Ambient Study of Dioxins and Furans at the Pacific Gas and Electric Company Topock Compressor Station, Needles, California

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This technical memorandum (TM) presents an ambient study of polychlorinated dibenzo-*p*-dioxins and polychlorinated dibenzofurans (dioxins and furans) at the Pacific Gas and Electric Company (PG&E) Topock Compressor Station (TCS), located in Needles, California. The ambient study was conducted in accordance with the *Revised Work Plan for Ambient/Background Study of Dioxins and Furans at the Pacific Gas and Electric Company Topock Compressor Station, Needles, California* (Work Plan) (CH2M, 2017). The purpose of the study is to establish ambient values for dioxins and furans at the site.

This TM was submitted to the Consultative Work Group members on July 20 for review. The U.S. Department of the Interior (DOI) provided aggregated comments to the TM to PG&E on September 22, 2017. This TM has been revised to address those comments. A Response to Comments table is provided as an attachment to this TM (Attachment 1).

Introduction

In a letter dated November 9, 2016,DOI provided conditional approval of the *Resource Conservation and Recovery Act Facility Investigation (RFI)/Remedial Investigation (RI) Plan to Address Data Gaps Identified During Work Plan Implementation for the TCS, DG-WP-03* (DGWP-3) (CH2M, 2016). As part of their conditional approval, DOI directed PG&E to establish ambient values for dioxins and furans on federal land to assist with future risk assessment/risk management decision making. The lack of a dioxin and furan ambient study was also noted in comments on DGWP-3 from the Fort Mojave Tribe.

Previous Background Study

Ambient or background concentrations of inorganic chemicals in soils were estimated in several earlier studies (prior to 2006) for various portions of the property around the PG&E TCS in Needles, California. A formal background study was conducted in 2008 in accordance with the RFI/RI Soil Investigation Work Plan, Part A (CH2M, 2006), to augment the existing background data set, and to establish background concentrations of inorganic constituents and polycyclic aromatic hydrocarbons (PAHs). The results were reported in the *Soil Background Investigation at the Pacific Gas and Electric Company Topock Compressor Station, Needles, California* (“Soil Background Investigation Technical Memorandum”) (CH2M, 2009). Samples for the 2008 study were collected from various lithologic and geomorphic settings and soil types in the vicinity of the compressor station, but in areas that were not expected to be impacted by compressor station activities. Data from these different lithologic units were assessed statistically to evaluate if there were differences between the units requiring separate background values for each lithologic unit. Statistical differences between the lithologic units were not observed, and thus were not sufficient to require separation or partitioning of the data. Therefore, data were combined into a single data set that was used to generate the background values.

Background values were developed for inorganics but not PAHs, since PAHs were not detected above laboratory reporting limits. Polychlorinated dibenzo-*p*-dioxins and –furans ("dioxins and furans") were not analyzed during these events. This lack of an ambient/background study of dioxins and furans has resulted in the use of conservative ecological screening values to assess detected concentrations of dioxins and furans in soil collected as part of the implementation of the *Soil RCRA Facility Investigation/Remedial Investigation Work Plan* (CH2M, 2013).

Sampling Rationale and Approach

The occurrence of dioxins and furans is typically associated with the burning or combustion of organic materials such as trash, wood/trees, and petroleum fuels. Potential sources of dioxins and furans in the vicinity of the TCS may include historical industrial activities such as fire suppression exercises and burning of garbage. Other sources may include unauthorized dumping and burning; regional wildfires; combustion of diesel and leaded gas; and exhaust from cars, trucks, and trains. Assessing ambient concentrations of dioxins and furans will assist with data gap evaluation and future risk assessment/risk management decision making.

In addition to assessing ambient concentration of dioxins and furans, this study evaluates ambient concentrations of PAHs. PAHs are proposed for this study because they can be formed via similar anthropogenic mechanisms as dioxins and furans. PAHs have been detected at low concentrations in most RFI/RI soil investigation units; a revised and more robust ambient study may benefit future risk assessment/risk management decision making for PAHs as well as dioxins/furans.

The following sections present the DOI sampling criteria, sample locations and rational, field sampling activities, and analytical methods.

DOI Sampling Criteria

In the letter dated November 9, 2016, (DOI, 2016) the DOI listed the following criteria to be considered in the ambient study for dioxins and furans:

- Sample locations shall be based on the previous soil background sampling plan to the extent possible although the addition of new locations may be necessary [i.e., locations reported in the Soil Background Investigation Technical Memorandum (CH2M, 2009].
- While previous background sampling efforts focused on geologic variations to assess inorganic concentrations, this effort should focus on areas unimpacted by PG&E operations to assess ambient concentrations of dioxins and furans due to outside sources.
- The sampling should focus on surface to near-surface sample depths (less than 1 foot).
- Access to sample locations shall utilize areas already disturbed by previous grading and other mechanized activities to the extent practicable, and access beyond disturbed areas, as determined necessary, should be limited to foot access only.
- The performance of all field activities shall be executed in such a way as to avoid and/or minimize adverse effects to biological, cultural, and historic properties to the maximum extent practicable, and be consistent with the Programmatic Agreement and Programmatic Biological Assessment.

Sample Location Rationale

As detailed in the Work Plan, the sample locations were identified in areas not expected to be impacted by compressor station activities. Many of the locations are in and around areas that may have been affected by regional anthropogenic sources (trash dumping and/or burning, railroad and highway exhaust, and wild fires). Several other locations are also on federal land away from the known potential sources and a few locations are located in stormwater runoff pathways of potential sources. Because dioxins and furans in these areas would have been primarily aerially deposited, most sample locations were identified in areas outside of washes or arroyos where surface soils can be frequently disturbed. Unlike the previous background study in which samples were collected from multiple depths and potential differences between lithologic units were evaluated, samples were collected from the surface only where lithology is not likely to influence results.

Several sample locations from the 2008 background study (CH2M, 2009) were determined to be appropriate for use in this study. Previous sample locations BKG-1, BKG-6, BKG-7, BKG-8, BKG-9, BKG-10, BKG-11, BKG-12, BKG-13, and BKG-17 located on federal land were used in this study. For these locations, archived soil samples were available and were analyzed for dioxins and furans only.

Sample locations and rationale are presented in Table 1. Figure 1 shows the sample locations. Locations near historic waste deposits (BKG-24, BKG-25, BKG-26, BKG-31, and BKG-47) were sampled in order to establish a full understanding of potential sources of contamination, these locations were not included in the calculation of ambient values for the site.

Sample Collection and Analysis

Based on the sample location rationale described above, discrete soil samples were collected at 30 new locations during March 2017. Soil samples were collected from 0 to 0.5 foot below ground surface using hand tools following sampling protocols in the RFI/RI Soil Investigation Work Plan (CH2M, 2013).

Dioxins and furans were analyzed using U.S. Environmental Protection Agency (EPA) Method 8290. PAHs were analyzed using EPA Method 8270SIM. Analyses of archived soils samples collected in 2008 for dioxins and furans were performed beyond the regulatory hold time of 1 year, however, consistent with agreements with DTSC and DOI, and since it assumed that dioxins and furans are stable beyond one year, analyses performed on samples greater than one year old were not rejected, but flagged as estimated. All data were validated according to the *PG&E Program Quality Assurance Project Plan* (CH2M, 2012).

Results

Analytical results for dioxins, furans, and PAHs measured in soil samples at the locations listed in Table 1 are provided in Attachment 2. Attachment 2 also includes PAH results for the surface samples collected in 2008 as reported in the 2008 Soil Background Investigation Technical Memorandum (CH2M, 2009).

The data provided in Attachment 2 were used to calculate the toxic equivalent (TEQ) values for human/mammal and bird receptors for dioxins and furans, and benzo(a)pyrene toxic equivalent (B[a]P equivalent, the sum of low molecular weight PAHs (LMW-PAHs), and the sum of high molecular weight PAHs (HMW-PAHs) for PAHs. The TEQ for dioxins and furans were calculated using the TEFs from Van den Berg et al., 1998; the B(a)P equivalent was calculated using relative potency factors for carcinogenic PAHs from US EPA, 1993; calculations of LMW-PAHs and HMW-PAHs were consistent with US EPA, 2007.

For dioxin/furan TEQ calculations, results less than the detection limit (ND results) for any of the 17 congeners were addressed in the following three ways:

- Representing ND results as zero (the resulting data sets referred to herein as “TEQBird0” and “TEQMammals0”)
- Representing ND results as half of the detection limit (“TEQBirdHalf” and “TEQMammalsHalf”)
- Representing ND results as full detection limit (“TEQBird” and “TEQMammal”)

In the B(a)P equivalent calculations, ND values were represented as half of the detection limit. In the calculation of LWM-PAHs and HMW-PAHS, ND values were represented as zero.

Because no PAHs were detected during the 2008 sampling event, the PAH datasets were analyzed both by considering the data as a whole (2008 and 2017 data) and considering only the 2017 data. The resulting dataset is referred to herein as "BaPeqHalf", "LMW-PAHs", and "HMW-PAHs" when referring to the entire dataset (2008 and 2017 results) or "BaPeqHalf_2017", "LMW-PAHs_2017", and "HMW-PAHs_2017" when referring to only the 2017 results. All calculated values are presented in Table 2.

Determination of Ambient Values

According to the Revised Work Plan (CH2M, 2017), an ambient threshold value (ATV) is defined as the 95/95 upper tolerance limit (UTL). The 95/95 UTL represents a 95 percent upper confidence bound on the 95th percentile. It offers a value with 95 percent confidence that at least 95 percent of background TEQ values would fall below. The lower the confidence level or percentile coverage, the lower the UTL value.

Depending upon the distributional characteristics of a data set, two approaches, namely parametric and non-parametric procedures, are used to determine UTL values.

Parametric Tolerance Limit

Parametric tolerance limits assume normality of the sample background data used to construct the limit. Validity of this assumption is essential to the applicability of the method, since a tolerance limit with high coverage can be viewed as an estimate of a quantile or percentile associated with the tail probability of the underlying distribution. If the background sample data do not fit a normal distribution, data are transformed using an appropriate transformation so that the transformed data fit a normal distribution. If a suitable transformation is found, the UTL is calculated using the transformed measurements and then back-transformed to the raw concentration scale.

Assuming that sample background data are normally distributed or can be transformed to fit a normal distribution, then the normal UTL is calculated using the following equation:

$$UTL = \overline{x} + K(n, \gamma, 1 - \alpha)s \qquad (1)$$

Where:

$\overline{x}$ is the sample mean

K(n, γ, 1-α) is the one-sided normal tolerance factor associated with a sample size of n, coverage coefficient of γ, and confidence level of (1− α)

s is the sample standard deviation

Nonparametric Tolerance Limit

If a suitable transformation is not found, then a nonparametric tolerance limit is considered. Unfortunately, non-parametric tolerance limits generally require a much larger number of observations to provide the same levels of coverage and confidence as a parametric limit. EPA guidance (EPA 2009) recommends that a parametric model be fit to the data if at all possible.

Unlike parametric tolerance intervals, the desired coverage (γ) or confidence level (1–α) cannot be pre-specified using a non-parametric limit. Instead, the achieved coverage and/or confidence level depends entirely on the background sample size (n) and the order statistic chosen as the upper tolerance limit. For a non-parametric procedure, no distribution needs to be fitted to the background measurements. According to Guttman (EPA, 2009), the number of background samples should be chosen such that:

$$\sum_{i=m}^{n} \binom{n}{i} (1-\gamma)^i \gamma^{n-i} \geq 1-\propto \qquad (2)$$

If the background maximum is selected as the upper tolerance limit, the nonparametric UTL is defined in terms of the number of measurements, n as:

$$\gamma^n \leq \propto \qquad (3)$$

Equation (3) can be written as:

$$n = \frac{\ln(\propto)}{\ln(\gamma)} \qquad (4)$$

For 95 percent confidence level and 95 percent coverage, n = 59 background measurements are required according to Equation (3). A non-parametric UTL is computed by first ranking the concentration data in ascending order and then choosing the lowest-ranked detected concentration that defines the 95th percentile with 95 percent confidence. Data sets with less than 59 observations, definition of the 95 percentile is not statistically possible with 95 percent confidence, even when the maximum concentration is assigned as the UTL. In this situation, the value of the lowest achievable coverage is reported.

Assumptions

In order to construct an appropriate UTL, the following assumptions should be satisfied by the background data:

- Parametric tolerance limits assume that the data follow a normal distribution. If a data does not fit a normal distribution, then a suitable transformation is needed to normalize the measurements. The tolerance limit should be computed using the transformed values and then back-transformation be used to determine the final limit.
- Non-parametric tolerance limits do not assume normality or any particular distributional form.
- Tolerance limits assume that the population is stable over the period of time during which measurements are collected. Thus, no obvious trends or temporal patterns should exist in the background data.
- Although non-parametric tolerance limits do not require an assumption of normality, other assumptions of tolerance limits apply equally to parametric and non-parametric methods. Specifically, the sample data should be statistically independent and show no evidence of autocorrelation, trends, or seasonal effects in background.
- Confirmed outliers should be removed from the data set before estimating values of tolerance limits.

Preliminary Data Analysis

Table 3 presents the basic statistics of the full TEQ and B(a)P equivalent datasets (including samples BKG-24, BKG-25, BKG-26, BKG-31, and BKG-4). Analysis of LMW-PAHs and HMW-PAHs were added to the final version of this technical memorandum based on DOI comments on the draft version (in a letter dated September 22, 2017) and were not included in the preliminary analysis of the full datasets.

