N00296.002897
MOFFETT FIELD
SSIC NO. 5090.3

Cal/EPA

Department of
Toxic Substances
Control

700 Heinz Avenue
Suite 200
Berkeley, CA
94710-2737

August 23, 1996

Commander
Department of the Navy
Engineering Field Activity, West
Naval Facilities Engineering Command
Attn: Mr. Stephen Chao, Project Manager
900 Commodore Drive, Bldg. 101
San Bruno, California 94066-2402

Pete Wilson
Governor

James M. Strock
Secretary for
Environmental
Protection

Dear Mr. Chao:

DRAFT FINAL PHASE II SITE-WIDE ECOLOGICAL ASSESSMENT(SWEA) REPORT, MOFFETT FEDERAL AIRFIELD (MFA)

The Department of Toxic Substances Control (DTSC) and the San Francisco Regional Water Quality Control Board (RWQCB) have reviewed the subject document and prepared following comments for your consideration. All comments should be responded prior to the release of the final SWEA report.

We have previously commented on the draft Phase II SWEA in a letter dated December 8, 1995, the response to comments (memorandum dated February 1, 1996 and letter dated March 25, 1996). We have also written a letter on evaluating PCB congener data for birds and mammals dated January 23, 1996. The last letter has not been addressed in this report, so we are including the January 23, 1996 letter on evaluation of PCB congeners as an attachment. DTSC has not reviewed Section 2.4.3 of the subject document, on selection of contaminants of concern, because we have previously commented in numerous memoranda on that subject. A coordinated approach has been taken to review this document between DTSC, U.S. Environmental Protection Agency (U.S.EPA, Region IX) and the San Francisco Regional Water Quality Control Board (RWQCB). The U.S. EPA and RWQCB comments will focus on the aquatic toxicity testing aspect of this report. DTSC's comments only pertain to those portions of the SWEA which assess

AR

Printed on Recycled Paper

2897

risk to birds and animals. If you have any questions regarding following comments, please contact me at (510) 540-3830.

Sincerely,

Joseph Chou
Remedial Project Manager
Base Closure Unit
Office of Military Facilities

Enclosures

cc: Mr. Michael Rochette
Regional Water Quality Control Board
2101 Webster Street, Suite 500
Oakland, California 94612

Ms. Susan Gladstone
Regional Water Quality Control Board
2101 Webster Street, Suite 500
Oakland, California 94612

Mr. Michael D. Gill
U.S. Environmental Protection Agency
Region IX, Mail Stop H-9-2
75 Hawthorne St.
San Francisco, California 94105

Ms. Sandy Olliges
Assistant chief
Safety, Health and Environmental Services
National Aeronautics and Space Administration
Ames Research Center
Moffett Field, CA 94035-1000

Ms. Laura Valoppi, M.S.
Dept. of Toxic Substances Control
Office of Scientific Affairs
400 P Street, 4th Fl.
P.O. Box 806
Sacramento, CA 95812-0806

cc: Ms. Myrto Petreas, Ph.D.
Dept. of Toxic Substances Control
Hazardous Materials Laboratory
2151 Berkeley Way, Room 517
Berkeley, CA 94704

Mr. Barton Simmons, Ph.D.
Dept. of Toxic Substances Control
Hazardous Materials Laboratory
2151 Berkeley Way, Room 515
Berkeley, CA 94704

Ms. Patty Velez
California Department of Fish and Game
20 Lower Ragsdale Dr., Suite 100
Monterey, CA 93940

General Comments

This draft final version is greatly improved over the previously submitted draft. Overall, it is well organized and clear, with the exceptions noted below under our Specific Comments. DTSC appreciates the considerable effort and research that the Navy and their contractors have accomplished in a short period of time. The Thiessen polygon figures showing color displays of hazard quotient (HQ) ranges are a very nice addition to the report, and assist in assimilating the detailed information presented.

In brief, the analysis indicates that there are risks to avian receptors in areas of the eastern diked marsh (EDM), the Northern Channel (NC) and drainage ditches, the storm water retention ponds (SWRP), and upland areas. This is true for even the least health-conservative estimates (HQ1). The data also suggests that there are impacts to the endangered Salt Marsh Harvest Mouse (SMHM) in localized areas of the SWRP. The greatest sources of uncertainty in these risk estimates are the contaminant biotransfer factors to food items (in particular for PCBs, organochlorine pesticides, and some metals), in the levels and distribution of contaminants to which an individual animal may be exposed (exposure point concentrations), and to whether predicted impacts on individuals are resulting in significantly adverse impacts to populations of animals inhabiting MFA.

This ecological risk assessment (ERA) was conducted by selecting certain species as representing exposures from contaminants at MFA, with regulatory agency concurrence. Other special-status species may occupy habitat assessed in this report, but may not be well represented by the species evaluated in this report. For example, NASA (1995) report sighting a western snowy plover in the storm water retention pond. The Salt Marsh yellowthroat were observed in the diked marsh, and the loggerhead shrike and California horned lark were observed in the diked marsh and/or stormwater retention ponds at MFA.

The objective at this point is make decision regarding potential areas to remediate based upon risks to ecological receptors. There are uncertainties and data gaps remaining after this Phase II which will limit the certainty with which specific cleanup numbers can be derived. However, this analysis (with needed modifications noted below), along with consultation with the U.S. Fish and Wildlife Service and the

California Department of Fish and Game, could be used to make remediation decisions. However, DTSC is strongly recommending that post-remedial toxicity testing, tissue residue analysis, and other field activities be required. The purpose of the post-remedial monitoring would be to: 1) document decrease risk to ecological receptors as a result of the remediation, 2) decrease the uncertainties and data gaps in key parameters in order to refine cleanup levels, and 3)assess whether further contaminant migration from upland areas (via surface runoff and deposition into the wetlands) is continuing to impact ecological wetland habitats.

In hindsight, the ecological risk from polycyclic aromatic hydrocarbons (PAHs) and other COPECs could have been more efficiently determined if Data Quality Objectives (DQOs) had been established prior to data collection. Specifically, the report makes decisions about risk based on whether the total concentration of PAHs is orders of magnitude greater than 552 ug/kg for low molecular weight or 1,770 ug/kg high molecular weight PAHs. If these decision rules had been established at the beginning of the study, as required by the DQO process, data collection could have been optimized by the use of immunoassays for total and /or carcinogenic PAHs, composite sampling, or other techniques.

Specific Comments (Navy's Response to DTSC Comments on Draft Phase II SWEA Report Dated December 8, 1995)

1. Comment No. 8

DTSC had requested to list IUPAC numbers for PCB congeners and gave examples (PCB 77 is 3,3',4,4'-tetrachlorobiphenyl). These numbers would facilitate comparisons with literature values. The Draft Final does not include these numbers when presenting PCB data.

2. Comment No. 9

As DTSC has stated repeatedly, it was Navy's responsibility to facilitate direct communication between the selected contract laboratory and DTSC-HML chemists to discuss congener specific methodology for PCBs. This did not happen and it resulted in analysis of an incomplete list of PCB congeners. In previous versions of the Navy's responses, these was reference to a voice mail "message" left on Dr. Myrto Petreas' answering machine. In the last version, this "message"

is referred to as "..communication with DTSC-HML. DTSC-HML did not provide comments on the analyte list or request QA/QC procedures." For the record, the Department wants to state again that Hazardous Material Laboratory (HML) did not receive the "message" regarding the selection of Quanterra as the contract laboratory.

In the current version "The Navy apologizes for the misunderstanding regarding the distribution of DTSC's draft method for congener specific PCBs." In fact, we never releases our PCB method because nobody requested. This is what we would have discussed and released to the select lab, had we been put in contact with them. However, the draft and draft final Phase II SWEA reports erroneously list the PCB method as "DTSC draft method". The correction we had requested and hereby request again is that references to "DTSC draft method" be removed from the document.

