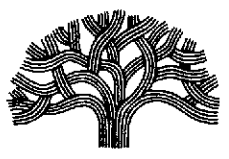




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ENVIRONMENTAL PROTECTION
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CITY OF OAKLAND



DALZIEL BUILDING • 250 FRANK H. OGAWA PLAZA, SUITE 5301 • OAKLAND, CALIFORNIA 94612

Public Works Agency
Environmental Services

(510) 238-6688
FAX (510) 238-7286
TDD (510) 238-7644

August 31, 1999

Mr. Barney Chan
Alameda County Department of Environmental Health
1131 Harbor Bay Parkway
Alameda, California

Re: Monitoring and Remediation Test Well Installation, and Monitoring Well Destruction
City of Oakland Municipal Service Center
7101 Edgewater Drive, Oakland, California 94621

Dear Mr. Chan:

Attached is the work plan for monitoring and remediation test well installation and monitoring well destruction at the above referenced site. This work plan describes procedures and protocol for the proposed field activities. Work is tentatively scheduled to begin in late September 1999. However, the project schedule is contingent upon your acceptance of this work plan.

Should you have any questions or require additional information, please contact me at 238-6259.

Sincerely,

Joseph A. Cotton
Environmental Program Specialist

JC:encl.

Need to combine up approval questions regarding pipeline removal report.

August 26, 1999

Joseph Cotton
City of Oakland, Public Works Agency
Environmental Services Division
250 Frank H. Ogawa Plaza, Ste. 5301
Oakland, California 94612-2034

Re: **Monitoring and Remediation Test Well Installation,
and Monitoring Well Destruction Workplan**
City of Oakland, Municipal Services Center
7101 Edgewater Drive
Oakland, California
Cambria Project #153-1247-009



Dear Mr. Cotton:

As required by the Alameda County Health Care Services Agency (ACHCSA), Cambria Environmental Technology, Inc., (Cambria) has prepared this workplan for additional subsurface investigation at the site referenced above. Our objectives are to further define the extent of hydrocarbons in groundwater and to initiate feasibility testing for future remedial options. To achieve these objectives, Cambria proposes installing four additional monitoring wells and one nested remediation test well. In addition, Cambria proposes destroying monitoring wells MW-3 and MW-4, as we have discussed in the past. This workplan contains a site summary, Cambria's proposed scope of work for additional investigation, and a schedule for completing the work.

SITE SUMMARY

Site and Area Use: The site is an approximately 17-acre corporation yard consisting of offices, shops, warehouse structures, and a vehicle maintenance and repair facility. Bordering the site to the west and to the north is the Martin Luther King Regional Shoreline park. Beyond the narrow strip of park lands lie San Leandro Bay to the west and Damon Slough to the north. Area use to the east and south is primarily light industrial.


Environmental Investigations: In 1989, an environmental site assessment was performed, and monitoring wells MW-1 through MW-4 were installed (Figure 1). In 1992, additional investigation was performed and monitoring wells MW-5 through MW-7 were installed. In 1993, thirty-four soil borings were advanced across the site, and groundwater samples were collected. In 1995, three shallow borings were advanced as part of a geotechnical investigation and soil samples were analyzed for petroleum hydrocarbons. In 1996, ten soil borings were advanced and temporary wells were installed outside the western and northern perimeters of the site along San Leandro Bay and Damon Slough. Three of the temporary well locations were converted to monitoring wells: MW-8

Oakland, CA
Sonoma, CA
Portland, OR
Seattle, WA

**Cambria
Environmental
Technology, Inc.**

1144 65th Street
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Oakland, CA 94608
Tel (510) 420-0700
Fax (510) 420-9170

through MW-10 (Figure 1). Since installation, monitoring wells MW-1 through MW-10 have been regularly gauged and sampled. From September through December 1998, an approximately 2,650 lineal foot fuel transport and dispensing system was removed from the site. Soil samples from beneath the former piping were collected at 20 ft intervals and analyzed for petroleum hydrocarbons and organic lead. In addition, eight underground storage tanks (USTs) and associated piping have been removed from the site.



