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TREASURE ISLAND
SSIC NO. 5090.3.A

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

June 4, 1992

Commanding Officer
Western Division
Attn: Mr. Ernesto Galang, Code 1813
Naval Facilities Engineering Command
900 Commodore Drive
San Bruno, California 94066-0720

Dear Mr. Galang:

DEPARTMENT OF TOXIC SUBSTANCES CONTROL COMMENTS ON THE DRAFT PRELIMINARY RISK ASSESSMENT, DATED JANUARY 24, 1992, FOR THE NAVAL STATION TREASURE ISLAND, SITE 12

The Toxicology and Risk Assessment Section has reviewed the Draft Preliminary Risk Assessment, (PRA) for Site 12 at Naval Station Treasure Island. Their comments are enclosed. Also enclosed is guidance derived by the Toxicology and Risk Assessment Section entitled "Assessment of Health Risks from Inorganic Lead in Soil". This guidance should be used in recalculating the hazard estimate for lead at Site 12.

If you have any questions regarding the comments, please call me at (510) 540-3809.

Sincerely,

Thomas P. Lanphar

Thomas P. Lanphar
Associate Hazardous Materials
Specialist
Site Mitigation Branch

Enclosure

cc: Commanding Officer
Building One, Code 84
Attn: Mr. Jim Sullivan
Staff Civil Engineers Office
NAVSTA Treasure Island
San Francisco, California 94103

Ms. Barbara Smith
San Francisco Bay
Regional Water Quality Control Board
2101 Webster Street, Suite 500
Oakland, California 94612

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Department of Toxic Substances Control

Memorandum

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To : Tom Lanphar
700 Heinz Avenue, Building F,
Second Floor
Berkeley, California 94710

Date: May 21, 1992

From : Toxicology and Risk Assessment
Section
P.O. Box 806
Sacramento, California 95812-0806
(916) 255-2045

Subject: Treasure Island, Site 12

I have reviewed the Draft Preliminary Risk Assessment, (PRA) January 24, 1992, for the Naval Station Treasure Island, Site 12, San Francisco, California. This site was limited to the residential section of the Island on the northwest corner. This risk assessment was apparently designed to proceed the baseline risk assessment which will be included in the RI/FS, although this assumption should be verified with the responsible party.

Overall, the assessment was a conservative approach to estimating the present hazards at the site. The noncancer hazards (total hazard indices of 13) appear to be grossly overestimated. The risks associated with dermal exposure and ingestion of homegrown produce are determining the major risks for this site. These pathways should not represent the majority of the risk, and, therefore, the calculated risks appear to be an artifact of the assumptions used in this assessment. The dermal exposures should be recalculated as described in the specific comments. The risks to homegrown produce should be analyzed separately, since this pathway has an excessive number of uncertainties built into it. Finally, the hazard estimates for lead should be recalculated using the guidance derived by the Toxicology and Risk Assessment Section entitled "Assessment of Health Risks from Inorganic Lead in Soil" (see attachments). Dr. James Carlisle is the author of the document and should be contacted if the contractor has any questions on the use of this model (916) 255-2049.

The other area of major concern was with the selection of the sampling sites for the Stage 1 sampling protocol. Since this assessment determined the chemicals of concern, extensive justification should be included for the adequacy of this design. The samples were taken in several clustered areas and it is not clear why these would provide representative chemicals for the entire site.

SPECIFIC COMMENTS

1. Page 6: The areas of known and suspected contamination must be identified on the map (Figure 2-1). The location of bunkers should also be identified. Any other information which was used to select the initial screening sites must be summarized and included in the document. Justification is needed for the clustering of the sampling locations.

2. Pages 8 and 10: A summary of the tentatively identified compounds (TIC) is needed. The concentrations and chemical classifications represented must be included. The TICs cannot be eliminated from the PRA without additional information.

3. Page 8 and Table A-2: The depth of the samples should be indicated. Also, if the contaminants appear to be clustered, then the distribution on the site should be indicated.

4. Page 9: Was toluene found in the same location as gasoline? It should not be dismissed as a chemical of concern if it can be associated with areas of gasoline contamination.

5. Page 11: The selection of chemicals for the Stage 2 assessment was dependent on the conclusions of the Stage 1 assessment. It is not possible to determine if the selection was adequate until additional information is supplied on the Stage 1 assessment.