Specific Comments

1. Page 5-4 states that the Eastern Diked Marsh (EDM) is contaminated due to historical discharge from Lindberg Avenue storm drain (which we understand is undergoing remediation). This page also states that since December 1992, "the majority of stormwater on the west side of the base has flowed through two 42-inch reinforced concrete pipes to the NASA settling basin and then into the Eastern Diked Marsh." Since upland areas on the west side of the base, which may be contaminated and/or undergoing remediation, may currently contribute to contaminant migration to the EDM via stormwater runoff, how will this influence the remedial decisions?

Similarly, page 5-4 states that the water entering the Lindberg Avenue drain is now routed to Building 191 Pumping Station. This pumping station apparently discharges this stormwater runoff, along with shallow groundwater, to the Northern Channel. The Northern Channel is one of the more contaminated area at MFA. How is it known what portion of the contamination in the Northern Channel is from historical discharges versus current discharge from stormwater runoff and shallow groundwater? DTSC suggests that post-remedial monitoring in the EDM and Northern Channel, may help answer some of these questions.

2. <u>Sediment to Pickleweed Transfer Coefficients (TC)</u>:

a. The comparison of PCB congener specific data to the

Aroclor data is limited due to analytical difficulties (refer to Dr. Mryto Petreas memorandum of January 10, 1996). Further, the location chosen for the collocated samples of sediment and pickleweed for both Aroclor and PCB congener analysis (SSRP-34 and PKWD-2), is not reflective of average concentrations of PCBs in the SWRP. The Aroclor 1260 analysis in the sediment was non-detected (Table 5-22, <26 ug/kg), while Table 5-11 indicates the mean concentration of Aroclor 1260 in sediments is considerably greater at 96.6 ug/kg. Since Aroclors were not detected at SSRP-34, a relationship between Aroclor concentrations and PCB congeners cannot be established. Refer to DTSC Human and Ecological Risk Division (HERD) memorandum of January 16, 1996. Therefore, these collocated samples are not representative of PCB contamination to which the salt marsh harvest mouse (SMHM) is exposed; this is a significant data gap that may result in underestimating the hazard to the SMHM since accurate transfer coefficients (TCs)or determination of dioxin-like PCB congeners cannot be quantified.

b. Similar to PCBs, organochlorine pesticides concentrations in sediments are not well-represented by the collocated samples (comparison of Table 5-22 to Tables 5-11 and 6-25). The concentrations organochlorine pesticides in the collocated sediment-pickleweed samples are considerably less than average exposure point concentrations to the SMHM. Sediment to plant TCs for the organochlorine pesticides were based upon soil to plant transfer in a terrestrial system (Travis and Arms, 1988). This extrapolation also imparts considerable uncertainty into the hazard estimates for the SMHM.

c. A comparison of metals concentrations in sediments upon which the sediment to plant TCs are based (Table I-49a), to the average exposure point concentrations for the SMHM (Table 6-25) reveals that antimony, cadmium, chromium, lead, selenium, and zinc are much higher in the SWRP than is represented by the collocated sediment-pickleweed samples. Therefore, there is uncertainty in the TCs.

DTSC recommends that these data gaps and limitations in sediment to pickleweed TCs be filled in the post-remedial monitoring plan.

d. There is an error in calculating the sediment-pickleweed TC for PCBs in Table I-49b. The TC should be calculated on a dry weight basis for both pickleweed and for sediment, since that is the format used in the

dose equations. This TC is incorrectly calculated on a TOC/lipid-normalized basis. In other words, the food ingestion rates are based upon dry weight amounts, not TOC/lipid-normalized ingestion rates, so the TC should be based on dry weights, as has been done for all the other contaminants. This same mistake appears to have been made for PAHs. Therefore, the dose estimates and hazard quotients for PCBs and PAHs for the SMHM need to be recalculated.

3. The collocated polychaete and sediment data collected in the SWRP, EDM, and NC have some unusual findings which limits their utility because chemical concentrations do not represent levels previously found in those areas. For example, samples SSRP-27, -29, -30, -31, -32 (SWRP) all have very low or non-detected values (detection limits range from 17 to 25 ug/kg) for Aroclor 1254 (refer to Table 5-20). However, Table 5-11 indicates that the mean sediment concentration for Aroclor 1254 is 198 ug/kg. Thus, the fact that little Aroclor 1254 was found in the polychaetes is not surprising. Unfortunately, these data cannot be considered representative of the SWRP. The sediment to aquatic invertebrate TC for PCBs used in this ERA was 3.9 (Table 6-4), based upon these collocated samples. However, Table I-14 indicates literature studies for PCBs TC may be higher, as much as 25.8 (also based upon a laboratory study). This data gap considerably increases the uncertainty of the transfer coefficients derived from these collocated samples, as well as estimates of higher trophic level tissue concentrations, for PCBs, and other organochlorine pesticides. DTSC recommends that this data gap be filled in the post-remedial monitoring plan.

The sediment to polychaete TCs for PAHs, PCBs, and organochlorine pesticides are based on a TOC/lipid normalized correction. This is not correct - the TC should be based upon dry weight concentrations since that is the form the food ingestion rates are based upon. Refer to our Specific Comment No. 2.d. above. Therefore, the dose estimates and hazard quotients for PCBs and PAHs for the great blue heron and black neck stilt (birds that ingest aquatic invertebrates) need to be recalculated.

3. Regarding the invertebrate collection and analysis in the upland and golf-course areas, page 6-19 states, "The results from the insect and earthworm analyses were insufficient for calculating site-specific transfer coefficients because (1) elevated reporting limits and (2) limited contamination in the abiotic samples that were collocated with the tissue samples...the lack of COPEC detections in the insect and earthworm tissues yielded no data with which to calculate site-specific transfer coefficients." Instead, the maximum

transfer coefficient (TC) cited from the literature review was used. This data gap increases the uncertainty of the transfer coefficients from soil to invertebrate, as well as estimates of higher trophic level tissue concentrations. However, the estimates are likely conservative, since maximum TC from the literature were used.

4. A study by Travis and Arms (1988) who developed a regression equation for soil-plant-cow contaminant transfer was used to estimate the terrestrial TCs for some of the terrestrial transfer coefficients for chlorinated pesticides (e.g. invertebrate to avian TC, plant to small mammal TC, plant to avian TC, plant to invertebrate TC). Similarly, the Travis and Arms regression equations were used to derive aquatic TCs for some chlorinated pesticide (sediment to plant TC, invertebrate to fish TC, and invertebrate to amphibian TC), and PCBs (invertebrate to amphibian TC). The ERA resorted to the Travis and Arms regression equations because there is a paucity of literature data on appropriate transfer factors. However, this increases the uncertainty in these TCs particularly since the regression equations are based upon the best fit, and may not be conservative. Also, the further removed from the system upon which the regression equations are based, the more uncertain are the TCs. For example, the Travis and Arms equations are not likely to represent aquatic systems, since they are based on terrestrial systems.

Also contributing to the uncertainty is use of a TC = 1 for PAHs and metals for which no literature data were available. This may underestimate, or overestimate, food-chain transfers.

In summary, some of the TCs are based upon conservative estimates from the literature, some are based upon regression equations which may not be conservative, or even applicable, and some TCs are arbitrary. The level of uncertainty in the TC directly impacts the level of uncertainty in the HQ estimates. This aspect should be discussed more specifically in the risk characterization sections.

5. Please clarify how TC were used when there were multiple transfer coefficients available. For example, in estimating the contaminant concentration in fish, one could use the TC for "sediment to fish", or one could use the TC for "sediment to invertebrates" to obtain an invertebrate tissue concentration, then use the "invertebrate to fish" TC to obtain a fish tissue concentration. For example, Table 6-15

contains estimates of total Aroclor in fish tissue (which the great blue heron ingests) of 167 mg/kg. However, if the invertebrate to fish TC of 51.5 (from Table 6-4) was used along with the estimated concentration of Aroclor in invertebrates of 29.7 mg/kg, one would estimate the fish tissue residue of Aroclor to be 1529 mg/kg (29.7 x 51.5).

