

**TECHNICAL MEMORANDUM**  
**Lead Contamination at DRMO**  
**Impact Area**

**Portsmouth Naval Shipyard**  
Kittery, Maine



**Northern Division**  
**Naval Facilities Engineering Command**  
**Contract Number N62472-90-D-1298**  
**Contract Task Order 0232**

February 2000

TECHNICAL MEMORANDUM  
FOR  
LEAD CONTAMINATION AT DRMO IMPACT AREA  
  
PORTSMOUTH NAVAL SHIPYARD  
KITTERY, MAINE  
  
COMPREHENSIVE LONG-TERM  
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

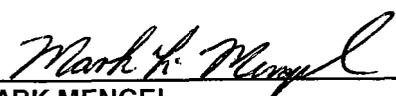
Submitted to:  
Northern Division  
Environmental Branch Code 18  
Naval Facilities Engineering Command  
10 Industrial Highway, Mail Stop #82  
Lester, Pennsylvania 19113-2090

Submitted by:  
Tetra Tech NUS, Inc.  
600 Clark Avenue, Suite 3  
King of Prussia, Pennsylvania 19406-1433

CONTRACT NUMBER N62472-90-D-1298  
CONTRACT TASK ORDER 0232

FEBRUARY 2000

PREPARED BY:

  
\_\_\_\_\_  
MARK MENGEL  
PROJECT MANAGER  
TETRA TECH NUS, INC.  
PITTSBURGH, PENNSYLVANIA

APPROVED BY:

  
\_\_\_\_\_  
JOHN J. TREPANOWSKI, P.E.  
PROGRAM MANAGER  
TETRA TECH NUS, INC.  
KING OF PRUSSIA, PENNSYLVANIA

## **TECHNICAL MEMORANDUM**

**SUBJECT: Lead Contamination at DRMO Impact Area, Portsmouth Naval Shipyard, Kittery, Maine.**

**DATE: February 23, 2000**

### **1.0 INTRODUCTION**

This technical memorandum summarizes the results of an evaluation of lead detected in soil samples collected at the DRMO Impact Area at Portsmouth Naval Shipyard, Kittery, Maine. The Impact Area includes Quarters S, N and 68. Attachment G presents the Navy response to USEPA, MEDEP, and SAPL comments (and follow-up comments) on the draft version of this technical memorandum.

A Human Health Risk Assessment for the shipyard was conducted by McLaren/Hart and submitted on August 20, 1992. The Integrated Exposure Uptake Biokinetic (IEUBK) Model for Lead in Children was utilized in this risk assessment to evaluate lead detected in soil at the Shipyard. This model evaluates exposures from lead in air, water, soil, dust, diet and paint to predict blood lead levels in children ages 0-6 years. IEUBK lead model results from the 1992 McLaren/Hart risk assessment are presented in Table 1. In order to compare results with those from the 1992 lead evaluation, the 1998 lead evaluation used the most recent version of the IEUBK model, version 99d, updated since version 4 in 1992.

The 1998 lead evaluation using the IEUBK model was conducted in a two different ways, in order to provide a variety of results for the sake of comparison. All runs for the 1998 lead evaluation were made with the current IEUBK model version 99d, using the average, maximum and 95 percent Upper Confidence Level (95% UCL) concentrations. The EPA recommends the arithmetic mean concentration as the exposure point concentration when evaluating lead in soils. An evaluation mimicking the 1992 evaluation was conducted by using site-specific air and soil/dust concentrations and model defaults for all other values (see Table 2 for results). Table 3 compares these results to the results from the 1992 lead evaluation. Another evaluation using site-specific air and soil/dust concentrations, water consumption and soil ingestion rate values from Maine guidance, and model defaults for all other values was also conducted in order to demonstrate results incorporating state recommendations (see Table 4 for results).

In addition, a new lead model introduced in December, 1996, was used to estimate blood lead concentrations in a typical industrial worker exposed to lead in soil in a non-residential setting and subsequent fetal blood lead concentrations.