6. Page 11: Sampling the top 6 inches of the soil is not adequate for determining potential soil contamination. The 6 inch measurements are appropriate for the particulate inhalation pathway, but it is not sufficient for oral or dermal pathways. Samples from 1 to 3 feet for this site would be necessary.

7. Page 13: The data in Appendix A are not well presented and it is difficult to determine where the samples are from, particularly for the play areas and the areas surrounding them. The individual play areas should be assessed as well as combining the data across the play areas. Potential hot spots could be masked the way the data are currently presented.

8. Page 25: The future populations on the site must be addressed. It is not clear what will be happening with this facility and what the potential future land uses will be.

9. Page 36: It is stated that the soil concentrations were based on samples taken from the first foot. On page 11, it is stated that the samples were taken from the first six inches. These discrepancies should be reconciled.

10. Page 37: Table 3-5 should contain all summary statistics for the soil contaminants, including range, mean, standard deviation, sample size, and other appropriate information.

11. Page 40: The Toxicology and Risk Assessment Section is currently requiring a skin surface area of 2,000 cm2/day for children, age 1 to 6.

12. Page 47: In calculating the dermal RfD for cadmium, the oral (food) RfD should be used instead of the oral (water) RfD.

13. Page 47: The RfD and health risks calculated for lead should be replaced with calculations using the lead model developed by the Toxicology and Risk Assessment Section. The guidance document "Assessment of Health Risks from Inorganic Lead in Soil" has been included and should be referred to in recalculating these risks.

14. Page 55: TTLCs and STLCs are criteria which have been developed for identification of hazardous waste for treatment, storage, and disposal considerations. These are not necessarily health based numbers and a comparison of residual concentrations of contaminants at sites is not appropriate. These comparisons are misleading and should be removed from the document.

If you have any questions or comments on this review, please call me at (916) 255-2045.

Deborah Oudiz, Ph.D.
Staff Toxicologist

Reviewed By: Judith Parker, Ph.D.,DABT
Staff Toxicologist

Attachments

VOLUME 6

CHAPTER 5

ASSESSMENT OF HEALTH RISKS FROM INORGANIC LEAD IN SOIL

FOREWORD

The Department of Toxic Substances Control (DTSC), within the California Environmental Protection Agency, has the responsibility of managing the State's hazardous waste program to protect public health and the environment. The Toxicology and Risk Assessment Section (TRAS) within the Technical Services Branch provides scientific assistance in the areas of toxicology, risk and environmental assessment, training, and guidance to the regional offices within DTSC. Part of this assistance and guidance is the preparation of regulations, scientific standards, guidance documents, and recommended procedures for use by regional staff, local governmental agencies, or responsible parties and their contractors in the characterization and mitigation of hazardous waste substances release sites.

This chapter is just one part of the DTSC document, Guidance for Site Characterization and Multimedia Risk Assessment for Hazardous Substances Release Sites. The document has been prepared to provide guidelines for the investigation, monitoring, and remediation of hazardous substances release sites. Please note that within each chapter the more commonly used terms, hazardous waste site and toxic waste site, are used synonomously with the term hazardous substances release site.

Toxicology and Risk Assessment Section staff responsible for preparation of these scientific guidance documents include:

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ABSTRACT

This guidance describes a mathematical model for estimating blood lead concentration resulting from contact with lead-contaminated environmental media. A lead concentration of concern of ten milligrams per deciliter of whole blood is established. A distributional approach is used, allowing estimation of various percentiles of blood lead concentration associated with a given set of inputs. The method can be adapted to a computer spreadsheet.

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Assessment of Health Risks From Inorganic Lead in Soil

1 INTRODUCTION

1.1 PURPOSE

The purpose of this guidance is to provide a methodology for evaluating exposure and the potential for adverse health effects resulting from exposure to lead in the environment.

1.2 APPLICATION

Since most human health effects data are based on blood lead (Pb) concentration, this guidance presents a blood Pb concentration of concern for the protection of human health, and an alogrithm for estimating blood Pb concentrations in children and adults based on a multi-pathway analysis.

1.3 LIMITATIONS

It is anticipated that this guidance will be periodically revised to reflect the changing state of the science.

2 PRINCIPLE OR THEORY

2.1 BLOOD LEAD CONCENTRATION OF CONCERN

The Pb concentration of concern in children and adults is ten micrograms (ug) per deciliter (dl) of whole blood. The point of departure for risk management is a 0.01 risk of exceeding this value.