6. Only p,p'-DDD,DDE, and DDT are reported in the tables, but toxicity reference values are based upon total DDT, including the o,p' isomers. We are not asking that all the tables be revised, instead indicate in the risk characterization summaries for DDT what percentage increase in DDT concentration the o,p'-isomers add the HQs.

7. Table I-2 uses a value of 9,700 mg/kg for lead as a maximum, while Table 5-13 indicates 76,000 mg/kg lead is the maximum. Also, Table I-2 uses a 95th UCL on mean of 251 mg/kg lead, but the mean value in Table 5-16 is 377 (the 95th UCL should be greater than the mean). Similar discrepancies occur in Table I-3 for the burrowing owl. Please clarify.

8. No toxicity reference values could be derived for avian receptors, due to limited data. However, PAHs have been shown to result in embryotoxicity to the developing embryo when externally applied to the egg. Since PAHs are present in the soil and sediment to which avian receptors are exposed, there is a potential for effects if the egg is in contact with the PAHs in soil or sediment. Sufficient information is not available at this time to quantify the risks. For the SMHM, toxicity values are available. However, Table 6-24 indicates that PAHs were not detected in sediments where the SMHM exists. In developing remedial strategies, it will be useful to evaluate the distribution of PAH contamination in relation to other contaminants.

9. Page 5-33 indicates that the sampling of the VOCs at burrowing owl burrows was conducted by sampling soil vapor "...from three burrow openings at each of the active burrow sites and one burrow opening at the inactive burrow site." The purpose of this sampling effort was to obtain an accurate estimate of the VOC concentrations <u>inside</u> the burrow where the female bird and young are spending most of the time, not at the opening. Since the <u>opening</u> of the burrow was sampled, it is not surprising that the sample results are not very different from ambient concentrations. For example, concentrations of xylene measured at the opening ranges from <2.0 to 12 ppb v/v. In contrast, soil gas survey data near Site 5 taken in 1991 at a depth of 5 feet are as high as 700 ppm (DON, August 8, 1996; August 16,

1996). These DON data also indicate that chlorinated solvents, including TCE and it's breakdown products, were also detected at high levels in this area, but these compounds were not analyzed in this ERA. In short, the exposure assessment for VOC inhalation to burrowing owls is not adequate.

We have conducted a cursory review of the toxicity information compiled in Appendix J for benzene, toluene, xylene and ethylbenzene (BTEX). We are not commenting at this time on these TRVS due to the inadequate exposure assessment. Due to the lack of information on inhalation toxicity studies in avian species, extrapolation from mammals has been done. There are inherent uncertainties in this approach, but it may be useful in a weight of evidence approach, once reasonable estimates of VOCs in burrow air are determined. The toxicity data for BTEX indicates, at air concentrations of 200 ppm to 2,500 ppm, significant reproductive, developmental, and teratogenic effects occur in mammals. It is not known whether similar effects occur in birds, or at what levels. We are particularly concerned with this exposure route because female burrowing owls nest in underground burrows, and the developing hatchling spends the first several weeks <u>inside</u> the burrow, only emerging as it matures. The very high levels of BTEX at MFA in Site 5 soil gas occur at levels close to that causing reproductive effects in mammals. We have made specific recommendations below regarding this issue for the final Phase II SWEA.

10. **Risk Summaries:** Tables 12-1 and 11b are not accurate reflections of the likelihood of adverse effects on individuals or populations. It is not exactly clear on how the low, medium, or high classification was done, but it appears to be conducted using only HQ1 estimates(average exposure estimates with high TRVs). The HQ1 estimates are NOT health protective. Page 7-21 of the report states that the high TRV was designed to "represent a level at which some adverse affects may likely occur", were chosen as a "mid-range of adverse effects", and "represents an exposure level that is expected to result in significant impacts on growth, reproductive success, or survival." Thus, HQ1 estimates greater than 1 would indicate that there can be expected to be significant adverse effects. We recommend a more accurate portrayal of the likelihood of adverse effects on the individual be evaluating for HQ3 greater than or equal to 1. However, it must be factored into the evaluation that localized areas of contamination may be adversely impacting individuals with small home ranges (e.g. salt marsh harvest mouse), or which may be exposed to localized areas of contamination during a sensitive life

stage (e.g. burrowing owl). Both the burrowing owl and salt marsh harvest mouse are special status species, so an evaluation of HQ4 one (high estimate of exposure combined with a low TRV) estimates greater than should also be discussed.

Summary of Recommendations for the Final Phase II SWEA

DTSC has the following summary of changes to incorporate into the Final Phase II SWEA. These will not address all uncertainties and data gaps noted above. DTSC anticipates post-remedial monitoring studies designed to address those uncertainties and data gaps, but the recommendations below will facilitate developing remedial strategies. In order to facilitate and expedite DTSC review of the Final Phase II SWEA, we request that a summary sheet be prepared indicating the changes and deletions made between the Draft Final and the Final.

1. **PCB Congener Evaluation** - Evaluate dioxin-like toxicity for select PCB congeners. Refer to DTSC memorandum of January 16, 1996, copy attached. Also, revise total PCB evaluation transfer coefficients for PCBs in pickleweed based upon dry weight, as indicated in our Specific Comment No. 1 above.

2. **PCBs and the SMHM** - The PCB high TRV for SMHM of 84 mg/kg-day is a based on an observed effect level, not a safe level. The exposure duration at which effects occur at that dose level in laboratory animals is 2 weeks. At chronic doses significantly below this in laboratory animals (1 to 2 mg/kg-day), there were significant adverse effects on male and female sex organs and reduced reproductive success. In particular, subsequent generations were successively more adversely affected. The low TRV for SMHM of 0.13 is based upon a effect level of 1.3 mg/kg-day in the second generation of offspring, when at the same dose, the first generation was not adversely affected to the same degree as the second generation. In other words, there is only a "margin of safety" of 10 fold above the low TRV before effects are predicted (based upon laboratory animals) to chronically exposed animals. The HQ3 (average dose with low TRV) is essentially one, and the HQ4 (high dose with low TRV) is 10. Therefore, the estimated doses of PCBs to the SMHM are within the range where adverse impacts may be expected. This evaluation does not consider the potential effects of dioxin-like PCBs (refer to Comment 1 above).

Since the home range for the SMHM is on average 1,372 square meters, or about 0.14 hectares (personal

communication, Jim Haas U.S. FWS, based upon SMHM at Mare Island), localized areas of contamination may be adversely affecting this animal. In addition, this species is endangered and so risks to individuals are of particular interest. DTSC requests that plots (similar to Figures 11-115 and 11-16) be developed for SMHM exposed to PCBs showing hazards for HQ4 and HQ3 from total PCBs, and separate figures for HQ4 and HQ3 from dioxin-like PCBs.

3. **SMHM risks** - DTSC requests that plots (similar to Figures 11-15 and 11-16) be developed for SMHM hazard to arsenic, lead, manganese, nickel, selenium, and zinc.

4. **Burrowing Owl** - The ERA should summarize all the soil-gas data for all VOCs present at MFA, including the chlorinated solvents. Figures showing the approximate location of owl burrows in relation to contour lines of soil-gas concentration should be developed. We recommend a separate figure for each VOC.

The data collected by Professor Lynne Trulio on the burrowing owl at Moffett, should be statistically analyzed by her to determine if owls at burrows near contaminated areas have lower reproductive or fledgling success. There appear to be four exposure scenarios for the owl: inhabiting relatively uncontaminated areas, inhabiting areas of high soil-gas concentrations (do not use the burrow opening samples), inhabiting areas with surface soil contamination, and inhabiting areas with both high soil-gas concentrations and surface soil contamination. This would require providing Professor Trulio with information on contaminated areas so she is able to group burrows into these four areas and conduct a statistical analysis. Note, it appears that owls feeding in the Northern Channel may also be ingesting aquatic animals (personal communication, Professor Trulio). We also recommend that Professor Trulio be asked for the home range and foraging areas (particularly during breeding) for the owls observed at MFA.