Based on the results shown in Table 3, the following points are noted:

- It appears that there are significant differences between the mean and median values for most parameters.

- Skewness values of B(a)P equivalent parameters are significantly larger than those of TEQ Avian and TEQ Mammals parameters.
- In order to further understand whether the data are suitable for determining ATVs using upper tolerance limits, statistical independence, temporal and spatial stationarity, outliers and normality are evaluated.

Statistical Independence and Stationarity of the Background Measurements

One of the most important key assumptions that any background data should pass is the statistical independence. That is, each measurement should be randomly representative of the target population and its value should not be influenced by any other measurement (i.e., each measurement should be independent of every other) as dependent measurements exhibit less variability, which leads to an underestimation of the population variance that in turn affects the estimated tolerance limit.

- In order to determine whether data are autocorrelated, a standard time series analysis method is applied if sufficient data are available. In the present case, the collected data set contains observations collected in only two different years 2008 and 2017. Thus, an autocorrelation cannot be developed using the available data. However, with a 9-year interval between the two data collection times, it is fair to assume that data are temporally independent. Furthermore, it is assumed that data have been collected at sufficiently spaced points to pass spatial independency.
- For testing the background sample data for temporal non-stationarity in the form of trends or other seasonal or cyclic variation, line plots were developed for various parameters of B(a)P equivalent, Bird (Avian) TEQ, and Mammal TEQ as depicted on Figures 2(A) through 2(C). As data are not sufficient to conduct a formal trend analysis due to data availability at two temporal points, it is assumed that the sample data do not exhibit temporal non-stationarity in spite of having few 2017 data points for most parameters with higher values than those of year 2008. One of the possible reasons for having higher values for the full 2017 dataset is that it covers anthropogenic areas also while the 2008 data do not.

Identification of Outliers

Outliers are data that appear anomalous or outside the range of expected values. Outliers may indicate errors, may indicate data unrelated to the rest of the data set, or may be perfectly valid data that indicate contamination or unusual geochemical conditions. The goal of outlier identification is to properly analyze the data to determine which outliers are representative of valid data points and should be kept, and which outliers likely represent anomalous situations, and should be removed from the data set. Data should not be ignored simply because they are identified as outliers. After identifying data points as potential outliers, further evaluation is conducted to determine the reason for their existence. Outliers should generally be kept as part of the data set unless there is reasonable evidence that they are the result of an error. Many statistical tests require that outliers resulting from an error be removed; some statistical tests may also require removal of valid, but extreme outliers that are not representative of the general population. The presence of outliers may preclude the use of some statistical methods altogether, requiring for example, a non-parametric alternative.

- The box plot is a good tool for screening the data to identify possible outliers. Figures 3(A) through 3(C) present box plots for the raw data of various parameters. These plots show potential outliers as separately plotted points. In a box plot, a potential outlier is identified as a value falling outside the first quartile (Q1) and the third quartile (Q3) range by more than 1.5 times the interquartile range (IQR = Q3-Q1).
- For formal outlier assessment, Rosner's test was applied. The results are shown in Table 4.

Testing Normality

Normality assumption is not only needed for establishing the UTLs but also for testing for outliers. Outlier tests (e.g., Rosner's test used in Table 4) assume normality. Therefore, data needs to be examined for normality prior to performing the outlier tests. In most situations, probability plots are used as a screening tool for checking a data set's conformance to a normal distribution and the Shapiro-Wilk test is used as a formal test of normality. In order to verify the normality of the raw data, histograms and Q-Q plots were developed as shown on Figures 4(A) through 4(C) and Figures 5(A) through 5(C) respectively.

Looking at the histograms and Q-Q plots of raw data, it is clear that there is no parameter that can be assumed normally distributed, all data sets are non-normal. As a confirmatory analysis, Shapiro-Wilk test was performed to examine whether the background data sets are normally distributed. Table 5 presents the results of the Shapiro-Wilk test that confirm the conclusions that were made based on the Q-Q plots.

As mentioned previously, Rosner's test assumes that the data be normally distributed thus the potential outliers identified in Table 4 are not valid. In order to conduct further statistical evaluations (e.g., outlier identification and establishing tolerance limits), the data need to be normalized using suitable transformations.

Data Transformation

The goal of data transformation is to find a transformation to approximate a normal distribution. Two transformation techniques namely the Box-Cox transformation and Tukey's power transformation were used to determine the best transformation that gives the largest p-value for the Shapiro-Wilks goodness of fit test. Using R Software (2016), three different objective functions were used while determining the exponent coefficient (lambda) of the Box-Cox transformation. These objective functions are: (1) probability plot correlation coefficient (PPCC), (2) the Shapiro-Wilk goodness-of-fit statistic (Shapiro-Wilk), and (3) the log-likelihood function (Log-Likelihood). For the Tukey's power transformation, the correlation coefficient is used as the objective function to determine the best value of lambda. Table 6 presents a summary of various transformations that can be used to convert the data into approximately normally distributed data. Using this summary, the lambda values corresponding to the Box-Cox transformation based on the Shapiro-Wilk goodness-of-fit statistic objective function were selected.

After transforming the data, it was examined for normality. Table 7 presents the results of normality assessment conducted on the transformed data. Figures 6(A) through 6(C) present the Q-Q plots of the transformed data. Figures 7(A) through 7(C) present the histogram plots of the transformed data. From Table 7, the following points are noted:

- All data sets could not be transformed to meet the normality assumption.
- The BAPEqHalf_2017 and BAPEqHalf data sets could not be transformed into normally distributed data. Therefore, for both of these data sets, a nonparametric tolerance limit method was considered. Similarly, the LMW-PAH, LMW-PAH_2017, HMW-PAH, and HMW-PAH_2017 data sets could not be transformed into normally distributed data and a nonparametric tolerance limit method was considered.
- The dioxin/furan TEQ data sets were successfully transformed into the normally distributed data. Therefore, for these parameters, a parametric tolerance limit method was considered.

Prior to determining the upper tolerance limits using a parametric method, the data sets that meet the normality assumption were further evaluated for potential outliers. As shown in Table 8, there are no potential outliers in the transformed data. The box and whisker plots of transformed data for these parameters also show that there are no points falling beyond the whiskers of their respective box and whisker plots.

Determination of UTLs

Based on DOI comments on the draft version of this technical memorandum in a letter dated September 22, 2017, data for sample locations near historic waste deposits (BKG-24, BKG-25, BKG-26, BKG-31, and BKG-4) were removed from the dataset prior to calculation of the UTLs.

Using Equation (1) and statistical characteristics of the normally distributed transformed data, upper tolerance limits are determined for TEQBird0, TEQBirdHalf, TEQBird, TEQMammals0, TEQMammalsHalf and TEQMammals, as listed in Table 9(A). The obtained UTL values are back transformed to obtain the UTL results into the original system of units.

As mentioned previously, the PAH data sets had less than 59 observations, thus the 95 percent coverage with 95 percent confidence is not statistically possible, even when the maximum concentration is assigned as the UTL. In this situation, the value of the maximum achievable coverage is reported. Table 9(B) presents the maximum achievable coverages for the PAH data sets with 95 percent confidence by assigning the maximum sample values as the upper prediction limits.

Summary

In accordance with the Revised Work Plan (CH2M, 2017) dioxin and furan analysis was performed on soil samples collected at locations in the vicinity of TCS in 2017 and archived samples from the 2008 background investigation. Samples were collected in areas not expected to be impacted by compressor station activities in order to establish ambient conditions. Following sample analysis, the results were used to calculate TEQ values for birds and mammals in support of the establishment of ATVs. Soil samples were also analyzed for PAHs and the analytical results were used to determine B(a)P eq. values, LMW-PAHs, and HMW-PAHs.

Following statistical analysis of the data, ATVs were determined for dioxin and furan TEQ values determined using the assumptions that NDs in individual congeners were equal to zero, half, or the full detection limit. The resulting ATVs based on 95/95 UTLs are as follows:

- TEQ bird (ND = 0): 4.05 ng/kg
- TEQ bird (ND = Half the detection limit): 5.98 ng/kg
- TEQ bird (ND = DL): 7.791 ng/kg
- TEQ mammals (ND = 0): 2.88 ng/kg
- TEQ mammals (ND = Half the detection limit): 5.58 ng/kg
- TEQ mammals (ND = DL): 7.53 ng/kg

These ATVs were determined using parametric methods after transformation of the data which resulted in normally-distributed datasets with no outliers.

The 95 percent confidence ATV determined for B(a)P eq., LMW-PAHs, and HMW-PAHs (using either the full dataset or data from 2017 only) are as follows:

- B(a) P eq.: 55 µg/kg
- LMW-PAHs: 267.4 µg/kg
- HMW-PAHs: 37.6 µg/kg

These ATV were determined using non-parametric methods with a coverage of 89 percent using the 2017 data only and 94 percent using the combined 2008 and 2017 data.

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Tables

Table 1. Sample Locations and Rationale
Ambient Study of Dioxins and Furans
Pacific Gas and Electric Company Topock Compressor Station, Needles, California

Sample Location	Previous or New Sample Location	Rationale
BKG-1	Previous	Archived background sample
BKG-6	Previous	Archived background sample
BKG-7	Previous	Archived background sample
BKG-8	Previous	Archived background sample
BKG-9	Previous	Archived background sample
BKG-10	Previous	Archived background sample
BKG-11	Previous	Archived background sample
BKG-12	Previous	Archived background sample
BKG-13	Previous	Archived background sample from area near former Route 66
BKG-17	Previous	Archived background sample from area near former Route 66
BKG-18	New	Area near Interstate 40
BKG-19	New	Area between railroad and Interstate 40
BKG-20	New	Area near Interstate 40
BKG-21	New	Area near railroad
BKG-22	New	Area near railroad (low energy wash)
BKG-23	New	Area near Interstate 40 (low energy wash)
BKG-24*	New	Area near former dump
BKG-25*	New	Area near former dump
BKG-26*	New	Area near former dump
BKG-27	New	Area between railroad and Interstate 40
BKG-28	New	Area near railroad, small deposition area
BKG-29	New	Area near railroad, small deposition area
BKG-30	New	Area near railroad
BKG-31*	New	Area near former dump
BKG-32	New	Near or in the former wildfire area
BKG-33	New	Near or in the former wildfire area
BKG-34	New	Near or in the former wildfire area
BKG-35	New	Near or in the former wildfire area
BKG-36	New	Near or in the former wildfire area
BKG-37	New	Near or in the former wildfire area and near former Route 66
BKG-38	New	Area near Interstate 40 and Havasu National Wildlife Refuge
BKG-39	New	Area near Interstate 40 and Havasu National Wildlife Refuge
BKG-40	New	Area on Havasu National Wildlife Refuge
BKG-41	New	Area on Havasu National Wildlife Refuge
BKG-42	New	Area on Havasu National Wildlife Refuge and former evaporation ponds
BKG-43	New	Area on Havasu National Wildlife Refuge

Table 1. Sample Locations and Rationale
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Pacific Gas and Electric Company Topock Compressor Station, Needles, California

Sample Location	Previous or New Sample Location	Rationale
BKG-44	New	Area on Havasu National Wildlife Refuge
BKG-45	New	Area away from known potential sources
BKG-46	New	Area away from known potential sources
BKG-47*	New	Area near former Workman's Roadhouse

* Location not included in calculation of ambient concentrations.

