

RECEIVED

7:59 am, Apr 27, 2007

Alameda County
Environmental Health

**SELF-MONITORING REPORT –
FIRST QUARTER 2007
NPDES PERMIT NO. CAG912002**

**GROUNDWATER REMEDIATION AT
CITY OF OAKLAND
MUNICIPAL SERVICES CENTER
7101 EDGEWATER DRIVE
OAKLAND, CALIFORNIA**

Prepared for

**City of Oakland
Public Works Agency
Environmental Services Division
250 Frank H. Ogawa Plaza, Suite 5301
Oakland, CA94612**

April 2007

Prepared by

OTG

**Enviroengineering
Solutions, Inc.**

464 19th Street, Suite 206
Oakland, CA 94612

April 13, 2007

Mr. Farhad Azimzadeh
Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612

Reference: RWQCB Order No. R2-2006-0075, NPDES Permit #CAG912002

Subject: Self-Monitoring Report – First Quarter 2007
Groundwater Remediation at 7101 Edgewater Drive, Oakland, CA

Dear Mr. Azimzadeh:

On behalf of the City of Oakland, OTG Enviroengineering Solutions, Inc. is pleased to submit this Self-Monitoring Report for a groundwater extraction, treatment and discharge system at the City of Oakland Municipal Services Center (MSC) located at 7101 Edgewater Drive, Oakland, California. No violations of RWQCB Order No. R2-2006-0075 and NPDES Permit #CAG912002 were identified during this reporting period of time.

Certification

I certify under penalty of law that this document and all attachments are prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who managed the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Please contact the undersigned at (510) 465-8982 if you have questions or comments.

Sincerely,
OTG EnviroEngineering Solutions, Inc.



Xinggang Tong, PhD, PE
Project Manager



cc: Mr. Gopal Nair, City of Oakland
Mr. Barney Chan, Alameda County Department of Environmental Health

464 19th Street, Suite 206, Oakland, CA 94612
(510) 465-8982, fax (510) 868-0667

Mailing Address:
P.O. Box 70125, Oakland, CA 94612

TABLE OF CONTENTS

SECTION	Page
1. INTRODUCTION	1
2. DESCRIPTION OF REMEDIATION SYSTEM	2
3. OPERATIONS AND MAINTENANCE	2
4. DISCHARGE MONITORING – FIRST QUARTER 2007	3
5. REFERENCES	5

FIGURES

1. Site Location and Discharge Location Map
2. Identification of Free-Phase Petroleum Product Locations
3. Identification of Extraction Wells and Trench Layout
4. Remediation System Process & Instrumentation Diagram
5. Schematic of Groundwater Treatment System and Sampling Locations

TABLES

- 1 Summary of Laboratory Analytical Procedures
- 2 Summary of Operational Data and Field Measured Parameters
- 3 Summary of Petroleum Hydrocarbon Analytical Data
- 4 Summary of Analytical Data for Inorganic Constituents and Fish Bioassay
- 5 Summary of Analytical Data for Organic Constituents
- 6 TPH Removed Through Dissolved Phase and Floating Product

APPENDICES

- A. Laboratory Analytical Reports for January 19, 2007 Samples
- B. Laboratory Analytical Reports for February 22, 2007 Samples
- C. Laboratory Analytical Reports for March 14, 2007 Samples

1 INTRODUCTION

The City of Oakland Municipal Services Center (MSC) is located at 7101 Edgewater Drive, Oakland, CA (Figure 1). The site was originally part of a waterfront tidal marsh complex, which was filled between 1950 and 1971. The MSC occupies an area of approximately 17 acres. The City leased the land from the Port of Oakland for use as a corporation yard. Bordering the MSC site to the west and the north is the Martin Luther King Regional Shoreline Park. This park land is also owned by the Port of Oakland. Damon Slough is located to the north, and commercial developments are located to the east and south.

The MSC site has been the subject of numerous environmental investigations starting in about 1989. The suspected sources of on-site contamination include releases from underground storage tanks (USTs), gasoline and diesel fuel hydrant system, and the floor drain waste collection pits formerly located adjacent to Building No. 5. In addition, some or all of the material used to fill the site may have been waste or contaminated prior to placement at the site. A comprehensive investigation conducted by Baseline in 2000 identified the existence of free-phase petroleum hydrocarbon product at four separate areas within the MSC. They are labeled as Plumes A through D on Figure 2. Baseline's investigation is documented in the report of *Site History and Characterization* (January 2001).

Groundwater monitoring has been conducted quarterly from the fourth Quarter of 1989 through the third quarter of 2002 and then semi-annually to current. Shallow groundwater elevation varies from 2 to 10 feet below ground surface and is partially subject to tidal influence. Shallow groundwater flow is toward the southwest to the nearest shoreline along San Leandro Bay across much of the site. In the northern portion of the MSC, groundwater flows in a more northerly direction toward the curving shoreline and Damon Slough (Baseline, January 2001)

Pilot-scale Dual-Phase Extraction (DPE) tests were conducted in 2002 to enhance the removal of free-phase petroleum product from the four identified areas (Cambria, August 13, 2002 and URS, August 29, 2002). Extracted groundwater was treated on-site through two 2,000-lb granular activated carbon units connected in series and discharged to on-site storm drain via a NPDES permit granted by the San Francisco Bay Regional Water Quality Control Board (NPDES Permit No. CAG912002). Based on the pilot test result, the City retained Cambria in May 2003 to design a full-scale application of product recovery and groundwater/soil vapor extraction at Plumes C and D. Cambria's design was revised in October 2005 by Groundwater and Environmental Services (GES) to focus the first phase of product removal in Plume D. The final design drawings were included in Appendix A of the Startup Report (OTG, June 2006). Chemical oxidation and enhanced bioremediation through periodic injections of hydrogen peroxide have been implemented in Plumes A, B and C since July 2004.

In March 2006, the City retained URS Corporation and its subcontractor ERRG to construct the GES' revised remediation system of product recovery and groundwater/soil vapor extraction. The construction was completed in early May 2006. On May 22, 2006, the product recovery and groundwater extraction portion of the remediation system was turned on.

2. DESCRIPTION OF REMEDIATION SYSTEM

The remediation system consists of extraction of liquid (petroleum product and groundwater) and soil vapor from seven (7) wells located in Plume D area (Figure 3), separation of petroleum product from groundwater, treatment of groundwater by activated carbon, discharge of treated water to local storm drain via a NPDES permit, treatment of soil vapor, and discharge of treated vapor to the atmosphere via an air discharge permit. A process and instrumentation diagram of the remediation system is illustrated on Figure 4. Design details were included in Appendix A of the Startup Report (OTG, June 2006).

The seven wells are: RW-D1, RW-D2, RW-D3, RW-D4, RW-D5, TBW-5 and RW-1. Their locations are shown on Figure 3. RW-D1 through RW-D5 were constructed in December 2001 specifically for remediation purposes, and RW-1 and TBW-5 were placed during backfilling of the excavation of former fuel hydrant lines in the early 1990s. Each well is equipped with a total fluid recovery pneumatic pump specifically designed for viscous petroleum product recovery. The pump is manufactured by Clean Environment Equipment in Oakland and has the Model # AP-Custom. An Ingersoll-Rand air compressor (model # SSR UP6-10) provides compressed air to the pneumatic pumps. Each well is also piped into a high vacuum extraction unit that can produce up to 28 inches of mercury vacuum. This vacuum unit can be operated at either mode of soil vapor extraction only or soil vapor and liquid simultaneous extraction. The pneumatic pumps and the vacuum extraction unit can be operated independently.

The liquid extracted by the pneumatic pumps and the vacuum unit is pumped into an oil/water separator (Model # AGM-3SS-90V, Hydro Quip, Inc.). Recovered oil is contained in 55-gallon drums, which are sent to an off-site oil recycling facility. Groundwater is treated through three (3) granular activated carbon (GAC) units connected in series (Model #ASC-2000, U.S.Filter/Westates Carbons) before being discharged into local storm drain. Each GAC unit contains 2,000 lbs of GAC. Figure 5 illustrates the groundwater treatment portion of the remediation system and identifies sampling ports.