5. **Food-chain estimates for Raptors:** Clarify how the transfer of contaminants to prey items for raptors (burrowing owl and kestrel) were calculated.

6. **Transfer Coefficients:** Include in the discussion of uncertainties and risk characterization how the level of confidence in the transfer coefficients may impact the hazard estimates. Refer to our Specific Comment No. 4 above.

Summary

DTSC comments were restricted to the evaluation of hazards to birds and mammals. Overall, significant improvement has been made in these hazard estimates compared to the draft version. We have made specific comments on the Final document which we believe will clarify and improve the estimates of hazard to birds and mammals at MFA. DTSC appreciates the more cooperative effort with which the Navy and their contractors have exhibited for this Phase II analysis.

References

Department of the Navy (DON). August 8, 1996 and August 16, 1996. Facsimile transmittals from Don Chuck of the Moffett Federal Airfield Navy Environmental Office, to Laura Valoppi of the Department of Toxic Substances Control, summarizing information from the Phase I Site Characterization Report dated April 1991.

National Aeronautics and Space Administration/Ames Research Center (NASA). August 1995. "Sensitive Species Surveys at Moffett Field, 1994" prepared by San Francisco Bay Bird Observatory and U.S. Fish and Wildlife Service.

STATE OF CALIFORNIA — ENVIRONMENTAL PROTECTION AGENCY

PETE WILSON, Governor

DEPARTMENT OF TOXIC SUBSTANCES CONTROL

REGION 2
700 HEINZ AVE., SUITE 200
BERKELEY, CA 94710-2737

FILE

January 23, 1996

Commander
Department of the Navy
Engineering Field Activity, West
Naval Facilities Engineering Command
Attn: Mr. Stephen Chao, Project Manager
900 Commodore Drive, Bldg. 101
San Bruno, California 94066-2402

Dear Mr. Chao:

PHASE II SITE-WIDE ECOLOGICAL ASSESSMENT(SWEA), MOFFETT FEDERAL AIRFIELD (MFA)

The Department of Toxic Substances Control (DTSC) has provided critical comments regarding the Draft Phase II SWEA Report on Dec. 8, 1995. To further assist the Navy in evaluating the polychlorinated biphenyl (PCBs) congener-specific data in the Phase II SWEA, the Department is forwarding the following recommendations for your considerations. If you have any questions, please contact me at (510) 540-3830.

Sincerely,

C. Joseph Chou
Remedial Project Manager
Base Closure Unit
Office of Military Facilities

Enclosures

cc:

Mr. Michael Bessette
Regional Water Quality Control Board
2101 Webster Street, Suite 500
Oakland, California 94612

Ms. Susan Gladstone
Regional Water Quality Control Board
2101 Webster Street, Suite 500
Oakland, California 94612

California Regional Water Quality Control Board
San Francisco Bay Region

Date:	August 15, 1996	File No.	2189.8009(sfg)
To:	Joseph Chou, DTSC	Prepared By:	Susan Gladstone SFG

Subject: Moffett Federal Airfield Remedial Investigation/Feasibility Study Draft Final Phase II Site-wide Ecological Assessment Report, dated May 1996

General Comments:

1. In general, my comments focused on the water quality issues of sections 6.0 through 9.0 where the majority of the the characterization and exposure assessment is detailed. The prior sections focused on the basis for the Phase II SWEA and the subsequent sections summarized that information detailed in sections 6.0 through 9.0. However, the issues identified in the Specific Comments section pertain to any section of the report where they are discussed.

2. For perspective on the overall outcome of the assessment, some of my comments on various aspects of the evaluation are framed in terms of high, medium, or low confidence.

3. There seems to be some confusion on the part of the authors about the relationship of the measurement endpoints to assessment endpoints with respect to the bioassays. The authors' implication is that the qualitative benthic community survey did not identify any of the species similar to those used in the bioassays and, therefore, the Moffett sediments would not pose a risk if those species are not present. Or, because the surface water bioassay species are not indigenous to Moffett, the bioassay results therefore involve a level of uncertainty because there is a difference in sensitivity between test organisms and species at the site. This evaluation is simplistic and inaccurate.

   One of the goals for the ecological risk assessment is to determine impact to beneficial uses, in this case the wetland habitat, the diked marshes, the channels, the ditches, and potentially, the bay. One of the tools to evaluate that impact is the use of laboratory test organisms to evaluate impacts to sensitive endpoints (reproduction, development, survival, and growth) of aquatic species. The species used for the bioassays are selected because they work well in a laboratory setting to measure those particular endpoints. They are not meant to signify that effects are being evaluated only for those particular types of species; they are meant to represent responses to sensitive aquatic species. The relevance of the assessment endpoint to the measurement endpoints is in determining adverse effects to aquatic species which may pose a threat to the beneficial uses of that system.

Specific Comments:

Section 4.0: Ecosystem Characterization

1. **Section 4.2.2.1, Hydrological, Physical, and Chemical Characteristics, Sediment:** The Navy should indicate whether sediment concentrations were normalized to total organic carbon for purposes of comparisons across the site.

Section 6.0: Characterization of Exposure

2. **Sections 6.1.8 and 6.2.8, Determination of Exposure Point Concentrations for COPECs Detected in Surface Water and Sediment:** The Navy has not described the rationale for the approach used in calculating Exposure Point Concentrations (EPC) for surface water and sediment. The Navy should provide this discussion, including (i) why the maximum value **or** the 95% UCL is not considered for the sediment EPCs, (ii) why the mean sediment value is used for geographic areas with five or less COPEC detections but not for those areas with COPECs detected greater than five times, (iii) what the basis is for selecting five detections as the cut off, and (iv) why different approaches are used for calculating surface water and sediment EPCs.

3. **Section 6.2.2, COPEC Properties:** The Navy calculated theoretical porewater concentrations from measured concentrations in bulk sediment. RWQCB staff have low to medium confidence in the equilibrium partitioning (EqP) approach to determining theoretical porewater concentrations for organics, primarily because (i) it assumes steady-state conditions, which may not be the case for Moffett Field and is generally believed not to be the case for San Francisco Bay, (ii) it is unclear if the model is applicable for different types of organic chemicals, and (iii) the model will be difficult to validate with measured porewater concentrations because there is limited site-specific data. While these issues are noted elsewhere in the document, the Navy should address or acknowledge these concerns as limitations of the approach within the same section (Section 6.2.2) as they are first discussed.

4. **Section 6.5.1, Exposure Assessment Uncertainties - Surface Water Receptors:** The last sentence of the first paragraph, page 6-31, indicates that the assumption of steady-state conditions likely results in an overestimation of chemical concentrations. The Navy has not fully represented all possible scenarios, in that assuming steady-state may also underestimate chemical concentrations if current physical conditions at the site change in the future which allow contaminants to be released, or possibly completing an exposure pathway that is current incomplete. The Navy should modify this sentence.

5. **Section 6.5.1, Exposure Assessment Uncertainties - Surface Water Receptors (Six potentially significant areas of uncertainty):** The fifth full

paragraph, **Comparison to Background Concentrations**, page 6-32, indicates that the Navy was unable to identify a reference site for comparison of surface water samples. This issue leads to uncertainty of whether detected metal concentrations in site samples are naturally-occuring or indicate possible contamination. The Navy can partially reduce this uncertainty by comparing the Moffett surface water samples to ambient concentrations in the South Bay surface water measured by the San Francisco Estuary Institute's (SFEI) Regional Monitoring Program (RMP) beginning 1993 through 1994 (data collected in 1995 has not yet been published, but may be available by contacting SFEI).

