



**RECEIVED**

By Alameda County Environmental Health 11:37 am, Mar 04, 2016

March 3, 2016

Mr. Keith Nowell  
Alameda County Health Care Services Agency  
Department of Environmental Health  
1131 Harbor Bay Parkway, Suite 250  
Alameda, CA 94502-6577

**Subject: Transmittal of Technical Memorandum – Evaluation of Benzo(a)Pyrene  
Equivalent Values in Excavated Soil  
Terminal 2 Utility Corridor  
0 Airport Drive Oakland, California  
(Site#: RO00002917)**

Dear Mr. Nowell:

Please find attached the above-referenced technical memorandum prepared by BASELINE Environmental Consulting providing information requested by the Alameda County Environmental Health Care Services Agency, Department of Environmental Health related to the Terminal 2 Utility Corridor.

I declare, under penalty of perjury, that the information and/or recommendations contained in the attached document or report is true and correct to the best of my knowledge.

Please feel free to contact me at the Port of Oakland at (510) 627-1184 or [dherman@portoakland.com](mailto:dherman@portoakland.com) if you have any questions.

Sincerely,



Douglas Herman  
Environmental Scientist  
Port of Oakland

## TECHNICAL MEMORANDUM

**Date:** 3 March 2016 **Job No.:** 12315-34.02383

**To:** Keith Nowell, Alameda County Health Care Agency, Department of Environmental Health

**From:** Cem Atabek and Lydia Huang, P.E. No. 43995

**Subject:** **Evaluation of Benzo(a)Pyrene Equivalent Values in Excavated Soil, Terminal 2 Utility Corridor, Oakland International Airport, Oakland, California (Case No. RO2917)**

In August 2014, the Port of Oakland (“Port”) submitted a Soils Investigation Report to Alameda County Environmental Health (“ACEH”) for the Terminal 2 Utility Corridor at the Oakland International Airport (“OIA”).<sup>1</sup> This technical memorandum has been prepared by BASELINE Environmental Consulting (“BASELINE”) on behalf of the Port of Oakland (“Port”) in response to discussions between the Port and ACEH in a meeting on 3 November 2015, and email correspondence between ACEH and the Port on 25 November 2015, in which ACEH requested the Port to evaluate benzo(a)pyrene equivalent (“BaP-EQ”) values based on concentrations of carcinogenic polycyclic aromatic hydrocarbons (“PAHs”) detected in soil samples collected prior to excavation for the Terminal 2 Utility Corridor project. Soil excavated from the Terminal 2 Utility Corridor which met the requirements for reuse, as described in the Soil Management Protocol (“SMP”)<sup>2</sup> for the OIA, was placed at the 65-Acre Storage Site at the OIA in 2006<sup>3</sup> and 2007<sup>4</sup>, and was later re-used as fill material at various locations at the OIA.

### DISCUSSION

BaP-EQ values were calculated based on the concentrations of carcinogenic PAHs reported in soil that was excavated from the Terminal 2 Utility Corridor and reused at the OIA. The seven carcinogenic PAHs included in the calculation of BaP-EQ values were: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene. The California Environmental Protection Agency (“Cal/EPA”), Department of Toxic Substances Control (“DTSC”) has developed potency equivalency factors (“PEFs”) for carcinogenic PAHs based on their potential toxicity relative to benzo(a)pyrene. To calculate BaP-EQ values, the concentrations of each carcinogenic PAH

---

<sup>1</sup> Science Applications International Corporation (“SAIC”), 2005. *Terminal 2 Utility Corridor Soils Investigation Report, Oakland International Airport, Oakland, California*, May 16.

<sup>2</sup> BASELINE Environmental Consulting, 2005. *Final Soil Management Protocol, Part of Oakland International Airport Materials Management Program*, October.

<sup>3</sup> Port of Oakland, 2007. *2006 Annual Report for Soil Reuse Activities at Oakland International Airport*, February 15.

<sup>4</sup> Port of Oakland, 2008. *2007 Annual Report for Soil Reuse Activities at Oakland International Airport*, February 4.

