



February 27, 2012

Mr. Gopal Nair  
Environmental Services Division  
Public Works Agency  
City of Oakland  
250 Frank H. Ogawa Plaza, 4<sup>th</sup> Floor  
Oakland, California 94612

RE: Soil Vapor Testing Report  
6<sup>th</sup> and Castro Street Caltrans Property  
Oakland, California

Dear Mr. Nair:

This report presents the results of a soil vapor testing program performed by Northgate Environmental Management, Inc. (Northgate) at the 6<sup>th</sup> and Castro Street Caltrans Property in Oakland, California (the Site). The purpose of the investigation was to evaluate the potential presence of total petroleum hydrocarbons as gasoline (TPH-g) and benzene, toluene, ethylbenzene, and xylenes (BTEX) in soil vapor beneath the Site and to provide a preliminary evaluation of whether these contaminants could potentially impact air quality inside any future buildings at the Site. A Site Location Map is shown as Figure 1 and a Site Plan is shown as Figure 2.

## **BACKGROUND**

Records indicate that three underground storage tanks (USTs) were removed from the southwest portion of the Site in 1971, where a former gasoline service station occupied the corner of Brush and 6th Streets between 1956 and 1967. Other historical Site uses included a dairy creamer and a commercial warehouse where underground storage tanks were known or reported. The California Department of Transportation (Caltrans) purchased the property between 1969 and 1971 and in 1973 demolished all on-Site buildings. The parcel has remained vacant since that time. Aerial photographs indicate that the Site has occasionally been used for truck and trailer parking and as a staging area for the 1985 construction of the 980 Freeway.

Seven subsurface investigations and ten groundwater monitoring events have been performed at the subject Site. The earliest investigations were conducted to assess potential environmental liabilities related to valuation and sale of the property. The investigations identified fuel contaminants in soil and grab groundwater samples, in addition to lead in shallow soil samples and one grab groundwater sample. In 1998 Alameda County Environmental Health Services was assigned as the



local oversight agency responsible for overseeing investigation and clean-up. Investigations performed after 1998 focused on determining the extent of contamination, and these investigations included the installation of three on-Site monitoring wells in 1999 and four on- and off-Site monitoring wells in 2008. Groundwater monitoring occurred on a quarterly basis between fourth quarter of 1999 and first quarter of 2001, and then again between the third quarter of 2008 and second quarter of 2009. The subsurface contamination identified during these investigations appears to be gasoline fuel, associated with underground fuel tanks, removed in January 1971 from the former gasoline service station located in the southwestern portion of the Site. The highest concentrations of contaminants detected in groundwater between 1999 and 2009 are TPH-g at 65,000 micrograms per liter ( $\mu\text{g/L}$ ), benzene at 880  $\mu\text{g/L}$ , toluene at 5,100  $\mu\text{g/L}$ , ethylbenzene at 3,100  $\mu\text{g/L}$ , total xylenes at 18,400  $\mu\text{g/L}$ , total petroleum hydrocarbons as diesel (TPH-d) at 6,500  $\mu\text{g/L}$ , 1,2-dichloroethane at 160  $\mu\text{g/L}$ , and other fuel-related volatile organic compounds (VOCs) up to 3,500  $\mu\text{g/L}$ . These constituents were measured in well MW-2, located on-Site about 85 feet east of the corner of Brush and 6<sup>th</sup> Streets. Other on-Site wells displayed at least three orders of magnitude lower concentrations of these contaminants. Groundwater sample analyses did not contain methyl tert-butyl ether (MTBE) or other fuel oxygenates. The groundwater gradient beneath the Site appears to be generally to the south, with historical monitoring data also indicating a southwest or southeast groundwater flow direction.

## INVESTIGATION METHODS

Northgate performed a soil vapor survey at the Site on October 25, 2011. The survey consisted of collecting soil vapor samples at 11 locations in the southwest portion of the subject Site, at the approximate locations shown on Figure 2. Soil vapor samples were collected and analyzed by TEG-Northern California of Rancho Cordova, California under the direction of Northgate. Samples were collected from a depth of five feet below the ground surface (bgs), in accordance with California Department of Toxic Substances Control (DTSC) guidelines, with the exception of sample locations SV-5, SV-6, SV-9, and SV11. Location SV-5 was sampled at 4.5 feet bgs, while sample locations SV-6, SV-9, and SV-11 were all sampled at 4.0 feet bgs due to the presence of tight or low permeability soil conditions. The soil vapor sampling probes were constructed of 1-inch outer diameter chrome-moly steel, equipped with a steel drop-off tip. An inert 1/8-inch diameter Nylaflo<sup>®</sup> tube ran down the center of the probe to sample ports at the base of the tip. The probe was driven into the subsurface with an electric rotary hammer. Once inserted to the desired depth, the probe was retracted slightly to open the tip and expose the vapor sampling ports. This design prevents clogging of the sampling ports and cross-contamination from soils during probe insertion.