### **2.0 LEAD MODEL INPUTS/APPROACH**

The air concentrations used to run the IEUBK lead model as part of the Human Health Risk Assessment in 1992 were obtained using actual air monitoring data. The upwind and downwind ambient air monitoring data for each site were extracted from the complete ambient air monitoring data set. The upwind/downwind ambient air concentrations were averaged in order to determine a single concentration for a particular day. Daily upwind/downwind air concentrations were then averaged in order to determine a representative air concentration for

the complete sampling period. The resulting average and maximum air concentrations for lead were used in the IEUBK model. The air concentrations used in the 1992 IEUBK lead evaluation are presented in Table 1; the corresponding IEUBK lead model printouts are provided in Attachment A. An interim corrective measure was conducted at the DRMO in 1993, which included capping to prevent exposure to significantly elevated concentrations of lead in surface soil. Air monitoring data prior to 1993 is not considered reflective of current day conditions.

Air concentrations used to run the lead model for the 1998 evaluation were estimated by assuming the following: (1) contaminant concentrations in the particulate matter reflect contaminant concentrations measured in surface soil samples, and (2) the concentration of respirable particulates in air is 22 ug/m<sup>3</sup> (value for chronic exposures, State of Maine, June 1994). These calculated air concentrations are presented in Table 2; the corresponding IEUBK lead model printouts are provided in Attachment B. The sample identification numbers included in the data set used to derive the concentrations for the 1998 lead evaluation are presented in Attachment C.

Actual soil lead concentrations were used in the 1992 lead evaluation. Average and maximum values were used as inputs. These results are presented in Table 1, a reproduction of Table 5-50 from the 1992 Risk Assessment Report. Actual soil lead concentrations were also used in the 1998 lead evaluation. Average, 95% UCL and maximum values were used as inputs. These results are presented in Table 2. As noted previously, the EPA recommends the arithmetic mean concentration as the exposure point concentration when evaluating lead in soils.

The 1992 Human Health Risk Assessment Report indicates that site-specific soil values were used as input parameters for air and soil/dust lead concentrations (page 5-5). Additional site-specific input parameters are not addressed in the report, so it is assumed that the IEUBK model defaults were used for all of the other input values. The 1998 lead evaluation mimicked the approach used to conduct the 1992 lead evaluation. Table 1 presents the 1992 IEUBK lead model results, obtained using actual air and soil/dust lead concentrations as the only site-specific inputs. Table 2 presents the 1998 IEUBK lead model results, obtained using the same approach.

### **3.0 IEUBK LEAD MODEL**

The only USEPA IEUBK Lead Model in existence in 1992 was Version 4. The model, however, has been updated twice since then, and the latest version is Version 99d. Ms. Anne Marie Burke at USEPA Region I was contacted on January 22, 1998, in order to obtain guidance as to which IEUBK Lead Model version should be used to conduct a current lead evaluation for a site in Region I. Ms. Burke indicated that the most recent version, 99d, should be used to conduct the 1998 lead evaluation for Portsmouth Naval Shipyard.

Table 3 presents a comparison of the 1992 and 1998 IEUBK lead model results. The 1998 results in this table were obtained by entering the 1992 data into the new IEUBK model. This was done in order to demonstrate how the different model versions process the same inputs. In addition, in both cases, air and soil/dust concentrations were the only site-specific inputs used, and model defaults were used for all other inputs. However, the outputs displayed in this table differ between the 1992 and 1998 results.

Table 3 illustrates that there are inherent differences between the older version 4 and the newer version 99d of the IEUBK Lead Model. Staff members from the USEPA indicate that compared to version 4, version 99d is an enhanced version; for this reason, version 99d is expected to produce more realistic results. Some of the changes in the version 99d model are addressed in the USEPA's "Guidance Manual for the Integrated Exposure Uptake Biokinetic Model for Lead in Children", February 1994.

The inherent differences between model versions 4 and 99d account for the differences in outputs displayed in Table 3. For example, one significant change was made to the default value representing contribution of lead (Pb) in soil to household dust. The old value was 0.28 ug Pb/g dust per ug Pb/g soil, and the new value is 0.7. Another significant change was made to the default value for soil intake. The old value was a constant rate of 100 mg/day, for children within the general age range of 0-6 years. The new values are age specific (i.e., 0-1 year, 1-2 years, etc.), but the average value is 109 mg/day.

Because these new default values in version 99d are more conservative than the old values in version 4, the results produced by version 99d are somewhat higher than those produced by version 4, using identical inputs. Similarly, results from the 1998 lead evaluation using site-specific data are skewed in the same manner.