Table 2. Calculated Values

Ambient Study of Dioxins and Furans

Pacific Gas and Electric Company Topock Compressor Station, Needles, California

				TEQ Mammal (ng/kg)			TEQ Avian (ng/kg)					
				TEQMammals0	TEQMammalsHalf	TEQMammals	TEQBird0	TEQBirdHalf	TEQBird			
Location	Sample Type	Sample Date	Depth	ND = 0	ND = 1/2 RL	ND = RL	ND = 0	ND = 1/2 RL	ND = RL	B(a)P Eq. Half (µg/kg)	LMW-PAHs (µg/kg)	HMW-PAHs (µg/kg)
BKG-01	LS	9/18/2008	0 - 0.5	0.1	0.29	0.47	0.08	0.34	0.6	5.9 U	0 U	0 U
BKG-02	LS	9/18/2008	0 - 0.5	-	-	-	-	-	-	5.9 U	0 U	0 U
BKG-03	LS	9/18/2008	0 - 0.5	-	-	-	-	-	-	5.9 U	0 U	0 U
BKG-04	LS	9/18/2008	0 - 0.5	-	-	-	-	-	-	5.9 U	0 U	0 U
BKG-04	LFD	9/18/2008	0 - 0.5	-	-	-	-	-	-	5.9 U	0 U	0 U
BKG-05	LS	9/19/2008	0 - 0.5	-	-	-	-	-	-	6 U	0 U	0 U
BKG-06	LS	9/19/2008	0 - 0.5	0.055	0.29	0.52	0.013	0.3	0.58	6 U	0 U	0 U
BKG-07	LS	9/19/2008	0 - 0.5	0.17	0.45	0.73	0.023	0.38	0.73	6.1 U	0 U	0 U
BKG-07	LFD	9/19/2008	0 - 0.5	-	-	-	-	-	-	6.1 U	0 U	0 U
BKG-08	LS	8/23/2008	0 - 0.5	0.12	0.23	0.34	0.12	0.28	0.44	5.8 U	0 U	0 U
BKG-09	LS	8/23/2008	0 - 0.5	0.064	0.2	0.34	0.042	0.21	0.37	5.8 U	0 U	0 U
BKG-10	LS	9/19/2008	0 - 0.5	0.3	0.9	1.5	0.046	0.67	1.3	5.8 U	0 U	0 U
BKG-11	LS	9/19/2008	0 - 0.5	0.023	0.16	0.29	0.003	0.19	0.38	5.8 U	0 U	0 U
BKG-11	LFD	9/19/2008	0 - 0.5	-	-	-	-	-	-	5.8 U	0 U	0 U
BKG-12	LS	8/23/2008	0 - 0.5	0.024	0.15	0.27	0.006	0.19	0.37	5.8 U	0 U	0 U
BKG-13	LS	9/20/2008	0 - 0.5	0.36	0.57	0.79	0.36	0.74	1.1	5.9 U	0 U	0 U
BKG-14	LS	9/20/2008	0 - 0.5	-	-	-	-	-	-	5.8 U	0 U	0 U
BKG-14	LFD	9/20/2008	0 - 0.5	-	-	-	-	-	-	5.8 U	0 U	0 U
BKG-15	LS	9/20/2008	0 - 0.5	-	-	-	-	-	-	5.8 U	0 U	0 U
BKG-16	LS	9/23/2008	0 - 0.5	-	-	-	-	-	-	5.8 U	0 U	0 U
BKG-17	LS	9/20/2008	0 - 0.5	0.89	1.4	1.9	0.17	0.73	1.3	5.8 U	0 U	0 U
BKG-18	LS	3/18/2017	0 - 0.5	0.026	0.16	0.3	0.007	0.18	0.36	5.8 U	0 U	0 U
BKG-19	LS	3/18/2017	0 - 0.5	0.19	0.43	0.67	0.28	0.54	0.8	55	0 U	187.1
BKG-20	LS	3/18/2017	0 - 0.5	0.075	0.25	0.43	0.011	0.26	0.5	12	0 U	30.8
BKG-21	LS	3/18/2017	0 - 0.5	0.067	0.33	0.59	0.009	0.33	0.65	6.3	0 U	26.1
BKG-22	LS	3/18/2017	0 - 0.5	0.33	0.92	1.5	0.044	0.77	1.5	6.6	0 U	34.7
BKG-23	LS	3/18/2017	0 - 0.5	0.83	1.7	2.6	0.19	1.5	2.7	6.1	0 U	5.1
BKG-24*	LS	3/17/2017	0 - 0.5	0 U	0.23 U	0.45 U	0 U	0.29 U	0.59 U	5.9 U	0 U	0 U

Table 2. Calculated Values
Ambient Study of Dioxins and Furans
Pacific Gas and Electric Company Topock Compressor Station, Needles, California

				TEQ Mammal (ng/kg)			TEQ Avian (ng/kg)					
				TEQMammals0	**TEQMammalsHalf**	**TEQMammals**	**TEQBird0**	**TEQBirdHalf**	**TEQBird**			
Location	**Sample Type**	**Sample Date**	**Depth**	**ND = 0**	**ND = 1/2 RL**	**ND = RL**	**ND = 0**	**ND = 1/2 RL**	**ND = RL**	**B(a)P Eq. Half (µg/kg)**	**LMW-PAHs (µg/kg)**	**HMW-PAHs (µg/kg)**
BKG-25*	LS	3/17/2017	0 - 0.5	1.1	1.5	1.9	1.5	2.4	3.2	5.8 U	0 U	0 U
BKG-26*	LS	3/17/2017	0 - 0.5	0.11	0.49	0.87	0.015	0.72	1.4	6.2	5.7	40.2
BKG-27	LS	3/17/2017	0 - 0.5	0.16	0.35	0.54	0.071	0.3	0.52	5.8 U	0 U	0 U
BKG-28	LS	3/17/2017	0 - 0.5	2	2.5	3.1	2.1	2.6	3.1	23	16	267.4
BKG-29	LS	3/17/2017	0 - 0.5	2.8	3.6	4.4	2.1	3	4	18	9.2	183.5
BKG-30	LS	3/17/2017	0 - 0.5	0.12	0.25	0.38	0.079	0.27	0.46	6.1	0 U	11
BKG-31*	LS	3/17/2017	0 - 0.5	0.56	0.95	1.4	1.2	1.7	2.1	89	24.7	754
BKG-32	LS	3/17/2017	0 - 0.5	0 U	0.17 U	0.34 U	0 U	0.27 U	0.55 U	6.1	0 U	6
BKG-33	LS	3/17/2017	0 - 0.5	0.19	0.73	1.3	0.17	0.84	1.5	7.4	0 U	40.9
BKG-34	LS	3/17/2017	0 - 0.5	0.83	1.7	2.6	1.3	2.2	3.1	14	37.6	128.3
BKG-35	LS	3/17/2017	0 - 0.5	0.11	0.5	0.88	0.03	0.5	0.96	10	7.7	122.7
BKG-36	LS	3/17/2017	0 - 0.5	0.31	0.77	1.2	0.9	1.4	2	6.9	36	52.9
BKG-37	LS	3/17/2017	0 - 0.5	1.4	2.3	3.2	0.64	1.8	3	15	6.9	117.9
BKG-38	LS	3/18/2017	0 - 0.5	0.018	0.13	0.25	0.002	0.17	0.33	5.9 U	0 U	0 U
BKG-39	LS	3/18/2017	0 - 0.5	0.015	0.1	0.19	0.002	0.13	0.26	5.8 U	0 U	0 U
BKG-40	LS	3/18/2017	0 - 0.5	0.53	1	1.5	0.11	0.6	1.1	5.8 U	0 U	0 U
BKG-41	LS	3/18/2017	0 - 0.5	0.35	0.49	0.64	0.22	0.46	0.7	5.9 U	0 U	0 U
BKG-42	LS	3/18/2017	0 - 0.5	0 U	0.086 U	0.17 U	0 U	0.12 U	0.24 U	5.9 U	0 U	0 U
BKG-43	LS	3/18/2017	0 - 0.5	0.35	0.6	0.85	0.062	0.37	0.68	5.9 U	0 U	0 U
BKG-44	LS	3/18/2017	0 - 0.5	0.15	0.31	0.48	0.12	0.32	0.53	5.9 U	0 U	0 U
BKG-45	LS	3/18/2017	0 - 0.5	0.00018	0.096	0.19	6E-05	0.13	0.26	5.9 U	0 U	0 U
BKG-46	LS	3/18/2017	0 - 0.5	0.023	0.13	0.25	0.002	0.17	0.34	5.9 U	0 U	0 U
BKG-47*	LS	3/17/2017	0 - 0.5	1.2	1.7	2.2	0.97	1.5	2	7	0 U	42.4

* Location not included in calculation of ambient concentrations.
Notes:
TEQ = toxicity equivalent
B(a)P Eq. = benzo(a)pyrene toxic equivalent factor
µg/kg = micrograms per kilogram
ng/kg = nanograms per kilogram
U = not detected at specified reporting limit

Table 3. Basic Statistics of Raw Data – Full Dataset

Ambient Study of Dioxins and Furans

Pacific Gas and Electric Company Topock Compressor Station, Needles, California

	B(a)P equivalent		TEQ Avian			TEQ Mammals		
Statistic	**BaPeqHalf_ 2017**	**BaPeq Half**	**TEQBird0**	**TEQBird Half**	**TEQBird**	**TEQ Mammals 0**	**TEQ Mammals Half**	**TEQ Mammals**
Mean	12.36	9.69	0.32	0.75	1.17	0.4	0.73	1.06
Standard Error	3.16	1.9	0.09	0.12	0.16	0.09	0.12	0.16
Median	6.1	5.9	0.07	0.38	0.69	0.16	0.44	0.66
Mode	5.9	5.8	0	0.17	0.37	0	1.7	0.34
Stdev	17.33	13.59	0.57	0.76	1.00	0.59	0.78	0.99
Variance	300.34	184.6	0.32	0.58	1.00	0.35	0.61	0.98
Kurtosis	14.46	25.81	3.61	1.59	0.76	6.83	4.01	2.35
Skewness	3.72	4.92	2.1	1.58	1.32	2.47	1.93	1.60
Range	83.2	83.2	2.1	2.88	3.76	2.8	3.514	4.23
Minimum	5.8	5.8	0	0.12	0.24	0	0.086	0.17
Maximum	89	89	2.1	3	4.0	2.8	3.6	4.4
Count	30	51	40	40	40	40	40	40

Table 4. Outlier Assessment using the Raw Data – Full Dataset

Ambient Study of Dioxins and Furans

Pacific Gas and Electric Company Topock Compressor Station, Needles, California

Parameter	Outlier Test	Number of Observations	Assumed Number of Suspected Outliers	Identified Potential Outlier at 5% Significance	Number of Potential Outliers
BAPEqHalf_2017	Rosner	30	5	89, 55, 23, 18, 15	5
BAPEqHalf	Rosner	51	5	89, 55, 23, 18, 15	5
TEQBird0	Rosner	40	5	2.1, 2.1, 1.5, 1.3, 1.2	5
TEQBirdHalf	Rosner	40	5	None	0
TEQBird	Rosner	40	5	None	0
TEQMammals0	Rosner	40	5	2.8, 2, 1.4, 1.2, 1.1	5
TEQMammalsHalf	Rosner	40	5	3.6, 2.5, 2.3	3
TEQMammals	Rosner	40	5	4.4	1

Table 5. Normality Assessment of Raw Data – Full Dataset
Ambient Study of Dioxins and Furans
Pacific Gas and Electric Company Topock Compressor Station, Needles, California

Parameter	Shapiro Wilk Test using Raw Data			Conclusion
	Statistic	Critical Value at 5% significance	P Value	
BAPEqHalf_2017	0.435	0.927	1.249E-11	Not Normal
BAPEqHalf	0.332	0.947	0	Not Normal
TEQBird0	0.622	0.94	1.146E-11	Not Normal
TEQBirdHalf	0.759	0.94	4.6323E-8	Not Normal
TEQBird	0.805	0.94	1.089E-6	Not Normal
TEQMammals0	0.683	0.94	3.998E-10	Not Normal
TEQMammalsHalf	0.768	0.94	8.3059E-8	Not Normal
TEQMammals	0.806	0.94	1.181E-6	Not Normal

Table 6. Data Transformation Summary – Full Dataset
Ambient Study of Dioxins and Furans
Pacific Gas and Electric Company Topock Compressor Station, Needles, California

Parameter	PPCC		Shapiro-Wilk		Log-Likelihood		Tukey	
	Lambda	P-Val	Lambda	P-Val	Lambda	P-Val	Lambda	P-Val
BAPEqHalf	-2.0	3.6E-10	-2.0	3.6E-10	-2.0	3.6E-10	-10.0	3.8E-07
BAPEqHalf2017	-2.0	1.2E-05	-2.0	1.2E-05	-2.0	1.2E-05	-10.0	2.5E-04
TEQBird0	0.042	0.160	0.043	0.160	0.034	0.159	0.050	0.159
TEQBirdHalf	-0.350	0.186	-0.354	0.186	-0.271	0.171	-0.350	0.186
TEQBird	-0.353	0.149	-0.359	0.149	-0.258	0.137	-0.375	0.148
TEQMammals0	0.208	0.598	0.210	0.599	0.178	0.549	0.200	0.594
TEQMammalsHalf	-0.145	0.475	-0.139	0.475	-0.126	0.474	-0.150	0.474
TEQMammals	-0.189	0.337	-0.185	0.337	-0.157	0.334	-0.200	0.336

Table 7. Normality Assessment of Transformed Data – Full Dataset
Ambient Study of Dioxins and Furans
Pacific Gas and Electric Company Topock Compressor Station, Needles, California

Parameter	Shapiro Wilk Test using Transformed Data			Conclusion
	Statistic	Critical Value at 5% significance	P Value	
BAPEqHalf_2017	0.752	0.927	2.7854E-6	Not Normal
BAPEqHalf	0.619	0.947	9.992E-16	Not Normal
TEQBird0	0.949	0.94	0.0981	Normal
TEQBirdHalf	0.952	0.94	0.128	Normal
TEQBird	0.949	0.94	0.103	Normal
TEQMammals0	0.971	0.94	0.5	Normal
TEQMammalsHalf	0.966	0.94	0.363	Normal
TEQMammals	0.961	0.94	0.251	Normal

Table 8. Outlier Assessment using the Transformed Data – Full Dataset
Ambient Study of Dioxins and Furans
Pacific Gas and Electric Company Topock Compressor Station, Needles, California

Parameter	Outlier Test	Number of Observations	Assumed Number of Suspected Outliers	Identified Potential Outlier at 5% Significance	Number of Potential Outliers
TEQBird0	Rosner	40	5	None	0
TEQBirdHalf	Rosner	40	5	None	0
TEQBird	Rosner	40	5	None	0
TEQMammals0	Rosner	40	5	None	0
TEQMammalsHalf	Rosner	40	5	None	0
TEQMammals	Rosner	40	5	None	0