Site Hydrogeology: The site is underlain by artificial fill that was emplaced during several phases since 1945. The fill material varies significantly in character across the site. The fill is underlain by clayey silt deposits, known as Bay Mud. Based on measured groundwater elevations, groundwater generally appears to flow towards Damon Slough in the northern part of the site, and toward San Leandro Bay in the southern part of the site. The heterogeneity of the artificial fill material, the presence of underground utilities with high permeability backfill material, and the low permeability of the Bay Mud used as fill at various site locations influence local groundwater flow.

Contaminant Distribution: Petroleum hydrocarbons have been detected in soil and groundwater at multiple locations across the site. The distribution of contamination appears to be related to the former USTs and fuel dispensing systems. The former USTs near TBW-1 and TBW-2, the former USTs east of MW-6, and the recently upgraded active USTs near MW-5 are likely to have been sources of contamination (Figure 1). Low concentrations of petroleum hydrocarbons have been detected in off-site wells MW-8, MW-9, and MW-10 in the past. No petroleum hydrocarbons have ever been detected in off-site wells MW-3 and MW-4.

PROPOSED SCOPE OF WORK

Cambria proposes installing four additional monitoring wells and one nested remediation test well, and destroying monitoring wells MW-3 and MW-4. A discussion of the recommended well locations and a description of the necessary tasks to install the wells are presented below.

Well Location Rationale

Cambria selected the proposed monitoring well locations shown on Figure 1 to further define the extent of hydrocarbons in groundwater and to better assess the groundwater flow direction in the northwestern portion of the site. Cambria also incorporated the analytic results from the recent piping removal to choose the proposed locations. Specifically, our rationale for the selected monitoring well locations is as follows:

- Cambria proposes installing one monitoring well in the southwestern portion of the site, between wells MW-8 and MW-9. This location was selected to monitor

groundwater west of the former USTs located east of MW-6. This well will be located on East Bay Regional Park District property.

- *west* Due to a history of separate-phase hydrocarbons, we propose installing one well ~~east~~ of the former USTs, TBW-1, and TBW-2, located immediately north of the Municipal Service Center storage building. This well will also be installed on the East Bay Regional Park District property.
- Cambria recommends installing an additional monitoring well west of TBW-5. During the piping removal, and recent sampling events, separate-phase hydrocarbons were detected in this area. We will also attempt to install this well on the East Bay Regional Park District property.
- Cambria recommends installing the fourth well west of TBW-6. We recommend installing this well on the City of Oakland Municipal Service Center (MSC) site to allow for a better assessment of the change in groundwater flow direction that has been documented consistently in this area.

Cambria selected the remediation testing well location to be near a known hydrocarbon source with separate-phase hydrocarbons. Cambria proposes installing the remediation testing well in native soils or fill not associated with the tankpit, and adjacent to either TBW-1 or TBW-5. The exact location will be decided in the field to minimize any impact on the MSC operations.

Well Destruction Rationale

Monitoring wells MW-3 and MW-4 were approved for discontinued sampling in March 1998 because they are located distant from the site and do not provide significant ground water flow or contaminant distribution data, and because petroleum hydrocarbons have never been detected in groundwater samples. Therefore, Cambria proposes destroying these wells during the well installation field mobilization. Cambria will either pressure grout or drill out the wells depending on the final guidance we receive from the Alameda County Public Works Agency. We have included our Standard Field Procedures for well destruction as Attachment C.

Cambria has outlined below the necessary tasks to further define the extent of hydrocarbons in soil and groundwater at the site, and to initiate feasibility testing for possible future remediation.

Pre-Drill Preparation

Utility Location: Cambria will notify Underground Service Alert (USA) of our planned drilling activities. USA will identify the underground utilities in the site vicinity. If necessary, Cambria will perform an underground utility survey using a private line locating firm.

Site Health and Safety Plan: Cambria will prepare a site safety plan to protect site workers. The plan will be kept on site while Cambria is performing the field activities outlined below. Cambria's field crew members and any Cambria subcontractors will sign and follow the provisions of the plan.

Permits: Cambria will obtain the necessary permits for installation of the borings and wells from the Alameda County Public Works Agency and will finalize an access agreement with the East Bay Regional Park District to install the wells within the Martin Luther King, Jr. Shoreline Park.