One of the goals of the RMP is to identify trends in ambient (not to be confused with naturally-occuring background) surface water concentrations to determine the overall health of the Bay. Because the Northern Channel is in contact and mixes with Bay waters, RMP data would provide some sense as to whether the Moffett site samples fall in the range of ambient, or may represent contamination. A cursory comparison of Moffett's mean surface water concentrations in Ditches and Channels (Table 5-1) to the RMP trace metals data indicates that zinc, lead, silver, selenium, mercury, arsenic, chromium, and cadmium fall above the range of 1993-1994 RMP data. RWQCB staff recommend this comparison be evaluated further and discussed in the light of uncertainty about surface water inorganic concentrations in the Northern Channel.

6. **Section 6.5.2.3, Bioavailability of COPECs:** This section discusses uncertainty in determining the bioavailability of contaminants measured in bulk sediments and effects observed in the bioassays. It indicates that the polychaete bioassay data, which showed no mortality, suggests that the contaminants may not be bioavailable. The Navy should also note in this section, as mentioned elsewhere in the report, that the lack of mortality may also reflect the low sensitivity of this particular test species.

Section 7.0, Toxicity Assessment:

7. **Section 7.1.1, Surface Water Receptors, Basis of Benchmarks and Section 7.2.2, Pore Water Toxicity Benchmarks:** The Navy has utilized the California Water Resources Control Board, Water Quality Control Plan for Enclosed Bays and Estuaries (Statewide Plan) as screening values for surface water samples. This document should not be used or cited because it was ruled invalid due to SWRCB procedural violations by a court decision in 1993. Until the Statewide Plans are promulgated, the Navy should rely on the US EPA Ambient Water Quality Criteria for Protection of Aquatic Life. This modification will not substantially change the calculations or comparisons performed in Sections 8.0 and 9.0.

8. **Section 7.2.1, Bulk Sediment Toxicity Benchmarks:** The Navy has listed a

set of sediment quality guidelines used to evaluate bulk sediment toxicity. I do not recall the Navy requesting nor the agencies agreeing to the approach (page 7-5) for identifying appropriate sediment toxicity benchmarks. We have some concern about using some of the guidelines described on page 7-4. In particular, RWQCB staff have asked the Navy at other installations not to utilize the 1989 Northern California amphipod and bivalve AETs because the limited number of data points in that particular dataset significantly lowers our confidence in the representativeness of those AET values. This also applies to the AET values selected from the Long and Morgan 1991 report because it used the AETs from the 1989 Northern California document. We also have low confidence in values derived for other locations because we do not know how representative they are of San Francisco Bay conditions.

We acknowledge the lack of sediment benchmarks or guidelines for some of the Moffett COPECs. We also recognize the need for a screening value to get a sense of the whether or not the bulk concentrations may pose an adverse effect to invertebrate receptors. However, we must indicate that we have lower confidence in the hazard quotients (HQ) derived utilizing AETs from Puget Sound, values from Province of Ontario, EqP values, and 1989 Northern California AETs than the Long, et al 1995 ER-Ls. The 1995 ER-Ls are not San Francisco Bay-specific but values derived from numerous nationwide studies. However, they have been generally accepted as screening values in lieu of San Francisco Bay-specific values at other Navy installations.

9. **Section 7.2.3, Sediment COPECs Without Toxicity Benchmarks:** The Navy indicates that potential risk from these contaminants (petroleum and nonpetroleum hydrocarbons) would be assessed qualitatively. This section requires a detailed discussion of how this was accomplished. I could not locate any discussion of hydrocarbon contaminant-associated risk anywhere else in this report.

10. **Section 7.2.4, Biological Significance of Benchmarks:** The last sentence in this section on page 7-8 indicates that using benchmarks reflecting adverse effects to sensitive aquatic species can be used to draw conclusions about impacts to less sensitive species. The Navy should describe how this would be accomplished. One general goal of an evalution of impact to aquatic receptors is to protect the most sensitive species or determine impact to beneficial uses, not to demonstrate no risk to less sensitive species.

Section 8.0: Characterization of Potential Adverse Effects on Endpoint Receptors:

11. **Section 8.3.1, Benthic Receptors, Stressor-Response Analysis:** It is unclear how the Navy can determine the duration of adverse ecological effects (third objective to identify evidence of causality) from the study as designed. The Navy should clarify this point.

12. **Section 8.3.1.2, Presentation of Sediment COPEC Hazard Quotients, Summary of Bulk Sediment and Pore Water Hazard Quotients:** On page 8-14, the Navy should indicate that bivalves, polychaetes, and amphipods may also be adversely affected by COPECs in porewater, as well as in bulk sediments.

13. **Section 8.3.1.3, Evaluation of Synoptic Bioassay and Chemistry Data, Porewater Sulfide and Ammonia Data:** This section discusses sulfide and ammonia as potential stressors which may have affected the results of the echinoderm bioassay. It raises the issue of the proportions of H_2S and HS^-, their relationship to pH, and the potential toxicity to test organisms. It also discusses the reported ammonia concentrations in porewater and what effect it might have had on the bioassays. There are some discrepancies and clarifications required regarding the sulfide and ammonia data.

    First, the sulfide data in Table C-1.6.1 (Appendix C; there is no designation for the units in this table) does not indicate whether the measured value is total sulfides or speciated, and whether the sulfide and ammonia was measured on the 100% concentrations only or if the dilutions were also measured (a dilution series was developed for this Northern Channel porewater bioassay). This is critical because sulfide and ammonia concentrations are compared to USEPA criterion for aquatic species and also because H_2S is described as being the toxic form of sulfide to aquatic species. The Navy should indicate what the relationship might be in sulfide and ammonia concentrations in the diluted samples and whether they might have played a role in observed toxicity for those samples.

    Additionally, there is a discrepancy in the text and Table C-1.6.1 in the reported pH; pH affects the proportion of each sulfide species. According to the USEPA citation, at pH 7 the sulfide is equally divided between HS^- and H_2S, and HS^- increases with increasing pH. For the reported pH for the echinoderm bioassay, the text indicates 7.9 to 8.1; the Table C-1.6.1 (and also Table 4-3) indicates 7.2 to 7.5 for Northern Channel porewater samples. The Navy should confirm the correct values.

    Lastly, the USEPA criteria cited for ammonia and sulfide are objectives for receiving waters. The Navy should also evaluate the ammonia and sulfide tolerances to test species since laboratory conditions may be different than conditions in the field. Anderson and Knezovich, 1995 provide ammonia and sulfide toxicity for some laboratory species.

14. **Section 8.3.1.4, Relationship of Measurement Endpoints to Assessment Endpoints and Section 8.6.2, Uncertainties, Benthic Receptors:** There appears to be some confusion in this document about the selection of the sediment bioassays as measurement endpoints and their relationship to the assessment endpoint designated for Moffett as protection of the wetland

habitat. The Navy has implied that the bioassays performed on laboratory test organisms with Moffett sediments reflects how those particular species would respond in the field. A major uncertainty is stated as whether adverse effects observed in the laboratory species are based on the *correct* or *resident* (Navy's terminology) species at Moffett. The measurement endpoints were selected, in fact, to evaluate survival, growth, reproduction, and development of benthic invertebrates exposed to Moffett sediments. The particular species are selected because of their utility in a laboratory setting to measure those particular endpoints; they are not meant to signify that effects are being evaluated only for those particular types of species.

15. These sections, and in other locations where the above idea is carried through, should be revised to reflect the correct use of the measurement endpoints. This should include the following modifications on page 8-22:

Bullet #1: "Bulk sediment HQ and HI information . . . potential adverse effect of sediment COPECs on ~~amphipod and polychaete benthic invertebrate~~ populations in the wetland habitats." Toxicity benchmarks generally include effects to a variety of benthic invertebrate species, not just to amphipods and polychaetes.

