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September 3, 1996

Commanding Officer
Naval Facilities Engineering Command
Southwest Division
Mr. Richard Selby, Code 0233.RS
Building 128
1220 Pacific Highway
San Diego, CA 92132-5187

Subject: Additional Comment and Response from DTSC
Anthropogenic PAH Reference-Level Study
Marine Corps Air Station, El Toro, California

Dear Mr. Selby:

One document review comment, concerning the above referenced report and the analytical method specified, was received verbally from the State of California, Environmental Protection Agency, Department of Toxic Substance Control. Their final comment has been addressed by revising references from "U.S. EPA Method 8310" to the "NOAA PAH/SIM" analytical method. Where appropriate this revision is incorporated into the Final Anthropogenic PAH Reference-Level Study for CTO-065, MCAS El Toro, California. The revisions made to the report have not altered the conclusions or recommendations. The affected pages are enclosed and you are requested to replace the affected pages with the enclosed revised pages.

Please call me (619/686-8803) if you have any questions.

Very truly yours,

Jacques Lord
CTO Leader

JL/sp
cc: Distribution
Enclosures

SUMMARY

The Base Realignment and Closure Cleanup Team (BCT) for Marine Corps Air Station (MCAS) El Toro recognized a potential for anthropogenic (man-made) polynuclear aromatic hydrocarbons (PAHs) not associated with contaminated sites to be present in MCAS El Toro surface soils. If present at significant levels yet not taken into account, these anthropogenic PAH constituents could complicate environmental assessments and cleanup levels. Therefore, the BCT proposed sampling and statistical analysis be performed to estimate the PAH reference levels specific to MCAS El Toro surface soils and whether these levels were above or below current residential soil preliminary remediation goals (PRGs) as established by the Region IX United States Environmental Protection Agency (U.S. EPA)(U.S. EPA 1995).

In order to estimate a statistically valid reference level, soil samples were collected from 20 randomly located points through out the station. These soil samples were analyzed for PAHs by a fixed-base laboratory using the U.S. EPA Contract Laboratory Program (CLP) Method and the National Oceanic and Atmospheric Administration (NOAA) modified method for PAHs using selective ion monitoring (SIM) and by two immunoassay field-screening methods. The NOAA PAH/SIM results were used as the population for the statistical analysis and were also used to evaluate the reliability of the two immunoassay field-screening methods.

In addition, at the request of the MCAS El Toro BCT, six of the PAH sample locations associated with runway areas had additional surface soil collected for target analyte list metals analysis. Of these six locations, three also had soil samples collected for dioxins analysis. These data will be used to support BCT decisions on whether or not the runway parcels can be released for unrestricted use in their present condition.

Based on the statistical analysis of the PAH levels reported by the fixed laboratory, the MCAS El Toro reference-level concentrations for the PAH compounds with established PRGs are all below the residential soil action levels. The concept of PAH reference levels above PRGs in surface soils due to the urban setting for MCAS El Toro has not been supported.

The comparison of the two immunoassay methods for PAHs with NOAA PAH/SIM results suggests that the immunoassay kits are viable analytical tools to collect quick preliminary data with detection limits below residential soil PRGs. The two immunoassay kits reported similar results leading to the same decisions, but they could not be numerically correlated to each other due to different reporting formats (a bracketed range versus a total carcinogenic PAH value). If proper sampling and analytical techniques are followed, both immunoassay methods are reliable assessment tools.

The reported results of the dioxin and metals analyses should support unrestricted release of the runway parcels. No dioxins or furans were reported, and the mean metal concentrations reported, with the exception of selenium, are at or below background levels reported in the draft Phase II Remedial Investigation Report for Site 2 (BNI 1996).

This study was conducted under Contract Task Order (CTO)-0065. It followed the protocols as approved in the CTO-0065 Field Sampling Plan, Quality Assurance Project Plan, Data Management Plan, Investigation-Derived Waste Management Plan, and Site-Specific Health and Safety Plan Supplement, as presented in the final Addendum to the Resource Conservation and Recovery Act Facility Assessment Work Plan for MCAS El Toro (BNI 1995a).

