time of analysis. Samples analyzed in the laboratory will be qualified on the final report with an ‘H’ to indicate holding time exceedance.

7) All samples submitted for Volatile Organic analyses must have a Trip Blank submitted at the same time. TestAmerica will supply a trip blank with the bottle order upon request.

8) The project manager will be notified if any sample is received in damaged condition. TestAmerica will request that a sample be resubmitted for analysis.

9) Recommendations for packing samples for shipment.

   - Pack samples in Ice rather than “Blue” ice packs.

- Soil samples should be placed in plastic zip-lock bags. The containers often have dirt around the top and do not seal very well and are prone to intrusion from the water from melted ice.
- Water samples would be best if wrapped with bubble-wrap or paper (newspaper, or paper towels work) and then placed in plastic zip-lock bags.
- Fill extra cooler space with bubble wrap.

Figure 23-3. Example: Cooler Receipt Form

Login Number: 30207 **List Source: TestAmerica San Francisco**
Creator: Hoang, Julie
List Number: 1

Question	T / F/ NA	Comment
Radioactivity either was not measured or, if measured, is at or below background	N/A	
The cooler's custody seal, if present, is intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the sample IDs on the containers and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
VOA sample vials do not have headspace or bubble is <6mm (1/4") in diameter.	True	
If necessary, staff have been informed of any short hold time or quick TAT needs	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	

SECTION 24

ASSURING THE QUALITY OF TEST RESULTS *(NELAC 5.5.9)*

24.1 OVERVIEW

In order to assure our clients of the validity of their data, the laboratory continuously evaluates the quality of the analytical process. The analytical process is controlled not only by instrument calibration as discussed in Section 20, but also by routine process quality control measurements (e.g. Blanks, Laboratory Control Samples (LCS), Matrix Spikes (MS), duplicates (DUP), surrogates, Internal Standards (IS)). These quality control checks are performed as required by the method or regulations to assess precision and accuracy. In addition to the routine process quality control samples, Proficiency Testing (PT) Samples (concentrations unknown to laboratory) are analyzed to help ensure laboratory performance.

24.2 CONTROLS

Sample preparation or pre-treatment is commonly required before analysis. Typical preparation steps include homogenization, grinding, solvent extraction, sonication, acid digestion, reflux, evaporation, drying and ashing. During these pre-treatment steps, samples are arranged into discreet manageable groups referred to as preparation (prep) batches. Prep batches provide a means to control variability in sample treatment. Control samples are added to each prep batch to monitor method performance and are processed through the entire analytical procedure with investigative/field samples.

24.3 NEGATIVE CONTROLS

Table 24-1. Example – Negative Controls

Control Type	Details
Method Blank (MB)	are used to assess preparation and analysis for possible contamination during the preparation and processing steps.
	The specific frequency of use for method blanks during the analytical sequence is defined in the specific standard operating procedure for each analysis. Generally it is 1 for each batch of samples; not to exceed 20 environmental samples.
	The method blank is prepared from a clean matrix similar to that of the associated samples that is free from target analytes (e.g., Reagent water, Ottawa sand, glass beads, etc.) and is processed along with and under the same conditions as the associated samples. The method blank goes through all of the steps of the process (including as necessary: filtration, clean-ups, etc.).
Calibration Blanks	are prepared and analyzed along with calibration standards where applicable. They are prepared using the same reagents that are used to prepare the standards. In some analyses the calibration blank may be included in the calibration curve.
Instrument Blanks	are blank reagents or reagent water that may be processed during an analytical sequence in order to assess contamination in the analytical system. In general, instrument blanks are used to differentiate between contamination caused by the analytical system and that caused by the sample handling or sample prep process. Instrument blanks may also be inserted throughout the analytical sequence to minimize the effect of carryover from samples with high analyte content.

Table 24-1. Example – Negative Controls

Control Type	Details
Trip Blank [1]	are required to be submitted by the client with each shipment of samples requiring aqueous and solid volatiles analyses. Additionally, trip blanks may be prepared and analyzed for volatile analysis of air samples, when required by the client. A trip blank may be purchased (certified clean) or is prepared by the laboratory by filling a clean container with pure deionized water that has been purged to remove any volatile compounds. Appropriate preservatives are also added to the container. The trip blank is sent with the bottle order and is intended to reflect the environment that the containers are subjected to throughout shipping and handling and help identify possible sources if contamination is found. The field sampler returns the trip blank in the cooler with the field samples.
Field Blanks [1]	are sometimes used for specific projects by the field samplers. A field blank prepared in the field by filling a clean container with pure reagent water and appropriate preservative, if any, for the specific sampling activity being undertaken. (EPA OSWER)
Equipment Blanks [1]	are also sometimes created in the field for specific projects. An equipment blank is a sample of analyte-free media which has been used to rinse common sampling equipment to check effectiveness of decontamination procedures. (NELAC)
Holding Blanks	also referred to as refrigerator or freezer blanks, are used to monitor the sample storage units for volatile organic compounds during the storage of VOA samples in the laboratory

[1] When known, these field QC samples should not be selected for matrix QC as it does not provide information on the behavior of the target compounds in the field samples. Usually, the client sample ID will provide information to identify the field blanks with labels such as "FB", "EB", or "TB."

Evaluation criteria and corrective action for these controls are defined in the specific standard operating procedure for each analysis.

24.4 POSITIVE CONTROLS

Control samples (e.g., QC indicators) are analyzed with each batch of samples to evaluate data based upon (1) Method Performance (Laboratory Control Sample (LCS) or Blank Spike (BS)), which entails both the preparation and measurement steps; and (2) Matrix Effects (Matrix Spike (MS) (Matrix spikes are not applicable to air) or Sample Duplicate (MD, DUP), which evaluates field sampling accuracy, precision, representativeness, interferences, and the effect of the matrix on the method performed. Each regulatory program and each method within those programs specify the control samples that are prepared and/or analyzed with a specific batch

Note that frequency of control samples vary with specific regulatory, methodology and project specific criteria. Complete details on method control samples are as listed in each analytical SOP.

24.4.1 Method Performance Control - Laboratory Control Sample (LCS)

24.4.1.1 The LCS measures the accuracy of the method in a blank matrix and assesses method performance independent of potential field sample matrix affects in a laboratory batch.

24.4.1.2 The LCS is prepared from a clean matrix similar to that of the associated samples that is free from target analytes (for example: Reagent water, Ottawa sand, glass beads, etc.) and is processed along with and under the same conditions as the associated samples. The LCS is spiked with verified known amounts of analytes or is

made of a material containing known and verified amounts of analytes, taken through all preparation and analysis steps along with the field samples. Where there is no preparation taken for an analysis (such as in aqueous volatiles), or when all samples and standards undergo the same preparation and analysis process (such as Phosphorus), a calibration verification standard is reported as the LCS. In some instances where there is no practical clean solid matrix available, aqueous LCS's may be processed for solid matrices; final results may be calculated as mg/kg or ug/kg, assuming 100% solids and a weight equivalent to the aliquot used for the corresponding field samples, to facilitate comparison with the field samples.