Monitoring Well Installation and Soil Sampling



Well Installation and Construction: Cambria will install the four proposed monitoring wells using 8" diameter hollow-stem augers, collecting soil samples at five-foot intervals, at lithologic changes, and from just above the water table. Soil samples will be field screened for hydrocarbons based on observations of hydrocarbon staining and odor and on the results of a photo-ionization detector. The borings will be converted to monitoring wells, constructed of 2-inch diameter 0.010-inch slotted PVC, and will be screened from 10 ft below to 5 ft above the static water table where possible. Given the shallow depth of groundwater in many portions of the site (less than 5 ft), it will not be possible to screen the wells to 5 ft above the water table. Where the depth to groundwater is less than 5 ft, we will screen the wells to the minimum practicable depth of approximately 3 ft below ground surface (bgs). Each well will be covered with a traffic-rated vault and a locking well cap. Our standard field procedures for monitoring wells are included as Attachment A.

Well Development: Cambria will develop the wells using consecutive episodes of surge block agitation and evacuation. Evacuation will continue until at least ten well-casing volumes of water have been removed and the well purge water is as sediment-free as practical.

Chemical Analyses: Select soil samples will be analyzed for TPHg and TPHd by modified EPA Method 8015 and for BTEX and MTBE by EPA Method 8020. Silica gel cleanup will be performed on all samples analyzed for TPHd. If MTBE is detected in soil samples by EPA Method 8020, MTBE detection will be confirmed by re-analysis using EPA Method 8260. Cambria anticipates analyzing three soil samples from each boring to vertically profile hydrocarbons in soil. Depending on field conditions, we will analyze one vadose zone soil sample, one capillary fringe soil sample, and one saturated zone soil sample from each boring. Cambria will collect groundwater samples during the next quarterly monitoring event, after well installation.

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Remediation Well Installation and Soil Sampling

Well Installation and Construction: Cambria will install the proposed remediation testing well using 11" diameter hollow-stem augers, collecting soil samples at five-foot intervals, at lithologic changes, and from just above the water table. Soil samples will be field screened for hydrocarbons

based on observations of hydrocarbon staining and odor and on the results of a photo-ionization detector. The boring will be converted to a nested remediation well featuring an air sparging well and a dual-phase extraction well. The air sparging well will be constructed of 1-inch diameter 0.010-inch slotted PVC, screened from approximately 18 to 20 ft bgs. The dual phase extraction well will be constructed of 4-inch diameter 0.010-inch slotted PVC, screened from approximately 3 to 13 ft bgs. The well will be covered with a traffic-rated vault and a locking well cap. The remediation testing well location is shown on Figure 1. Our standard field procedures for remediation wells are included as Attachment B.



Well Development: Cambria will develop the well using consecutive episodes of surge block agitation and evacuation. Evacuation will continue until at least ten well-casing volumes of water have been removed and the well purge water is as sediment-free as practical.

Chemical Analyses: Select soil samples will be analyzed for TPHg and TPHd by modified EPA Method 8015 and for BTEX and MTBE by EPA Method 8020. Silica gel cleanup will be performed on all samples analyzed for TPHd. If MTBE is detected in soil samples by EPA Method 8020, MTBE detection will be confirmed by re-analysis using EPA Method 8260. Cambria anticipates analyzing two soil samples from the boring to vertically profile hydrocarbons in soil. Depending on field conditions, we will analyze one vadose zone soil sample and one capillary fringe soil sample from the boring.

Soil and Drilling Rinseate Disposal

Cambria will profile, transport, and dispose of all drilling rinseate and soil cuttings generated during installation of monitoring and remediation wells. Transport and disposal will be performed under manifest by licensed trucking and recycling/disposal facilities.

Reporting

After Cambria receives the analytical results, we will prepare a subsurface investigation report that, at a minimum, will contain:

- A summary of the site background and history;
- Descriptions of the drilling and soil sampling methods;
- Well diagrams and boring logs;
- Tabulated soil analytical results;
- Analytical reports and chain-of-custody forms;

- Soil and water disposal methods; and,
- A discussion of the hydrocarbon distribution in soil and groundwater.

SCHEDULE

Upon receiving written approval of this workplan from the ACHCSA, Cambria will initiate the permit process and begin scheduling field activities.