Bullet #3: "Amphipod survival and polychaete survival and growth ~~information from~~ laboratory bioassays were used ~~as a tool~~ to evaluate the potential adverse effects posed by sediments to ~~populations of amphipods and polychaetes at each of the benthic invertebrates which might inhabit~~ the wetland habitats."

Bullet #5: The Navy should describe how the echinoderm development test on Northern Channel sediments was used to determine adverse effects from the diked marshes and the stormwater retention ponds.

16. **Section 8.6.2, Uncertainties, Benthic Receptors:** The uncertainties as stated in this section should be similar to those as stated in the previous section for risk characterization for surface water receptors. That is, with these tools, uncertainties are inherent in deriving COPEC EPC, exposure frequency, toxicity benchmarks, and bioassay results. The Navy should modify this section to include the language in Section 8.6.1.

17. **Tables 8-1, 8-2, and 8-3, Hazard Quotients for Surface Water in Eastern Diked Marsh, in Stormwater Retention Ponds, and in Ditches and Channels:** There are discrepancies in the Surface Water Reference

Concentrations listed for some chemicals and those noted in Table 7-1 Literature Surface Water Benchmarks. The Navy should check and revise the tables and the calculated HQs.

LMW PAHs:	It is unclear where the value 0.0046 mg/L came from, as it is not listed in Table 7-1.
gamma-BHC:	It is unclear where the value 0.00016 came from, as it is not listed in Table 7-1.
p,p'-DDD p,p'-DDE p,p'-DDT	Values used are not presented in Table 7-1
total DDT:	No value is given for this COPEC; a value of 0.001 µg/l is listed Table 7-1 as the marine chronic AWQC.

18. **Tables 8-5, 8-7, 8-9, and 8-11, Hazard Quotients for Porewater in Eastern Diked Marsh, in Stormwater Retention Ponds, and in Ditches and Channels:** It is unclear from these tables which porewater values are theoretical and which were actually measured. The Navy should clarify this in the notations.

Section 9.0: Characterization of Ecological Risk:

19. **Section 9.1.6, Risk Estimation - Surface Water Receptors, Analysis of Risk Estimate Uncertainties:** The Navy should justify the statement on page 9-10 that an assumption of steady-state conditions probably results in an overestimation of chemical concentrations (see also comment # 4).

20. **Section 9.2, Risk Estimation - Sediment Receptors and Section 9.2.2, Interpretation of Bioassay Data:** The third paragraph on page 9-12 should be modified to indicate that the measurement endpoints used to characterize the risk to benthic receptors included invertebrate bioassays to **determine effects of survival, growth, development, and reproduction**. The bottom of page 9-16 should be modified to indicate that bioassay data are interpreted based on responses of the four test species and their associated endpoints (survival, growth, development and reproduction). On page 9-17, the top paragraph should be modified to indicate that " the objective of the evaluation was to determine whether there is a low, moderate, or high potential risk to ~~these~~ benthic receptors." The risk estimation is not to determine impact to test species. Please see comment #14 for the basis of these comments.

21. **Section 9.2.1.1, COPEC Risk Drivers (sediment receptors):** The Navy should provide the basis for using the approach described to determine COPEC risk drivers for bulk sediments and how it compares to observed biological

responses. The Navy should also state why this approach was not used to determine the surface water risk drivers.

22. **Section 9.2.7, Risk Estimate Uncertainties (sediment receptors):** The Navy should also note in this section that the study design did not provide for uniform coverage of the entire site.

Section 11.0: Risk Description - Sediments

23. **Section 11.1.5.1, Confidence in Risk Estimates for the Four Geographic Areas:** The Navy indicates that the COPEC HQs are based on high quality data representing good spatial coverage of potentially hazardous concentrations. RWQCB staff believe that this statement is incorrect, that in fact because the sampling design was nonrandom, we do not have good spatial coverage. Although the study design was to focus on areas believed to be highest in contaminant concentrations, with this purposive sampling approach, there will remain some level of uncertainty as to whether all high contaminant areas were evaluated. The Navy should include a statement in this section reflecting this uncertainty.

concur: Ron Gervason, Section Leader

Ron Gervason

References:

Anderson, S.L. and Knezovich, J.P., 1995. *Potential Positive Interferences in Sediment Toxicity Tests, A Briefing Report to The In-Bay Studies Work Group of Interagency Long Term Management Strategy Committee*, September 26.

San Francisco Estuary Institute, 1994. *San Francisco Estuary Regional Monitoring Program for Trace Substances 1994 Annual Report*

cc: Micheal Bessette, RWQCB
Clarence Callahan, US EPA
Laura Valoppi, DTSC
Jim Haas, USFWS
Laurie Sullivan, NOAA

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY PETE WILSON, *Governor*

DEPARTMENT OF TOXIC SUBSTANCES CONTROL
301 Capitol Mall, 2nd Floor
Sacramento, CA 95814
Mail: P. O. Box 806
Sacramento, CA 95812-0806
Voice: (916) 327-2513
Fax: (916) 327-2509

MEMORANDUM

TO: C. Joseph Chou
Office of Military Facilities
Region 2
700 Heinze Avenue, Suite 200
Berkeley, California 94710

FROM: Laura M. Valoppi, M.S. LM Valoppi
Associate Toxicologist
Office of Scientific Affairs (OSA)
Human and Ecological Risk Section (HERS)

DATE: January 16, 1996

SUBJECT: Moffet Field, Site Wide Ecological Assessment - PCB congeners
PCA = 14740, Site = 200068/45

This memorandum is a follow-up to our HERS memorandum, dated December 8, 1995, on the Moffett Field Phase II Site Wide Ecological Assessment (SWEA). As part of the assistance HERS is providing to the Navy contractors in the development of wildlife toxicity reference values, the contractors requested that HERS clarify our recommendations for using the polychlorinated biphenyl (PCBs) congener-specific data collected for Phase II.

Background

1. The analytical methods for PCB mixtures (e.g. Aroclor 1254, 1260, etc.) are based on visual recognition of patterns of peaks in the sample and a comparison to the pattern of peaks in a standard Aroclor. The peaks do not necessarily correspond to individual PCB congeners; one or more congeners may elute under the same peak. When these methods are applied to samples of weathered environmental material (e.g. sediments) or biota, they become semi-quantitative because the patterns of the originally spilled Aroclors have changed through biodegradation or metabolism. These changes make the comparison to the standard Aroclor mixtures problematic. There is evidence to indicate that the PCB congeners with toxicity similar to 2,3,7,8-tetrachlorodibenzo-p-

dioxin (TCDD) are among those enriched or retained. These congeners include the non-ortho, di-ortho, and mono-ortho substituted PCB congeners (Refs. 1,2,6,7,9).

Therefore, Aroclor analytical methods may not identify a biological sample as containing an Aroclor mixture, when in fact the biota contain PCB congeners. Another consideration is the detection sensitivity of the PCB congener analysis is better, by a few orders of magnitude, than the Aroclor analytical methods. Therefore, a sample of soil, sediment, or biota may not detect the presence of Aroclor mixtures, while the same sample analyzed using the PCB congener methods may detect the presence of PCBs. For these reasons, reliance on the Aroclor data alone is insufficient in evaluating the PCB toxicity to wildlife, in particular when food-chain transfer may be a dominant pathway.

An example of this phenomenon is the pickleweed and sediment data collected at Moffett at locations SSRP-34. The Aroclor analysis failed to detect any of the Aroclor mixtures in either sediment or pickleweed. Nonetheless, several PCB congeners were found in the pickleweed, and sediment using congener-specific analysis. One reason is the Aroclor analysis has detection limits of about 10 to 26 ppb, while the congener specific analysis has detection limits considerably lower at about 1 x 10^{-3} ppb. Another possible reason is the issue of degradation or biological uptake resulting in the selective enrichment of the higher chlorinated congeners.