24.4.1.3 Certified pre-made reference material purchased from a NIST/A2LA accredited vendor may also be used for the LCS when the material represents the sample matrix or the analyte is not easily spiked (e.g. solid matrix LCS for metals, TDS, etc.).

24.4.1.4 The specific frequency of use for LCS during the analytical sequence is defined in the specific standard operating procedure for each analysis. It is generally 1 for each batch of samples; not to exceed 20 environmental samples.

24.4.1.5 If the mandated or requested test method, or project requirements, do not specify the spiking components, the laboratory shall spike all reportable components to be reported in the Laboratory Control Sample (and Matrix Spike) where applicable (e.g. no spike of pH). However, in cases where the components interfere with accurate assessment (such as simultaneously spiking chlordane, toxaphene and PCBs in Method 608), the test method has an extremely long list of components or components are incompatible, at a minimum, a representative number of the listed components (see below) shall be used to control the test method. The selected components of each spiking mix shall represent all chemistries, elution patterns and masses, permit specified analytes and other client requested components. However, the laboratory shall ensure that all reported components are used in the spike mixture within a two-year time period.

24.4.1.5.1 For methods that have 1-10 target analytes, spike all components.

24.4.1.5.2 For methods that include 11-20 target analytes, spike at least 10 or 80%, whichever is greater.

24.4.1.5.3 For methods with more than 20 target analytes, spike at least 16 components.

24.4.1.5.4 Exception: Due to analyte incompatibility in pesticides, Toxaphene and Chlordane are only spiked at client request based on specific project needs.

24.4.1.5.5 Exception: Due to analyte incompatibility between the various PCB aroclors, aroclors 1016 and 1260 are used for spiking as they cover the range of all of the aroclors. Specific aroclors may be used by request on a project specific basis.

24.5 SAMPLE MATRIX CONTROLS

Table 24-2. Example - Sample Matrix Control

Control Type	Details	
Matrix Spikes (MS)	Use	used to assess the effect sample matrix of the spiked sample has on the precision and accuracy of the results generated by the method used;
	Typical Frequency [1]	At a minimum, with each matrix-specific batch of samples processed, an MS is carried through the complete analytical procedure. Unless specified by the client, samples used for spiking are randomly selected and rotated between different client projects.If the mandated or requested test method does not specify the spiking components, the laboratory shall spike all reportable components to be reported in the Laboratory Control Sample and Matrix Spike. Refer to the method SOP for complete details
	Description	essentially a sample fortified with a known amount of the test analyte(s).
Surrogate	Use	Measures method performance to sample matrix (organics only).
	Typical Frequency [1]	Are added to all samples, standards, and blanks, for all organic chromatography methods except when the matrix precludes its use or when a surrogate is not available. The recovery of the surrogates is compared to the acceptance limits for the specific method. Poor surrogate recovery may indicate a problem with sample composition and shall be reported, with data qualifiers, to the client whose sample produced poor recovery.
	Description	Are similar to matrix spikes except the analytes are compounds with properties that mimic the analyte of interest and are unlikely to be found in environment samples.
Duplicates[2]	Use	For a measure of analytical precision, with each matrix-specific batch of samples processed, a matrix duplicate (MD or DUP) sample, matrix spike duplicate (MSD), or LCS duplicate (LCSD) is carried through the complete analytical procedure.
	Typical Frequency [1]	Duplicate samples are usually analyzed with methods that do not require matrix spike analysis.
	Description	Performed by analyzing two aliquots of the same field sample independently or an additional LCS.
Internal Standards	Use	Are spiked into all environmental and quality control samples (including the initial calibration standards) to monitor the qualitative aspect of organic and some inorganic analytical measurements.
	Typical Frequency [1]	All organic and ICP methods as required by the analytical method.
	Description	Used to correct for matrix effects and to help troubleshoot variability in analytical response and are assessed after data acquisition. Possible sources of poor internal standard response are sample matrix, poor analytical technique or instrument performance.

[1] See the specific analytical SOP for type and frequency of sample matrix control samples.

[2] LCSD's are normally not performed except when regulatory agencies or client specifications require them. The recoveries for the spiked duplicate samples must meet the same laboratory established recovery limits as the accuracy QC samples. If an LCSD is analyzed both the LCS and LCSD must meet the same recovery criteria and be included in the final report. The precision measurement is reported as "Relative Percent Difference" (RPD). Poor precision between duplicates (except LCS/LCSD) may indicate non-homogeneous matrix or sampling.

24.6 ACCEPTANCE CRITERIA (CONTROL LIMITS)

24.6.1 As mandated by the test method and regulation, each individual analyte in the LCS, MS, or Surrogate Spike is evaluated against the control limits published in the test method. Where there are no established acceptance criteria, the laboratory calculates in-house control limits with the use of control charts or, in some cases, utilizes client project specific control limits. When this occurs, the regulatory or project limits will supersede the laboratory's in-house limits.

Note: For methods, analytes and matrices with very limited data (e.g., unusual matrices not analyzed often), interim limits are established using available data or by analogy to similar methods or matrices.

24.6.2 Once control limits have been established, they are verified, reviewed, and updated if necessary on an annual basis unless the method requires more frequent updating. Control limits are established per method (as opposed to per instrument) regardless of the number of instruments utilized.

24.6.3 Laboratory generated % Recovery acceptance (control) limits are generally established by taking ± 3 Standard Deviations (99% confidence level) from the average recovery of a minimum of 20-30 data points (more points are preferred).

24.6.3.1 Regardless of the calculated limit, the limit should be no tighter than the Calibration Verification (ICV/CCV). (Unless the analytical method specifies a tighter limit).

24.6.3.2 In-house limits cannot be any wider than those mandated in a regulated analytical method. Client or contract required control limits are evaluated against the laboratory's statistically derived control limits to determine if the data quality objectives (DQOs) can be achieved. If laboratory control limits are not consistent with DQOs, then alternatives must be considered, such as method improvements or use of an alternate analytical method.

24.6.3.3 The lowest acceptable recovery limit will be 10% (the analyte must be detectable and identifiable). Exception: The lowest acceptable recovery limit for Benzidine will be 5% and the analyte must be detectable and identifiable.

24.6.3.4 The maximum acceptable recovery limit will be 150%.

24.6.3.5 The maximum acceptable RPD limit will be 35% for waters and 40% for soils. The minimum RPD limit is 10%.

24.6.3.6 If either the high or low end of the control limit changes by ≤ 5% from previous, the control chart is visually inspected and, using professional judgment, they may be left unchanged if there is no affect on laboratory ability to meet the existing limits.

24.6.4 The lab must be able to generate a current listing of their control limits and track when the updates are performed. In addition, the laboratory must be able to recreate historical control limits, which are stored in TALS under Control Chart Logs.