A 40 hp liquid-ring vacuum pump capable of 500 ACFM and up to 28" Hg extracts soil vapor and liquid from the seven wells. The vapor is abated by a combination of thermal and catalytic oxidizer. At low vapor organic concentrations, activated carbon can also be used for vapor abatement.

3 OPERATIONS AND MAINTENANCE

On May 22, 2006, the pneumatic pumps were turned on to start the remediation process. The vacuum extraction portion remained off line. Because the free-phase product appears to be a mixture of gasoline, diesel, and some other highly viscous organics (petroleum tank bottom or coal tar like material), the vacuum extraction, if turned on, will vaporize gasoline and a portion of the diesel and will make the removal of the viscous product even more difficult. The plan is to first use the pneumatic pumps to remove the free-phase product as much as practically achievable and then to use the vacuum extraction system to enhance the removal of the remaining petroleum hydrocarbons.

The groundwater extraction, treatment, and discharge system was operated continuously during the First Quarter 2007. Operations and maintenance (O&M) of the system were performed following the instruction of *Operation & Maintenance Manual for Groundwater Remediation System at City of Oakland Municipal Services Center, Draft* (OTG, July 2006), which included daily check of air compressor's oil & pressure levels, functions of liquid level sensors and pumps, draining condensate from air tank, removing oil from the oil/water separator, and other tasks necessary for maintaining proper functions of the remediation system. No carbon changes were performed this quarter.

On-site measurement included temperature, pH, and electric conductivity using an Oakton pH/Con 10 meter (Serial #311648) and turbidity using an Oakton T-100 meter (Serial #316738). Before measurement, the pH probe was calibrated with standard solutions of pH 4.00, 7.00, and 10.00; the electric conductivity probe calibrated with 1413 ug/cm standard solution; and the turbidity meter calibrated with standards of 0.02, 20.0, 100, and 800 NTUs.

Chemical analyses were performed by Curtis & Tompkins, Ltd of Berkeley. Fish toxicity bioassay was conducted by Block Environmental Services of Pleasant Hill. The data received from laboratories was found to be of acceptable quality with qualifications as noted in the laboratory reports.

4 DISCHARGE MONITORING – FIRST QUARTER 2007

Field measured data and laboratory analysis results are summarized in the following tables:

- Table 1 – Summary of Laboratory Analytical Procedures
- Table 2 – Summary of Operational Data and Field Measured Parameters
- Table 3 – Summary of Petroleum Hydrocarbon Analytical Data
- Table 4 – Summary of Analytical Data for Inorganic Constituents & Fish Bioassay
- Table 5 – Summary of Analytical Data for Organic Constituents
- Table 6 – TPH removed through Dissolved in Groundwater and Floating Product

Major highlights for the First Quarter 2007 are:

- Liquid extraction by the pneumatic pumps ran continuously for this reporting period (January 1 through March 31, 2007). A total of 260,870 gallons of groundwater was extracted within the plume D area, treated, and discharged into the local storm drain, resulting in an average monthly flow rate of 1.322 gallons per minute (gpm) in January, 2.282 gpm in February, and 2.693 gpm in March (Table 2).
- 40 gallons of separate-phase floating product was recovered. Counting the TPH removed with the groundwater (dissolved phase), approximately 54 gallons, or 380 lbs, of TPH was removed (Table 6). The removed floating product is highly viscous and black in color. Its appearance does not resemble gasoline or diesel.

- Monthly monitoring was conducted on January 19, February 22, and March 14, respectively. Monthly monitoring results are summarized in Tables 2 and 3. Quarterly monitoring was conducted on March 14 and results are presented in Tables 4 and 5.
- Effluent (treated groundwater) had pHs between 7.1 and 7.3, temperatures between 9.4 and 17.6 °C, conductivities between 13.34 and 19.9 ms/cm, and turbidities between 0.04 and 0.04 (Table 2).
- TPH gas, diesel, benzene, toluene, ethylbenzene, and xylenes (BTEX), and MTBE in the monthly effluent samples were all below their respective reporting limits. The BTEX and MTBE reporting limit is 0.5 ug/L.
- Daily mass discharges calculated based on the average daily flow rate and the quarterly monitoring data (March 14) for all inorganic constituents were significantly below their respective daily mass limits imposed by the discharge permit for the category of less than 10 gpm discharge rate (Table 4).
- Effluent concentrations of volatile organic compounds (VOCs) and fuel oxygenates analyzed by EPA8260, methanol and ethanol by EPA 8015, semi-VOCs by EPA8270 and EPA8310 were all below their respective reporting limits (Table 5). A sample collected from Btw-2 (after the second carbon unit) on March 14 was also analyzed for VOCs by EPA 8260 and none of the VOCs was reported at or above its reporting limit. Breakthrough at the second carbon vessel has yet to occur.
- The rainbow trout survival rate was 100% in the 96-hour static renewal bioassay conducted for the effluent sample collected on March 14 (Table 4).
- The average concentration for the influent (after the oil/water separator, but before the carbon treatment) for the First Quarter 2007 was 39.7 mg/L TPH gas, 6.4 mg/L TPH diesel, and 3.57 mg/L benzene.

5 REFERENCES

Baseline Environmental Consulting, *Site History and Characterization*, January 2001

Cambria Environmental Technology, Inc. *TPE Pilot Test and Feasibility Report*, August 13, 2002.

California Regional Water Quality Control Board – San Francisco Bay Region, *Notice of General Permit Coverage for Discharge from the City of Oakland Municipal Service Center located at 7101 Edgewater Drive, Oakland, Alameda County, CA 94621, under the Requirements of Order No. R2-2006-0075, NPDES Permit No. CAG912002 (Fuel General Permit)*, March 12, 2007.

California Regional Water Quality Control Board – San Francisco Bay Region, *Authorization to Discharge Treated Groundwater Under the Requirements of Order No. 01-100, NPDES Permit No. CAG 912002*, April 23, 2002.

OTG Enviroengineering Solutions, Inc. *Self-Monitoring Report – Fourth Quarter & YEAR 2006, Groundwater Remediation at City of Oakland Municipal Services Center*, January 2007

OTG Enviroengineering Solutions, Inc. *Self-Monitoring Report – Third Quarter 2006, Groundwater Remediation at City of Oakland Municipal Services Center*, October 2006

OTG Enviroengineering Solutions, Inc. *Self-Monitoring Report – Second Quarter 2006, Groundwater Remediation at City of Oakland Municipal Services Center*, July 2006

OTG Enviroengineering Solutions, Inc. *Operation & Maintenance Manual for Groundwater Remediation System at City of Oakland Municipal Services Center, Draft*, July 2006

OTG Enviroengineering Solutions, Inc. *Startup Report, Groundwater Remediation at City of Oakland Municipal Services Center*, June 2006

URS Corporation, *Results of Dual-Phase Extraction Pilot Test for Plumes A & B, City of Oakland Municipal Services Center*, August 29, 2002.