A surface seal consisting of hydrated bentonite was then installed around the soil vapor probe, and leak tests were performed using a tracer gas (1,1-difluoroethane) to evaluate ambient air intrusion. Each probe was allowed to stabilize for approximately 30 minutes before purging and sampling. Soil vapor samples were withdrawn from the Nylaflo<sup>®</sup> tubing at a flow rate of less than 200 milliliters (ml) per minute using a small, calibrated-syringe connected to the tubing via an on-off



valve. A purge volume test was initially conducted at vapor sample location SV-9 to determine the optimal purge volume for sampling. Vapor samples were collected for chemical analysis at SV-9 after purging the sampling apparatus of 1, 3, and 7 purge-volumes of air. As shown in Table 1, the highest VOC concentrations at SV-9 were measured in the sample collected after removing one purge volume from the probe. All subsequent samples were collected after one purge volume was withdrawn and discarded to flush the sample tubing in order to fill it with in-situ soil vapor. The next 200 ml of soil vapor were drawn from each probe location into the syringe, which was then plugged and immediately transferred to TEG's on-Site mobile laboratory for analysis. A duplicate soil vapor sample was collected at SV-5. After sampling, the steel probes were removed, and all vapor probe boreholes were backfilled with cement grout.

Soil vapor sampling results were compared to the California Human Health Screening Levels (CHHSLs), established by the DTSC, for evaluating potential impacts to indoor air quality in residential and commercial land use scenarios. Where CHHSLs are not established, they were substituted by Environmental Screening Levels (ESLs) for potential vapor intrusion concerns in residential and commercial land use scenarios, as established by the California Regional Water Quality Control Board (RWQCB).

## INVESTIGATION RESULTS

Soil vapor samples were analyzed for TPH-g, BTEX, naphthalene, and trichloroethene using EPA Method 8260B in TEG's on-Site mobile laboratory. Soil vapor samples were additionally analyzed for methane, oxygen, and carbon dioxide by GC/TCD in the on-Site mobile laboratory. TEG's mobile laboratory is certified by the California Department of Health Services for the analyses performed.

Soil vapor sample analytical results are presented in Table 1, and the laboratory analytical report is attached to this letter. As shown in Table 1, ethylbenzene, xylenes, naphthalene, and trichloroethene were not measured above the laboratory method reporting limits (MRLs) in any of the soil vapor samples analyzed. TPH-g was reported in soil vapor samples collected from three locations: the primary and duplicate samples from SV-5, at concentrations of 13,000 and 11,000 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ), respectively; from SV-6 at a concentration of 10,000  $\mu\text{g}/\text{m}^3$ ; and from SV-11, at a concentration of 15,000  $\mu\text{g}/\text{m}^3$ . Three of the four reported concentrations of TPH-g exceed the ESL of 10,000  $\mu\text{g}/\text{m}^3$  for potential vapor intrusion in residential land use, but do not exceed the ESL for commercial land use of 29,000  $\mu\text{g}/\text{m}^3$ .

Benzene was measured in every soil vapor sample analyzed, at concentrations ranging from 32 to 320  $\mu\text{g}/\text{m}^3$ . Nine of the measured concentrations exceed the residential CHHSL of 36.2  $\mu\text{g}/\text{m}^3$ . Four reported concentrations (140  $\mu\text{g}/\text{m}^3$  from SV-4; 280 and 160  $\mu\text{g}/\text{m}^3$  from SV-5; 210  $\mu\text{g}/\text{m}^3$  from SV-10; and 320  $\mu\text{g}/\text{m}^3$  from SV-11) exceed the commercial land use CHHSL for benzene of 122  $\mu\text{g}/\text{m}^3$ . Toluene was reported in three of the soil vapor samples: 270  $\mu\text{g}/\text{m}^3$  at SV-5 (duplicate



sample contained  $< 200 \mu\text{g}/\text{m}^3$ ),  $220 \mu\text{g}/\text{m}^3$  at SV-10, and  $250 \mu\text{g}/\text{m}^3$  at SV-11. None of the measured concentrations of toluene exceed the residential land use CHHSL of  $135,000 \mu\text{g}/\text{m}^3$  or the commercial land use CHHSL of  $378,000 \mu\text{g}/\text{m}^3$ .

As shown on Table 1, methane was not detected above the laboratory MRL in any sample analyzed. Oxygen was reported at concentrations ranging from 13 to 19 percent by volume (%). Carbon dioxide was reported at concentrations ranging from 1 to 5.5 %. Although these findings do not suggest inadequate or limited biotic conditions in soil at the Site, conclusions regarding the potential for biodegradation cannot be made, based on findings from the current investigation. Additional soil vapor sampling would be required to assess the trends in oxygen and carbon dioxide concentrations in soil vapor at the Site.

## CONCLUSIONS

In summary, the soil vapor sampling performed during this investigation indicates that TPH-g is present in soil vapor at concentrations that exceed the ESL for residential land use. Benzene is present in soil vapor at concentrations that locally exceed the CHHSLs for residential and commercial land use scenarios. As such, soil and groundwater contamination beneath the Site could potentially impact indoor air quality in future on-Site structures. Additional evaluation of the extent of elevated soil vapor concentrations is recommended.

## CLOSING

We appreciate the opportunity to work with you on this project. Should you have any questions or require additional information, please do not hesitate to call.

Sincerely,  
Northgate Environmental Management, Inc.



Dennis Laduzinsky, C.E.G., R.E.A.  
Principal



Anya Starovoytov  
Staff Environmental Scientist

Enclosures:      Figure 1: Site Location Map  
                         Figure 2: Soil Gas Sample Locations  
                         Table 1: Soil Vapor Sample Analytical Results  
                         Attachment 1: Laboratory Report