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ACRONYMS/ABBREVIATIONS

AGTL	amber glass Teflon-lined lid
BCT	Base Realignment and Closure Cleanup Team
BNI	Bechtel National, Inc.
BRAC	Base Realignment and Closure
CAS	Chemical Analysis Survey
CLP	(U.S. EPA) Contract Laboratory Program
COC	chain of custody
COPC	chemical of potential concern
CTO	Contract Task Order
µg/kg	micrograms per kilogram
mg/kg	milligrams per kilogram
MCAS	Marine Corps Air Station
MSL	mean sea level
NOAA	National Oceanic and Atmospheric Administration
PAH	polynuclear aromatic hydrocarbons
PRG	(U.S. EPA Region IX) preliminary remediation goal
PP	Program Procedure
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
SOP	standard operating procedure
SOW	Statement of Work
SVOC	semi-volatile organic compound
TAL	target analyte list
U.S. EPA	United States Environmental Protection Agency
UCL	upper confidence level
UTL	upper tolerance level
WMGJTL	wide-mouthed glass jar (with) Teflon-lined lid

bottles. Complete decontamination procedures for sampling equipment and field measuring devices were presented in the final Work Plan (BNI 1995b). Expendable equipment that came into contact with potentially contaminated soil was disposed in accordance with the Investigation-Derived Waste Management Plan (BNI 1995c).

Fixed-base laboratory sample containers were supplied by the laboratory designated for analytical services. The sample containers were cleaned and QC-tested by procedures directly related to the specific analyses to be performed on samples collected in these bottles. Methods used followed U.S. EPA Contract Laboratory Program (CLP) Sample Bottle Repository Program Procedures to assure that the containers were free of contaminants (this QC testing was performed by the container vendor for the off-site laboratory prior to shipment to the field). Field screening sample containers were unused pint-sized plastic bags.

2.1.4 Sample Analyses

Table 2-1 lists the PAH chemicals of potential concern (COPCs) for the anthropogenic PAH reference-level study at MCAS El Toro. Table 2-2 summarizes the matrices, number of samples taken, analyses performed, and the applicable container(s), preservatives, holding times, and other relevant information, in accordance with CLEAN II Program Procedures and the final Work Plan (BNI 1995b), for the sample locations shown on Figure 1-1. Sample locations are unchanged from the proposed locations.

Several analytical methods were used to field screen and analyze surface soil samples for the PAHs listed in Table 2-1. These methods included:

- field screening for PAHs in soil using ENSYS immunoassay for PAHs (U.S. EPA Method 4035) and OHMICRON RaPID Assay for carcinogenic PAHs; and
- off-site, fixed-base laboratory analyses for PAHs using U.S. EPA CLP Method for PAHs, and for semivolatile organic compounds using 8270-Modified (National Oceanic and Atmospheric Administration Status & Trends).

The ENSYS and OHMICRON immunoassay kits are designed for on-site analyses of soils when rapid results are needed for time-critical decisions. The data provided by the immunoassay kits is not useable for risk-assessment decisions but recent advances in the immunoassay technology allows for very low detection limits. The immunoassay kits report results as a total PAH value. The two kits vary slightly with respect to sensitivities to the individual PAH compounds listed in Table 2-1. The OHMICRON kit is sensitive to the seven carcinogenic PAHs and calibrated to benzo(a)pyrene; the ENSYS kit is sensitive to 13 PAHs associated with waste oils and calibrated to chrysene. There is some overlap between the sensitivities of the two kits but the reported values for any one sample by the two kits cannot be directly compared.

For soil samples collected in the runway areas, metals analysis was performed by U.S. EPA Method for TAL metals as set by the CLP Statement of Work (SOW). Dioxins analysis was performed using U.S. EPA Method 8280 for dioxin/dibenzofurans.

Section 3
STUDY RESULTS

3.1 FIXED-BASE LABORATORY RESULTS

Fixed-base laboratory results were reported in accordance with project requirements for the analyses requested by the final Work Plan (BNI 1995b). The reported values used in this study were verified and validated prior to statistical analysis or interpretation.