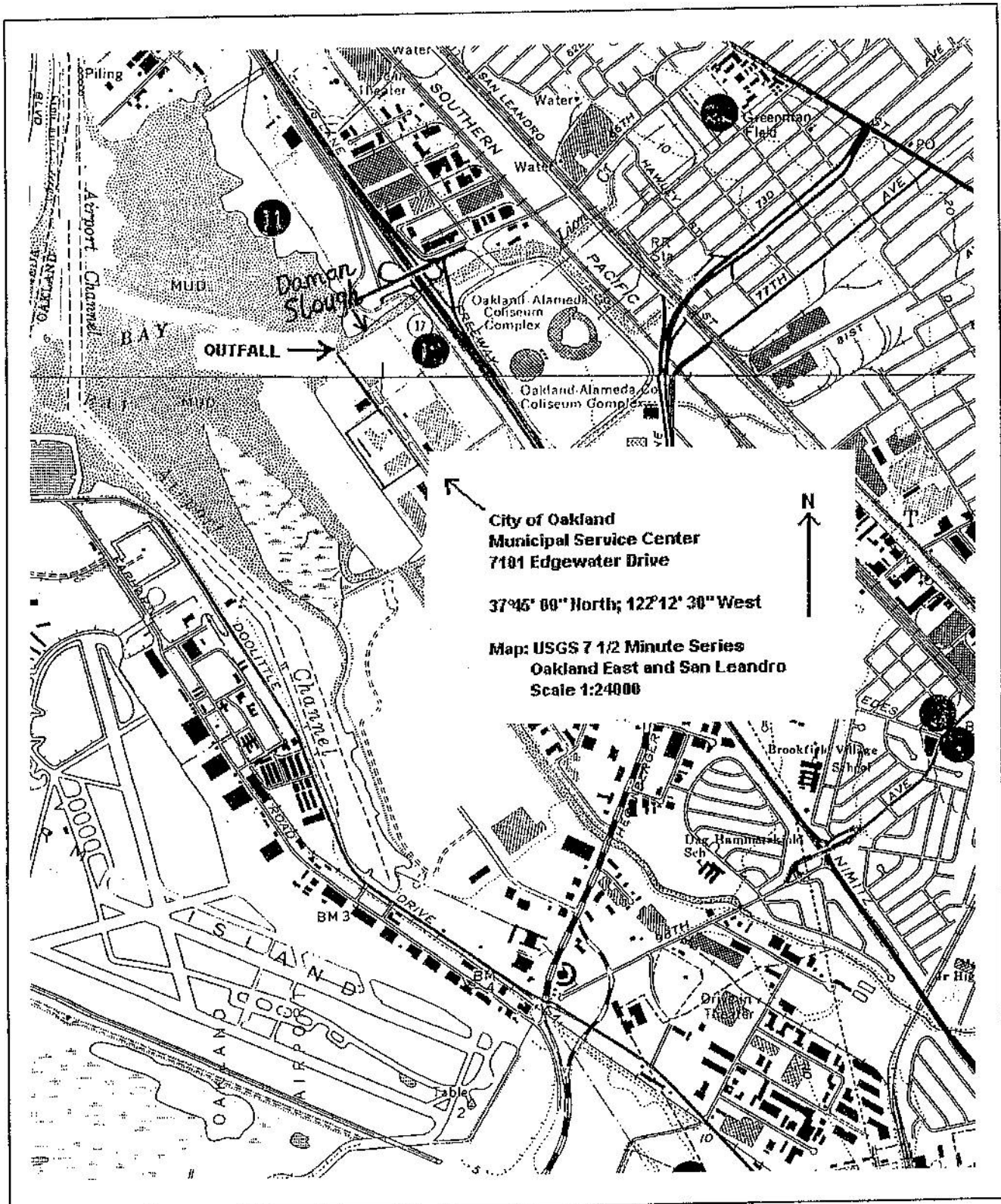


FIGURE 1 SITE LOCATION AND DISCHARGE LOCATION

OTG EnviroEngineering
Solutions, Inc.

City of Oakland Municipal Service Center
7101 EdgeWater Drive, Oakland, CA

EXPLANATION

- MW-1 ● Monitoring well location
- RW-1 ⚡ Remediation well location
- TBW-1 ⚡ Tank Backfill Well
- MW-3 ⊗ Abandoned Well
- Fence
- Former underground piping
- Area of free product on groundwater

DAMON SLOUGH

EDGEWATER DRIVE

SAN LEANDRO BAY

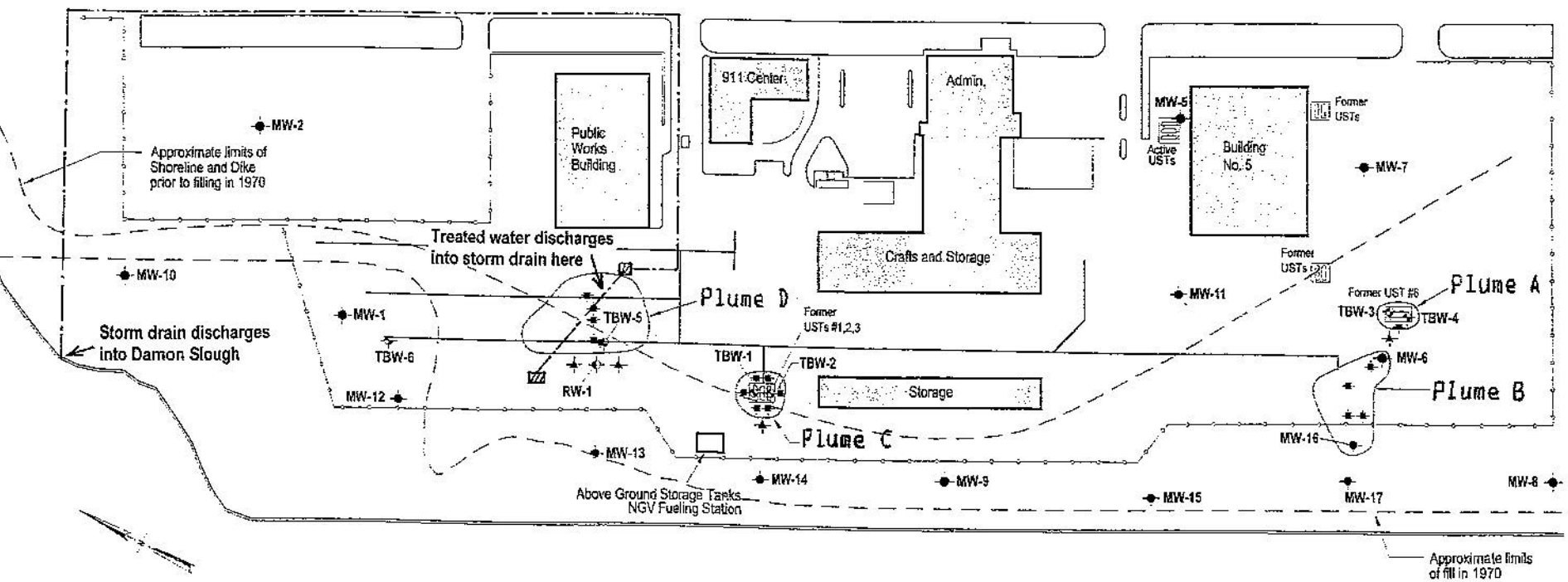


FIGURE 2 Identification of Free-Phase Petroleum Product Locations

OTG EnviroEngineering Solutions, Inc.