It should be noted that the IEUBK results presented in Tables 1 through 4, 6, and 7 reference model runs using single or multiple source analysis. The "Multiple Source Analysis" refers to a model option to predict lead concentrations in in-door dust (the current default value is 0.7) whereas the "Single Source" option simply assumes that the lead concentration in in-door dust is equal to the lead concentration in soils.

#### **4.0 MAINE GUIDANCE**

Table 4 displays results from an IEUBK lead model run incorporating inputs from the "State of Maine Guidance Manual for Human Health Risk Assessments and Hazardous Substance Sites", June 1994. State-recommended values for water consumption rate and soil ingestion rate were substituted for model default inputs. All of the other model defaults were left unchanged.

The Maine value for water consumption rate is 1L/day for children ages 0-6 years. The Maine soil ingestion rate is 200 mg/day for children ages 0-6 years. In using these inputs, an assumption is made that every day, any child up to 6 years old will be consuming 1 liter of water and ingesting 200 mg of soil, whether that child is 6 months, 1 year or 6 years old. The model defaults for water consumption and soil ingestion are incremental values that increase with age and do not reach the state-recommended values, even at the maximum levels (maximum default water consumption rate is 0.59 L/day, and maximum default soil ingestion rate is 135 mg/day). The corresponding IEUBK lead model printouts for evaluations using Maine inputs are provided in Attachment D.

The results presented in Table 4, generated with Maine water consumption and soil ingestion rates, are elevated in comparison to those presented in Table 2, generated using the default values for water consumption and soil ingestion rates. However, this can be attributed to the highly conservative nature of the state values for these particular inputs. Although the highly conservative drinking water consumption rates and soil ingestion rates may be preferred by MEDEP for baseline risk assessments, the MEDEP finds it appropriate and acceptable to defer

to the USEPA default values in the IEUBK model, as stated in the MEDEP's attached comment letter dated July 29, 1998 (comment number 3).

## **5.0 ADULT/FETAL LEAD EXPOSURES**

The new adult lead model spreadsheet calculates a range of 95<sup>th</sup> percentile fetal blood lead concentrations from central estimates of blood lead concentrations in a typical adult worker based on nonresidential exposures to lead in soil. This model corresponds to the following guidance: "Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil", December 1996. A printout of the adult lead model spreadsheet is provided in Table 5. A sample calculation is provided in Attachment E.

This model was run using a soil lead concentration of 765 mg/kg, the maximum concentration detected in the DRMO data, to demonstrate the worst case scenario. Model defaults were used for all other input values. Of note, the default exposure duration parameter is based on USEPA guidance for average time spent at work by both full-time and part-time workers (USEPA, "Superfund's Standard Default Exposure Factors for the Central Tendency and RME" – Draft, November 1993). The results indicate the maximum concentration of 765 mg/kg (at location SS-23S from the "N" residence) produces estimated blood lead concentrations at acceptable levels. This sample is located on a hill, which is densely covered with grass with no bare spots apparent; there was no indication of children's toys on the hill, nor was there any indication of the lawn having unusual wear in that area. The last row on the table displays the calculated 95<sup>th</sup> percentile blood lead concentrations in fetuses. Exposure to lead at 765 mg/kg in the soil produces an estimated blood lead level of 10.07 ug/dL as the 95th percentile fetal blood lead concentration. This estimated blood lead concentration is just barely above the benchmark value. In the same scenario, the central or average estimate of blood lead concentrations in a typical adult worker 3.3 ug/dL, is (non-residential setting) far below the benchmark value of 10 ug/dL.

The EPA recommends the arithmetic mean concentration as the exposure point concentration when evaluating lead concentrations in soils. (The maximum and/or 95 percent upper confidence limit on the mean concentrations were included in this technical memorandum simple as points of comparison.)

## **6.0 SUPPLEMENTAL IEUBK MODELING FOR INDIVIDUAL RESIDENCES**

In accordance with a USEPA request, supplemental IEUBK modeling was conducted for each of the three individual residences (Quarters S, N and 68). Note that the 1992 assessment considered the samples only as a whole rather than splitting sample data specific to each of the three areas.