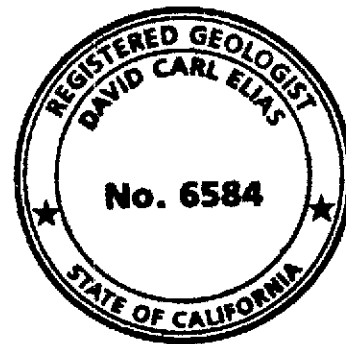
CLOSING

If you have any questions or comments regarding this workplan or future site activities, please call David Elias at (510) 420-3307.

Sincerely,
Cambria Environmental Technology, Inc.

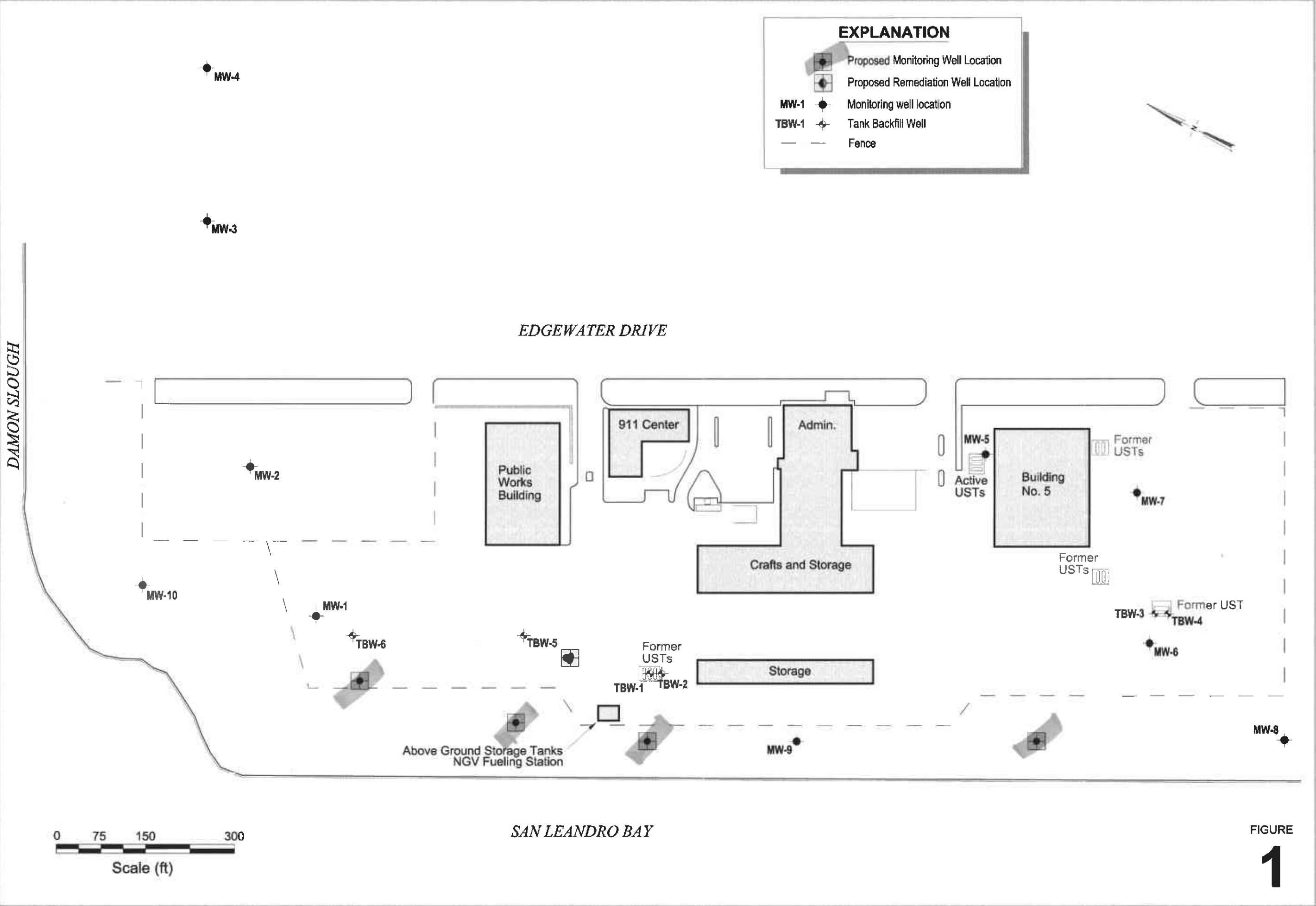
Robert W. Schultz
Senior Staff Geologist