2. It is widely reported in the literature that the non-ortho, mono-ortho, and di-ortho PCB congeners exhibit effects similar to TCDD in a variety of birds and mammals. The PCB congeners which are most potent TCDD-mimics include PCB 77, 126 118, 153, 180, 156. (Refs. 1, 2, and 3). Several authors indicate that the evaluation of PCB toxicity based on the Aroclor mixture alone can underestimate toxicity compared to that determined by accounting for the selective enrichment of the more toxic PCB congeners. (Refs. 9, 10)

3. Due to the selective retention of certain PCB congeners, including congeners which have TCDD-like toxicity, several authors have used a toxicity equivalency factor (TEF) approach for those PCB congeners which exhibit TCDD-like toxicity. (Refs. 3, 4, 5, 8, 10, 12). One drawback to the TEF approach is that additivity of the toxicity is assumed. There is some evidence that there may be antagonistic interactions between nonTCDD-like PCBs and the TCDD-like congeners (Ref. 3). Other authors suggest that there may be synergistic (greater than additive) effects among combinations of the di-, mono, and non-ortho-substituted PCBs (Ref. 12). Therefore, the TEF approach may overestimate, or perhaps even underestimate, the toxicity of PCBs.

Recommendations

It is for the reasons stated above that OSA originally requested that congener-specific PCB analysis be conducted in Phase II, in addition to the Aroclor analysis. Due to the higher cost of the congeners specific analysis versus the Aroclor method, the Navy was reluctant to conduct congener-specific analysis on all Phase II SWEA samples. So, it was agreed that all Phase II samples would have Aroclor analysis, while a limited subset of samples would be analyzed using congener-specific methods. The congener-specific data would then be extrapolated to other locations where only Aroclor data were available. HERS has the following recommendations for evaluating the PCB congener-specific data in the Phase II SWEA:

A. Determine ratios of toxicologically/environmentally important congeners to the Aroclor data, and apply these ratios to estimate these congener concentrations at locations where only Aroclor data are available. Refer to Dr. Mryto Petreas memorandum for specific details and examples, dated January 10, 1996 (attached). In this manner, congener concentrations for the most relevant TCDD-like congeners can be estimated. As Dr. Petreas points out, the limited data set for congener-specific analysis means that there will be uncertainties in the congener-specific estimates. However, as the summary data presented by Dr. Petreas indicates, reliance on the Aroclor data alone does not provide a full description of the nature of PCB contamination at Moffett Field.

There is a matched set of congener-specific and Aroclor data for sediments and polychaetes at Moffett Field. However, for the pickleweed data, sample location SSRP-34 did not detect Aroclors, while congener-specific PCBs were detected. Because of this, ratios of congener-specific PCBs to Aroclor concentrations can not be developed for pickleweed . Thus, the congener-specific data for pickleweed cannot be extrapolated to other locations at Moffett. We suggest that the SSRP-34 congener-specific data for pickleweed be used to estimate incidental sediment ingestion and food-chain dioxin-like PCB doses to the salt marsh harvest mouse, and uncertainties and data gaps be discussed in the SWEA. This will underestimate toxicity from dioxin-like PCBs since other areas of pickleweed habitat have detected Aroclors.

While it is true that different Aroclor mixtures can vary in the congener concentrations, the source to the wetlands at Moffett Field has been from the release of contaminants in stormwater drains at select locations and subsequent deposition in sediments. Apparently, this discharge has occurred over a number of years. This manner of deposition could be expected to result in a more homogeneous mixture than if the release where discreet spills or disposal directly to different locations in the wetlands. Nevertheless, there is uncertainty in extrapolating from the limited number of

congener-specific analysis, which can be reduced only by taking more congener-specific samples.

B. Choose TEFs from applicable references (e.g. Refs. 3,5 for mammals; Ref. 4 for birds). While the data for bird species indicates a wide number of species are sensitive to the TCDD-like effects of these PCB congeners, to date only TEFs based on chicken data are available in the open literature. However, not all the representative bird species chosen at Moffett have been tested using the TCDD-like PCB congeners. Therefore, use of the TEFs for birds cited in Bosveld et al. (1995) may be conservative since there is some indication in the literature that chickens are among the most sensitive species tested for TCDD-like toxicity.

C. Use the TEFs chosen in B., along with the PCB congener concentrations determined in A., to calculate a toxicity equivalency concentration (TEQ). This TEQ is a single value which represents the relative contribution, based on TCDD-like potency, in a sample. This is very similar to what is typically done to estimate the relative contribution to toxicity of polychlorinated dibenzo-p-dioxin and polychlorinated dibenzofuran mixtures (PCDD/Fs). This TEQ can then be used in the dose calculations. Depending on the data analysis in A., a separate TEQ may be needed for sediment, pickleweed, and polychaetes.

D. Use wildlife toxicity reference values (TRVs) based upon TCDD toxicity data and uncertainty factors presented in U.S. EPA (Ref. 13). Separate data are presented for birds and mammals. This follows a similar recommendation we have made for Moffett Field TRVs for DDTr and mercury. The TCDD TRVs, along with the TEQ dose estimates made in C. above, can be used to develop hazard quotients for vertebrate species at Moffett Field.

Summary

Due to the selective retention of PCB congeners by biota, and because certain PCB congeners are potent TCDD-mimics, reliance on the Aroclor data alone would provide a misleading representation of the potential PCB hazards to wildlife, and may underestimate toxicity. The approach recommended above for select PCB congeners, in addition to the evaluation of the Aroclor toxicity already proposed by the Navy and their contractors, will provide a fuller description of potential hazards to wildlife from PCB to the remedial managers for their consideration in evaluating possible remedial actions. OSA is well aware that the approach suggested for PCB congeners has uncertainties. However, in the absence of additional congener-specific samples, these are the only data available at Moffett Field.

If you have any questions, please contact me at (916)327-2513.

Attachment (1)

Peer Reviewed: Gerald Chernoff, Ph.D.,
Staff Toxicologist

References

1. McFarland, V.A. and J.U. Clarke. 1989. *Environmental Occurrence, Abundance, and Potential Toxicity of Polychlorinated Biphenyl congeners: Considerations for a Congener-specific Analysis.* Environ. Health Persp. , 81:225-239.

2. Metcalfe, C.D. and G.D. Haffner. 1995. *The ecotoxicology of coplanar polychlorinated biphenyls.* Environ. Rev. ,3: 171-190.

3. Ahlborg, U.G., GC Becking, L.S. Birnbaum, A. Brouwer, HJGM Derks, M. Fee, G. Golor, A. Hanberg, J.C. Larsen, AKD Liem, S.H. Safe, c. Schlatter, F. Waern, M. Younes, E. Yrjanheikki. 1994. *Toxic Equivalency Factors for Dioxin-Like PCBs.* Chemosphere, 28(6):1049-1067.

4. Bosveld, A.T.C., J. Gradener, A.J. Murk, A. Brouwer, M.van Kampen, E.H.G. Evers, and M. Van den Berg. 1995. *Effects of PCDDs, PCDFs and PCBs in Common Tern (Sterna hirundo) Breeding in Estuary and Coastal Colonies in the Netherlands and Belgium.* Environ. Tox. and Chem., 14(1):99-115.

5. Safe, S. 1990. *Polychlorinated Biphenyls (PCBs), Dibenzo-p-Dioxins (PCDDs), Dibenzofurans (PCDFs), and Related Compounds: Environmental and Mechanistic Considerations Which Support the Development of Toxic Equivalency Factors (TEFs).* Crit. Rev. Toxicol., 21(1):51- 88.

6. Focardi, S., C.Leonzio, and C. . 1988. *Variations in Polychlorinated Biphenyl congener Composition in Eggs of Mediterranean Water Birds in Relation to Their Position in the Food Chain.* Environ. Poll., 52:243-255.