Only samples from a 0-0.5 foot interval were considered, in accordance with a USEPA request. Note that USEPA guidance recommends the "top layers of soil be considered in developing the exposure concentration for input to the model. The Navy interpreted this as surface soils from 0-2 foot depth to ensure data was not being "left out." Note also that the 1992 assessment considered samples up to 1.5-foot depth. For the supplemental IEUBK modeling, the 0-0.5 foot samples included the following:

- "N" Residence: Samples SS-17S, 18S, 19S, 20S, 21S, 22S, and 23S
- "68" Residence: Samples SS-06 and SS07 (these samples were actually collected from the 0-1 foot interval and included in the modeling because no samples from the 0-0.5 foot interval are available)
- "S" Residence: Samples SS-14S and 16S

The results from the supplemental IEUBK modeling were evaluated using the same methodology previously presented in the subject technical memorandum. The small data sets for the "N" and "S" residences resulted in the 95% UCL input concentrations equal to the maximum concentration; therefore, average and maximum input concentration model runs were conducted. Indoor air concentrations were calculated using the average and maximum soil concentrations and were used as input to the model. The modeling was conducted using the USEPA and MEDEP recommended input assumptions.

Results of the evaluation are summarized in Table 6 (IEUBK model version 99d) and the supporting modeling printouts are provided as Attachment F. For the average soil/dust lead concentration, results are within acceptable levels for the "S" residence (i.e., at least 95 percent of the population has estimated blood lead levels below 10 ug/dL). The average soil/dust concentration is the input value recommended by the IEUBK guidance as the most appropriate concentration for evaluating lead in children. Of note, based on the maximum soil/dust lead concentration for the "S" residence, the estimated geometric mean blood lead levels were acceptable (less than 10 ug/dL); however, the IEUBK model does estimate that greater than 5 percent of an exposed population would have a blood lead concentration exceeding 10 ug/dL. (As noted previously, the EPA recommends the arithmetic mean concentration as the exposure point concentration when evaluating lead in soils.)

For the "N" and "68" residences, the estimated geometric mean blood lead level for both the average and maximum soil/dust concentrations were acceptable (less than 10 ug/dL); however, the IEUBK model does estimate that greater than 5 percent of an exposed population would have a blood lead concentration exceeding 10 ug/dL. (As noted previously, the EPA recommends the arithmetic mean concentration as the exposure point concentration when evaluating lead in soils.)

With the exception of the maximum lead concentration for the "N" residence, average and maximum lead concentrations in soil at the individual residences were less than or only slightly exceeded the 400 mg/kg lead screening level (residential land use) published in USEPA Office of Solid Waste and Emergency Response (OSWER) Directive 9355.4-12. It should be noted that the IEUBK model does estimate that greater than 5 percent of an exposed population would have a blood lead concentration exceeding 10 ug/dL when the 400 mg/kg soil screening level is evaluated as the exposure point concentration. (The IEUBK model estimates that exposure to approximately 360 mg/kg lead in soils is the threshold value which would not result in a blood lead concentration exceeding 10 ug/dL in greater than 5 percent of the population. It should also be noted that EPA assumes a 0 to 7 year exposure period in the derivation of the 400 mg/kg benchmark which produces a slightly less conservative result than calculated when a 0 to 6 year exposure period is evaluated.) EPA has rounded the 360 mg/kg value up to 400 mg/kg to account for the conservative variability and uncertainty associated with the IEUBK model.

An additional run was conducted to determine results assuming no exposure to soil by a child and using the default exposure assumptions. As shown in Table 6, the estimated geometric

mean blood lead levels for this case are 1.5 ug/dL and 1.6 ug/dL, which indicate the default values are reasonable.

Results using inputs from Maine guidance are provided in Table 7 with supplemental printouts in Attachment F. Table 7 includes results for the individual residences as well as results for the run assuming no exposure to soil by a child.

## **7.0 CONCLUSIONS**

### **7.1 IEUBK Model - (Children)**

The 1998 IEUBK lead model results presented in Table 2 are slightly higher than the 1992 IEUBK lead model results presented in Table 1. As discussed in Section 3.0, some differences can be attributed to updates made in the lead model between 1992 (version 4) and 1998 (version 99d).