City of Oakland Municipal Services Center
7101 Edgewater Drive, Oakland, CA

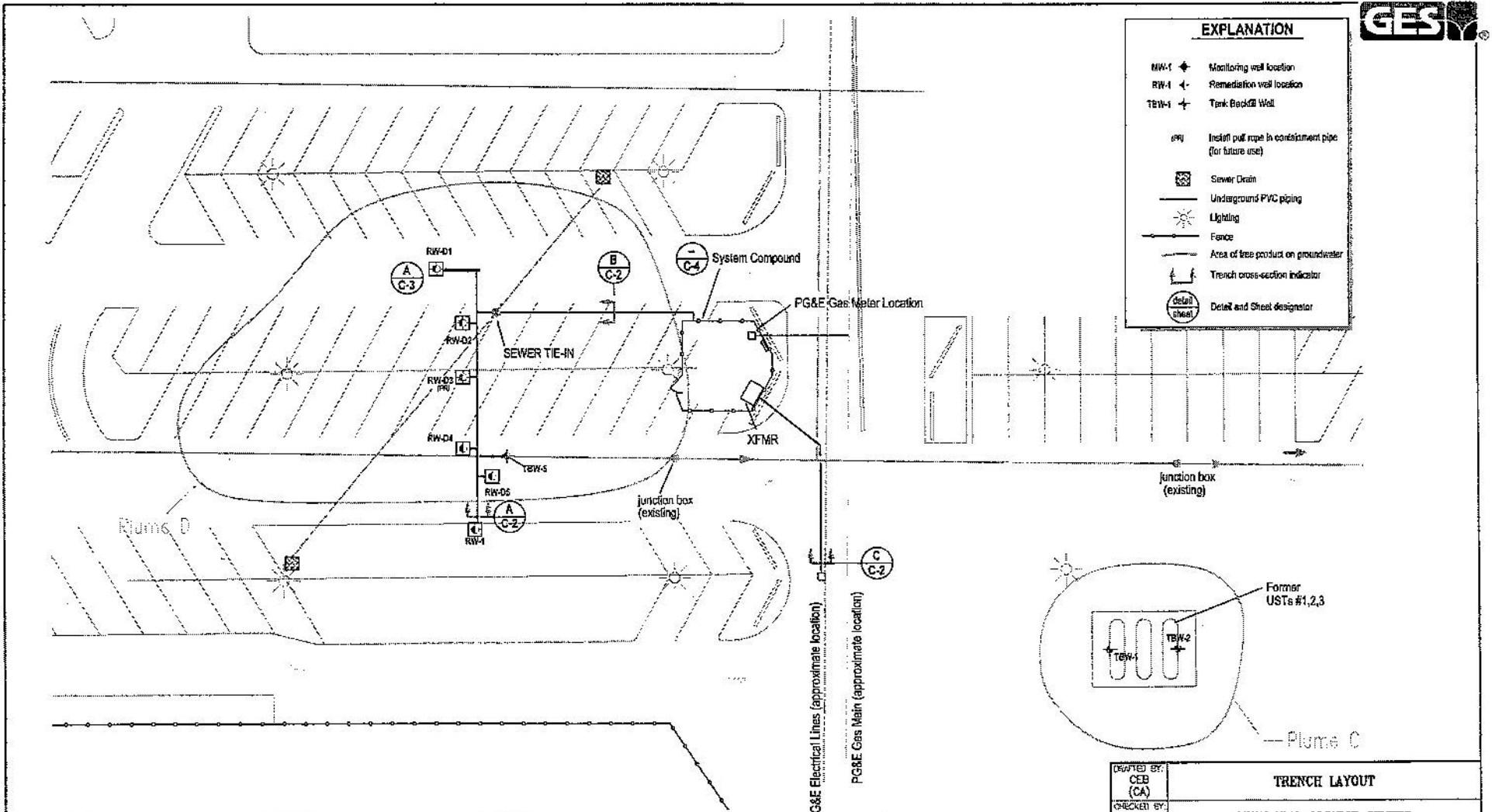


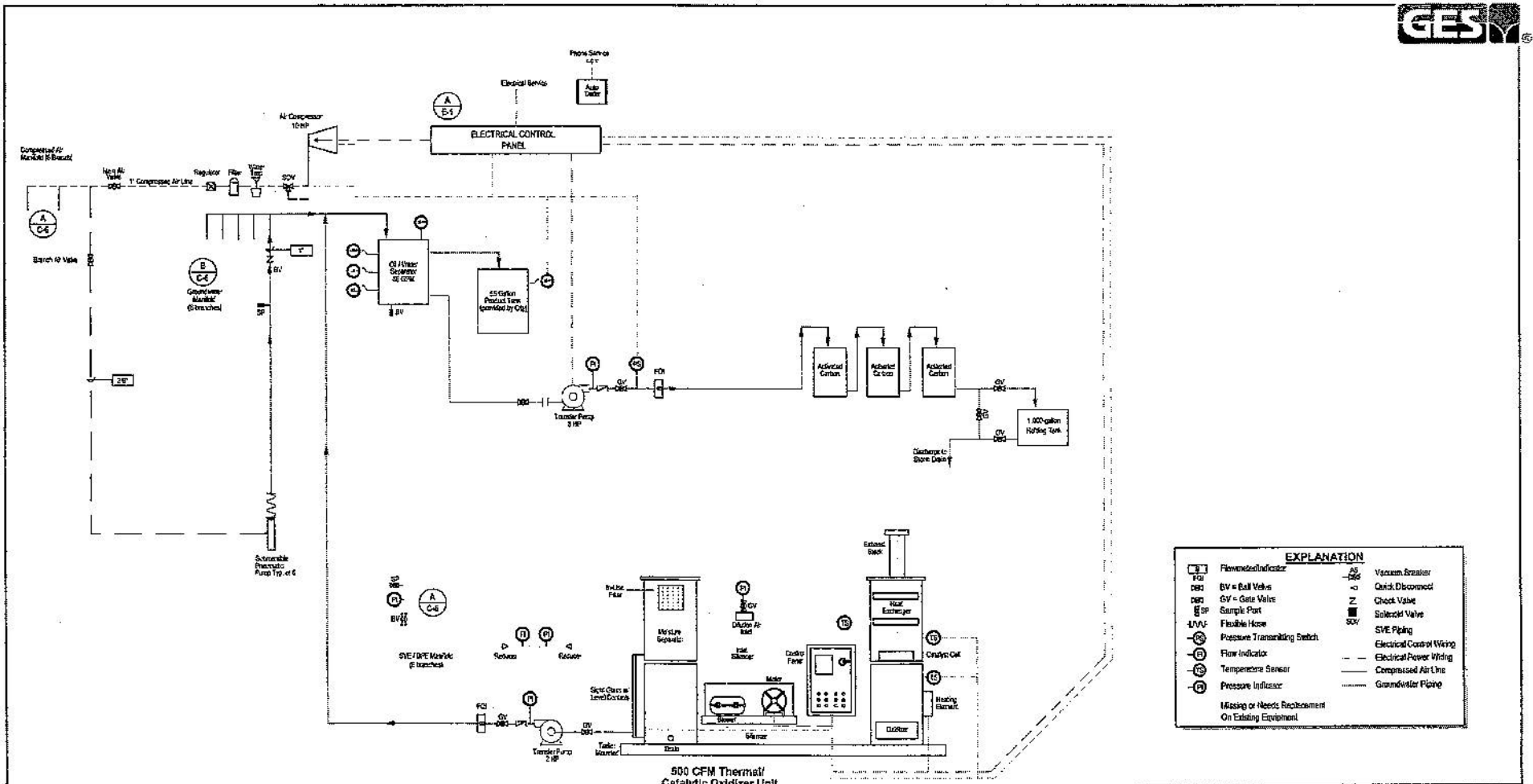
FIGURE 3 Identification of Extraction Wells & Trench Layout

OTG EnviroEngineering Solutions, Inc.

City of Oakland Municipal Services Center
7101 Edgewater Drive, Oakland, CA

Above Ground Storage Tanks
NGV Fueling Station

DRAFTED BY: CEB (CA) CHECKED BY: GWH REVIEWED BY:	TRENCH LAYOUT	
	MUNICIPAL SERVICE CENTER 7101 EDGEWATER DRIVE OAKLAND, CALIFORNIA	
NORTH 	Groundwater & Environmental Services, Inc. 333 VINCENT ROAD, SUITE 222, PLEASANT HILL, CA 94523	
APPROX. SCALE 	DATE 11-02-05	FIGURE C-1



EXPLANATION	
FI	Flowmeter/Indicator
DE	Ball Valve
GV	Gate Valve
SP	Sample Post
FW	Flexible Hose
PT	Pressure Transducing Switch
FI	Flow Indicator
TS	Temperature Sensor
PI	Pressure Indicator
AS	Vacuum Breaker
CD	Quick Disconnect
Z	Check Valve
Z	Sluiceway Valve
SW	SVE Piping
---	Electrical Control Wiring
---	Electrical Power Wiring
---	Compressed Air Line
---	Groundwater Piping
Missing or Needs Replacement On Existing Equipment	

DRAFTED BY: CEB (CA)	PROCESS AND INSTRUMENTATION DIAGRAM	
CHECKED BY: GMH	MUNICIPAL SERVICE CENTER 7101 EDGEWATER DRIVE OAKLAND, CALIFORNIA	
REVIEWED BY: NORTH	Groundwater & Environmental Services, Inc. 333 VINCENT ROAD, SUITE 222, PLEASANT HILL, CA 94523	
	NOT TO SCALE	DATE 11-02-05
		FIGURE M-1