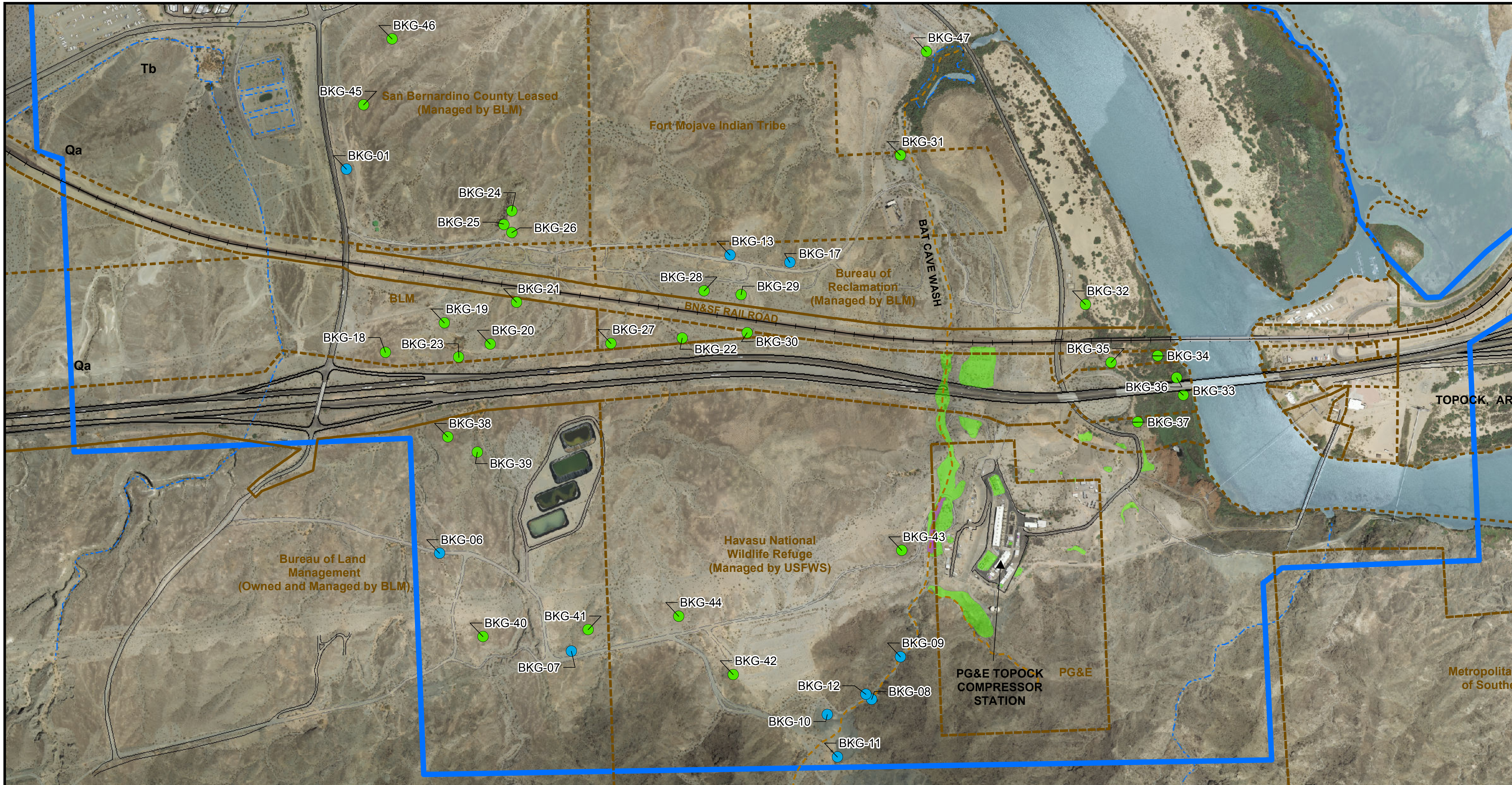
Table 9(A). UTLs based on Parametric Method using Normally Distributed Transformed Data – Limited Dataset
Ambient Study of Dioxins and Furans
Pacific Gas and Electric Company Topock Compressor Station, Needles, California

Statistic	TEQ Bird0	TEQ BirdHalf	TEQ Bird	TEQ Mammals0	TEQ MammalsHalf	TEQ Mammal
Mean	-2.91	-1.15	-0.4	-1.68	-1.06	-0.52
St dev	2	1.14	0.84	1.3	1.17	0.97
CV	0.69	0.99	2.08	0.78	1.1	1.88
Sample size, n	35	35	35	35	35	35
K(n, γ = 95%, 1-α=95%)	2.17	2.17	2.17	2.17	2.17	2.17
UTL (transformed data)	1.43	1.32	1.42	1.15	1.46	1.58
Lambda	0.03	-0.36	-0.38	0.16	-0.19	-0.25
Constant	0.001	0	0	0.001	0	0
UTL (ng/kg)	**4.05**	**5.98**	**7.79**	**2.88**	**5.58**	**7.53**

Table 9(B). UTLs using Nonparametric Method – Limited Dataset
Ambient Study of Dioxins and Furans
Pacific Gas and Electric Company Topock Compressor Station, Needles, California

Statistic	BAPEqHalf_2017	BAPEqHalf	PAHHigh_2017	PAHHigh	PAHLow2017	PAHLow
Sample Size (n)	25	46	25	46	25	46
Confidence (1-α)	95 percent	95 percent	95 percent	95 percent	95 percent	95 percent
UTL (µg/kg)	55	55	267.4	267.4	37.6	37.6
Maximum Achievable Coverage (γ)	89 percent	94 percent	89 percent	94 percent	89 percent	94 percent

Figures



Legend

- 2008 Soil Background Location
- 2017 Soil Background Location
- Bat Cave Wash Channel
- Solid Waste Management Unit (SWMU)
- Area of Concern (AOC)
- Area of Potential Effects

N

0 0.05 0.1 0.2 Miles

Figure 1
Ambient/Background Soil Sample Locations
Work Plan for Background Study of Dioxins and Furans
Pacific Gas and Electric Company Topock Compressor Station, Needles, California

ch2m:

\\brookside\gis_share\ENBG\00_Proj\P\PGE\Topock\MapFiles\2017\BackgroundStudy\DioxinFuran_Locations_Soil_Background_Study.mxd