24.6.4.1 The QA department generates a Quality Control Limit Summary that contains tables that summarize the precision and accuracy acceptability limits for analyses performed at TestAmerica San Francisco. This summary includes an effective date, is updated each time new limits are generated and is located in the LIMS. Unless otherwise noted, limits within these tables are laboratory generated. The analysts are instructed to use the current limits in the laboratory (dated and approved by the Department Manager and QA Manager) and entered into the Laboratory Information Management System (LIMS). The Quality Assurance department maintains an archive of all limits used within the laboratory.

24.6.5 A LCS that is within the acceptance criteria establishes that the analytical system is in control and is used to validate the process. Samples that are analyzed with an LCS with recoveries outside of the acceptance limits may be determined as out of control and should be reanalyzed if possible. If reanalysis is not possible, then the results for all affected analytes for samples within the same batch must be qualified when reported. The internal corrective action process (see Section 12) is also initiated if an LCS exceeds the acceptance limits. Sample results may be qualified and reported without reanalysis if:

24.6.5.1 The analyte results are below the reporting limit and the LCS is above the upper control limit.

24.6.5.2 If the analytical results are above the relevant regulatory limit and the LCS is below the lower control limit.

24.6.5.3 Or, for NELAC and Department Of Defense (DOD) work, there are an allowable number of Marginal Exceedances (ME):

- <11 analytes – 0 marginal exceedances are allowed.
- 11 – 30 Analytes – 1 marginal exceedance is allowed
- 31-50 Analytes – 2 marginal exceedances are allowed
- 51-70 Analytes – 3 marginal exceedances are allowed
- 71-90 Analytes – 4 marginal exceedances are allowed
- > 90 Analytes – 5 marginal exceedances are allowed

24.6.5.3.1 Marginal exceedances are recovery exceedances between 3 SD and 4 SD from the mean recovery limit (NELAC).

24.6.5.3.2 Marginal exceedances must be random. If the same analyte exceeds the LCS control limit repeatedly, it is an indication of a systematic problem. The source of the error must be located and corrective action taken.

24.6.5.3.3 Though marginal excedences may be allowed, the data must still be qualified to indicate it is outside of the normal limits.

24.6.6 If the MS/MSDs do not meet acceptance limits, the MS/MSD and the associated spiked sample is reported with a qualifier for those analytes that do not meet limits. If obvious preparation errors are suspected, or if requested by the client, unacceptable MS/MSDs are reprocessed and reanalyzed to prove matrix interference. A more detailed discussion of acceptance criteria and corrective action can be found in the lab's method SOPs and in Section 12.

24.6.7 If a surrogate standard falls outside the acceptance limits, if there is not obvious chromatographic matrix interference, reanalyze the sample to confirm a possible matrix effect. If the recoveries confirm or there was obvious chromatographic interference, results are reported from the original analysis and a qualifier is added. If the reanalysis meets surrogate recovery criteria, the second run is reported (or both are reported if requested by the client). Under certain circumstances, where all of the samples are from the same location and share similar chromatography, the reanalysis may be performed on a single sample rather than all of

the samples and if the surrogate meets the recovery criteria in the reanalysis, all of the affected samples would require reanalysis.

24.7 ADDITIONAL PROCEDURES TO ASSURE QUALITY CONTROL

24.7.1 The laboratory has written and approved method SOPs to assure the accuracy of the test method including calibration (see Section 20), use of certified reference materials (see Section 21) and use of PT samples (see Section 15).

24.7.2 A discussion regarding MDLs, Limit of Detection (LOD) and Limit of Quantitation (LOQ) can be found in Section 19.

24.7.3 Use of formulae to reduce data is discussed in the method SOPs and in Section 20.

24.7.4 Selection of appropriate reagents and standards is included in Section 9 and 21.

24.7.5 A discussion on selectivity of the test is included in Section 5.

24.7.6 Constant and consistent test conditions are discussed in Section 18.

24.7.7 The laboratories sample acceptance policy is included in Section 23.

SECTION 25

REPORTING RESULTS *(NELAC 5.5.10)*

25.1 OVERVIEW

The results of each test are reported accurately, clearly, unambiguously, and objectively in accordance with State and Federal regulations as well as client requirements. Analytical results are issued in a format that is intended to satisfy customer and laboratory accreditation requirements as well as provide the end user with the information needed to properly evaluate the results. Where there is conflict between client requests and laboratory ethics or regulatory requirements, the laboratory's ethical and legal requirements are paramount, and the laboratory will work with the client during project set up to develop an acceptable solution. Refer to Section 7.

A variety of report formats are available to meet specific needs.

In cases where a client asks for simplified reports, there must be a written request from the client. There still must be enough information that would show any analyses that were out of conformance (QC out of limits) and there should be a reference to a full report that is made available to the client.

Review of reported data is included in Section 19.

25.2 TEST REPORTS

Analytical results are reported in a format that is satisfactory to the client and meets all requirements of applicable accrediting authorities and agencies. A variety of report formats are available to meet specific needs. The report is printed on laboratory letterhead, reviewed, and signed by the appropriate project manager. At a minimum, the standard laboratory report shall contain the following information:

25.2.1 A report title (e.g. Analytical Report For Samples) with a "sample results" column header.

25.2.2 Each report cover page printed on company letterhead, which includes the laboratory name, address and telephone number.

25.2.3 A unique identification of the report (e.g. work order number) and on each page an identification in order to ensure the page is recognized as part of the report and a clear identification of the end.

Note: Page numbers of report are represented as page # of ##. Where the first number is the page number and the second is the total number of pages.

25.2.4 A copy of the chain of custody (COC).

- Any COCs involved with Subcontracting are included.

- Any additional addenda to the report must be treated in a similar fashion so it is a recognizable part of the report and cannot accidentally get separated from the report (eg. Sampling information).

25.2.5 The name and address of client and a project name/number, if applicable.

25.2.6 Client project manager or other contact

25.2.7 Description and unambiguous identification of the tested sample(s) including the client identification code.

25.2.8 Date of receipt of sample, date and time of collection, and date(s) of test preparation and performance, and time of preparation or analysis if the required holding time for either activity is less than or equal to 72 hours.

25.2.9 Date reported or date of revision, if applicable.

25.2.10 Method of analysis including method code (EPA, Standard Methods, etc).

25.2.11 Practical quantitation limits or reporting limit.

25.2.12 Method detection limits (if requested)

25.2.13 Definition of Data qualifiers and reporting acronyms (e.g. ND).

25.2.14 Sample results.

25.2.15 QC data consisting of method blank, surrogate, LCS, and MS/MSD recoveries and control limits.

25.2.16 Condition of samples at receipt including temperature. This may be accomplished in a narrative or by attaching sample login sheets (Refer to Sec. 25.2.4 – Item 3 regarding additional addenda).

25.2.17 A statement that the report shall not be reproduced except in full, without prior express written approval of the laboratory.