The IEUBK lead model guidance manual recommends that the average lead concentration (as opposed to the maximum concentration or 95% UCL) be used as the input value to run the lead model. The average and maximum soil lead concentrations were used to run the model for the 1998 evaluation because the average and maximum concentrations were used in the initial 1992 evaluation conducted by McLaren/Hart. The 95% UCL was used as an additional input in 1998 for the sake of comparison, because this value (314 mg/kg) is in between the average and maximum values (253 and 765 mg/kg, respectively).

The 1998 IEUBK results derived using the average soil/dust lead concentration and the corresponding air concentration are well within acceptable levels (at least 95 % of the population has estimated blood lead levels below 10 ug/dL). Furthermore, the average soil/dust concentration is the input value recommended by the IEUBK guidance as the most appropriate concentration for evaluating lead in children.

The 1998 results derived using the 95% UCL input soil/dust concentration and the corresponding air concentration are within an acceptable range (93.16 - 95.85 % of the population has estimated blood lead levels below 10 ug/dL). The 1998 results using the maximum detected soil/dust concentration and the corresponding air concentration exceed acceptable levels. However, it is important to note that the lesser of the 95% UCL or the maximum concentration would be chosen to compare lead concentrations to criteria for a human health risk assessment, and in this case, this value produces acceptable results using the IEUBK lead model.

Regarding the results presented for the individual residences in Attachment F and summarized in Table 6, please note that a number of cases were evaluated (i.e., maximum concentration, average concentration, single source analysis, multiple source analysis, EPA suggested intake values, State of Maine intake values, etc.). The various cases allow a comparison with the McLaren/Hart results presented in 1992 and provide an indication of the impact of varying input parameters (i.e., exposure assumptions). However, based on EPA and State guidance the recommended IEUBK model runs to evaluate/consider are those that use the arithmetic mean concentration as the exposure point concentration and use the soil ingestion rates specified in the IEUBK model. The EPA further suggests "multiple source analysis" with regard to the relationship between the lead concentrations in the soil and the lead concentrations in house dust. The lead model results presented for this case (for 0 to 0.5 foot soils) in Table 6

for the "68" and "S" residences approximate or do not exceed the EPA benchmark (i.e., less 5 percent of the population exceeding the 10ug/dL blood lead concentration). The Navy believes that the results presented for the "N" residence indicate a "marginal" exceedance of the EPA benchmark. This is based on the fact that the arithmetic mean concentration for the "N" residence marginally exceeds the EPA action level of 400 mg/kg.

## **7.2 Adult/Fetal Lead Model**

The adult/fetal lead model results indicate the soil lead concentration at the maximum detected level of 765 mg/kg produces estimated blood lead concentrations at acceptable levels. Exposure to lead at 765 mg/kg in the soil produces an estimated blood lead level of 10.07 ug/dL as the 95th percentile fetal blood lead concentration. This estimated blood lead concentration marginally exceeds the benchmark value. In the same scenario, the central or average estimate of blood lead concentrations in a typical adult worker (non-residential scenario), 3.3 ug/dL, is far below the benchmark value of 10 ug/dL. As noted previously, the EPA recommends the arithmetic mean concentration as the exposure point concentration when evaluating lead in soils.

## **7.3 Recommendations**

The following items summarized the most relevant results of the risk assessment of lead concentrations detected within the study are:

- The IEUBK model evaluation (multi-source analysis mode) of the arithmetic mean lead concentration of all soils in the area evaluated and for the subsets of shallow soil samples collected at the "68" residence and at the "S" residence yields results within the benchmarks established by the EPA (i.e., blood lead concentrations less than 10 ug/dL in at least 95 percent or more of exposed individuals).
- The IEUBK model evaluation (multi-source analysis mode) of the arithmetic mean lead concentration for shallow soils collected at the "N" residence yields results that marginally exceed the benchmarks established by the EPA. The arithmetic mean concentration for these shallow soils (404 mg/kg) marginally exceeds the aforementioned OSWER Directive screening level of 400 mg/kg.

Consequently, a time critical removal action is not warranted. However, all of the lead data and model results presented in this report, in conjunction with all of the DRMO data, will be evaluated further in the pending OU2 Risk Assessment and Feasibility Study.

considering surface soils less than 1-foot depth, the estimated geometric means are acceptable (less than 10 ug/dL), although greater than 5 percent of an exposed population would have a blood lead concentration exceeding 10 ug/dL, which would not be within acceptable levels. However, the exceedances noted are marginal when arithmetic mean lead concentrations are evaluated.