2.2 LEAD EXPOSURE PATHWAYS--BLOOD LEAD CALCULATION

This method can be used to estimate blood lead concentrations (Pb_b) resulting from exposure via the five pathways listed below. Each pathway is represented by an equation relating incremental blood lead increase to a concentration in a medium, using contact rates and empirically determined ratios. The contributions via the five pathways are added

Inhalation Intake Equation

Pb_b = atmospheric Pb * inhalation constant

where:

atmospheric Pb = local or regional ambient Pb (ug/m^3) [10]
inhalation constant, children = 1.92 (ug/dl)/(ug/m^3)[11]
inhalation constant, adults = 1.64 (ug/dl)/(ug/m^3)[11]

Dermal Contact Intake Equation

Pb_b = soil Pb * contact rate * soil constant

where:

soil Pb (ug Pb/gm soil) is a site-specific, measured value
contact rate, children = 1.4 gm soil/day [12]
contact rate, adults = 1.85 gm soil/day [13]
soil constant = 0.0001 (ug Pb/dl blood)/(ug dermal Pb/day)[14]

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1 Derived as follows: (0.945 * 10 ug/kg) + (0.055 * 0.00045 * soil Pb in mg/kg * 1000 ug/mg). Assumes that 5.5% of the diet consists of home-grown produce with the other 94.5% supplied by a homogeneous source with a lead content of 10 ug/kg. If food production on the site can be ruled out, use 10 ug/kg for dietary lead (EPA, 1989b, Bolger, et.al., 1990). Home-grown produce is assumed to contain 0.045% of the lead level in the soil.

2 Based on a report by Pennington (1983). For this method, a one-year-old child shall represent all children, based on the assumption that protecting the one-year-old child will protect all children.

3 Based on a study by Ryu, et.al. (1983)

4 Based on a report by FDA (1990)

5 Pb concentrations in local water supplies as consumed. If site-specific data are unavailable, a value of 15 ug/l may be used.

6 EPA (1989b)

7 Based on Calabrese (1990). Deliberate soil ingestion (soil pica) is represented as 0.00079 kg soil/day average.

8 For residential exposures and most occupational exposures, based on Calabrese (1990). Occupations with a high potential for soil ingestion (such as construction) should be represented as 0.00005 kg soil/day average.

9 These values are 44% of that for lead ingested with food or water, based on a study in rats which compared the bioavailability of lead acetate mixed with the diet to that of soil-bound lead (Chaney et.al., 1990).

4 COMMENTS

4.1 BLOOD LEAD CONCENTRATION OF CONCERN

The traditional reference dose approach to toxic chemicals is not applied to Pb because most human health effects data are based on blood Pb concentrations rather than external dose. Blood Pb concentration is an integrated measure of internal dose, reflecting total exposure from site-related and background sources. A clear no-observed-effect concentration has not been established for such Pb-related endpoints as birth weight, gestation period, heme synthesis and neurobehavioral development in children and fetuses, and blood pressure in middle-aged men. Dose-response curves for these endpoints appear to extend down to 10 ug Pb/dl or less (ATSDR, 1990).

4.2 ESTIMATING BLOOD LEAD CONCENTRATIONS FROM ENVIRONMENTAL CONCENTRATIONS

Total Pb is generally used as the measure of Pb in various media, even though the disposition of Pb may differ according to its form. Insufficient data are available to justify differential treatment of different forms of inorganic Pb, and most of the published toxicity data and most site characterization data are in terms of total Pb. Organic Pb is more readily absorbed through the skin and other membranes than inorganic Pb, and it must therefore be treated separately. Since it is less stable in the environment, it is usually a minor source of exposure. In the absence of specific information for the population of interest, background exposures are estimated using norms developed from survey data.

4.3 DERIVATION OF MODEL PARAMETERS

Unless the potential for on-site gardening can be ruled out, it is assumed that 5.5% of the diet consists of home-grown produce, based on EPA guidance (USEPA, 1991). Pb concentration in home-grown produce is calculated as 0.045% of that in the soil, based on plant uptake studies (Chaney, et.al., 1982). Background dietary Pb concentration (10 ug/kg) is based on a 1990 report based on FDA data (Bolger, et.al., 1990). The default drinking water Pb concentration is based on the federal action concentration of 15 ug/l at the tap (USEPA, 1991b).