FIGURE 2(A). Line Plots for B(a)P equivalent – Full Dataset

Pacific Gas and Electric Company Topock Compressor Station, Needles, California

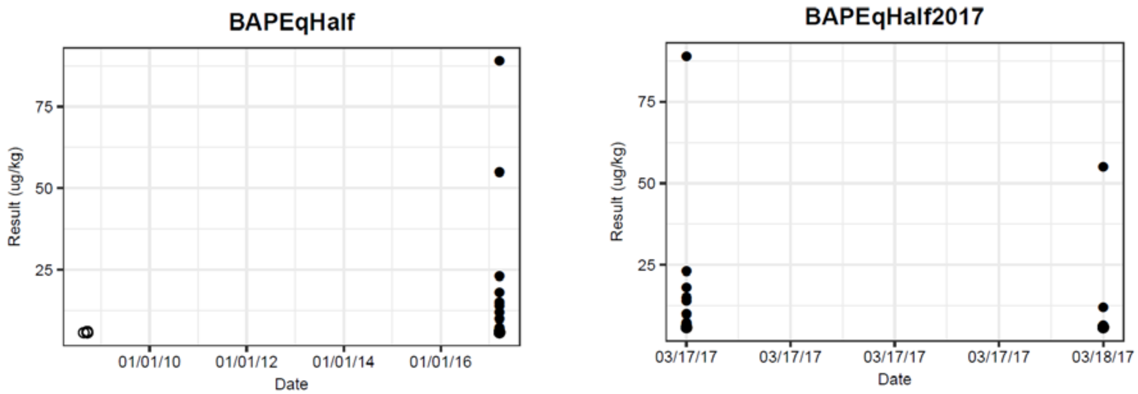


FIGURE 2(B). Line Plots for TEQ Avians – Full Dataset

Pacific Gas and Electric Company Topock Compressor Station, Needles, California

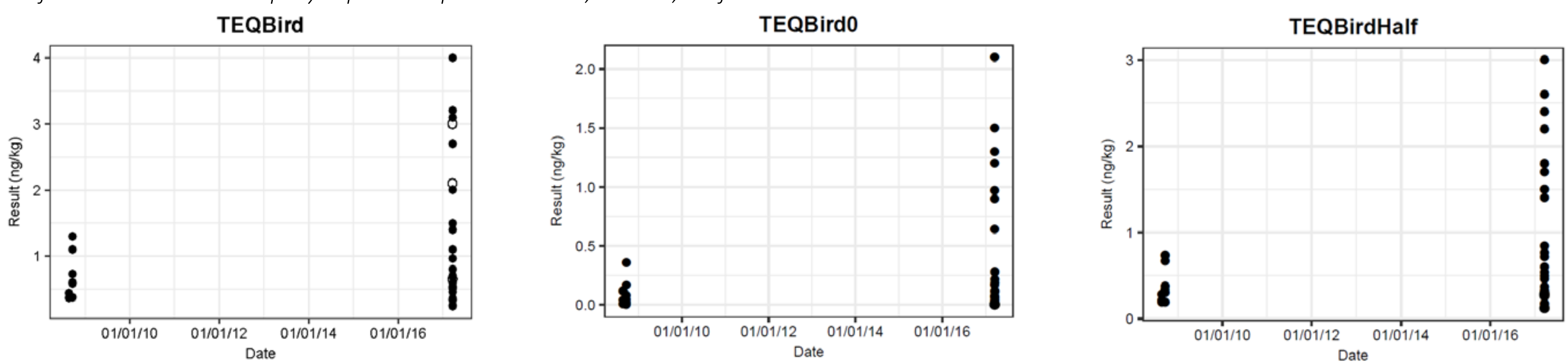


FIGURE 2(C). Line Plots for TEQ Mammals – Full Dataset

Pacific Gas and Electric Company Topock Compressor Station, Needles, California

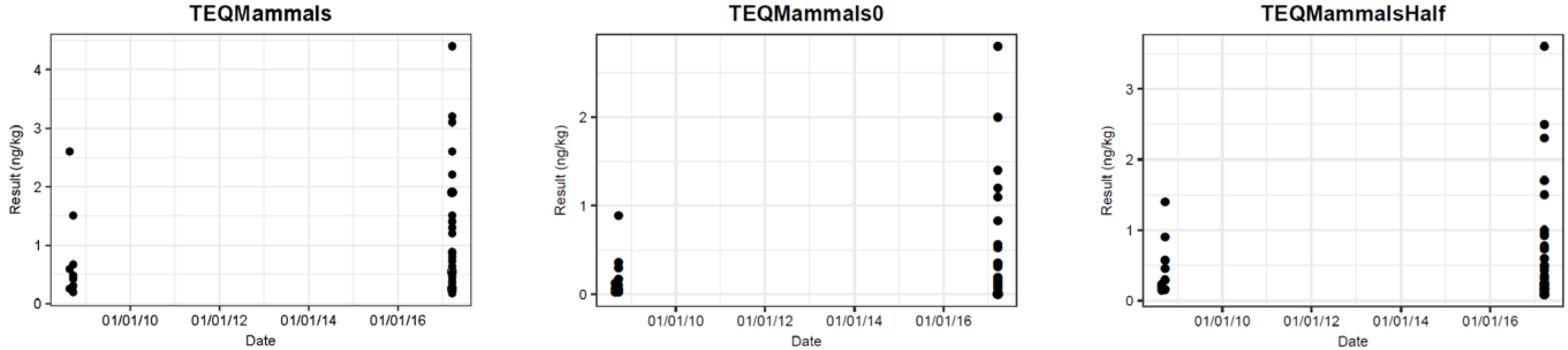


FIGURE 3(A). Box Plots for B(a)P equivalent – Full Datset

Pacific Gas and Electric Company Topock Compressor Station, Needles, California

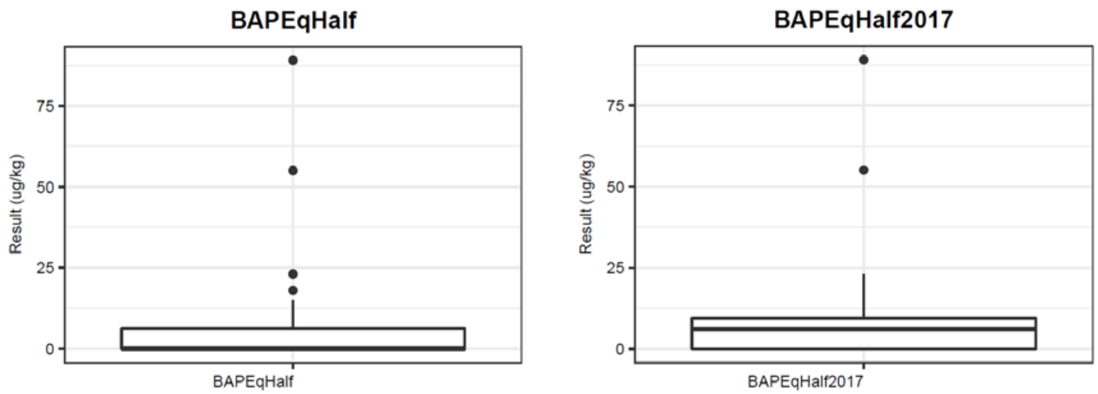


FIGURE 3(B). Box Plots for TEQ Avians – Full Dataset

Pacific Gas and Electric Company Topock Compressor Station, Needles, California

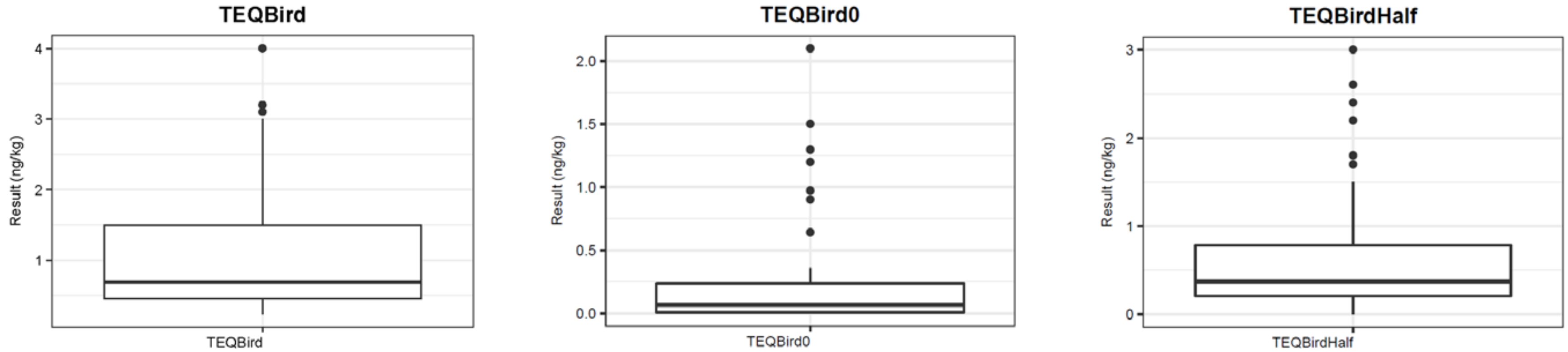


FIGURE 3(C). Box Plots for TEQ Mammals – Full Dataset

Pacific Gas and Electric Company Topock Compressor Station, Needles, California

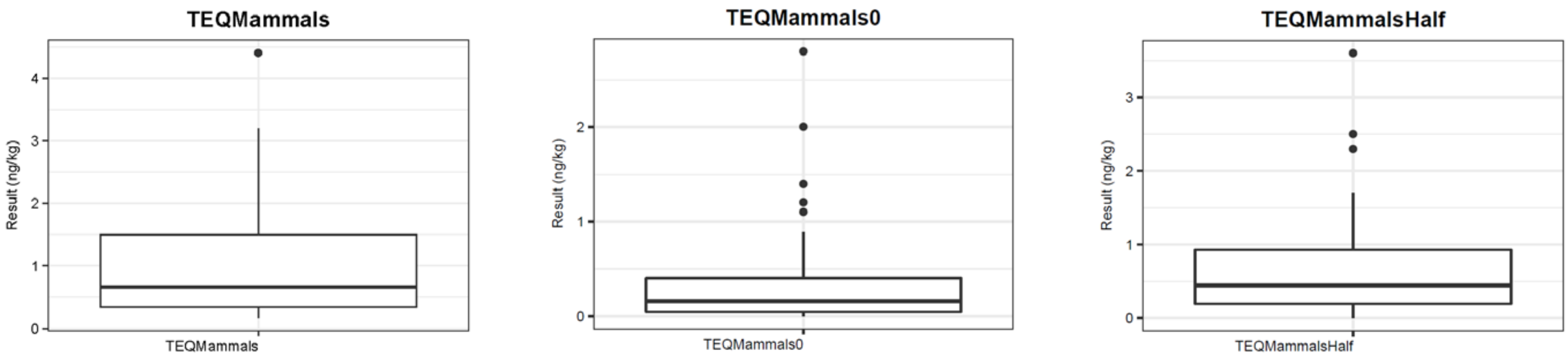


FIGURE 4(A). Histograms Plots for B(a)P equivalent – Full Dataset

Pacific Gas and Electric Company Topock Compressor Station, Needles, California

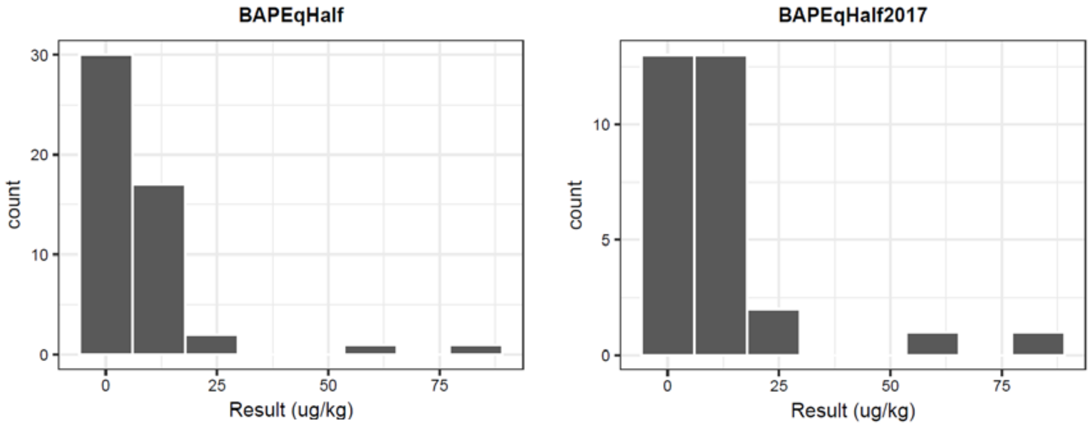


FIGURE 4(B). Histograms Plots for TEQ Avians - Full Dataset

Pacific Gas and Electric Company Topock Compressor Station, Needles, California

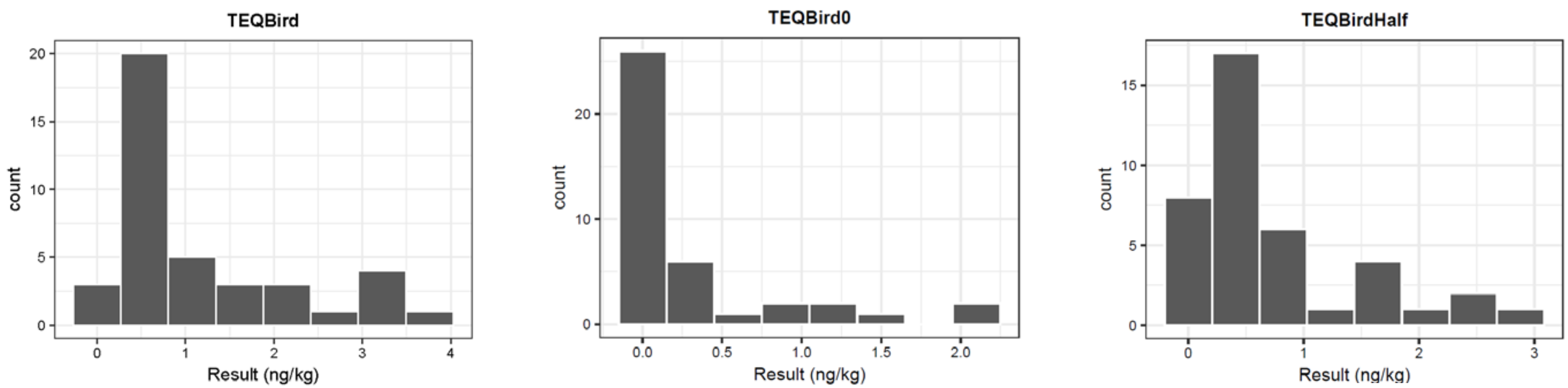


FIGURE 4(C). Histograms Plots for TEQ Mammals – Full Dataset

Pacific Gas and Electric Company Topock Compressor Station, Needles, California