25.2.18 A signature and title of the person(s) accepting responsibility for the content of the report and date of issue. Signatories are appointed by the Lab Director.

25.2.19 When NELAC accreditation is required, the lab shall certify that the test results meet all requirements of NELAC or provide reasons and/or justification if they do not.

25.2.20 The laboratory includes a cover letter.

25.2.21 Where applicable, a narrative to the report that explains the issue(s) and corrective action(s) taken in the event that a specific accreditation or certification requirement was not met.

25.2.22 When soil samples are analyzed, a specific identification as to whether soils are reported on a “wet weight” or “dry weight” basis.

25.2.23 Appropriate laboratory certification number for the state of origin of the sample, if applicable.

25.2.24 If only part of the report is provided to the client (client requests some results before all of it is complete), it must be clearly indicated on the report. A complete report must be sent once all of the work has been completed.

25.2.25 Any non-TestAmerica subcontracted analysis results are provided as a separate report on the official letterhead of the subcontractor. All TestAmerica subcontracting is clearly identified on the report as to which laboratory performed a specific analysis.

Note: Refer to the Corporate SOP on Electronic Reporting and Signature Policy (No. CA-I-P-002) for details on internally applying electronic signatures of approval.

25.3 REPORTING LEVEL OR REPORT TYPE

The laboratory offers four levels of quality control reporting. Each level, in addition to its own specific requirements, contains all the information provided in the preceding level. The packages provide the following information in addition to the information described above:

- Level I is a report with the features described in Section 25.2 above.
- Level II is a Level I report plus summary information, including results for the method blank, percent recovery for laboratory control samples and matrix spike samples, and the RPD values for all MSD and sample duplicate analyses.
- Level III contains all the information supplied in Level II, but presented on the CLP-like summary forms, and relevant calibration information. No raw data is provided.
- Level IV is the same as Level III with the addition of all raw supporting data.

In addition to the various levels of QC packaging, the laboratory also provides reports in diskette deliverable form. Initial reports may be provided to clients by facsimile. Procedures used to ensure client confidentiality are outlined in Section 25.6.

25.3.1 Electronic Data Deliverables (EDDs)

EDDs are routinely offered as part of TestAmerica’s services. TestAmerica San Francisco offers a variety of EDD formats including Environmental Restoration Information Management System (ERPIMS), New Agency Standard (NAS), Format A, Excel, Dbase, GISKEY, and Text Files. Some of the common EDDs that are handled by the laboratory are listed below.

AdaPT_Fdep_Result
ADR_8.1_2file_LimsValues
Boeing
EDF1.2
EDF_1.2i_Csv
EDF_Weiss

EIM_Cvx_Rcra
EIM_Cvx_Rtbu
EIM_Cvx_Rtbu_Smpl
EIM_Honeywell_EDF
Eim_ParsonsFMC
Element_Ta
Equ_Cra
Equ_Cra_Ez
Equ_Golder_NorthHaven
Equ_Shell_2File
Geomatrix
Geosyntec
LevineFricke_Apr2001
Mactec_MontWat
Secor_HP
Sedd_5.0_2a
Sk01_Cc
Std_Sav_STD1
std_Sav_Std1a
Std_SF_QcN
Std_SF_QcY
Std_Stl
TRC Alton GeoScience
Trc_Vectre
Urs_Mission
WccTl_Ashland_Escambia

EDD specifications are submitted to the IT department by the PM for review and undergo the contract review process. Once the facility has committed to providing data in a specific electronic format, the coding of the format may need to be performed. This coding is documented and validated. The validation of the code is retained by the IT staff coding the EDD.

EDDs shall be subject to a review to ensure their accuracy and completeness. If EDD generation is automated, review may be reduced to periodic screening if the laboratory can demonstrate that it can routinely generate that EDD without errors. Any revisions to the EDD format must be reviewed until it is demonstrated that it can routinely be generated without errors. If the EDD can be reproduced accurately and if all subsequent EDDs can be produced error-free, each EDD does not necessarily require a review.

25.4 SUPPLEMENTAL INFORMATION FOR TEST

The lab identifies any unacceptable QC analyses or any other unusual circumstances or observations such as environmental conditions and any non-standard conditions that may have affected the quality of a result. This is typically in the form of a footnote or a qualifier and/or a narrative explaining the discrepancy in the front of the report.

25.4.1 Numeric results with values outside of the calibration range, either high or low are qualified as ‘estimated’.

25.4.2 Where quality system requirements are not met, a statement of compliance/non-compliance with requirements and/or specifications is required, including identification of test results derived from any sample that did not meet sample acceptance requirements such as improper container, holding time, or temperature.

25.4.3 Where applicable, a statement on the estimated uncertainty of measurements; information on uncertainty is needed when a client's instructions so require.

25.4.4 Opinions and Interpretations - The test report contains objective information, and generally does not contain subjective information such as opinions and interpretations. If such information is required by the client, the Laboratory Director will determine if a response can be prepared. If so, the Laboratory Director will designate the appropriate member of the management team to prepare a response. The response will be fully documented, and reviewed by the Laboratory Director, before release to the client. There may be additional fees charged to the client at this time, as this is a non-routine function of the laboratory.

Note: Review of data deliverable packages for submittal to regulatory authorities requires responses to non-conforming data concerning potential impact on data quality. This necessitates a limited scope of interpretation, and this work is performed by the QA Department. This is the only form of "interpretation" of data that is routinely performed by the laboratory.

When opinions or interpretations are included in the report, the laboratory provides an explanation as to the basis upon which the opinions and interpretations have been made. Opinions and interpretations are clearly noted as such and where applicable, a comment should be added suggesting that the client verify the opinion or interpretation with their regulator.

25.5 ENVIRONMENTAL TESTING OBTAINED FROM SUBCONTRACTORS

If the laboratory is not able to provide the client the requested analysis, the samples would be subcontracted following the procedures outlined in the Corporate SOP on Subcontracting (SOP # CA-L-S-002).

Data reported from analyses performed by a subcontractor laboratory are clearly identified as such on the analytical report provided to the client. Results from a subcontract laboratory outside of TestAmerica are reported to the client on the subcontract laboratory's original report stationary and the report includes any accompanying documentation.

25.6 CLIENT CONFIDENTIALITY

In situations involving the transmission of environmental test results by telephone, facsimile or other electronic means, client confidentiality must be maintained.

TestAmerica will not intentionally divulge to any person (other than the Client or any other person designated by the Client in writing) any information regarding the services provided by TestAmerica or any information disclosed to TestAmerica by the Client. Furthermore, information known to be potentially endangering to national security or an entity's proprietary rights will not be released.

Note: This shall not apply to the extent that the information is required to be disclosed by TestAmerica under the compulsion of legal process. TestAmerica will, to the extent feasible, provide reasonable notice to the client before disclosing the information.

Note: Authorized representatives of an accrediting authority are permitted to make copies of any analyses or records relevant to the accreditation process, and copies may be removed from the laboratory for purposes of assessment.

