BALCO
PROPERTIES

7 November 2008
Project No. 2543.04

Mr. Paresh Khatri
Alameda County Environmental Health
1131 Harbor Bay Parkway
Alameda, CA 94502-6577

Subject: Additional Purge Volume Calculations
2855 Mandela Parkway
Oakland, California

Dear Mr. Khatri:

As a legally authorized representative of BALCO properties, LLC, and on behalf of BALCO properties, LLC, I declare, under penalty of perjury, that the information and/or recommendations contained in the attached document *Additional Purge Volume Calculations, 2855 Mandela Parkway, Oakland, California*, are true and correct to the best of my knowledge.

Sincerely yours,

Janet Jolley
Property manager
BALCO Properties, LLC

Treadwell&Rollo

7 November 2008
Project No. 2543.04

Mr. Paresh Khatri
Alameda County Environmental Health
1131 Harbor Bay Parkway
Alameda, CA 94502-6577

Subject: Additional Purge Volume Calculations
2855 Mandela Parkway
Oakland, California

Dear Mr. Khatri:

On behalf of BALCO properties, LLC, Treadwell & Rollo in response to your letter dated 24 October, 2008 is pleased to submit the following additional information regarding purge volume calculations and soil vapor well construction details for our work plan dated 1 October, 2008.

Soil Vapor Well Construction Details

The ten permanent soil vapor wells (A through J) were installed in June 2001 by Precision Sampling, Incorporated (Precision) under the supervision of Treadwell and Rollo personnel.

At each location the concrete floor slab was cored using a 4-inch diameter core, to allow access to the underlying soil. Each dedicated soil vapor-sampling probe was installed using a direct push technique. The soil vapor sampling probes are stainless steel, 12-inch long tubes with a slotted screen. At the bottom of each soil vapor-sampling probe is a steel point that was used to push into the ground. Precision personnel attached ¼-inch (0.25-inch) outer diameter (OD), 0.17-inch inner diameter (ID) Teflon tubing on a nipple at the top of the soil vapor-sampling probe and brought above the floor grade. Upon completion of soil vapor-sampling probe Teflon tubing installation, the holes were backfilled with grout to provide a vapor seal between the slab and the underlying sand/fill. A well box with a screw on lid was installed to protect the tubing.

Vapor-sampling probes were typically set 2 to 3 feet below the top of the slab to correspond with the middle of the sandy fill interval in the shallow soil, which generally occurs between the surface and 5 ft bgs and is underlain by a clay zone. During previous investigations, the base of the shallow sandy zone has sometimes been very wet to saturated and may represent a perched water zone. This perched-water zone appears to be relatively thin and does not extend under the entire Site. To get a more accurate measurement of soil vapor and the potential for vapors to enter the building through the concrete foundation, vapor sampling points were installed above the perched-water zone rather than 5-feet or deeper as recommended.

Purge Volume Calculations

To calculate the volume of air to be purged from each soil vapor well, as described in the work plan, several factors were considered.

- To collect a representative sample, three soil vapor well volumes will be purged at each location prior to the collection of the soil vapor sample.

- To account for the range of installation depths and to ensure three well volumes purged, it is assumed all soil vapor-sampling points consist of a 12-inch long, 1-inch pre-fabricated stainless steel tube with two feet of 0.25-inch OD, 0.17-inch ID Teflon tubing extending to the surface.

- Two additional feet will be figured into the purge volume calculation. One foot will be used to account for additional Teflon tubing that will extend from the vapor point to the sampling equipment and one foot will be used to account for the distance between the tubing connection at the Summa canister manifold metal tubing to the purge Summa canister. These calculations will use 0.25-inch OD, 0.17-inch ID for the foot of Teflon tubing and for the foot of manifold metal tubing.

The calculation is as follows:

Where $3V_P$ = selected purge volume

V_1 = volume of soil vapor probe

V_2 = volume of 2 feet of Teflon tubing from the soil vapor sampling probe to the ground surface and 1 foot of Teflon tubing from the vapor point to the sampling equipment

V_3 = volume of sixteen inches of metal tubing extending from the connection with the Teflon tubing to the sample Summa canister.