3.1.1 Polynuclear Aromatic Hydrocarbons

Polynuclear aromatic hydrocarbons include results reported by U.S. EPA Contract Laboratory (CLP) Method for PAHs and by the National Oceanic and Atmospheric Administration (NOAA) modified method for PAHs by selective ion monitoring (SIM); the latter is a modified U.S. EPA Method 8270 that provides very low practical quantitation levels. The reported results by U.S. EPA/CLP had a higher overall detection limit (60 to 80 micrograms per kilogram[µg/kg]) than those results reported by NOAA/SIM (2 to 10 µg/kg), so the NOAA PAH/SIM results were used in the reference-level calculations and for the comparison to the reported immunoassay results. The complete report of results for both methods are included in Appendix B. The compounds detected, other than those listed in Table 2-1 are either common laboratory contaminants or are not COPCs. The highest concentrations of PAHs reported were in sample 0650189 from Site 15. This sample location is in planter soil and shrubs bounding the parking lot of the automobile repair facility for MCAS El Toro. The next highest concentrations of PAHs reported were in sample 0650207 at Site 17. The reported PAH values are something of an anomaly in that the duplicate sample (0650208), a split of sample 0650207, does not have similarly elevated concentrations for approximately half of the PAHs detected. The discrepancy is attributed to the heterogeneity of soil despite having mixed it, since both the immunoassay methods and the fixed laboratory methods report the same discrepancy. Table 3-1 summarizes the PAH results reported by NOAA PAH/SIM that were used in this study.

3.1.2 TAL Metals and Dioxins

Results reported from the samples collected for TAL metals and dioxin indicate that there are no detectable quantities of dioxins or dibenzofurans. The mean concentration for metals were reported below soil background for the listed TAL elements except for selenium. The mean selenium concentration (0.46 mg/kg) is near the background value (0.32 mg/kg) value in soil and does not indicate a release or contamination situation (BNI 1996c). Table 3-2 summarizes results of U.S. EPA Method 8280 and the CLP SOW target analyte metals. Complete results are attached to this report in Appendix B.

3.2 FIELD-SCREENING RESULTS

Both the ENSYS and OHMICRON immunoassay field-screening methods were used to collect on-site PAH data for each of the twenty sampling locations. Both kits were used in accordance with U.S. EPA Method 4035 and manufacturer operating manuals. The kits provided results in a "real-time" turnaround of within 24-hours (usually less) of field sample collection. Both kits were operated by a chemist certified by the vendors

Section 4
DATA ANALYSIS AND RECOMMENDATIONS

4.1 ANTHROPOGENIC REFERENCE LEVELS FOR PAHS

A statistical analysis of PAH values reported from surface soils at MCAS El Toro was performed as outlined in the final Work Plan (BNI 1995b) and the upper tolerance limit (UTL), as well as the 95 percent upper confidence limit (UCL) on the mean, were calculated for each compound at each location. A comparison of the data from the two fixed-base laboratory analytical methods indicated that the reference-levels should be calculated using NOAA PAH/SIM data because this method reported lower detection limits.

The statistical analysis was performed using only the regular validated value of each analyte for each sampling station. The establishment of the UCL of the background analyte distribution and the UTL followed a decision flowchart (BNI 1995b) that is the same as that used to calculate background metals in soils as reported in the draft final report for Site 2 (BNI 1996). The data contains numerous nondetect values. Because of the small population (20 sampling points) and the numerous nondetects for such critical compounds as benzo(a)pyrene, the calculated UTL values turned out to be inappropriate as reference levels for PAHs. The assumption that the statistical method for background metals would be appropriate for PAH reference levels was wrong, mostly because PAH compounds are not derived or distributed in the same way as naturally-occurring inorganics.

The calculation of the 95 percent UCL of the mean is more useful in determining whether MCAS El Toro has anthropogenic PAHs above the residential soil PRGs. Therefore, while UTLs have been calculated, the UCL value has been used as the MCAS El Toro reference level in surface soils (Table 4-1). The calculated reference levels do not support the hypothesis that surface soils at MCAS El Toro have anthropogenic PAHs at or above the residential soil PRGs.

4.2 COMPARISON OF IMMUNOASSAY METHODS AND FIXED-BASE ANALYSIS

The comparison of the two immunoassay methods for PAHs with the NOAA PAH/SIM results suggests that the immunoassay kits are viable analytical tools to collect quick preliminary data with detection limits below residential soil PRGs. The two immunoassay kits reported similar results, if the criteria for "similar" is defined as reporting results that lead to the same decision of whether soils are above or below residential PRGs. In a purely numerical comparison the immunoassay kits reported PAH values that vary a great deal when compared to each other and to the NOAA PAH/SIM results. But the kits should not be correlated to each other directly due to different reporting formats (a bracketed range versus a total carcinogenic PAH value), and different sensitivities to individual PAH compounds. Table 4-2 summarizes the results from each immunoassay kit and compares the reported results to the summed NOAA PAH/SIM values of PAHs to which the immunoassay kits are sensitive.