25.6.1 Report deliverable formats are discussed with each new client. If a client requests that reports be faxed or e-mailed, the reports are faxed with a cover sheet or e-mailed with the following note that includes a confidentiality statement similar to the following:

This material is intended only for the use of the individual(s) or entity to whom it is addressed, and may contain information that is privileged and confidential. If you are not the intended recipient, or the employee or agent responsible for delivering this material to the intended recipient, you are hereby notified that any dissemination, distribution or copying of this communication is strictly prohibited. If you have received this communication in error, please notify us immediately by telephone at the 1-800-765-0980 (or for e-mails: please notify us immediately by e-mail or by phone (1-800-765-0980) and delete this material from any computer).

25.7 FORMAT OF REPORTS

The format of reports is designed to accommodate each type of environmental test carried out and to minimize the possibility of misunderstanding or misuse.

25.8 AMENDMENTS TO TEST REPORTS

Corrections, additions, or deletions to reports are only made when justification arises through supplemental documentation. Justification is documented using the laboratory's corrective action system (refer to Section 12).

The revised report is electronically archived off-site, as is the original report. The revised report will be noted as such on the cover page.

When the report is re-issued, a notation of "report re-issue "is placed on the cover/signature page of the report *or at the top of the narrative page* with a brief explanation of reason for the re-issue and a reference back to the last final report generated. *For Example*: *Report was revised*

on 11/3/08 to include toluene in sample NQA1504 per client's request. This final report replaces the final report generated on 10/27/08 at 10:47am.

25.9 POLICIES ON CLIENT REQUESTS FOR AMENDMENTS

25.9.1 Policy on Data Omissions or Reporting Limit Increases

Fundamentally, our policy is simply to not omit previously reported results (including data qualifiers) or to not raise reporting limits and report sample results as ND. This policy has few exceptions. Exceptions are:

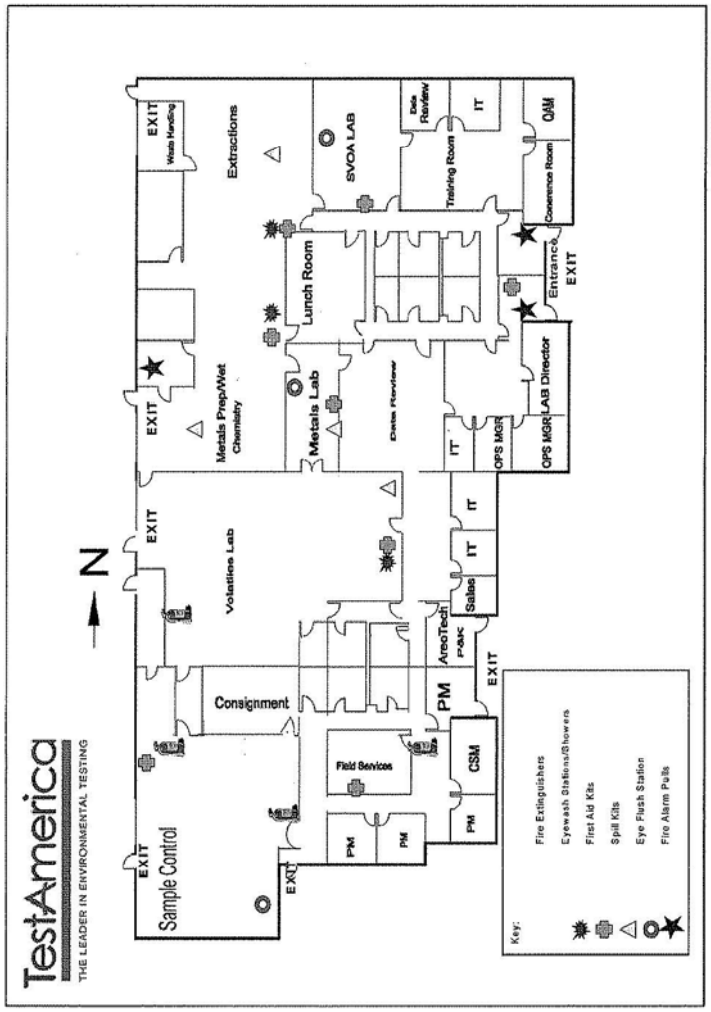
- Laboratory error.
- Sample identification is indeterminate (confusion between COC and sample labels).
- An incorrect analysis (not analyte) was requested (e.g., COC lists 8315 but client wanted 8310). A written request for the change is required.
- Incorrect limits reported based on regulatory requirements.
- The requested change has absolutely *no possible* impact on the interpretation of the analytical results and there is *no possibility* of the change being interpreted as misrepresentation by anyone inside or outside of our company.

25.9.2 Multiple Reports

TestAmerica does not issue multiple reports for the same workorder where there is different information on each report (this does not refer to copies of the same report) unless required to meet regulatory needs and approved by QA.

Appendix 1.

Laboratory Floor Plan



Appendix 2. Glossary/Acronyms

Glossary:

Acceptance Criteria:
Specified limits placed on characteristics of an item, process, or service defined in requirement documents. (ASQC)

Accreditation:
The process by which an agency or organization evaluates and recognizes a laboratory as meeting certain predetermined qualifications or standards, thereby accrediting the laboratory. In the context of the National Environmental Laboratory Accreditation Program (NELAP), this process is a voluntary one. (NELAC)

Accrediting Authority:
The Territorial, State, or Federal Agency having responsibility and accountability for environmental laboratory accreditation and which grants accreditation (NELAC) [1.5.2.3]

Accuracy:
The degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components which are due to sampling and analytical operations; a data quality indicator. (QAMS)

Analyst:
The designated individual who performs the "hands-on" analytical methods and associated techniques and who is the one responsible for applying required laboratory practices and other pertinent quality controls to meet the required level of quality. (NELAC)

Batch:
Environmental samples which are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A preparation batch is composed of one to 20 environmental samples of the same matrix, meeting the above mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be 24 hours. An analytical batch is composed of prepared environmental samples (extracts, digestates or concentrates) and /or those samples not requiring preparation, which are analyzed together as a group using the same calibration curve or factor. An analytical batch can include samples originating from various environmental matrices and can exceed 20 samples. (NELAC Quality Systems Committee)

Blank:
A sample that has not been exposed to the analyzed sample stream in order to monitor contamination during sampling, transport, storage or analysis. The blank is subjected to the usual analytical and measurement process to establish a zero baseline or background value and is sometimes used to adjust or correct routine analytical results. (ASQC)

Blind Sample:
A sample for analysis with a composition known to the submitter. The analyst/laboratory may know the identity of the sample but not its composition. It is used to test the analyst's or laboratory's proficiency in the execution of the measurement process.