## Memorandum

3 March 2016

Page 2

reported in a soil sample are multiplied by the appropriate PEF, and the resulting BaP-EQ values for the individual PAHs are summed to determine the BaP-EQ value for that sample. For PAH concentrations that were below the laboratory reporting limit, the value of one half of the laboratory reporting limit was used to calculate of BaP-EQ values. The attached Table 1 summarizes the concentrations of carcinogenic PAHs reported for the soil samples collected for the Terminal 2 Utility Corridor project, the PEFs used in the calculations, and the calculated BaP-EQ value for each sample. The calculated BaP-EQ values ranged from 0.004 to 0.9 mg/kg.

The State Water Resources Control Board ("State Water Board") has developed a risk-based soil screening level for PAHs as BaP-EQ of 0.68 milligrams per kilogram ("mg/kg") for a commercial/industrial land use scenario under the Low-Threat Underground Storage Tank Case Closure Policy.<sup>5</sup> One of the 31 samples collected for the Terminal 2 Utility Corridor project exceeded this screening value at 0.9 mg/kg. However, it should be noted that this policy only requires data for PAHs to be determined and evaluated if the soil has been impacted by Bunker C oil or waste oil, which does not appear to be applicable to the Terminal 2 Utility Corridor soils.

The DTSC evaluated ambient concentrations of PAHs in northern and southern California. For northern California, DTSC has determined that the 95% percentile for ambient BaP-EQ was 0.9 mg/kg, and the 95% upper tolerance limit (95% confidence, 95% coverage) for ambient BaP-EQ was 1.5 mg/kg.<sup>6</sup> One of the 31 samples collected for the Terminal 2 Utility Corridor project equaled the 95% percentile for ambient BaP-EQ for northern California, and none of the samples exceeded the 95% upper tolerance limit.

## Conclusions

The BaP-EQ values calculated for the samples collected for the Terminal 2 Utility Corridor project were below the commercial/industrial screening level presented in the Low-Threat Underground Storage Tank Case Closure Policy of 0.68 mg/kg, with the exception of one sample, which had a BaP-EQ value of 0.9 mg/kg. This highest BaP-EQ value was equaled to the DTSC established 95% percentile value for ambient BaP-EQ for northern California, and less than the 95% upper tolerance limit for ambient BaP-EQ in northern California of 1.5 mg/kg. This BaP-EQ evaluation indicates that there is no significant risk to human health or the environment associated with the soil that was excavated for the Terminal 2 Utility Corridor project and reused at the OIA in accordance with the SMP. Therefore, on behalf of the Port, we respectfully request that ACEH issues a No Further Action for this site.

---

<sup>5</sup> State Water Board, 2012. *Low-Threat Underground Storage Tank Case Closure Policy*, Effective August 17.

<sup>6</sup> DTSC, 2009. *Use of the Northern and Southern California Polynuclear Aromatic Hydrocarbon (PAH) Studies in the Manufactured Gas Plant Site Cleanup Process*, July 1.

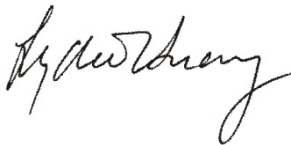
**Memorandum**

3 March 2016

Page 3

**ENCLOSURES:**

Table 1: Benzo(a)pyrene Equivalent Calculation for Soil Samples from Terminal 2 Utility Corridor Project, Oakland International Airport, Oakland, California



---

Lydia Huang



**Table 1: Benzo(a)pyrene Equivalent Calculation for Soil Samples from Terminal 2 Utility Corridor Project  
Oakland International Airport, Oakland, California**