FIGURE 4 Remediation System Process & Instrumentation Diagram

OTG **EnviroEngineering Solutions, Inc.**

City of Oakland Municipal Services Center
7101 Edgewater Drive, Oakland, CA

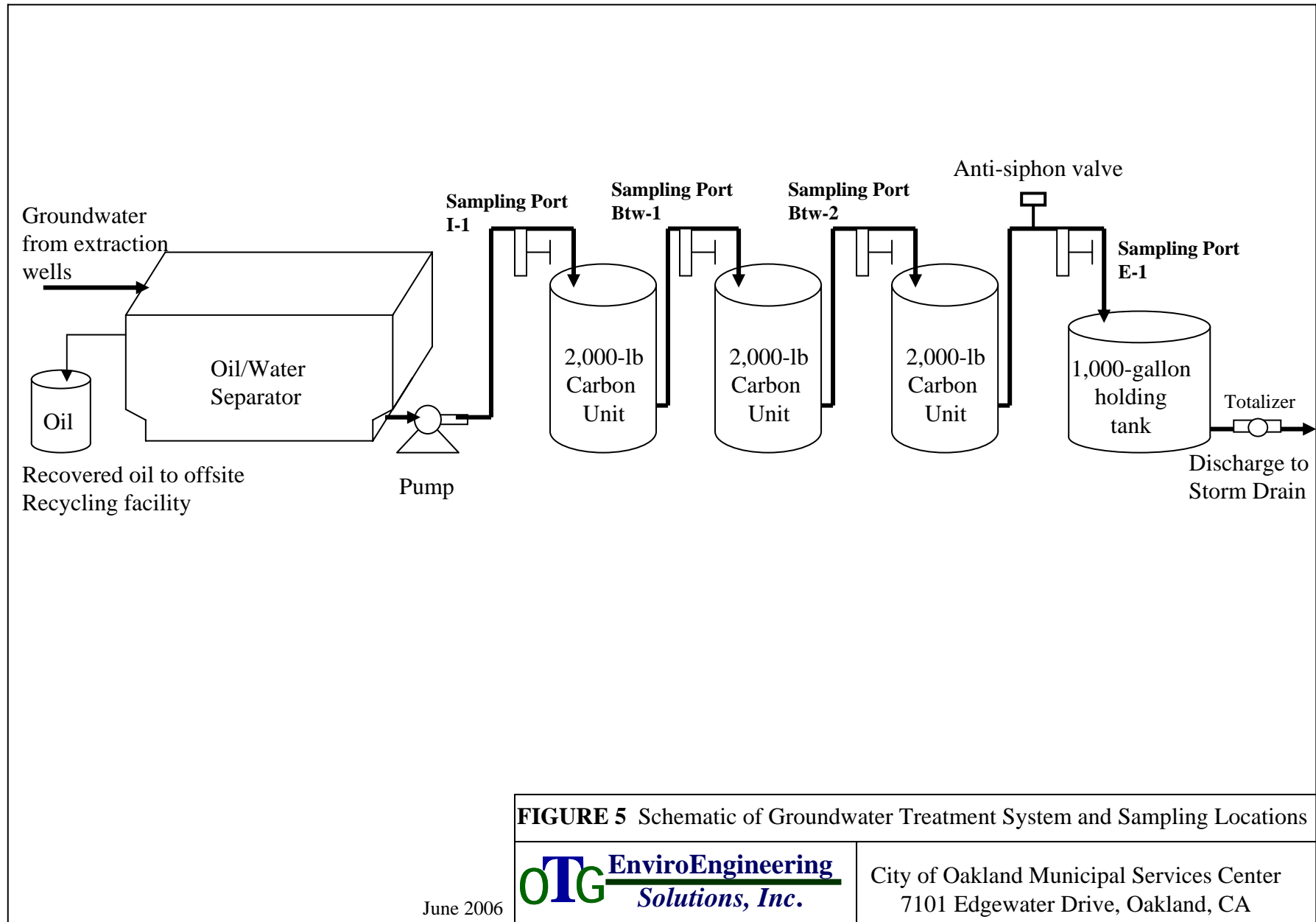


FIGURE 5 Schematic of Groundwater Treatment System and Sampling Locations

June 2006

OTG **EnviroEngineering**
Solutions, Inc.

City of Oakland Municipal Services Center
7101 Edgewater Drive, Oakland, CA

Table 1 - Summary of Laboratory Analytical Procedures
City of Oakland Municipal Services Center Groundwater Remediation Project

	5/22/06	5/30/06	6/26/06	7/25/06	9/5/06	10/4/06	11/8/06
				& 8/11/06		& 12/6/06	
Flow rate	onsite totalizer	onsite totalizer	onsite totalizer	onsite totalizer	onsite totalizer	onsite totalizer	onsite totalizer
Turbidity	on-site	on-site	on-site	on-site	on-site	on-site	on-site
Fish bioassay			EPA/821/R-02/012		EPA/821/R-02/012		EPA/821/R-02/012
pH	on-site	on-site	on-site	on-site	on-site	on-site	on-site
DO							
Temperature	on-site	on-site	on-site	on-site	on-site	on-site	on-site
E. conductivity	on-site	on-site	on-site	on-site	on-site	on-site	on-site
Benzene	EPA 8021B	EPA 8021B	EPA 8021B	EPA 8021B	EPA 8260B	EPA 8021B	EPA 8021B
Toluene	EPA 8021B	EPA 8021B	EPA 8021B	EPA 8021B	EPA 8260B	EPA 8021B	EPA 8021B
Ethylbenzene	EPA 8021B	EPA 8021B	EPA 8021B	EPA 8021B	EPA 8260B	EPA 8021B	EPA 8021B
Total xylenes	EPA 8021B	EPA 8021B	EPA 8021B	EPA 8021B	EPA 8260B	EPA 8021B	EPA 8021B
MTBE	EPA 8021B	EPA 8021B	EPA 8021B	EPA 8021B	EPA 8260B	EPA 8021B	EPA 8021B
TPH g&d	EPA 8015B	EPA 8015B	EPA 8015B	EPA 8015B	EPA 8015B	EPA 8015B	EPA 8015B
EDB		EPA 8260B			EPA 8260B		
VOCs		EPA 8260B			EPA 8260B		
TAME		EPA 8260B			EPA 8260B		
DIPE		EPA 8260B			EPA 8260B		
ETBE		EPA 8260B			EPA 8260B		
TBA		EPA 8260B			EPA 8260B		
Ethanol		EPA 8015B			EPA 8260B		
Methanol		EPA 8015B			EPA 8015B		
SVOCs		EPA 625			EPA 8270C		
PAHs		EPA 610			EPA 8310		
Hardness	SM 2340B	SM 2340B	SM 2340B		SM 2340B		SM 2340B
Antimony	EPA 200.8	EPA 200.8	EPA 6020		EPA 6020		EPA 6020
Arsenic	EPA 200.8	EPA 200.8	EPA 6020		EPA 6020		EPA 6020
Beryllium	EPA 200.8	EPA 200.8	EPA 6020		EPA 6020		EPA 6020
Cadmium	EPA 200.8	EPA 200.8	EPA 6020		EPA 6020		EPA 6020
Chromium	EPA 200.8	EPA 200.8	EPA 6020		EPA 6020		EPA 6020
Cr +6	EPA 7196	EPA 7196	EPA 7199		EPA 7199		EPA 7199
Copper	EPA 200.8	EPA 200.8	EPA 6020		EPA 6020		EPA 6020
Cyanide	EPA 335.2	EPA 335.2	EPA 335.2		EPA 335.2		EPA 335.2
Lead	EPA 200.8	EPA 200.8	EPA 6020		EPA 6020		EPA 6020
Mercury	EPA 245.1	EPA 245.1	EPA 7470A		EPA 7470A		EPA 7470A
Nickel	EPA 200.8	EPA 200.8	EPA 6020		EPA 6020		EPA 6020
Selenium	EPA 200.8	EPA 200.8	EPA 6020		EPA 6020		EPA 6020
Silver	EPA 200.8	EPA 200.8	EPA 6020		EPA 6020		EPA 6020
Thallium	EPA 200.8	EPA 200.8	EPA 6020		EPA 6020		EPA 6020
Zinc	EPA 200.8	EPA 200.8	EPA 6020		EPA 6020		EPA 6020
	pH/Conductivity/Tempt were measured on-site using a Oakton pH/Con 10 meter, Serial #311648, calibrated daily before use.						
	Turbidity was measured on-site using a Oakton T-100 meter, Serial #316738, calibrated daily before use.						