Table 3-1
Summary of NOAA PAH/SIM Analysis of Surface Soils

Sample Number	0650202	0650194	0650193	0650191	0650192	0650196	0650199	0650200	0650190	0650195
Location[1]	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10
Reported PAH value (µg/kg)										
Naphthalene	2UJ	2UJ	2UJ	2UJ	2UJ	2J	2UJ	2UJ	2UJ	2UJ
Acenaphthylene[2]	2UJ	2UJ	2UJ	2UJ	2UJ	2UJ	2UJ	2UJ	2UJ	2UJ
Acenaphthene[2]	2UJ	2UJ	2UJ	2UJ	2UJ	3J	2UJ	2UJ	2UJ	2UJ
Fluorene[2]	2UJ	2UJ	2UJ	2UJ	2UJ	2UJ	2UJ	2UJ	2UJ	2UJ
Phenanthrene[2]	2U	3	4	6	10	25	8	5	6	2U
Anthracene[2]	2UJ	2UJ	2UJ	2UJ	2UJ	2UJ	2UJ	2UJ	2UJ	2UJ
Fluoranthene[2]	3J	7J	10J	12J	19J	31J	15J	8J	16J	2J
Pyrene[2]	2	6	10	11	17	29	16	7	15	2U
Benz(a)anthracene[2, 5]	2UJ	3J	5J	5J	7J	10J	5J	2J	9J	2UJ
Chrysene[2,5]	2J	13J	10J	10J	13J	21J	12J	8J	16J	3J
Benzo(b)fluoranthene[5]	2UJ	6J	9J	10J	12J	21J	8J	6J	17J	2UJ
Benzo(k)fluoranthene[5]	2UJ	5J	9J	6J	10J	17J	6J	3J	11J	2UJ
Benzo(a)pyrene[2,5]	2UJ	6J	8J	8J	10J	16J	6J	3J	13J	2UJ
Indeno(1,2,3,-cd) pyrene[2,5]	2UJ	6J	9J	6J	8J	17J	5J	3J	11J	2J
Dibenz(a,h)anthracene[5]	2UJ	4J	4J	3J	3J	6J	2J	2UJ	5J	2UJ
Benzo(ghi)perylene	2J	8J	13J	9J	10J	22J	12J	4J	18J	4J

(Table continues)

Table 4-2
Summary Comparison of Immunoassay and NOAA PAH/SIM Reported Values

Sample Number	ENSYS PAH[a] Immunoassay Results (µg/kg)[b]	NOAA PAH/SIM ENSYS-Sensitive Results[c] (µg/kg)	OHMICRON CPH[d] Immunoassay Results (µg/kg)	NOAA PAH/SIM OHMICRON-Sensitive Results[e] (µg/kg)	Comments
0650187	< 60	< 22J[f]	7	< 14J[f]	Compatible results
0650188	> 60, < 275	104J	95	65J	Compatible results
0650189	> 60, < 275	589J	261	< 737J	Compatible both immunoassays lower than Method 8310.
0650190	> 60, < 275	< 94J	71	82J	Compatible results
0650191	<60	< 66J	27	48J	Compatible results
0650192	> 60, < 275	93J	76	< 63J	Partially compatible results; OHMICRON confirmation result is low.
0650193	< 60	< 64J	61	54J	Compatible results
0650194	< 60	52J	51	< 43J	Compatible results
0650195	< 60	< 23J	24	< 15J	Compatible results
0650196	> 60, < 275	< 158J	176	108J	Compatible results
0650197	> 60, < 275	215J	178	188J	Compatible results
0650198	< 60	< 87J	59	62J	Marginally compatible results; 62J can be construed as a positive.
0650199	> 60, <275	< 75J	109	44J	ENSYS compatible; OHMICRON is a false positive
0650200	> 60, < 275	< 44J	65	27J	ENSYS and OHMICRON both false positives
0650202	< 60	< 23J	34	< 14J	Compatible results
0650203	< 60	< 38J	37	< 25J	Compatible results
0650204	< 60	< 22J	20	< 14J	Compatible results
0650205	< 60	< 22J	13	< 14J	Compatible results
0650206	< 60	< 38J	29	25J	Compatible results
0650207	> 60, < 275	< 345J	58	273J	False negatives - possible sample heterogeneity problems, or lab error.
0650208	> 60, < 275	< 130J	75	96J	Duplicate of 065207; compatible results

(Table continues)