7. Tillitt, D.E., G.T. Ankley, J.P. Giesy, J.P. Ludwig, H. Kurita-Matsuba, D.V. Weseloh, P.S. Ross, C.A. Bishop, L Sileo, J. Larson, T.J. Kubiak. 1992. *Polychlorinated Biphenyl Residues and Egg Mortality in Double-crested Cormorants from the Great Lakes.* Environ. Tox. and Chem., 11:1281 - 1288.

8. Rattner, B.A., J.S. Hatfield, M.J. Melancon, T.W. Custer, D.E. Tillitt. 1994. *Relation among Cytochrome P450, Ah-Active PCB Congeners, and Dioxin Equivalents in*

Pipping Black-crowned Night-heron Embryos. Environ. Tox. and Chem., 13 (1)805-1812.

9. Ludwig, J.P., J.P. Giesy, C.L. Summer, W. Bowerman, R. Aulerich, S. Bursian, H.J. Auman, P.D. Jones, L.L. Williams, D.E. Tillitt, and M. Gilbertson. 1993. *A Comparison of Water Quality Criteria for the Great Lakes Based on Human and Wildlife Health.* J. Great Lakes Res. ,9(4):789-807.

10. Giesy, J.P., W.W. Bowerman, M.A. Mora, D.A. Verbrugge, R.A. Othoudt, J.L. Newsted, C.L. Summer, R.J. Aulerich, S.J. Bursian, J.P. Ludwig, G.A. Dawson, T.J. Kubiak, D.A. Best, D.E. Tillitt. 1995. *Contaminants in Fishes from Great Lakes-Influenced Sections and Above Dams of Three Michigan Rivers: III. Implications for Health of Bald Eagles.* Arch. Environ. Contam. Toxicol., 29:309-321.

11. Tillitt, D.E., T.J. Kubiak, G.T. Ankley, and J.P. Giesy. 1993. *Dioxin-like Toxic Potency in Forster's Tern Eggs from Green Bay, Lake Michigan, North America.* Chemosphere, 26 (11):079-2084.

12. Leonards, P.E.G., T.H. deVries, W. Minnaard, S. Stuijfzand, P.de Voogt, W.P. Cofino, N. M. van Straalen, and B. van Hattum. 1995. *Assessment of Experimental data on PCB-induced Reproduction Inhibition in Mink, Based on an Isomer- and Congener-specific Approach Using 2,3,7,8 tetrachlorodibenzo-p-Dioxin Toxic Equivalency.* Environ. Tox. and Chem., 14(4):639-652.

13. U.S. Environmental Protection Agency. March 1995. *Great Lakes Water Quality Initiative Criteria Documents for the Protection of Wildlife, DDT, Mercury, 2,3,7,8-TCDD, PCBs.* Office of Water, EPA-820-B-95-008.

cc: Michael J. Wade, Ph.D., D.A.B.T.
Senior Toxicologist, HERS

Clarence Callahan, Ph.D. (H-9-3)
Technical Support Section
U.S. Environmental Protection Agency
75 Hawthorne St.
San Francisco, CA 94105

Michael Martin, Ph.D.
California Department of Fish and Game
20 Lower Ragsdale Drive
Suite 100
Monterey, CA 93940

Jim Haas
U.S. Fish and Wildlife Service
3310 El Camino Ave., Suite 130
Sacramento, CA 95821

Laurie Sullivan
Coastal Resources Coordinator (H-1-2)
National Oceanic and Atmospheric Administration
c/o U.S. Environmental Protection Agency
75 Hawthorne St.

Susan Gladstone
San Francisco Regional Water Quality Control Board
2101 Webster Street, Suite 500
Oakland, CA 94612

To: Laura Valoppi, OSA

From: Myrto Petreas, HML MP

Date: January 10, 1996

Re: PCB data at Moffet

Following our meeting last week, I reviewed in more detail the PCB data contained in the Draft Phase II Report for Moffet. My task was to assess:

1 How congener-specific PCB data and Aroclor data for the same samples compared;

2 Whether Aroclor data could be used to estimate congener-specific PCB data for sediments and biota.

The attached table summarizes data for the sediment/pickleweed (SSRP-34) and the sediment/polychaete (SSWL-22) sets. Please note that all measurements are in the same units (pg/g). Also note that the value for Total PCB for sediment SSWL-22 in the report is incorrect. The correct value (calculated by summing the total mono- to deca-PCB) is in the table. Of all individual congeners I chose to show only the 3 coplanars (77, 126, 169) which are the most toxic; and PCB 105 and 118 as examples of prevalent and toxic mono-orthos. The table could be expanded to include all other PCB congeners reported, particularly those with an assigned TEF value.

Please note that I have not received any reply to the comments I had submitted to Joseph and, therefore, I have no information on the methodology used in the congener analysis in order to judge its quality. For the purpose of this task I will assume that the congener PCB data are accurate and valid. I will also assume that the samples bearing the same ID are homogeneous, i.e., the two labs who performed the analyses (Aroclor and congeners) did so on the same homogeneous (or previously homogenized) sample.

This brings up the first striking observation. Looking at sediment SSWL-22 (the only sample with complete data), PCB 118 is 58% of Aroclor 1254. This is very irregular, given that PCB 118 is usually ~10% of 1254. Even more irregular is the comparison of PCB 118 with Aroclor 1260, where PCB 118 appears to be over twice the concentration of 1260. Usually, PCB 118 is 5-10% of 1260. There is clearly some big error here. One explanation may be the semiquantitative nature of Aroclor analysis on weathered or metabolised materials. A review of the Aroclor chromatograms may reveal lack of fit to assumed patterns. Such inaccuracies are the basic reasons that congener-specific PCB analysis is such a breakthrough. Similar conclusions can be drawn by observing the ratios of PCB 105 and Aroclors.

It is unfortunate that we only have one sample with complete data.

However, we could use that sample as a crude tool to translate Aroclor data to congener data in sediments. Using the ratios shown in the table, all maps showing Aroclor data could generate maps showing estimated PCB 118, 105, etc. I feel more confident about such prevalent and abundant congeners than I do about the coplanar PCBs. The reason is that the latter are present at very low levels and any extrapolation may introduce great error. Of course, one could estimate coplanar PCBs, keeping this caveat in mind as long as these concentrations are considered crude estimates. TEFs could then be applied and toxic equivalents (TEQs) calculated for each sediment sample. I would suggest you calculate TEQs with and without the coplanars to determine a range of TEQs. This could serve as a screening tool by which one could evaluate the potential toxicity of sediments.

To go from sediments to biota, we are again limited to SSWL-22 sediment/polychaete pair. BAFs can be calculated for each congener SEPARATELY. It makes no sense to obtain specific congener data only to lump them all together in calculating "Total PCB BAFs".

We have no information on whether this sediment/polychaete pair is representative of sediments and polychaetes, or whether BAFs in polychaetes could be used as BAFs in pickleweed. Nevertheless, unless more congener-specific data are generated, I cannot see any other way to salvage the data.

cc: Joseph Chao, OMF
Bart Simmons, HML

CONCENTRATION (pg/g) OF SPECIFIC PCB CONGENERS AND AROCLORS

SAMPLE #	TYPE	#77	#126	#169	#105	#118	TOTAL PCB	AR 1254	AR 1260
S$RP-34	SEDIMENT	34	9.7	1.2 U	250	570	11,900	26,000 U	26,000 U
SSWL-22	SEDIMENT	33,000	6,700	120	500,000	1,400,000	75,585,148	2,400,000	680,000
SSRP-34	PICKLEWD	6.8	1.3 U	0.2 U	49	120	2,720	10,000 U	10,000 U
SSWL-22	POLYCH	3200	470	28 U	46,000	80,000	1,392,070	3,000 U	330,000
RATIOS									
CONG/AROCLOR 1254		0.014	0.003	0.000050	0.21	0.58	31.5		
CONG/AROCLOR 1260		0.049	0.010	0.000176	0.735	2.06	111.2		

NOTE: Entries with a "U" suffix indicate measurements below the detection limit. The shown number is the detection limit