David C. Elias, R.G.
Senior Geologist



Figures: 1 - Proposed Well Locations

Attachment: A - Standard Field Procedures for Monitoring Wells
B - Standard Field Procedures for Remediation Wells
C - Standard Field Procedures for Well Destruction



Proposed Monitoring Well and Remediation Well Locations



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Municipal Service Center
7101 Edgewater Drive
Oakland, California

PROJECT OF CAMBRIDGE'S PARTNERSHIP FOR NEIGHBORHOOD WELL-BEING

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ATTACHMENT A

Standard Field Procedures for Monitoring Wells

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STANDARD FIELD PROCEDURES FOR MONITORING WELLS

This document presents standard field methods for drilling and sampling soil borings and installing, developing and sampling ground water monitoring wells. These procedures are designed to comply with Federal, State and local regulatory guidelines. Specific field procedures are summarized below.

SOIL BORINGS

Objectives

Soil samples are collected to characterize subsurface lithology, assess whether the soils exhibit obvious hydrocarbon or other compound vapor or staining, and to collect samples for analysis at a State-certified laboratory. All borings are logged using the Unified Soil Classification System by a trained geologist working under the supervision of a California Registered Geologist (RG).

Soil Boring and Sampling

Soil borings are typically drilled using hollow-stem augers or direct-push technologies such as the Geoprobe®. Soil samples are collected at least every five ft to characterize the subsurface sediments and for possible chemical analysis. Additional soil samples are collected near the water table and at lithologic changes. Samples are collected using lined split-barrel or equivalent samplers driven into undisturbed sediments at the bottom of the borehole.

Drilling and sampling equipment is steam-cleaned prior to drilling and between borings to prevent cross-contamination. Sampling equipment is washed between samples with trisodium phosphate or an equivalent EPA-approved detergent.

Sample Analysis

Sampling tubes chosen for analysis are trimmed of excess soil and capped with Teflon tape and plastic end caps. Soil samples are labeled and stored at or below 4° C on either crushed or dry ice, depending upon local regulations. Samples are transported under chain-of-custody to a State-certified analytic laboratory.

Field Screening

One of the remaining tubes is partially emptied leaving about one-third of the soil in the tube. The tube is capped with plastic end caps and set aside to allow hydrocarbons to volatilize from the soil. After ten to fifteen minutes, a portable volatile vapor analyzer measures volatile hydrocarbon vapor concentrations in the tube headspace, extracting the vapor through a slit in the cap. Volatile vapor analyzer measurements are used along with the field observations, odors, stratigraphy and ground water depth to select soil samples for analysis.

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Water Sampling

Water samples, if they are collected from the boring, are either collected using a driven Hydropunch® type sampler or are collected from the open borehole using bailers. The ground water samples are decanted into the appropriate containers supplied by the analytic laboratory. Samples are labeled, placed in protective foam sleeves, stored on crushed ice at or below 4°C, and transported under chain-of-custody to the laboratory. Laboratory-supplied trip blanks accompany the samples and are analyzed to check for cross-contamination. An equipment blank may be analyzed if non-dedicated sampling equipment is used.

Grouting

If the borings are not completed as wells, the borings are filled to the ground surface with cement grout poured or pumped through a tremie pipe.

MONITORING WELL INSTALLATION, DEVELOPMENT AND SAMPLING

Well Construction and Surveying

Ground water monitoring wells are installed to monitor ground water quality and determine the ground water elevation, flow direction and gradient. Well depths and screen lengths are based on ground water depth, occurrence of hydrocarbons or other compounds in the borehole, stratigraphy and State and local regulatory guidelines. Well screens typically extend 10 to 15 ft below and 5 ft above the static water level at the time of drilling. However, the well screen will generally not extend into or through a clay layer that is at least three ft thick.

Well casing and screen are flush-threaded, Schedule 40 PVC. Screen slot size varies according to the sediments screened, but slots are generally 0.010 or 0.020 inches wide. A rinsed and graded sand occupies the annular space between the boring and the well screen to about one to two ft above the well screen. A two ft thick hydrated bentonite seal separates the sand from the overlying sanitary surface seal composed of Portland type I,II cement.