The distribution of blood Pb concentrations for a given set of environmental inputs is a critical factor in protecting sensitive members of the population. Based on a review of data from NHANES II and from several published studies of blood Pb concentrations in children living near point sources of lead, EPA concluded that blood Pb was generally log-normally distributed, that the geometric standard deviation (GSD) for children was between 1.3 and 1.53, and that 1.42 was a representative value for the

The slopes of 1.92 and 1.64 ug/dl of blood per ug/m³ of continuously-breathed air at atmospheric Pb concentrations <5 ug/m³ are based on results of experimental exposures and epidemiological studies which adjusted for airborne lead contributions to pathways other than inhalation. These studies found slopes ranging from 1.52 to 2.46 ug/dl per ug/m³ in children and 1.25 to 2.14 in adults (USEPA, 1986). The default airborne lead concentration is the highest monthly mean 24-hour value recorded in California in 1990.

4.4 USING THIS GUIDANCE

This guidance may be implemented using a computer spreadsheet, which may be obtained from DTSC. The spreadsheet is based on DTSC Guidance, Volume 4, Chapter 1, which should be consulted for more general aspects of spreadsheet application. For this spreadsheet, soil concentration in mg/kg (ppm w/w) is entered in cell E6. The spreadsheet uses it in each calculation that is affected by soil Pb. Atmospheric Pb is entered in cell E5. Drinking-water Pb is entered in cell E7. If omission of the site-grown produce pathway can be justified, a "0" is entered in cell E8. The remainder of the cells are protected and should not be altered without approval of DTSC. Any such changes will require sufficient justification and must be documented.

4.5 OTHER STANDARDS AND GUIDANCE

USEPA (1991c) considers lead to be a class B-2 carcinogen, with sufficient evidence in animals and inadequate evidence in humans. A carcinogenic potency has not been assigned. The federal MCL is 15 ug/l maximum at the tap with a maximum of 5 ug/l as a system-wide average (USEPA, 1991b). The Centers for Disease Control recommends that blood Pb concentrations exceeding 25 ug/dl require follow-up and intervention (CDC, 1985). The EPA has set 1.5 ug/m³ as the Pb concentration limit for ambient air (quarterly average) (USEPA, 1978). California's standard is also 1.5 ug/m³, but is based on a monthly average. The threshold limit value is 50 ug/m³ for workplace air (ACGIH, 1989).

FDA (1990) considers the Lowest Observable Adverse Effect Level (LOAEL) to be 10 ug/dl in children and fetuses, and 30 ug/dl in adults. They use empirically-derived ratios of 0.16 and 0.04 ug/dl per ug/day ingested to predict concentrations in young children and adults, respectively. Applying an uncertainty factor of ten results in provisional tolerable intake levels of 6 ug/day for children six or less, 15 ug/day for children over six, 25 ug/day for pregnant women, and 75 ug/day for men.

Pennington, J. A. T. 1983. Revision of the total diet study food list and diets. J. Am. Dietetic Association, 82: 166.

Ryu, J. E., E. E. Ziegler, S. E. Nelson, and S. J. Fomon. 1983. Dietary intake of lead and blood lead concentration in early infancy. Am. J. Dis. Early Child. 137: 886.

USEPA. 1978. U.S. Environmental Protection Agency; National Primary and Secondary Ambient Air Quality Standards for Lead. Fed. Regist. 43(194): 46246-46261.

USEPA. 1986. Environmental Criteria And Assessment Office, U.S. Environmental Protection Agency. Air Quality Criteria for Lead, EPA 600/8-83-028, June 1986.

USEPA. 1989a. Office of Emergency and Remedial Response, U.S. Environmental Protection Agency. Risk Assessment Guidance for Superfund, Volume 1; EPA 540/1-89-002 December, 1989.

USEPA. 1989b. U.S. Environmental Protection Agency, Office of Health and Environmental Assessment. Exposure Factors Handbook. EPA/600/8-89/043

USEPA. 1989c. Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency. Review of the National Ambient Air Quality Standards for Lead, EPA 450/2-89-011 June 1989.

USEPA. 1991a. Office of Solid Waste and Emergency Response U.S. Environmental Protection Agency. Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors; OSWER Directive 9285.6-03.

USEPA. 1991b. U.S. Environmental Protection Agency. National Primary Drinking Water Quality Standards for Lead and Copper. Fed. Regist. 56(110): June 7, 1991, p. 26460.

USEPA. 1991c. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. Health Effects Assessment Summary Tables, NTIS No. PB91-921199, January 1991.