Calibration:
To determine, by measurement or comparison with a standard, the correct value of each scale reading on a meter, instrument, or other device. The levels of the applied calibration standard should bracket the range of planned or expected sample measurements. (NELAC)

Calibration Curve:
The graphical relationship between the known values, such as concentrations, of a series of calibration standards and their instrument response. (NELAC)

Calibration Method:
A defined technical procedure for performing a calibration. (NELAC)

Calibration Standard:
A substance or reference material used to calibrate an instrument (QAMS)

Certified Reference Material (CRM):
A reference material one or more of whose property values are certified by a technically valid procedure, accompanied by or traceable to a certificate or other documentation which is issued by a certifying body. (ISO Guide 30–2.2)

Chain of Custody:
An unbroken trail of accountability that ensures the physical security of samples and includes the signatures of all who handle the samples. (NELAC) [5.12.4]

Clean Air Act:
The enabling legislation in 42 U>S>C> 7401 et seq., Public Law 91-604, 84 Stat. 1676 Pub. L. 95-95, 91 Stat., 685 and Pub. L. 95-190, 91 Stat., 1399, as amended, empowering EPA to promulgate air quality standards, monitor and enforce them. (NELAC)

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA/SUPERFUND):
The enabling legislation in 42 U.S.C. 9601-9675 et seq., as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), 42 U.S.C. 9601 et seq., to eliminate the health and environmental threats posed by hazardous waste sites. (NELAC)

Compromised Samples:
Those samples which are improperly sampled, insufficiently documented (chain of custody and other sample records and/or labels), improperly preserved, collected in improper containers, or exceeding holding times when delivered to a laboratory. Under normal conditions, compromised samples are not analyzed. If emergency situation require analysis, the results must be appropriately qualified. (NELAC)

Confidential Business Information (CBI):
Information that an organization designates as having the potential of providing a competitor with inappropriate insight into its management, operation or products. NELAC and its representatives agree to safeguarding identified CBI and to maintain all information identified as such in full confidentiality.

Confirmation:
Verification of the identity of a component through the use of an approach with a different scientific principle from the original method. These may include, but are not limited to:

Second column confirmation
Alternate wavelength
Derivatization
Mass spectral interpretation
Alternative detectors or
Additional Cleanup procedures
(NELAC)

Conformance:
An affirmative indication or judgement that a product or service has met the requirements of the relevant specifications, contract, or regulation; also the state of meeting the requirements. (ANSI/ASQC E4-1994)

Correction: Actions necessary to correct or repair analysis specific non-conformances. The acceptance criteria for method specific QC and protocols as well as the associated corrective actions. The analyst will most frequently be the one to identify the need for this action as a result of calibration checks and QC sample analysis. No significant action is taken to change behavior, process or procedure.

Corrective Action:
The action taken to eliminate the causes of an existing nonconformity, defect or other undesirable situation in order to prevent recurrence. (ISO 8402)

Data Audit:
A qualitative and quantitative evaluation of the documentation and procedures associated with environmental measurements to verify that the resulting data are of acceptable quality (i.e., that they meet specified acceptance criteria). (NELAC)

Data Reduction:
The process of transforming raw data by arithmetic or statistical calculations, standard curves, concentration factors, etc., and collation into a more useable form. (EPA-QAD)

Deficiency:
An unauthorized deviation from acceptable procedures or practices, or a defect in an item. (ASQC)

Detection Limit:
The lowest concentration or amount of the target analyte that can be identified, measured, and reported with confidence that the analyte concentration is not a false positive value. See Method Detection Limit. (NELAC)

Document Control:
The act of ensuring that documents (and revisions thereto) are proposed, reviewed for accuracy, approved for release by authorized personnel, distributed properly, and controlled to ensure use of the correct version at the location where the prescribed activity if performed. (ASQC)

Duplicate Analyses:
The analyses or measurements of the variable of interest performed identically on two subsamples of the same sample. The results from duplicate analyses are used to evaluate analytical or measurement precision but not the precision of sampling, preservation or storage internal to the laboratory. (EPA-QAD)

Environmental Detection Limit (EDL):
The smallest level at which a radionuclide in an environmental medium can be unambiguously distinguished for a given confidence interval using a particular combination of sampling and measurement procedures, sample size, analytical detection limit, and processing procedure. The EDL shall be specified for the 0.95 or greater confidence interval. The EDL shall be established initially and verified annually for each test method and sample matrix. (NELAC Radioanalysis Subcommittee)

Equipment Blank:
Sample of analyte-free media which has been used to rinse common sampling equipment to check effectiveness of decontamination procedures. (NELAC)

External Standard Calibration:
Calibrations for methods that do not utilize internal standards to compensate for changes in instrument conditions.

Federal Water Pollution Control Act (Clean Water Act, CWA):
The enabling legislation under 33 U.S.C. 1251 et seq., Public Law 92-50086 Stat 816, that empowers EPA to set discharge limitations, write discharge permits, monitor, and bring enforcement action for non-compliance. (NELAC)

Field Blank:
Blank prepared in the field by filing a clean container with pure de-ionized water and appropriate preservative, if any, for the specific sampling activity being undertaken (EPA OSWER)

Field of Testing:
NELAC's approach to accrediting laboratories by program, method and analyte. Laboratories requesting accreditation for a program-method-analyte combination or for an up-dated/improved method are required to submit to only that portion of the accreditation process not previously addressed (see NELAC, section 1.9ff). (NELAC)

Holding Times (Maximum Allowable Holding Times):
The maximum times that samples may be held prior to analyses and still be considered valid or not compromised. (40 CFR Part 136)

Internal Standard:
A known amount of standard added to a test portion of a sample and carried through the entire measurement process as a reference for evaluating and controlling the precision and bias of the applied analytical test method. (NELAC)

Internal Standard Calibration:
Calibrations for methods that utilize internal standards to compensate for changes in instrument conditions.

Instrument Blank:
A clean sample (e.g., distilled water) processed through the instrumental steps of the measurement process; used to determine instrument contamination. (EPA-QAD)

Laboratory Control Sample (however named, such as laboratory fortified blank, spiked blank, or QC check sample):
A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes, taken through all preparation and analysis steps. Where there is no preparation taken for an analysis (such as in aqueous volatiles), or when all samples and standards undergo the same preparation and analysis process (such as Phosphorus), there is no LCS. It is generally used to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system.

An LCS shall be prepared at a minimum of 1 per batch of 20 or less samples per matrix type per sample extraction or preparation method except for analytes for which spiking solutions are not available such as total suspended solids, total dissolved solids, total volatile solids, total solids, pH, color, odor, temperature, dissolved oxygen or turbidity. The results of these samples shall be used to determine batch acceptance.

Note: NELAC standards allow a matrix spike to be used in place of this control as long as the acceptance criteria are as stringent as for the LCS. (NELAC)

Laboratory Duplicate:
Aliquots of a sample taken from the same container under laboratory conditions and processed and analyzed independently. (NELAC)

Least Squares Regression (1st Order Curve):
The least squares regression is a mathematical calculation of a straight line over two axes. The y axis represents the instrument response (or Response ratio) of a standard or sample and the x axis represents the concentration. The regression calculation will generate a correlation coefficient (r) that is a measure of the "goodness of fit" of the regression line to the data. A value of 1.00 indicates a perfect fit.