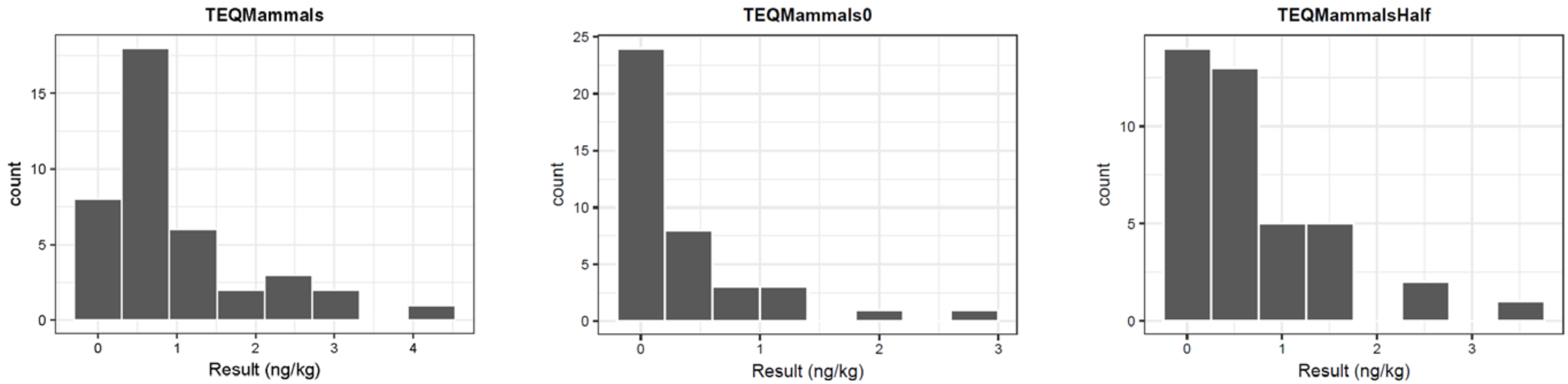


FIGURE 5(A). QQ Plots for B(a)P equivalent – Full Dataset

Pacific Gas and Electric Company Topock Compressor Station, Needles, California

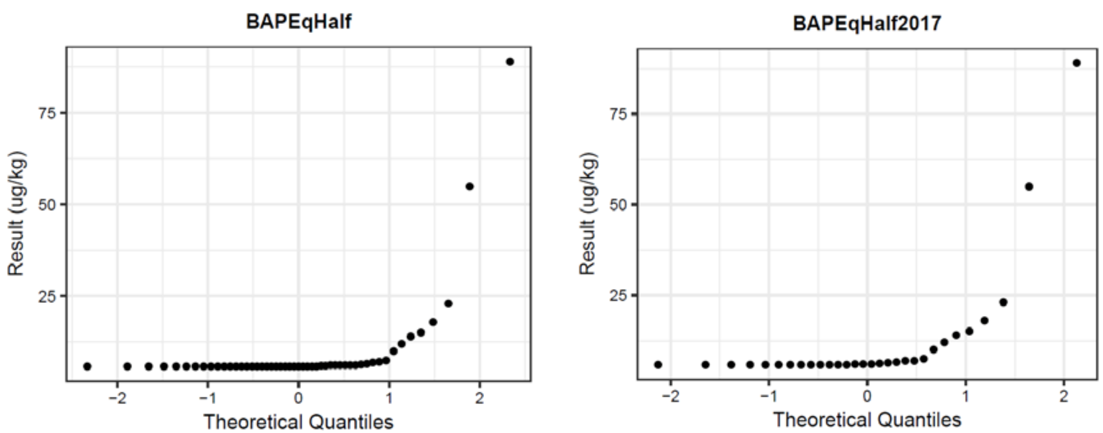


FIGURE 5(B). QQ Plots for TEQ Avians – Full Dataset

Pacific Gas and Electric Company Topock Compressor Station, Needles, California

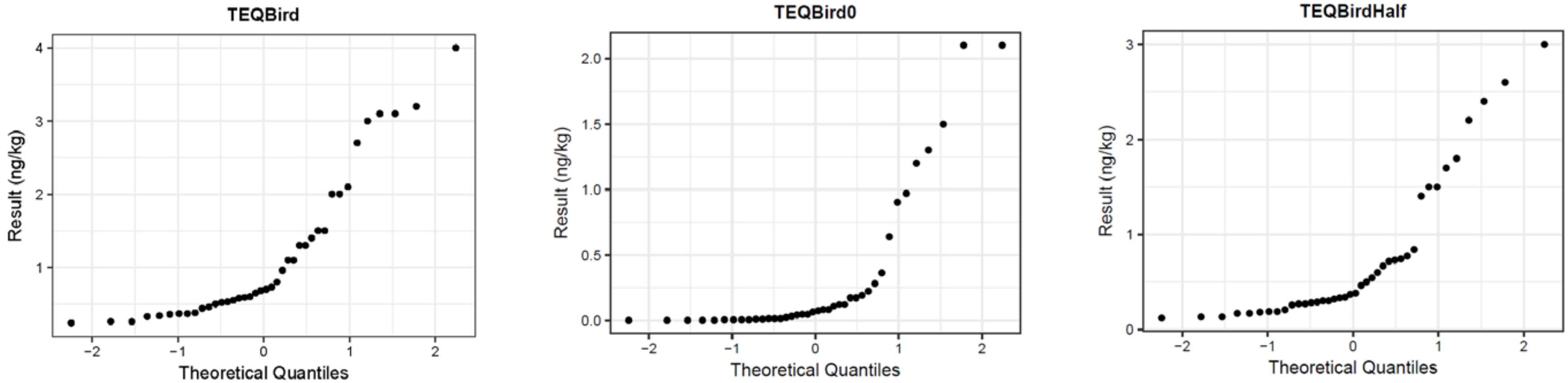


FIGURE 5(C). QQ Plots for TEQ Mammals – Full Dataset

Pacific Gas and Electric Company Topock Compressor Station, Needles, California

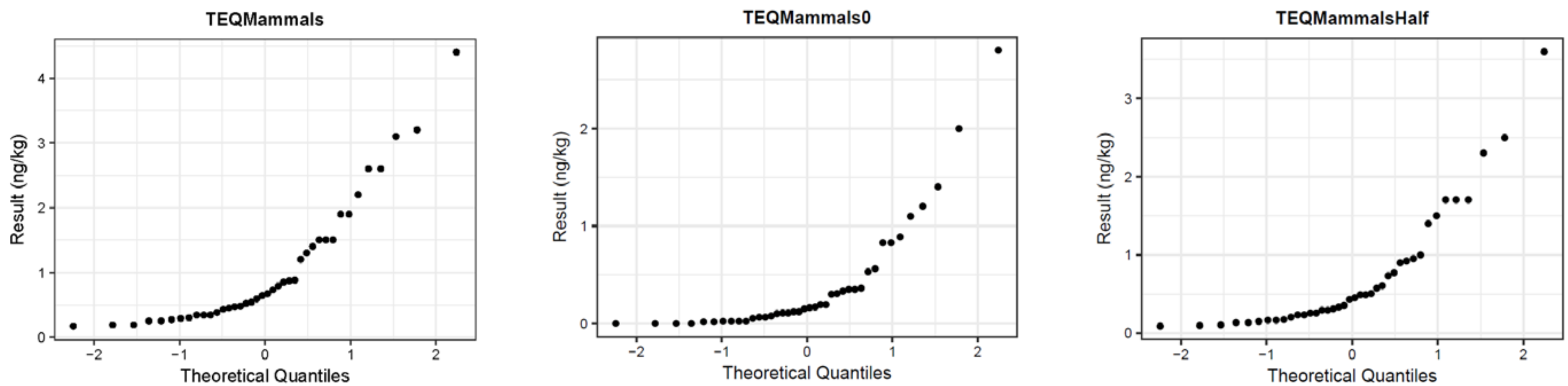


FIGURE 6(A). QQ Plots for Transformed Data for B(a)P equivalent – Full Dataset

Pacific Gas and Electric Company Topock Compressor Station, Needles, California

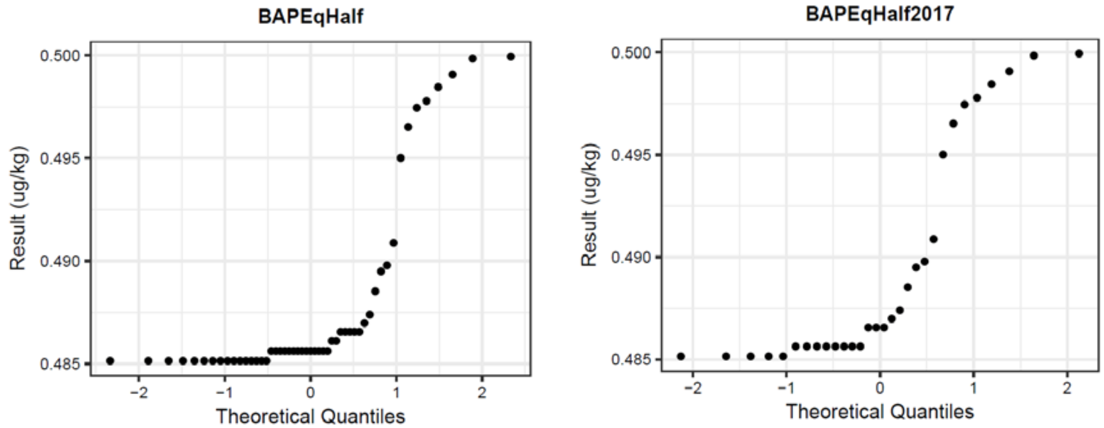


FIGURE 6(B). QQ Plots for Transformed Data for TEQ Avians – Full Dataset

Pacific Gas and Electric Company Topock Compressor Station, Needles, California

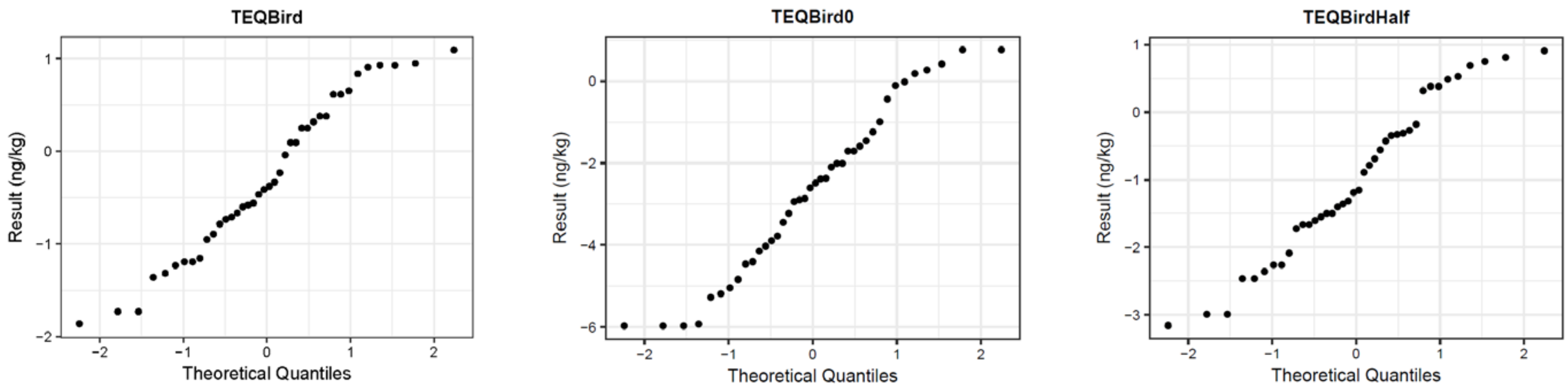


FIGURE 6(C). QQ Plots for Transformed Data for TEQ Mammals – Full Dataset

Pacific Gas and Electric Company Topock Compressor Station, Needles, California

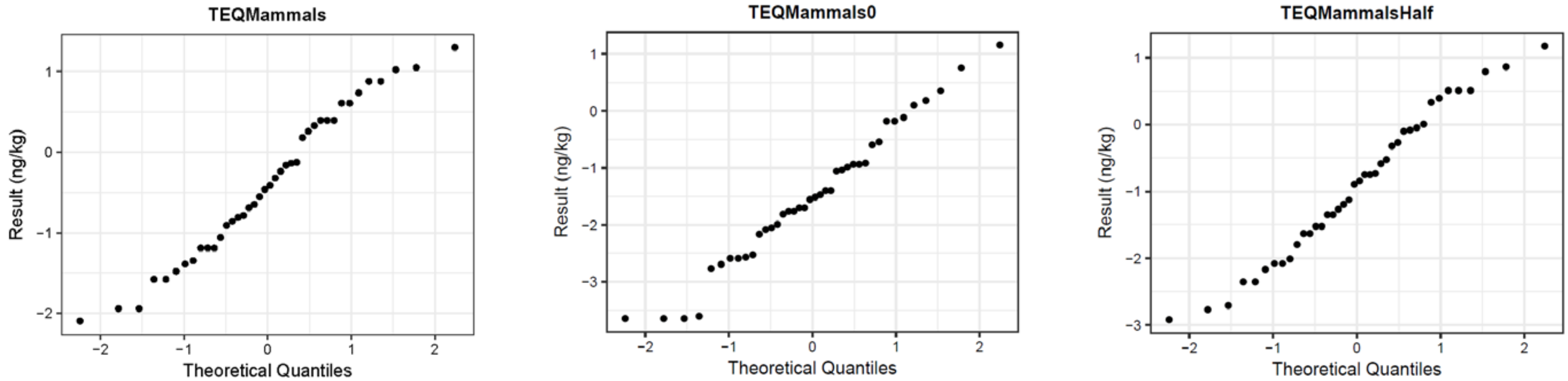


FIGURE 7(A). Box Plots for Transformed Data for B(a)P equivalent – Full Dataset

Pacific Gas and Electric Company Topock Compressor Station, Needles, California

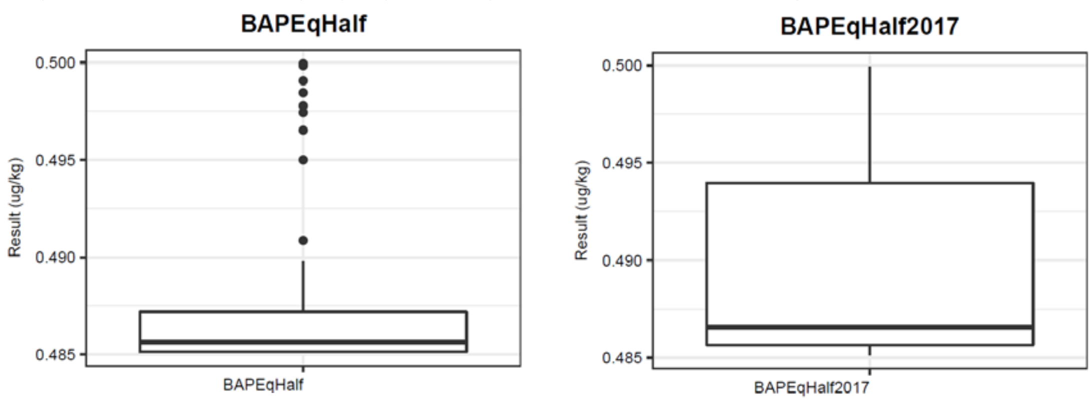


FIGURE 7(B). Box Plots for Transformed Data for TEQ Avians – Full Dataset

Pacific Gas and Electric Company Topock Compressor Station, Needles, California

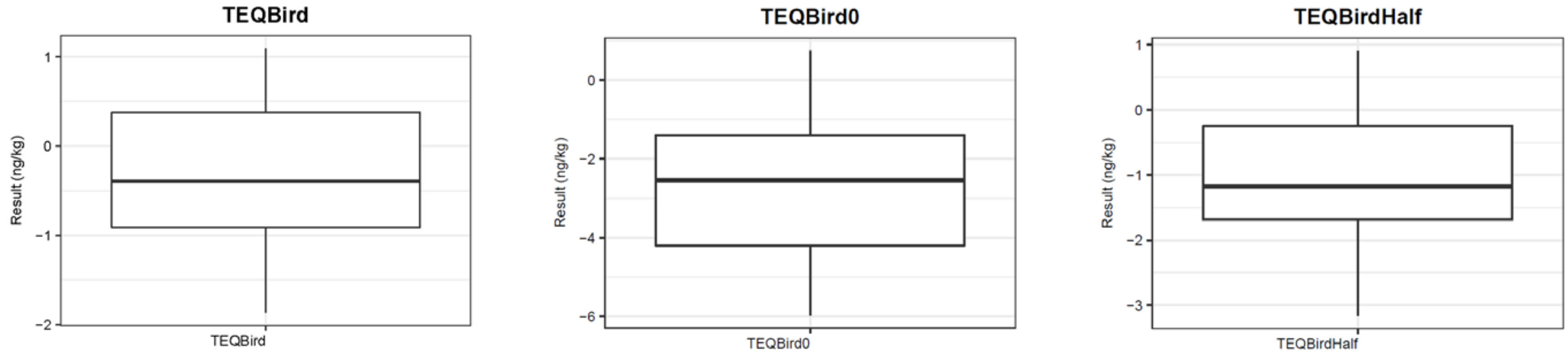
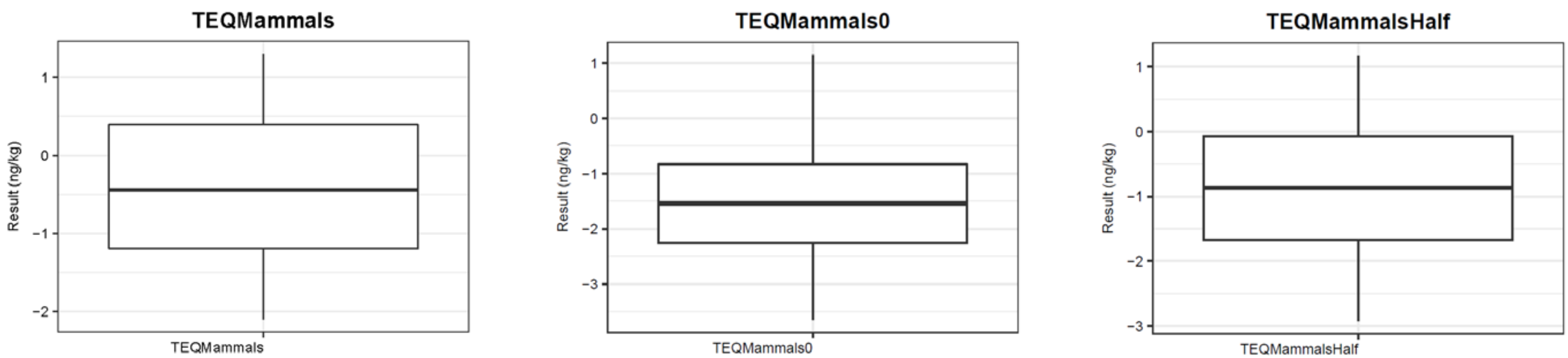