Well-heads are secured by locking well-caps inside traffic-rated vaults finished flush with the ground surface. A stovepipe may be installed between the well-head and the vault cap for additional security.

The well top-of-casing elevation is surveyed with respect to mean sea level and the well is surveyed for horizontal location with respect to an onsite or nearby offsite landmark.

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Well Development

Wells are generally developed using a combination of ground water surging and extraction. Surging agitates the ground water and dislodges fine sediments from the sand pack. After about ten minutes of surging, ground water is extracted from the well using bailing, pumping and/or reverse air-lifting through an eductor pipe to remove the sediments from the well. Surging and extraction continue until at least ten well-casing volumes of ground water are extracted and the sediment volume in the ground water is negligible. This process usually occurs prior to installing the sanitary surface seal to ensure sand pack stabilization. If development occurs after surface seal installation, then development occurs 24 to 72 hours after seal installation to ensure that the Portland cement has set up correctly.

All equipment is steam-cleaned prior to use and air used for air-lifting is filtered to prevent oil entrained in the compressed air from entering the well. Wells that are developed using air-lift evacuation are not sampled until at least 24 hours after they are developed.

Ground Water Sampling

Depending on local regulatory guidelines, three to four well-casing volumes of ground water are purged prior to sampling. Purging continues until ground water pH, conductivity, and temperature have stabilized. Ground water samples are collected using bailers or pumps and are decanted into the appropriate containers supplied by the analytic laboratory. Samples are labeled, placed in protective foam sleeves, stored on crushed ice at or below 4°C, and transported under chain-of-custody to the laboratory. Laboratory-supplied trip blanks accompany the samples and are analyzed to check for cross-contamination. An equipment blank may be analyzed if non-dedicated sampling equipment is used.

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ATTACHMENT B

Standard Field Procedures for Remediation Wells

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STANDARD FIELD PROCEDURES FOR REMEDIATION WELL INSTALLATION

This document presents standard field methods for drilling and sampling soil borings and installing remediation wells. These procedures are designed to comply with Federal, State and local regulatory guidelines. Specific field procedures are summarized below.

SOIL BORING AND SAMPLING

Objectives

Soil samples are collected to characterize subsurface lithology, assess whether the soils exhibit obvious hydrocarbon or other compound vapor or staining, and to collect samples for analysis at a State-certified laboratory. All borings are logged using the Unified Soil Classification System by a trained geologist working under the supervision of a California Registered Geologist (RG) or a Certified Engineering Geologist (CEG).

Soil Boring and Sampling

Soil borings are typically drilled using hollow-stem augers or push technologies such as the Geoprobe. Soil samples are collected at least every five ft to characterize the subsurface sediments and for possible chemical analysis. Additional soil samples are collected near the water table and at lithologic changes. Samples are collected using lined split-barrel or equivalent samplers driven into undisturbed sediments at the bottom of the borehole.

Drilling and sampling equipment is steam-cleaned prior to drilling and between borings to prevent cross-contamination. Sampling equipment is washed between samples with trisodium phosphate or an equivalent EPA-approved detergent.

Sample Analysis

Sampling tubes chosen for analysis are trimmed of excess soil and capped with Teflon tape and plastic end caps. Soil samples are labeled and stored at or below 4°C on either crushed or dry ice, depending upon local regulations. Samples are transported under chain-of-custody to a State-certified analytic laboratory.

Field Screening

One of the remaining tubes is partially emptied leaving about one-third of the soil in the tube. The tube is capped with plastic end caps and set aside to allow hydrocarbons to volatilize from the soil. After ten to fifteen minutes, a portable photoionization detector (PID) measures volatile hydrocarbon vapor concentrations in the tube headspace, extracting the vapor through a slit in the

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cap. PID measurements are used along with the field observations, odors, stratigraphy and ground water depth to select soil samples for analysis.

Grouting

If the borings are not completed as wells, the borings are filled to the ground surface with cement grout poured or pumped through a tremie pipe.

REMEDATION WELL INSTALLATION

Well Construction

Remediation wells are installed for soil vapor extraction (SVE), ground water extraction (GWE), oxygenation, air sparging (AS) and for vapor monitoring (VM). Well depths and screen lengths will vary depending upon several factors including the intended use of the well, ground water depth, occurrence of hydrocarbons or other compounds in the borehole, stratigraphy and State and local regulatory guidelines.