In order to be used for quantitative purposes, r must be greater than or equal to 0.99 for organics and 0.995 for inorganics.

Limit of Detection (LOD):
An estimate of the minimum amount of a substance that an analytical process can reliably detect. An LOD is analyte- and matrix-specific and may be laboratory dependent. (Analytical Chemistry, 55, p.2217, December 1983, modified) See also Method Detection Limit.

Matrix:
The component or substrate that contains the analyte of interest. For purposes of batch and QC requirement determinations, the following matrix distinctions shall be used:

Aqueous: Any aqueous sample excluded from the definition of Saline/Estuarine source. Includes surface water, groundwater, effluents, and TCLP or other extracts.

Drinking Water: any aqueous sample that has been designated as a potable or potential potable water source.

Saline/Estuarine: any aqueous sample from an ocean or estuary, or other salt water source such as the Great Salt Lake.

Non-aqueous Liquid: any organic liquid with <15% settleable solids.

Biological Tissue: any sample of a biological origin such as fish tissue, shellfish, or plant material. Such samples shall be grouped according to origin.

Solids: includes soils, sediments, sludges, and other matrices with >15% settleable solids.

Chemical Waste: a product or by-product of an industrial process that results in a matrix not previously defined.

Air: whole gas or vapor samples including those contained in flexible or rigid wall containers and the extracted concentrated analytes of interest from a gas or vapor that are collected with a sorbant tube, impinger solution, filter, or other device. (NELAC)

Matrix Spike (spiked sample or fortified sample):

Prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. Matrix spikes are used, for example, to determine the effect of the matrix on a method's recovery efficiency.

Matrix spikes shall be performed at a frequency of one in 20 samples per matrix type per sample extraction or preparation method except for analytes for which spiking solutions are not available such as, total suspended solids, total dissolved solids, total volatile solids, total solids, pH, color, odor, temperature, dissolved oxygen or turbidity. The selected sample(s) shall be rotated among client samples so that various matrix problems may be noted and/or addressed. Poor performance in a matrix spike may indicate a problem with the sample composition and shall be reported to the client whose sample was used for the spike. (QAMS)

Matrix Spike Duplicate (spiked sample or fortified sample duplicate):
A second replicate matrix spike is prepared in the laboratory and analyzed to obtain a measure of the precision of the recovery for each analyte.

Matrix spike duplicates or laboratory duplicates shall be analyzed at a minimum of 1 in 20 samples per matrix type per sample extraction or preparation method. The laboratory shall document their procedure to select the use of an appropriate type of duplicate. The selected sample(s) shall be rotated among client

samples so that various matrix problems may be noted and/or addressed. Poor performance in the duplicates may indicate a problem with the sample composition and shall be reported to the client whose sample was used for the duplicate. (QAMS)

Method Blank:
A sample of a matrix similar to the batch of associated samples (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences are present at concentrations that impact the analytical results for sample analyses. (NELAC)

Method Detection Limit:
The minimum concentration of a substance (an analyte) that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte. (40 CFR Part 136, Appendix B)

Negative Control:
Measures taken to ensure that a test, its components, or the environment do not cause undesired effects, or produce incorrect test results. (NELAC)

Performance Audit:
The routine comparison of independently obtained qualitative and quantitative measurement system data with routinely obtained data in order to evaluate the proficiency of an analyst or laboratory. (NELAC)

Performance Based Measurement System (PBMS):
A set of processes wherein the data quality needs, mandates or limitations of a program or project are specified and serve as criteria for selecting appropriate test methods to meet those needs in a cost-effective manner. (NELAC)

Positive Control:
Measures taken to ensure that a test and/or its components are working properly and producing correct or expected results from positive test subjects. (NELAC)

Precision:
The degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves; a data quality indicator. Precision is usually expressed as standard deviation, variance or range, in either absolute or relative terms. (NELAC)

Preservation:
Refrigeration and/or reagents added at the time of sample collection (or later) to maintain the chemical and/or biological integrity of the sample. (NELAC)

Proficiency Testing:
A means of evaluating a laboratory's performance under controlled conditions relative to a given set of criteria through analysis of unknown samples provided by an external source. (NELAC) [2.1]

Proficiency Testing Program:
The aggregate of providing rigorously controlled and standardized environmental samples to a laboratory for analysis, reporting of results, statistical evaluation of the results and the collective demographics and results summary of all participating laboratories. (NELAC)

Proficiency Test Sample (PT):
A sample, the composition of which is unknown to the analyst and is provided to test whether the analyst/laboratory can produce analytical results within specified acceptance criteria. (QAMS)

Quality Assurance:
An integrated system of activities involving planning, quality control, quality assessment, reporting and quality improvement to ensure that a product or service meets defined standards of quality with a stated level of confidence. (QAMS)

Quality Assurance [Project] Plan (QAPP):
A formal document describing the detailed quality control procedures by which the quality requirements defined for the data and decisions pertaining to a specific project are to be achieved. (EAP-QAD)

Quality Control:
The overall system of technical activities whose purpose is to measure and control the quality of a product or service so that it meets the needs of users. (QAMS)

Quality Control Sample:
An uncontaminated sample matrix spiked with known amounts of analytes from a source independent from the calibration standards. It is generally used to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system. (EPA-QAD)

Quality Manual:
A document stating the management policies, objectives, principles, organizational structure and authority, responsibilities, accountability, and implementation of an agency, organization, or laboratory, to ensure the quality of its product and the utility of its product to its users. (NELAC)

Quality System:
A structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required QA and QC (ANSI/ASQC-E-41994)

Quantitation Limits:
The maximum or minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be quantified with the confidence level required by the data user. (NELAC)

Range:
The difference between the minimum and the maximum of a set of values. (EPA-QAD)

Reagent Blank (method reagent blank):
A sample consisting of reagent(s), without the target analyte or sample matrix, introduced into the analytical procedure at the appropriate point and carried through all subsequent steps to determine the contribution of the reagents and of the involved analytical steps. (QAMS)

Reference Material:
A material or substance one or more properties of which are sufficiently well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials. (ISO Guide 30-2.1)

Reference Standard:
A standard, generally of the highest metrological quality available at a given location, from which measurements made at that location are derived. (VIM-6.0-8)

Replicate Analyses:
The measurements of the variable of interest performed identically on two or more sub-samples of the same sample within a short time interval. (NELAC)

Report Limit (RL):
The laboratory nominal Quantitation Limit (QL) or the level of sensitivity required by the client but not lower than the LOD.