FIGURE 7(C). Box Plots for Transformed Data for TEQ Mammals – Full Dataset

Pacific Gas and Electric Company Topock Compressor Station, Needles, California



Attachment 1
Response to Comments Table

Response to Comments on the

***Ambient/Background Study of Dioxins and Furans at the Pacific Gas and Electric Company (PG&E) Topock Compressor Station, Needles, California,* Issued September 2017**

From

United States Department of the Interior (DOI)

Comment No.	Comment Location (Section/Page)	Comment	Response	Comment Resolution
1	Table 1	Table 1 of the draft technical memorandum identifies BKG 24, 25, 26, 31 and 47 as sample locations are near historic waste deposits (former dumps). While it was necessary to sample these locations to fully understand other potential sources of contamination, these areas should be considered in calculating ambient conditions. PG&E shall recalculate the ambient concentrations and toxic equivalent (TEQ) values for human/mammal and avian receptors for dioxins and furans, and (B[a]P) equivalent for PAHs, excluding the BKG 24, 25, 26, 31 and 47 samples. All other data shall be used in the evaluation.	All ambient values have been recalculated excluding the identified sample locations. The Sample Location Rational text has been expanded to address exclusion of these samples in the calculation of ambient values. In addition, annotations have been added to Table 1 and Table 2 specifying that these locations and the associated results were not included in the calculation of ambient values. The draft technical memorandum included a robust statistical analysis of the full datasets. This analysis, as presented in the draft version, has been retained in the current version but was not replicated for the limited dataset (excluding BKG 24, 25, 26, 31 and 47).	
2	'Sample Location Rational' section (Page 2)	The FMIT noted the previous background study identified that the statistical differences between background values within different lithologic soil units were not observed and questioned whether this applied to the dioxins and furans study. As specified in the original work plan, the report should clarify that the presence of dioxins and furans were evaluated in surface soils only and that lithology would not likely influence the results.	The following sentence was added to the Sample Location Rational: "Unlike the previous background study in which samples were collected from multiple depths and potential differences between lithologic units were evaluated, samples were collected from the surface only where lithology is not likely to influence results."	
3	Title and throughout document	DTSC requested that the technical memorandum title be changed to reflect that the terminology "background" is considered to be representative of natural or native soil conditions while the study included the selection of sampling locations with anthropogenic sources of dioxins and furans. Please revise the title and language to identify this study as an "ambient study". Additionally, revise the term "background threshold value" to "ambient threshold value" throughout the document.	This change has been made.	
4	Pages 2 and 3	DTSC notes that pages 2 and 3 discuss the sample collection rationale and references that sample locations were identified outside of wash and arroyo areas where surface soils can be frequently disturbed. The inference is that the study only applies to areas outside of washes. The technical memorandum should discuss any implications and uncertainties for use of the study in washes and arroyos.	The purpose of the ambient study was to assess levels of dioxins and furans that may have been affected by long term regional anthropogenic sources, but not impacted by the site. Most study sample locations were located out of arroyos and washes because the surficial soil in these areas are frequently reworked and likely represent recently deposited material, which would not be as representative of long term aerial deposition. However, the study did include several samples located in or directly adjacent to washes (i.e., BKG-8 to BKG-12 and BKG-22 and 23), mostly from the 2008 background study. So the values should apply to all areas within the vicinity of the site.	
5	'Previous Background Study' section (Page 1) and throughout document	The document refers to the previous soil background study as the "previous ambient/ background study". The previous study was focused on background concentrations and should be referred to appropriately as the "Soil Background Investigation Technical Memorandum". This is the name of the document on file.	This change has been made.	
6	Page 8	The summary section on page 8 lists threshold values for TEQ bird and mammals that do not match those posted in Table 9(A). Revise those values accordingly.	The TEQ values presented in the summary section have been revised to reflect the recalculated values excluding the BKG 24, 25, 26, 31 and 47 samples, per Comment 1.	
7	Page 3	DTSC identified the need to clarify the citations referenced for calculating the TEQ values for receptor. The DTSC/HERO 2017 reference does not provide toxicity equivalency factors (TEFs) for ecological receptors (avian) and explicitly states that "the soil remedial goals derived herein are not necessarily protective of ecological organisms. Avian TEFs found in Van den Berg et al., 1998, should be used in the analysis and cited as the TEF reference.	As identified by DTSC, the correct citation should be to Van den Berg et al. 1998. The reference to DTSC/HERO 2017 has been replaced with the correct reference.	

Response to Comments on the
Ambient/Background Study of Dioxins and Furans at the Pacific Gas and Electric Company (PG&E) Topock Compressor Station, Needles, California, Issued September 2017
From
United States Department of the Interior (DOI)

Comment No.	Comment Location (Section/Page)	Comment	Response	Comment Resolution
8		DTSC also noted that (B[a]P) equivalents are based on a human health note utilizing a cancer endpoint, inappropriate for ecological receptors. The US Environmental Protection Agency (US EPA) Ecological Soil Screening Levels (Eco SSL) process provides an alternate approach that divides the PAHs into two classes; low molecular weight and high molecular weight molecules. Please see the reference document for US EPA Eco SSLs at https://www.epa.gov/sites/production/files/2015-09/documents/eco- ssl_pah.pdf. As prescribed by DTSC, the sum of the low molecular weight PAHs and the sum of the high molecular weight PAHs shall each be reported for each sample location.	The sum of low molecular weight PAHs (LMW-PAHs) and high molecular weight PAHs (HMW-PAHs) have been calculated for each location and added to Table 2. In addition, ambient values were calculated for these parameters. These are presented in Table 9(B). PAH data sets had less than 59 observations, thus the 95 percent coverage with 95 percent confidence is not statistically possible, even when the maximum concentration is assigned as the UTL. In this situation, the value of the lowest achievable coverage is reported. Table 9(B) presents the lowest achievable coverages for the PAH data sets with 95 percent confidence by assigning the maximum sample values as the upper prediction limits.”	

Attachment 2
Analytical Data

ATTACHMENT 2

Table 1-1. Soil Sample Analytical Results: Dioxins and Furans

Ambient/Background Study of Dioxins and Furans

Pacific Gas and Electric Company Topock Compressor Station, Needles, California

			Dioxins and Furans (ng/kg) *																
Location	Sample Type	Sample Date	1,2,3,4,6,7,8-HpCDD	1,2,3,4,6,7,8-HpCDF	1,2,3,4,7,8,9-HpCDF	1,2,3,4,7,8-HxCDD	1,2,3,4,7,8-HxCDF	1,2,3,6,7,8-HxCDD	1,2,3,6,7,8-HxCDF	1,2,3,7,8,9-HxCDD	1,2,3,7,8,9-HxCDF	1,2,3,7,8-PeCDD	1,2,3,7,8-PeCDF	2,3,4,6,7,8-HxCDF	2,3,4,7,8-PeCDF	2,3,7,8-TCDD	2,3,7,8-TCDF	OCDD	OCDF
BKG-01	LS	9/18/2008	2.2 J	0.51 J	0.098 U	0.071 U	0.13 U	0.071 U	0.12 U	0.12 U	0.71 J	0.12 U	0.15 U	0.54 U	0.14 U	0.089 U	0.06 U	19 J	0.77 U
BKG-06	LS	9/19/2008	4.1 J	0.63 J	0.11 U	0.18 U	0.15 U	0.26 U	0.14 U	0.16 U	0.17 U	0.14 U	0.12 U	0.52 U	0.085 U	0.13 U	0.072 U	26	0.73 U
BKG-07	LS	9/19/2008	14	1.2 U	0.2 U	0.19 U	0.13 U	0.45 U	0.17 U	0.41 U	0.14 U	0.11 U	0.15 U	0.99 U	0.12 U	0.14 U	0.11 U	91	2.7 J
BKG-08	LS	8/23/2008	1.6 U	0.39 J	0.088 U	0.091 U	0.076 U	0.075 U	0.15 U	0.1 U	0.085 U	0.11 J	0.16 U	0.34 U	0.087 U	0.071 U	0.072 U	13 J	0.88 U
BKG-09	LS	8/23/2008	2 J	0.43 J	0.096 U	0.095 U	0.071 U	0.095 U	0.067 U	0.095 U	0.08 U	0.13 U	0.04 U	0.34 J	0.041 U	0.075 U	0.041 U	20 J	0.77 U
BKG-10	LS	9/19/2008	24	1.8 U	0.29 J	0.13 U	0.097 U	0.82 U	0.091 U	0.13 U	0.11 U	0.11 U	0.1 U	8.4 U	0.083 U	0.064 U	0.069 U	190	5.5 J
BKG-11	LS	9/19/2008	1.8 J	0.18 U	0.071 U	0.048 U	0.063 U	0.047 U	0.06 U	0.046 U	0.45 U	0.085 U	0.06 U	0.3 U	0.062 U	0.054 U	0.07 U	16 J	0.29 U
BKG-12	LS	8/23/2008	1.7 J	0.31 J	0.07 U	0.078 U	0.054 U	0.094 U	0.051 U	0.13 U	0.06 U	0.081 U	0.064 U	0.2 U	0.066 U	0.065 U	0.093 U	12 J	0.37 U
BKG-13	LS	9/20/2008	2.6 J	0.48 J	0.15 U	0.12 U	0.097 U	0.12 U	0.091 U	0.33 U	3.1 J	0.09 U	0.38 J	0.73 U	0.35 U	0.073 U	0.11 U	21 J	0.77 U
BKG-17	LS	9/20/2008	53	3.6 J	0.12 U	0.19 U	0.13 U	1.3 J	0.12 U	0.37 U	0.14 U	0.066 U	0.13 U	8 U	0.067 U	0.055 U	0.045 U	650	13 J
BKG-18	LS	3/18/2017	2.1 J	0.44 J	0.13 U	0.095 U	0.092 U	0.074 U	0.088 U	0.22 U	0.11 U	0.068 U	0.051 U	0.51 U	0.054 U	0.061 U	0.052 U	19 U	0.56 J
BKG-19	LS	3/18/2017	7 J	1.6 J	0.17 U	0.24 U	0.096 U	0.32 U	0.24 U	0.093 U	0.11 U	0.081 U	0.064 U	2.2 U	0.25 J	0.062 U	0.08 U	90	7 J
BKG-20	LS	3/18/2017	6.2 J	1.2 U	0.19 U	0.073 U	0.15 U	0.074 U	0.14 U	0.22 U	0.17 U	0.083 U	0.072 U	0.89 U	0.096 U	0.05 U	0.078 U	42	1.5 J
BKG-21	LS	3/18/2017	5.5 J	0.74 U	0.11 U	0.15 U	0.13 U	0.21 U	0.12 U	0.28 U	0.14 U	0.099 U	0.11 U	2 U	0.12 U	0.07 U	0.055 U	38	1.4 J
BKG-22	LS	3/18/2017	19	2.3 U	0.29 U	0.45 U	0.33 U	0.96 J	0.25 U	0.29 U	0.17 U	0.39 U	0.13 U	3.6 U	0.3 U	0.15 U	0.092 U	150	4.3 J
BKG-23	LS	3/18/2017	43	7.9 J	0.83 U	0.32 U	1.2 U	1.8 J	1.4 U	1.2 U	0.42 U	0.16 U	0.39 U	8.2 U	0.76 U	0.097 U	0.22 U	450 J	19 J
BKG-24	LS	3/17/2017	2.5 U	0.28 U	0.2 U	0.11 U	0.18 U	0.11 U	0.17 U	0.17 U	0.21 U	0.12 U	0.14 U	0.18 U	0.15 U	0.13 U	0.068 U	13 U	0.59 U
BKG-25	LS	3/17/2017	21	5 J	0.19 U	0.64 U	1 U	1.5 J	1.3 J	1.3 J	0.26 U	0.28 U	0.94 J	2.3 U	1.1 J	0.076 U	0.94 U	91	4.3 J
BKG-26	LS	3/17/2017	9.1 J	1.4 U	0.18 U	0.18 U	0.17 U	0.18 U	0.16 U	0.18 U	0.19 U	0.13 U	0.17 U	1.2 U	0.81 U	0.13 U	0.11 U	56	3.6 U
BKG-27	LS	3/17/2017	8 J	1.3 J	0.22 U	0.11 U	0.18 U	0.43 U	0.17 U	0.43 J	0.2 U	0.056 U	0.074 U	1.3 U	0.077 U	0.052 U	0.062 U	64	1.9 J
BKG-28	LS	3/17/2017	54	5.8 J	0.77 J	0.93 U	0.89 J	1.9 U	0.74 U	1.8 J	0.37 U	0.7 J	0.38 U	5.1 U	0.95 J	0.12 U	0.16 U	510	10 J
BKG-29	LS	3/17/2017	120	8.4 J	0.64 U	1.6 J	0.9 J	3.3 J	1 U	2.7 J	0.34 U	0.74 U	0.45 U	6.3 U	1.3 J	0.069 U	0.29 U	980	11 J
BKG-30	LS	3/17/2017	3.8 J	0.83 U	0.2 U	0.16 U	0.14 U	0.24 U	0.13 U	0.16 U	0.16 U	0.07 U	0.13 U	0.73 J	0.14 U	0.032 U	0.045 U	25	1.5 J
BKG-31	LS	3/17/2017	10 J	2.4 J	0.2 U	0.17 U	0.21 U	0.5 J	1.9 U	0.26 U	0.24 U	0.12 U	0.26 U	3.4 U	1.2 J	0.035 U	0.1 U	79	2.8 J
BKG-32	LS	3/17/2017	1 U	0.14 U	0.12 U	0.13 U	0.092 U	0.13 U	0.088 U	0.12 U	0.11 U	0.084 U	0.074 U	0.3 U	0.23 U	0.069 U	0.073 U	7.5 U	0.15 U
BKG-33	LS	3/17/2017	11 J	1.7 J	0.2 U	0.32 U	0.25 U	0.64 U	1.7 U	0.32 U	0.29 U	0.27 U	1.3 J	2.5 U	0.27 U	0.11 U	0.16 U	93	2.4 U
BKG-34	LS	3/17/2017	38	2.5 U	0.26 U	0.4 U	0.4 U	2 J	0.72 J	1.7 U	0.28 U	0.69 U	0.37 U	5.4 U	0.17 U	0.16 U	1.1 J	210	3.6 U
BKG-35	LS	3/17/2017	7.1 J	1.2 J	0.16 U	0.29 U	0.29 U	0.29 U	0.28 U	0.28 U	0.34 U	0.22 U	0.13 U	1.9 U	0.13 U	0.12 U	0.12 U	100	4.6 J
BKG-36	LS	3/17/2017	8.6 J	1.8 U	0.28 U	0.28 U	0.55 U	0.28 U	1.1 J	0.27 U	0.26 U	0.21 U	0.8 J	3.1 U	0.26 U	0.14 U	0.69 J	73	3.2 J
BKG-37	LS	3/17/2017	56	13	0.45 U	1.2 J	0.5 U	2.3 J	0.87 J	1.7 J	0.17 U	0.57 U	0.75 J	7.7 U	0.74 U	0.079 U	0.092 U	410	15 J
BKG-38	LS	3/18/2017	1.8 J	0.4 U	0.12 U	0.072 U	0.077 U	0.072 U	0.074 U	0.071 U	0.089 U	0.051 U	0.099 U	0.36 U	0.1 U	0.049 U	0.039 U	15 U	0.36 U
BKG-39	LS	3/18/2017	1.5 J	0.14 U	0.064 U	0.093 U	0.045 U	0.044 U	0.043 U	0.064 U	0.052 U	0.04 U	0.064 U	0.3 U	0.066 U	0.041 U	0.045 U	14 U	0.28 U
BKG-40	LS	3/18/2017	38	3.5 J	0.49 J	0.48 U	0.21 U	1.1 U	0.2 U	1 U	0.24 U	0.12 U	0.11 U	3.7 U	0.12 U	0.082 U	0.072 U	360	6.1 J