Well casing and screen are typically one to four inch diameter flush-threaded Schedule 40 PVC. Screen slot size varies according to the sediments screened, but slots are generally 0.010 or 0.020 inches wide. A rinsed and graded sand occupies the annular space between the boring and the well screen to about one to two ft above the well screen. A two ft thick hydrated bentonite seal separates the sand from the overlying sanitary surface seal composed of Portland type I,II cement. Well-heads are typically connected remediation piping set in traffic-rated vaults finished flush with the ground surface. Typical well screen intervals for each type of well are as follows:

SVE Wells: SVE wells are screened in the vadose zone targeting horizons with the highest hydrocarbon concentrations. SVE wells are also occasionally screened as concurrent soil vapor and ground water extraction wells with screen interval above and below the water table.

GWE Wells: Ground water extraction wells are typically screened ten to fifteen ft below the first water-bearing zone encountered. The well screen may or may not be screened above the water table depending upon whether the water bearing zone is unconfined or confined.

Oxygenation Wells: Oxygenation wells are installed above or below the water table to supply oxygen and enhance naturally occurring hydrocarbon biodegradation. Oxygenation wells installed in the vadose zone typically have well screens that are two to ten feet long and target horizons with the highest hydrocarbon concentrations. Oxygenation wells installed below the water table typically have a two foot screen interval set ten to fifteen ft below the water table.

AS Wells: Air sparging wells are installed below the water table and typically have a two foot screen interval set ten to fifteen ft below the water table.

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VM Wells: Vapor monitoring wells are installed in the vadose zone to check for hydrocarbon vapor migration during air injection. The wells are typically constructed with short screens to target horizons through which hydrocarbon vapor migration could occur. These wells can also be constructed in borings drilled using push technologies such as the Geoprobe by using non-collapsible Teflon tubing set in small sand packed regions overlain by grout.

Well Development

Ground water extraction wells are generally developed using a combination of ground water surging and extraction. Surging agitates the ground water and dislodges fine sediments from the sand pack. After about ten minutes of surging, ground water is extracted from the well using bailing, pumping and/or reverse air-lifting through an eductor pipe to remove the sediments from the well. Surging and extraction continue until at least ten well-casing volumes of ground water are extracted and the sediment volume in the ground water is negligible. This process usually occurs prior to installing the sanitary surface seal to ensure sand pack stabilization. If development occurs after surface seal installation, then development occurs 24 to 72 hours after seal installation to ensure that the Portland cement has set up correctly.

All equipment is steam-cleaned prior to use and air used for air-lifting is filtered to prevent oil entrained in the compressed air from entering the well. Wells that are developed using air-lift evacuation are not sampled until at least 24 hours after they are developed.

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ATTACHMENT C

Standard Field Procedures for Well Destruction

CAMBRIA

STANDARD FIELD PROCEDURES FOR DESTROYING MONITORING WELLS

This document presents standard field methods for destroying ground water monitoring wells. The objective of well destruction is to destroy wells in a manner that is protective of potential water resources. The two procedures most commonly used are pressure grouting and drilling out the well. These procedures are designed to comply with Federal, State and local regulatory guidelines. Specific field procedures are summarized below.

Pressure Grouting

Pressure grouting consists of injecting neat Portland cement through a tremie pipe under pressure to the bottom of the well. The cement is composed of about five gallons of water to a 94 lb. sack of Portland I/II Cement. Once the well casing is full of grout, it remains pressurized by applying pressure with a grout pump. The well casing can also be pressurized by extending the well casing to the appropriate height and filling it with grout. In either case, the additional pressure allows the grout to be forced into the sand pack. After grouting the sand pack and casing, the well vault is removed and the area resurfaced or backfilled as required.

Well Drill Out

When well drill out is required, a hollow-stem auger drilling rig is used to drill out the well casing and pack materials. First, drill rods are placed in the well casing and used to guide the augers as they drill out the well. Once the well is drilled out, the boring is filled with Portland cement injected through the augers or a tremie pipe under pressure to the bottom of the boring. The well vault is removed and the area resurfaced or backfilled as required.