Resource Conservation and Recovery Act (RCRA):
The enabling legislation under 42 USC 321 et seq. (1976), that gives EPA the authority to control hazardous waste from the "cradle-to-grave", including its generation, transportation, treatment, storage, and disposal. (NELAC)

Safe Drinking Water Act (SDWA):
The enabling legislation, 42 USC 300f et seq. (1974), (Public Law 93-523), that requires the EPA to protect the quality of drinking water in the U.S. by setting maximum allowable contaminant levels, monitoring, and enforcing violations. (NELAC)

Sample Duplicate:
Two samples taken from and representative of the same population and carried through all steps of the sampling and analytical procedures in an identical manner. Duplicate samples are used to assess variance of the total method including sampling and analysis. (EPA-QAD)

Second Order Polynomial Curve (Quadratic): The 2nd order curves are a mathematical calculation of a slightly curved line over two axis. The y axis represents the instrument response (or Response ratio) of a standard or sample and the x axis represents the concentration. The 2nd order regression will generate a coefficient of determination (COD or r^2) that is a measure of the "goodness of fit" of the quadratic curvature the data. A value of 1.00 indicates a perfect fit. In order to be used for quantitative purposes, r^2 must be greater than or equal to 0.99.

Selectivity:
(Analytical chemistry) the capability of a test method or instrument to respond to a target substance of constituent in the presence of non-target substances. (EPA-QAD)

Sensitivity:
The capability of a method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest. (NELAC)

Spike:
A known mass of target analyte added to a blank, sample or sub-sample; used to determine recovery efficiency or for other quality control purposes.

If the mandated or requested test method does not specify the spiking components, the laboratory shall spike all reportable components to be reported in the Laboratory Control Sample and Matrix Spike. However, in cases where the components interfere with accurate assessment (such as simultaneously spiking chlordane, toxaphene and PCBs in Method 608), the test method has an extremely long list of components or components are incompatible, a representative number (at a minimum 10%) of the listed components may be used to control the test method. The selected components of each spiking mix shall represent all chemistries, elution patterns and masses permit specified analytes and other client requested components. However, the laboratory shall ensure that all reported components are used in the spike mixture within a two-year time period.. (NELAC)

Standard:
The document describing the elements of laboratory accreditation that has been developed and established within the consensus principles of NELAC and meets the approval requirements of NELAC procedures and policies. (ASQC)

Standard Operating Procedures (SOPs):
A written document which details the method of an operation, analysis, or action whose techniques and procedures are thoroughly prescribed and which is accepted as the method for performing certain routine or repetitive tasks. (QAMS)

Standardized Reference Material (SRM):
A certified reference material produced by the U.S. National Institute of Standards and Technology or other equivalent organization and characterized for absolute content, independent of analytical method. (EPA-QAD)

Surrogate:
A substance with properties that mimic the analyte of interest. It is unlikely to be found in environment samples and is added to them for quality control purposes.

Surrogate compounds must be added to all samples, standards, and blanks, for all organic chromatography methods except when the matrix precludes its use or when a surrogate is not available. Poor surrogate recovery may indicate a problem with sample composition and shall be reported to the client whose sample produced poor recovery. (QAMS)

Systems Audit (also Technical Systems Audit):
A thorough, systematic, qualitative on-site assessment of the facilities, equipment, personnel, training, procedures, record keeping, data validation, data management, and reporting aspects of a total measurement system. (EPA-QAD)

Toxic Substances Control Act (TSCA):
The enabling legislation in 15 USC 2601 et seq., (1976) that provides for testing, regulating, and screening all chemicals produced or imported into the United States for possible toxic effects prior to commercial manufacture. (NELAC)

Traceability:
The property of a result of a measurement whereby it can be related to appropriate standards, generally international or national standards, through an unbroken chain of comparisons. (VIM-6.12)

Uncertainty:
A parameter associated with the result of a measurement that characterizes the dispersion of the value that could reasonably be attributed to the measured value.

Acronyms:

BS – Blank Spike
BSD – Blank Spike Duplicate
CAR – Corrective Action Report
CCV – Continuing Calibration Verification
CF – Calibration Factor
CFR – Code of Federal Regulations
COC – Chain of Custody
CRS – Change Request Form
DOC – Demonstration of Capability
DQO – Data Quality Objectives
DU – Duplicate
DUP - Duplicate
EHS – Environment, Health and Safety
EPA – Environmental Protection Agency
GC - Gas Chromatography
GC/MS - Gas Chromatography/Mass Spectrometry
HPLC - High Performance Liquid Chromatography

ICP - Inductively Coupled Plasma Atomic Emission Spectroscopy
ICV – Initial Calibration Verification
IDL – Instrument Detection Limit
IH – Industrial Hygiene
IS – Internal Standard
LCS – Laboratory Control Sample
LCSD – Laboratory Control Sample Duplicate
LIMS – Laboratory Information Management System
MDL – Method Detection Limit
MS – Matrix Spike
MSD – Matrix Spike Duplicate
MSDS - Material Safety Data Sheet
NELAC - National Environmental Laboratory Accreditation Conference
NELAP - National Environmental Laboratory Accreditation Program
PT – Performance Testing
QAM – Quality Assurance Manual
QA/QC – Quality Assurance / Quality Control
QAPP – Quality Assurance Project Plan
RF – Response Factor
RPD – Relative Percent Difference
RSD – Relative Standard Deviation
SD – Standard Deviation
SOP: Standard Operating Procedure
TAT – Turn-Around-Time
VOA – Volatiles
VOC – Volatile Organic Compound

Appendix 3.

Laboratory Certifications, Accreditations, Validations

TestAmerica San Francisco maintains certifications, accreditations, and validations with the below listed state and national entities. Programs vary but may include on-site audits, reciprocal agreements with another entity, performance testing evaluations, review of the QA Manual, Standard Operating Procedures, Method Detection Limits, training records, etc. At the time of this QA Manual revision, the laboratory has accreditation/certification/licensing with the following organizations:

Organization	Certificate Number Or Laboratory ID Number	Organization	Certificate Number Or Laboratory ID Number
ELAP	2496		
State of Hawaii	None		

The certificates and parameter lists (which may differ) for each organization may be found on the corporate web site, the laboratory's public server, the final report review table, and in the following offices: QA, marketing, and project management.

APPENDIX C

CERTIFICATION

ATTACHMENT C

CERTIFICATION
SELF-IMPLEMENTING CLEANUP PLAN
837 INDUSTRIAL ROAD
SAN CARLOS, CALIFORNIA

In accordance with 40 CFR 761.61(a)(3), all sampling plans, sample collection procedures, sample preparation procedures, extraction procedures, and instrumental/chemical analysis procedures used to assess or characterize the presence and extent of polychlorinated biphenyls (PCBs) at 837 Industrial Road in San Carlos, California are available for USEPA inspection at the following location:

Department of Toxic Substances Control
700 Heinz Avenue, Bldg. F., Suite 200
Berkeley, California 94710-2712
510-540-3817

Property Owner	**Party Conducting the Cleanup**
_____	_____
_____ *Print Name*	Carl J. Michelsen, C.HG.
for Windy Hill Property Ventures	for PES Environmental, Inc.