Sample ID	Sample Date	Benzo (a) anthracene	Chrysene	Benzo (b) fluoranthene	Benzo (k) fluoranthene	Benzo (a) pyrene	Dibenz (a,h) anthracene	Indeno (1,2,3-cd) pyrene	Benzo(a)pyrene Equivalent
T2UC-1-3.5	2/14/05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.044
T2UC-2-3.0	2/14/05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.044
T2UC-3-6.0	2/14/05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.044
T2UC-4-6.0	2/14/05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.044
T2UC-5-6.5	2/14/05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.044
T2UC-6-5.5	2/14/05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.044
T2UC-7-3.5	2/14/05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.044
T2UC-8-4.0	2/14/05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.044
T2UC-9-5.0	2/14/05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.044
T2UC-10-4.0	2/14/05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.044
T2UC-11-3.0	2/14/05	0.095	0.087	0.079	0.053	0.093	<0.050	<0.050	0.13
T2UC-12-4.0	2/14/05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.044
T2UC-13-5.0	3/3/05	0.013	0.036	0.049	0.0066	0.0068	<0.0067	<0.0033	0.015
T2UC-13-12.0	3/3/05	0.051	0.052	0.13	0.045	0.15	0.16	0.14	0.24
T2UC-14-5.0	3/3/05	0.0093	0.014	0.016	0.0051	0.015	0.13	0.012	0.064
T2UC-15-5.0	3/3/05	<0.0033	<0.0033	<0.0066	<0.0033	<0.0033	0.024	<0.0033	0.011
T2UC-16-5.5	3/3/05	0.21	0.26	0.37	0.13	0.4	0.46	0.36	0.67
T2UC-18-5.0	3/3/05	0.02	0.04	0.039	<0.0033	<0.0033	0.15	<0.0033	0.059
T2UC-18-12.5	3/3/05	<0.0033	<0.0033	0.0067	<0.0033	<0.0033	<0.0066	<0.0033	0.0040
T2UC-19-5.0	3/3/05	0.026	0.067	0.034	0.013	0.033	0.28	0.016	0.14
T2UC-19B-12.0	3/7/05	<0.0033	<0.0033	<0.0066	<0.0033	<0.0033	<0.0066	<0.0033	0.0036
T2UC-20-5.5	3/7/05	0.0035	0.0064	0.007	<0.0033	0.006	<0.0066	0.0055	0.0090
T2UC-20-13.0	3/7/05	<0.0033	<0.0033	<0.0066	<0.0033	<0.0033	0.024	<0.0033	0.011
T2UC-21-5.5	3/7/05	0.44	0.58	0.67	0.26	0.49	0.65	0.48	0.90
T2UC-22-5.5	3/7/05	<0.0033	<0.0033	<0.0066	<0.0033	<0.0033	<0.0066	<0.0033	0.0036
T2UC-23-5.5	3/7/05	<0.0033	<0.0033	<0.0066	<0.0033	<0.0033	<0.0066	<0.0033	0.0036
T2UC-24-5.5	3/7/05	0.16	0.24	0.23	0.073	0.22	0.36	0.17	0.41
T2UC-24-13.0	3/7/05	<0.0033	<0.0033	<0.0066	<0.0033	<0.0033	<0.0066	<0.0033	0.0036
T2UC-25-5.5	3/7/05	<0.0033	<0.0033	<0.0067	<0.0033	<0.0033	<0.0067	<0.0033	0.0036
T2UC-26-4.0	3/7/05	<0.0033	<0.0033	<0.0066	<0.0033	0.0043	0.039	<0.0033	0.018
T2UC-27-3.0	3/7/05	<0.0033	0.005	<0.0066	<0.0033	0.0055	0.059	0.005	0.027

**Notes:**

All results are presented in milligrams per kilogram.

<X.XX indicates compound was not identified above the laboratory reporting limit of X.XX.

A value of one half of the reporting limit was used in the calculation of Benzo(a)pyrene Equivalent when the results were reported as less than the reporting limit.

**PAH Cancer Potency Equivalency Factors (PEFs)**

Benzo(a)anthracene	0.10
Chrysene	0.01
Benzo(b)fluoranthene	0.10
Benzo(k)fluoranthene	0.10
Benzo(a)pyrene	1.00
Dibenz(a,h)anthracene	0.34
Indeno(1,2,3-cd)pyrene	0.10

Source of PAH Cancer PEFs : Department of Toxics Substances Control, March 2014 "Benzo(a)pyrene Cancer Toxicity Criteria Updates: Implications for Human Health Risk". Available at <https://www.dtsc.ca.gov/AssessingRisk/DocsLib.cfm>