The equation is thus:

$$3V_P = 3V_1 + V_2 + V_3$$

Note

Whereas the volume calculated for the soil vapor-sampling point (V_1) is multiplied by three, the tubing volumes are not, because the purpose is to purge three volumes of the sampled interval (V_1).

Step 1 – Initial Calculation

$3V_P$ = 3 x Volume of soil-vapor sampling probe + volume of two feet of 0.17-inch ID Teflon tubing + volume of one foot of 0.17-inch ID Teflon tubing and one foot of 0.17-inch ID metal tubing.

$= \Pi r^2 h \times 3 + \Pi r^2 h \times 2 + \Pi r^2 h \times 2$

$= (3.14)\,(0.5 \text{ inches})^2\,(12 \text{ inches}) \times 3 + (3.14)\,(0.085 \text{ inches})^2\,(12 \text{ inches}) \times 2 + (3.14)\,(0.5 \text{ inches})^2\,(12 \text{ inches}) \times 2$

$= (3.14)\,(0.25 \text{ inches})\,(12 \text{ inches}) \times 3 + (3.14)\,(0.007 \text{ inches})\,(12 \text{ inches}) \times 2 + (3.14)\,(0.007 \text{ inches})\,(12 \text{ inches}) \times 2$

$= (9.42 \text{ inches}^3) \times 3 + (0.26 \text{ inches}^3) \times 2 + (0.26 \text{ inches}^3) \times 2$

Step 2 - Conversion to Cubic Feet

1-inch^3 = 0.0006 feet^3

= (9.42 inches^3) (0.0006 feet^3) x 3 + (0.26 inches^3) (0.0006 feet^3) x 2 + (0.26 I inches^3) (0.0006 feet^3) x 2

= (0.006 feet^3) x 3 + (0.00016 feet^3) x 2 + (0.00016 feet^3) x 2

Step 3 - Conversion to Liters

1-foot^3 = 28.32 Liters

= (0.006 feet^3) (28.32 Liters) x 3 + (0.00016 feet^3) (28.32 Liters) x 2 + (0.00016 feet^3) (28.32 Liters) x 2

= (0.17 Liters) x 3 + (0.0045 Liters) x 2 + (0.0045 Liters) x 2

Step 4 - Conversion to milliliters and $3V_P$

1 Liter = 1,000 milliliters

= (0.17 Liters) (1,000 milliliters) x 3 + (0.00453 Liters) (1,000 milliliters) x 2 + (0.00453 Liters) (1,000 milliliters) x 2

= (170 milliliters) x 3 + (4.53 milliliters) x 2 + (4.53 milliliters) x 2

= 510 milliliters + 9.06 milliliters + 9.06 milliliters

$3V_P$ = 528 milliliters

Based on these calculations each monitoring point will be purged of approximately 528 milliliters, in addition we know approximately how long it will take to purge each monitoring point Using the formula:

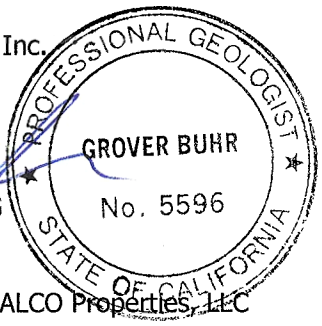
$$T = \frac{V}{R}$$

Where V = Volume to be purged (in ml), R = Rate of purge (in ml), and T = Time (in minutes)

$$\frac{528 \text{ ml}}{200 \text{ml/min}} = 2.64 \text{ minutes per monitoring point.}$$

If you have any questions please call Mr. Grover Buhr at (510) 874-4500, ext. 529.

Sincerely yours,
Treadwell & Rollo, Inc.



Grover S. Buhr, PG
Senior Geologist

Patrick Hubbard, PG, CEG
Principal Geologist

cc: Janet Jolley, BALCO Properties, LLC

25430402.OAK