Table 1 - Summary of Laboratory Analytical Procedures
 City of Oakland Municipal Services Center Groundwater Remediation Project

	1/19/07 & 2/22/07	3/14/07
Flow rate	onsite totalizer	onsite totalizer
Turbidity	on-site	on-site
Fish bioassay		EPA/821/R-02/012
pH	on-site	on-site
DO		
Temperature	on-site	on-site
E. conductivity	on-site	on-site
Benzene	EPA 8021B	EPA 8260B
Toluene	EPA 8021B	EPA 8260B
Ethylbenzene	EPA 8021B	EPA 8260B
Total xylenes	EPA 8021B	EPA 8260B
MTBE	EPA 8021B	EPA 8260B
TPH g&d	EPA 8015B	EPA 8015B
EDB		EPA 8260B
VOCs		EPA 8260B
TAME		EPA 8260B
DIPE		EPA 8260B
ETBE		EPA 8260B
TBA		EPA 8260B
Ethanol		EPA 8015B
Methanol		EPA 8015B
SVOCs		EPA 8270C
PAHs		EPA 8310
Hardness		SM 2340B
Antimony		EPA 6020
Arsenic		EPA 6020
Beryllium		EPA 6020
Cadmium		EPA 6020
Chromium		EPA 6020
Cr +6		EPA 7199
Copper		EPA 6020
Cyanide		EPA 335.2
Lead		EPA 6020
Mercury		EPA 7470A
Nickel		EPA 6020
Selenium		EPA 6020
Silver		EPA 6020
Thallium		EPA 6020
Zinc		EPA 6020

Table 2 - Summary of Operational Data and Field Measured Parameters
City of Oakland Municipal Services Center Groundwater Remediation Project

Date	Time	Effluent (E-1)				Influent (I-1)			Btw-1	Btw-2	Totalizer Reading (gallons)	Monthly Treated (gallons)	Monthly ave. rate (gal/min)	Product recovered (gallons)	Notes
		pH	Temp (°C)	E. conduc (ms/cm)	Turbidity (NTU)	pH	Temp (°C)	E. cond. (ms/cm)							
5/22/2006	7:00										1,389				Before turn on system
5/22/2006	11:25	8.3	20.4	8.81	0.2	7.12	21.4	10.2	sampled		2,050				treated water held in tank
5/22/2006	14:15										2,414				stopped, waiting for analy data
5/24/2006	13:00										2,414				system on, start discharge
5/30/2006	12:30	7.48	19.4	8.25	0.04	6.98	23.1	8.32	sampled		14,230			20	
5/31/2006	10:00										18,980	17,591	1.705		
6/2/2006	16:30								sampled	sampled	31,080				
6/9/2006	8:30										48,610				
6/16/2006	10:20										67,755				
6/19/2006	9:40										74,670				
6/22/2006	11:00										90,480				
6/26/2006	9:00	7.32	22.3	13	0.1	7.37	23.3	13.4	sampled	sampled	106,950				Monthly monitoring
6/30/2006	9:00										122,860	103,880	2.405	100	
7/5/2006	10:00										140,500				two full drums of product
7/12/2006	9:30								sampled	sampled	163,230				
7/19/2006	9:30										182,740				
7/25/2006	9:30	7.35	23.6	12.5	0.04	7.4	24.2	13.1	sampled		197,030				Monthly monitoring
7/31/2006	19:30										212,010	89,150	1.997	155	
8/2/2006	19:30										216,790			165	three full drums of product
8/9/2006	9:00										233,260				Morgan removed 3 drums prodt
8/11/2006	9:30	6.95	21.5	12.8	0.1	7.25	22.3	12.6	sampled	sampled	238,380				Monthly monitoring
8/14/2006	8:00										246,180				lowered pumps in wells
8/17/2006	11:30										255,030				
8/28/2006	11:30										283,080				
9/1/2006	18:30										294,910	82,900	1.801	220	one full drum of product on site
9/5/2006	11:00	7	19.7	12.3	0.1	7.1	22.8	11.5	sampled	sampled	301,450				Monthly & Qtrly monitoring
9/9/2006	18:00										310,750				
9/17/2006	13:00										333,310				
9/22/2006	13:30										349,210				
9/27/2006	10:00										364,350				
9/29/2006	15:00										371,290				
10/2/2006	14:30										380,360	85,450	1.925	245	
10/4/2006	11:00	7.1	19.4	12.67	0.04	7.3	21.5	12.22	sampled	sampled	386,160				monthly monitoring
10/9/2006	13:00										402,090				
10/16/2006	11:00										417,310				
10/23/2006	17:00										436,170				
10/27/2006	18:30										443,640				
10/30/2006	11:00										448,220			275	two full drums of product

Table 2 - Summary of Operational Data and Field Measured Parameters
City of Oakland Municipal Services Center Groundwater Remediation Project

Date	Time	Effluent (E-1)				Influent (I-1)			Btw-1	Btw-2	Totalizer Reading (gallons)	Monthly Treated (gallons)	Monthly ave. rate (gal/min)	Product recovered (gallons)	Notes
		pH	Temp (°C)	E. conduc (ms/cm)	Turbidity (NTU)	pH	Temp (°C)	E. cond. (ms/cm)							
11/1/2006	10:30										453,340	72,980	1.689		
11/8/2006	11:00	7.35	18.6	10.03	0.1	7.03	21.7	10.79	sampled	sampled	461,210				monthly & quarterly monitoring
11/14/2006	12:30										483,660				
11/20/2006	10:30										487,970				
12/1/2006	11:30										499,540	46,200	1.069	295	
12/6/2006	11:00	7.1	12.3	15.4	0.08	8.45	14.8	17.7	sampled	sampled	504,500				monthly monitoring
12/15/2006	10:00										513,050				
12/22/2006	14:30										533,130				
12/27/2006	10:00										540,340			315	2 full drums plus 40 gal product
1/2/2007	9:00										548,820	49,280	1.073		
1/10/2007	11:00										559,230				
1/19/2007	10:00	7.15	9.4	19.9	0.04	8	13.5	19.5	sampled	sampled	569,740				monthly monitoring
1/30/2007	10:00										592,780			330	3 full drums product on site
2/2/2007	10:00										607,920	59,100	1.322		
2/8/2007	16:30										615,000				
2/22/2007	10:00	7.12	13.8	15.5	0.04	7.67	15.2	19.13	sampled	sampled	672,610				monthly monitoring
2/28/2007	10:30										693,430	85,510	2.282	343	
3/9/2007	10:00										729,160				
3/14/2007	11:30	7.25	17.6	13.34	0.04	7.28	18.2	13.05	sampled	sampled	748,440				monthly & quarterly monitoring
3/21/2007	12:00										776,540				
3/30/2007	10:00										809,690	116,260	2.693	355	3 full drums+25 gal prod onsite
4/2/2007	10:00										819,750				
4/13/2007	10:00										849,540				

Table 3 - Summary of Petroleum Hydrocarbon Analytical Data
 City of Oakland Municipal Services Center Groundwater Remediation Project

Date	Effluent (E-1)							Influent (I-1)						
	TPH gas (ug/L)	TPHdiesel (ug/L)	benzene (ug/L)	toluene (ug/L)	ethyl benz (ug/L)	xylenes (ug/L)	MTBE (ug/L)	TPH gas (ug/L)	TPHdiesel (ug/L)	benzene (ug/L)	toluene (ug/L)	ethyl benz (ug/L)	xylenes (ug/L)	MTBE (ug/L)
Eff. Limit	50	50	5	5	5	5	13							
5/22/2006	ND (50)	ND (50)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (2.0)	52,000	25,000 (h,l)	6,100	5,200	1,200	6,100	ND (100)
5/30/2006	ND (50)	130 (y, a1)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	57,000	9,200 (l,y)	4900	5300	1100	7100	ND (36)
6/2/2006		ND (50)												
6/26/2006	ND (50)	ND (50)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (2.0)	50,000	10,000(h,l,y)	4800	6900	1100	7200	ND (50)
7/25/2006	ND (50)	ND (50)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (2.0)	60,000	4,000(l,y)	5800	8800	1100	9000	ND (80)
8/11/2006	ND (50)	ND (50)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	4.6 (a1a)	59,000	4,100 (l,y)	4900	7300	930	7000	ND (100)
9/5/2006	ND (50)	ND (50)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (2.0)	44,000	4,800 (l,y)	4700	4800	1200	5400	ND (50)
10/4/2006	ND (50)	ND (50)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (2.0)	42,000	9,100 (h,l,y)	5100	7300	1400	6700	ND (100)
11/8/2006	ND (50)	ND (50)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (2.0)	32,000	7,800 (h,l,y)	3100	3800	590	2880	ND (50)
12/6/2006	ND (50)	ND (50)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (2.0)	55,000	7,600 (h,l,y)	5800	8600	820	6600	ND (50)
1/19/2007	ND (50)	ND (50)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (2.0)	49,000	3,600 (l,y)	3900	5400	390	5900	ND (50)
2/22/2007	ND (50)	ND (50)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (2.0)	38,000	7,900 (l,y)	4100	4500	250	5200	ND (40)
3/14/2007	ND (50)	ND (50)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)	32,000	7,800 (h,l,y)	2700	2900	310	4,100	ND (13)
(a1) - false positive detection, confirmed ND on 6/2/06 samples at E-1, Btw-1 & Btw-2								(a1a) - false positive, confirmed ND on 9/5/06 sample						
(h) - heavier hydrocarbons contributed to the quantitation														
(l) - lighter hydrocarbons contributed to the quantitation														
(y) - sample exhibits chromatographic pattern which does not resemble standard														