ATTACHMENT 2

Table 1-1. Soil Sample Analytical Results: Dioxins and Furans

Ambient/Background Study of Dioxins and Furans

Pacific Gas and Electric Company Topock Compressor Station, Needles, California

			Dioxins and Furans (ng/kg) *																
Location	Sample Type	Sample Date	1,2,3,4,6,7,8-HpCDD	1,2,3,4,6,7,8-HpCDF	1,2,3,4,7,8,9-HpCDF	1,2,3,4,7,8-HxCDD	1,2,3,4,7,8-HxCDF	1,2,3,6,7,8-HxCDD	1,2,3,6,7,8-HxCDF	1,2,3,7,8,9-HxCDD	1,2,3,7,8,9-HxCDF	1,2,3,7,8-PeCDD	1,2,3,7,8-PeCDF	2,3,4,6,7,8-HxCDF	2,3,4,7,8-PeCDF	2,3,7,8-TCDD	2,3,7,8-TCDF	OCDD	OCDF
BKG-41	LS	3/18/2017	7.7 J	0.86 U	0.25 U	0.18 U	0.095 U	0.55 J	0.22 U	0.26 U	0.23 U	0.2 J	0.081 U	0.67 U	0.2 U	0.042 U	0.061 U	53	1.7 J
BKG-42	LS	3/18/2017	0.12 U	0.12 U	0.059 U	0.077 U	0.051 U	0.055 U	0.049 U	0.054 U	0.049 U	0.054 U	0.058 U	0.081 U	0.061 U	0.049 U	0.033 U	4.8 U	0.053 U
BKG-43	LS	3/18/2017	20	2 J	0.18 U	0.34 U	0.3 U	0.97 J	0.24 U	0.57 U	0.29 U	0.089 U	0.065 U	1.7 U	0.067 U	0.035 U	0.087 U	120	2.1 U
BKG-44	LS	3/18/2017	3.4 J	0.15 U	0.18 U	0.068 U	0.17 U	0.3 U	0.16 U	0.067 U	1.1 J	0.095 U	0.099 U	0.69 U	0.11 U	0.043 U	0.038 U	22 J	1.2 U
BKG-45	LS	3/18/2017	1.3 U	0.15 U	0.062 U	0.072 U	0.068 U	0.046 U	0.065 U	0.056 U	0.078 U	0.034 U	0.03 U	0.18 U	0.08 U	0.055 U	0.034 U	12 U	0.6 J
BKG-46	LS	3/18/2017	2.3 J	0.18 U	0.22 U	0.082 U	0.083 U	0.082 U	0.079 U	0.063 U	0.095 U	0.038 U	0.053 U	0.38 U	0.11 U	0.047 U	0.058 U	20 U	1.4 J
BKG-47	LS	3/17/2017	56	5.8 J	0.54 U	0.54 U	0.64 J	0.2 U	0.53 J	1.2 J	0.18 U	0.41 U	0.18 U	4 U	0.57 J	0.072 U	0.11 U	480	6.7 J

Notes:

* Samples collected in 2008 were analyzed out of holding time in 2017

All samples were collected at 0 - 0.5 feet below ground surface

ng/kg = nanograms per kilogram

N = primary sample

FD = field duplicate sample

U = not detected at specified reporting limit

J = estimated value

ATTACHMENT 2

Table 1-2. Soil Sample Analytical Results: Polycyclic Aromatic Hydrocarbons

Ambient/Background Study of Dioxins and Furans

Pacific Gas and Electric Company Topock Compressor Station, Needles, California

			Polycyclic Aromatic Hydrocarbons (µg/kg)																	
Location	Sample Type	Sample Date	1-Methyl naphthalene	2-Methyl naphthalene	Acenaphthene	Acenaphthylene	Anthracene	Benzo (a) anthracene	Benzo (a) pyrene	Benzo (b) fluoranthene	Benzo (ghi) perylene	Benzo (k) fluoranthene	Chrysene	Dibenzo (a,h) anthracene	Fluoranthene	Fluorene	Indeno (1,2,3-cd) pyrene	Naphthalene	Phenanthrene	Pyrene
BKG-01	N	9/18/2008	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U
BKG-02	N	9/18/2008	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U
BKG-03	N	9/18/2008	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U
BKG-04	N	9/18/2008	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U
BKG-04	FD	9/18/2008	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U
BKG-05	N	9/19/2008	5.2 U	5.2 U	5.2 U	5.2 U	5.2 U	5.2 U	5.2 U	5.2 UJ	5.2 U	5.2 U	5.2 U	5.2 U	5.2 U	5.2 U	5.2 U	5.2 U	5.2 U	5.2 U
BKG-06	N	9/19/2008	5.2 U	5.2 U	5.2 U	5.2 U	5.2 U	5.2 U	5.2 U	5.2 U	5.2 U	5.2 U	5.2 U	5.2 U	5.2 U	5.2 U	5.2 U	5.2 U	5.2 U	5.2 U
BKG-07	N	9/19/2008	5.3 U	5.3 U	5.3 U	5.3 U	5.3 U	5.3 U	5.3 U	5.3 UJ	5.3 U	5.3 U	5.3 U	5.3 U	5.3 U	5.3 U	5.3 U	5.3 U	5.3 U	5.3 U
BKG-07	FD	9/19/2008	5.3 U	5.3 U	5.3 U	5.3 U	5.3 U	5.3 U	5.3 U	5.3 UJ	5.3 U	5.3 U	5.3 U	5.3 U	5.3 U	5.3 U	5.3 U	5.3 U	5.3 U	5.3 U
BKG-08	N	8/23/2008	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BKG-09	N	8/23/2008	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BKG-10	N	9/19/2008	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BKG-11	N	9/19/2008	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BKG-11	FD	9/19/2008	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BKG-12	N	8/23/2008	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BKG-13	N	9/20/2008	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U
BKG-14	N	9/20/2008	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BKG-14	FD	9/20/2008	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BKG-15	N	9/20/2008	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BKG-16	N	9/23/2008	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BKG-17	N	9/20/2008	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BKG-18	N	3/18/2017	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BKG-19	N	3/18/2017	5 U	5 U	5 U	5 U	5 U	17	16	17	18	23	20	33	8.4	5 U	28	5 U	5 U	6.7
BKG-20	N	3/18/2017	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5	5 U	5.3	5.7	8.4	5 U	5 U	6.4	5 U	5 U	5 U
BKG-21	N	3/18/2017	5 U	5 U	5 U	5 U	5 U	5 U	5 U	8	5 U	5 U	5.7	5 U	6.7	5 U	5 U	5 U	5 U	5.7
BKG-22	N	3/18/2017	5 U	5 U	5 U	5 U	5 U	5 U	5 U	11	5 U	5 U	6	5 U	9.7	5 U	5 U	5 U	5 U	8
BKG-23	N	3/18/2017	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U
BKG-24	N	3/17/2017	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U
BKG-25	N	3/17/2017	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BKG-26	N	3/17/2017	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1	5.1 U	5.1 U	5.1	5.1 U	17	5.1 U	5.1 U	5.1 U	5.7	13
BKG-27	N	3/17/2017	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BKG-28	N	3/17/2017	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	9.8	12	70	8.8	13	40	5.1 U	61	5.1 U	7.8	5.1 U	16	45
BKG-29	N	3/17/2017	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	8.5	9.5	45	8.2	8.8	27	5.1 U	39	5.1 U	6.5	5.1 U	9.2	31
BKG-30	N	3/17/2017	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5.7	5 U	5 U	5 U	5 U	5.3	5 U	5 U	5 U	5 U	5 U
BKG-31	N	3/17/2017	5 U	5 U	5 U	5 U	5.7	100	62	110	42	37	68	5 U	160	5 U	35	5 U	19	140
BKG-32	N	3/17/2017	5 U	5 U	5 U	5 U	5 U	5 U	5 U	6	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BKG-33	N	3/17/2017	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U	5.4 U	14	5.4 U	5.4 U	8.3	5.4 U	11	5.4 U	5.4 U	5.4 U	5.4 U	7.6
BKG-34	N	3/17/2017	5.4 U	7.6	5.4 U	5.4 U	5.8	9.8	6.5	37	6.5	6.5	20	5.4 U	24	5.4 U	5.4 U	7.2	17	18
BKG-35	N	3/17/2017	5.3 U	5.3 U	5.3 U	5.3 U	5.3 U	6.7	5.3 U	39	5.3 U	7	24	5.3 U	29	5.3 U	5.3 U	5.3 U	7.7	17
BKG-36	N	3/17/2017	5.2 U	8	5.2 U	5.2 U	5.2 U	6.2	5.2 U	8.3	5.2 U	5.2 U	9.4	5.2 U	15	5.2 U	5.2 U	5.2 U	28	14
BKG-37	N	3/17/2017	5.2 U	5.2 U	5.2 U	5.2 U	5.2 U	7.9	7.9	34	5.2	7.9	17	5.2 U	21	5.2 U	5.2 U	5.2 U	6.9	17
BKG-38	N	3/18/2017	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U
BKG-39	N	3/18/2017	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BKG-40	N	3/18/2017	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U

ATTACHMENT 2

Table 1-2. Soil Sample Analytical Results: Polycyclic Aromatic Hydrocarbons

Ambient/Background Study of Dioxins and Furans

Pacific Gas and Electric Company Topock Compressor Station, Needles, California

			Polycyclic Aromatic Hydrocarbons (µg/kg)																	
Location	**Sample Type**	**Sample Date**	**1-Methyl naphthalene**	**2-Methyl naphthalene**	**Acenaphthene**	**Acenaphthylene**	**Anthracene**	**Benzo (a) anthracene**	**Benzo (a) pyrene**	**Benzo (b) fluoranthene**	**Benzo (ghi) perylene**	**Benzo (k) fluoranthene**	**Chrysene**	**Dibenzo (a,h) anthracene**	**Fluoranthene**	**Fluorene**	**Indeno (1,2,3-cd) pyrene**	**Naphthalene**	**Phenanthrene**	**Pyrene**
BKG-41	N	3/18/2017	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U
BKG-42	N	3/18/2017	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U
BKG-43	N	3/18/2017	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U
BKG-44	N	3/18/2017	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U
BKG-45	N	3/18/2017	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U
BKG-46	N	3/18/2017	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U	5.1 U
BKG-47	N	3/17/2017	5 U	5 U	5 U	5 U	5 U	5 U	5 U	15	5 U	5 U	7	5 U	11	5 U	5 U	5 U	5 U	9.4

Notes:

All samples were collected at 0 - 0.5 feet below ground surface

µg/kg = micrograms per kilogram

N = primary sample

FD = field duplicate sample

U = not detected at specified reporting limit

J = estimated value