Table 4 - Summary of Analytical Data for Inorganic Constituents and Fish Bioassay
City of Oakland Municipal Services Center Groundwater Remediation Project

Constituent	Unit	Eff Limit (<10 gpm)	Effluent (E-1)										
			5/22/06	5/30/06	6/26/06	9/5/06	11/8/06	3/14/07					
Antimony	ug/L		2.3	1.8	0.12	0.13	0.35	0.15					
	g/day	3	0.02137	0.01672	0.001572	0.00138	0.00243	0.001628					
Arsenic	ug/L		36	24	7	3	4.3	1.6					
	g/day	1	0.33444	0.22296	0.0917	0.03177	0.0298	0.01736					
Beryllium	ug/L		ND (0.35)	ND (0.5)	ND (0.055)	ND (0.12)	ND (0.12)	ND (0.17)					
	g/day	3											
Cadmium	ug/L		1	0.5	ND (0.14)	ND (0.17)	ND (0.17)	0.12					
	g/day	1	0.00929	0.00465				0.001302					
Total Cr	ug/L		3.1	ND (0.5)	0.62	0.86	0.78	0.61					
	g/day	2	0.0288		0.008122	0.00911	0.00541	0.006619					
Cr +6	ug/L		ND (1.0)	ND (10)	ND (0.5)	ND (0.5)	ND (0.5)	ND (0.5)					
	g/day	2											
Copper	ug/L		1.3	0.9	1.3	1.5	1.2	ND (0.28)					
	g/day	3	0.01208	0.00836	0.01703	0.01589	0.00832						
Lead	ug/L		ND (0.1)	ND (0.25)	0.26	0.3	0.3	0.75					
	g/day	5			0.003406	0.00318	0.00208	0.008138					
Mercury	ug/L		ND(0.008)	ND(0.2)	ND (0.2)	ND (0.06)	ND (0.02)	0.063					
	g/day	0.01						0.000684					
Nickel	ug/L		11	67	15	9.6	2.9	1.5					
	g/day	5	0.10219	0.62243	0.1965	0.10166	0.0201	0.016275					
Selenium	ug/L		3	3	1.2	ND (0.35)	1.2	ND (0.27)					
	g/day	2	0.02787	0.02787	0.01572		0.00832						
Silver	ug/L		ND (0.02)	ND (0.1)	ND (0.041)	ND (0.07)	ND (0.07)	ND (0.079)					
	g/day	1											
Thallium	ug/L		0.06	ND (0.1)	0.21	ND (0.03)	ND (0.03)	ND (0.3)					
	g/day	3	0.00056		0.002751								
Zinc	ug/L		2	ND (10)	44	11	1.9	10					
	g/day	10	0.01858		0.5764	0.11649	0.01317	0.1085					
Cyanide	ug/L		ND (0.8)	ND (3)	ND (10)	ND (10)	ND (10)	ND (10)					
	g/day												
Hardness	mg/LCaCO3		560	960	1100	1100	1,500	1,400					
Fish Bioassay -													
% survival of Rainbow Trout					100%	100%	100%	100%					

Table 4 - Summary of Analytical Data for Inorganic Constituents and Fish Bioassay
City of Oakland Municipal Services Center Groundwater Remediation Project

Inorganic	Unit	Eff Limit (<10 gpm)	Influent (I-1)									
			5/22/06	5/30/06								
Antimony	ug/L		ND (60)	ND (1)								
	g/day	3							1.1			
Arsenic	ug/L		7.2	8.5					0.011935			
	g/day	1	0.06689	0.07897					5.4			
Beryllium	ug/L		ND (2)	ND (1)					0.05859			
	g/day	3							ND (0.17)			
Cadmium	ug/L		34	10					0.33			
	g/day	1	0.31586	0.0929					0.003581			
Total Cr	ug/L		ND (10)	ND (1)					0.91			
	g/day	2							0.009874			
Cr +6	ug/L		ND (0.5)	ND (0.5)					ND (0.5)			
	g/day	2										
Copper	ug/L		250	25					ND (0.28)			
	g/day	3	2.3225	0.23225								
Lead	ug/L		28	21					8.1			
	g/day	5	0.26012	0.19509					0.087885			
Mercury	ug/L		ND (0.2)	ND (0.2)					0.047			
	g/day	0.01							0.00051			
Nickel	ug/L		68	19					2.8			
	g/day	5	0.63172	0.17651					0.03038			
Selenium	ug/L		9.4	ND (1)					0.31			
	g/day	2	0.08733						0.003364			
Silver	ug/L		ND (5)	ND (1)					ND (0.079)			
	g/day	1										
Thallium	ug/L		25	ND (1)					ND (0.30)			
	g/day	3	0.23225									
Zinc	ug/L		31	57					23			
	g/day	10	0.28799	0.52953					0.24955			
Cyanide	ug/L		10	10				20	30			
	g/day		0.0929	0.0929					0.3255			

Table 5 - Summary of Analytical Data for Organic Constituents
 City of Oakland Municipal Services Center Groundwater Remediation Project

	Max Daily Eff. Limit	Effluent (E-1)						
		5/30/06	9/5/06	3/14/07				
VOCs (EPA8260)	(ug/L)	(ug/L)	(ug/L)	(ug/L)				
Benzene	5	ND (0.5)	ND (0.5)	ND (0.5)				
Carbon tetrachloride	5	ND (0.5)	ND (0.5)	ND (0.5)				
Chloroform	5	ND (0.5)	ND (0.5)	ND (0.5)				
1,1-Dichloroethane	5	ND (0.5)	ND (0.5)	ND (0.5)				
1,2-Dichloroethane	5	ND (0.5)	ND (0.5)	ND (0.5)				
1,1-dichloroethylene	5	ND (0.5)	ND (0.5)	ND (0.5)				
Ethylbenzene	5	ND (0.5)	ND (0.5)	ND (0.5)				
Methylene chloride	5	ND (0.5)	ND (0.5)	ND (10)				
Tetrachloroethylene	5	ND (0.5)	ND (0.5)	ND (0.5)				
Toluene	5	ND (0.5)	ND (0.5)	ND (0.5)				
c-1,2-Dichloroethylene	5	ND (0.5)	ND (0.5)	ND (0.5)				
t-1,2-Dichloroethylene	5	ND (0.5)	ND (0.5)	ND (0.5)				
1,1,1-Trichloroethane	5	ND (0.5)	ND (0.5)	ND (0.5)				
1,1,2-Trichloroethane	5	ND (0.5)	ND (0.5)	ND (0.5)				
Trichloroethylene	5	ND (0.5)	ND (0.5)	ND (0.5)				
vinyl chloride	5	ND (0.5)	ND (0.5)	ND (0.5)				
total xylenes	5	ND (0.5)	ND (0.5)	ND (0.5)				
MTBE	13	ND (0.5)	ND (0.5)	ND (0.5)				
Ethylene dibromide	5	ND (0.5)	ND (0.5)	ND (0.5)				
Trichlorotrifluoroethane	5	ND (5)	ND (5)	ND (5)				
TPH gas	50	ND (50)	ND (50)	ND (50)				
TPH diesel	50	ND (50)	ND (50)	ND (50)				
TAME		ND (0.5)	ND (0.5)	ND (0.5)				
DIPE		ND (0.5)	ND (0.5)	ND (0.5)				
ETBE		ND (0.5)	ND (0.5)	ND (0.5)				
TBA		ND (10)	ND (10)	ND (10)				
Ethanol		ND(1000)	ND(1000)	ND(1000)				
Methanol		ND(1000)	ND(1000)	ND(1000)				
Other VOCs (EPA 8260)		ND	ND	ND				
PAHs (EPA 8310 or 610)								
All analytes		ND (1.0)	ND (0.1)	ND (0.1)				
SVOCs(EPA8270 or625)								
All analytes		ND (5.0)	ND (9.4)	ND (9.6)				

Table 5 - Summary of Analytical Data for Organic Constituents
City of Oakland Municipal Services Center Groundwater Remediation Project

	Influent (I-1)					
	5/30/06		3/14/07			
VOCs (EPA 8260)	(ug/L)		(ug/L)			
Benzene	4900		2,700			
Carbon tetrachloride	ND (36)		ND (13)			
Chloroform	ND (36)		ND (13)			
1,1-Dichloroethane	ND (36)		ND (13)			
1,2-Dichloroethane	ND (36)		ND (13)			
1,1-dichloroethylene	ND (36)		ND (13)			
Ethylbenzene	1100		310			
Methylene chloride	ND (36)		ND (250)			
Tetrachloroethylene	ND (36)		ND (13)			
Toluene	5300		2,900			
c-1,2-Dichloroethylene	ND (36)		ND (13)			
t-1,2-Dichloroethylene	ND (36)		ND (13)			
1,1,1-Trichloroethane	ND (36)		ND (13)			
1,1,2-Trichloroethane	ND (36)		ND (13)			
Trichloroethylene	ND (36)		ND (13)			
vinyl chloride	ND (36)		ND (13)			
total xylenes	7100		4,100			
MTBE	ND (36)		ND (13)			
Ethylene dibromide	ND (36)		ND (13)			
Trichlorotrifluoroethane	ND (360)		ND (13)			
TPH gas	57000		32,000			
TPH diesel	9200		7,800			
TAME	ND (36)		ND (13)			
DIPE	ND (36)		ND (13)			
ETBE	ND (36)		ND (13)			
TBA	ND (710)		ND (25)			
Ethanol	ND(1000)		ND(1000)			
Methanol	ND(1000)		ND(1000)			
Isopropylbenzene	40		16			
Propylbenzene	120		36			
1,3,5-Trimethylbenzene	410		270			
1,2,4-Trimethylbenzene	1500		960			
Naphthalene	370		260			
Other VOCs (EPA 8260)	ND		ND			
PAHs (EPA 8310 or 610)						
Benzo(a)anthracene	1.7		0.14			
Benzo(a)pyrene	1.6		0.12			
Benzo(g,h,i)perylene	ND (1.0)		0.21			
Chrysene	2.6		0.17			
Fluoranthene	3.8		0.63			
Naphthalene	130		230			
Pyrene	3.3		0.56			
Acenaphthene	ND (1.0)		130			
Acenaphthylene	ND (1.0)		58			
Fluorene	ND (1.0)		6.4			
Phenanthrene	ND (1.0)		1.6			
Anthracene	ND (1.0)		0.13			
SVOCs(EPA8270 or625)						
Dimethylphthalate	28		ND (97)			
bis(2-Ethylhexyl)phthalate	12		ND (97)			
Naphthalene	290		160			
Phenol	13		270			
All other SVOCs	ND (5)		ND (97)			

Table 5 - Summary of Analytical Data for Organic Constituents
 City of Oakland Municipal Services Center Groundwater Remediation Project

		After First Carbon Unit (Btw-1)						
	Max Daily	5/30/06	9/5/06					
	Eff. Limit							
	(ug/L)	(ug/L)						
Benzene	5	ND (0.5)	ND (0.5)					
Carbon tetrachloride	5	ND (0.5)	NA					
Chloroform	5	ND (0.5)	NA					
1,1-Dichloroethane	5	ND (0.5)	NA					
1,2-Dichloroethane	5	ND (0.5)	NA					
1,1-dichloroethylene	5	ND (0.5)	NA					
Ethylbenzene	5	ND (0.5)	ND (0.5)					
Methylene chloride	5	ND (0.5)	NA					
Tetrachloroethylene	5	ND (0.5)	NA					
Toluene	5	ND (0.5)	ND (0.5)					
c-1,2-Dichloroethylene	5	ND (0.5)	NA					
t-1,2-Dichloroethylene	5	ND (0.5)	NA					
1,1,1-Trichloroethane	5	ND (0.5)	NA					
1,1,2-Trichloroethane	5	ND (0.5)	NA					
Trichloroethylene	5	ND (0.5)	NA					
vinyl chloride	5	ND (0.5)	NA					
total xylenes	5	ND (0.5)	ND (0.5)					
MTBE	13	ND (0.5)	ND (2)					
Ethylene dibromide	5	ND (0.5)	NA					
Trichlorotrifluoroethane	5	ND (5)	NA					
TPH gas	50	ND (50)	ND (50)					
TPH diesel	50	ND (50)	ND (50)					
TAME		ND (0.5)	NA					
DIPE		ND (0.5)	NA					
ETBE		ND (0.5)	NA					
TBA		ND (10)	NA					
Ethanol		NA	NA					
Methanol		NA	NA					
Other VOCs (EPA 8260)		ND	NA					
PAHs (EPA 8310 or 610)		NA						
SVOCs(EPA8270 or625)		NA						

Table 5 - Summary of Analytical Data for Organic Constituents
 City of Oakland Municipal Services Center Groundwater Remediation Project

		After Second Carbon Unit (Btw-2)					
	Max Daily		9/5/06	3/14/07			
	Eff. Limit						
	(ug/L)		(ug/L)	(ug/L)			
Benzene	5		ND (0.5)	ND (0.5)			
Carbon tetrachloride	5		ND (0.5)	ND (0.5)			
Chloroform	5		ND (0.5)	ND (0.5)			
1,1-Dichloroethane	5		ND (0.5)	ND (0.5)			
1,2-Dichloroethane	5		ND (0.5)	ND (0.5)			
1,1-dichloroethylene	5		ND (0.5)	ND (0.5)			
Ethylbenzene	5		ND (0.5)	ND (0.5)			
Methylene chloride	5		ND (0.5)	ND (10)			
Tetrachloroethylene	5		ND (0.5)	ND (0.5)			
Toluene	5		ND (0.5)	ND (0.5)			
c-1,2-Dichloroethylene	5		ND (0.5)	ND (0.5)			
t-1,2-Dichloroethylene	5		ND (0.5)	ND (0.5)			
1,1,1-Trichloroethane	5		ND (0.5)	ND (0.5)			
1,1,2-Trichloroethane	5		ND (0.5)	ND (0.5)			
Trichloroethylene	5		ND (0.5)	ND (0.5)			
vinyl chloride	5		ND (0.5)	ND (0.5)			
total xylenes	5		ND (0.5)	ND (0.5)			
MTBE	13		ND (0.5)	ND (0.5)			
Ethylene dibromide	5		ND (0.5)	ND (0.5)			
Trichlorotrifluoroethane	5		ND (5)	ND (5)			
TPH gas	50		NA	NA			
TPH diesel	50		NA	NA			
TAME			ND (0.5)	ND (0.5)			
DIPE			ND (0.5)	ND (0.5)			
ETBE			ND (0.5)	ND (0.5)			
TBA			ND (10)	110			
Ethanol			ND (1000)	NA			
Methanol			NA	NA			
Other VOCs (EPA 8260)			ND	ND			
PAHs (EPA 8310 or 610)			NA	NA			
SVOCs(EPA8270 or625)			NA	NA			

APPENDIX A

Laboratory Analytical Reports for January 19, 2007 Samples

APPENDIX B

Laboratory Analytical Reports for February 22, 2007 Samples

APPENDIX C

Laboratory Analytical Reports for March 14, 2007 Samples