Consequently, a time-critical removal action is not warranted. The lead model results, in conjunction with all of the DRMO data, will be evaluated further in the pending Feasibility Study.

**TABLE 1**  
**REPRODUCTION OF TABLE 5-50 FROM ORIGINAL RISK ASSESSMENT REPORT, 1992**  
**SUMMARY OF POTENTIAL RISKS POSED BY LEAD EXPOSURES**  
**CALCULATED FOR CHILDREN AGES 0-6 YEARS**  
**PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE**

<b>Date</b>	<b>Lead Model Version</b>	<b>Single or Multiple Source Analysis</b>	<b>Input Description (Avg. or Max.)</b>	<b>Air Concentration (ug/m<sup>3</sup>)</b>	<b>Soil/Dust Concentration (ug/g)</b>	<b>Percent Below 10 ug/dL*</b>	<b>Geometric Mean (ug/dL)*</b>
8/20/92	4	Single Source	1992 Average	0.0497	362.8	98.78	4.59
8/20/92	4	Multiple Source	1992 Average	0.0497	362.8	99.9	3.4
8/20/92	4	Single Source	1992 Maximum	0.22	765	75.78	8.01
8/20/92	4	Multiple Source	1992 Maximum	0.22	765	95.54	5.56

**Notes:**

Air concentration and soil/dust concentration are the only site specific values used in this lead evaluation. Model defaults were used for all of the other input values.

\* Percent of model population with calculated blood lead levels below 10 ug/dL (goal = 95%).  
 Geometric mean represents mean blood lead level in model population.

**TABLE 2**  
**PREDICTED BLOOD LEAD LEVELS, 1998**  
**SUMMARY OF POTENTIAL RISKS POSED BY LEAD EXPOSURES**  
**CALCULATED FOR CHILDREN AGES 0-6 YEARS**  
**PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE**

Date	Lead Model Version	Single or Multiple Source Analysis	Input Description (Avg./UCL/Max.)	Air Concentration (ug/m <sup>3</sup> )	Soil/Dust Concentration (ug/g)	Percent Below 10 ug/dL*	Geometric Mean (ug/dL)*
1/26/98	99d	Single Source	Average	0.00557	253.08	96.1	4.4
1/26/98	99d	Multiple Source	Average	0.00557	253.08	97.75	4
1/26/98	99d	Single Source	95% UCL	0.00691	314	93.16	5.1
1/26/98	99d	Multiple Source	95% UCL	0.00691	314	95.85	4.5
1/26/98	99d	Single Source	Maximum	0.0168	765	59.63	9.3
1/26/98	99d	Multiple Source	Maximum	0.0168	765	67.9	8.2

**Notes:**

Air concentration and soil/dust concentration are the only site specific values used in this lead evaluation. Model defaults were used for all of the other input values.

Air concentrations were estimated by assuming that:

- (1) the contaminant concentrations in the particulate matter reflect the contaminant concentrations measured in surface soil samples collected at a site and
- (2) the total suspended particulate material in the air is 0.1 mg/m<sup>3</sup>
- (3) the concentration of respirable particulates in air (chronic exposures) = 22 ug/m<sup>3</sup> (State of Maine, June 1994)

\* Percent of model population with calculated blood lead levels below 10 ug/dL (goal = 95%).  
 Geometric mean represents mean blood lead level in model population.

**TABLE 3**  
**COMPARISON OF IEUBK LEAD MODEL RESULTS - VERSION 4.0 VS. VERSION 99D**  
**SUMMARY OF POTENTIAL RISKS POSED BY LEAD EXPOSURES**  
**CALCULATED FOR CHILDREN AGES 0-6 YEARS**  
**PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE**

Date	Lead Model Version	Single or Multiple Source Analysis	Input Description (Avg. or Max.)	Air Concentration (ug/m <sup>3</sup> )	Soil/Dust Concentration (ug/g)	Percent Below 10 ug/dL*	Geometric Mean (ug/dL)*
8/20/92	4	Single Source	1992 Average	0.0497	362.8	98.78	4.59
1/26/98	99d	Single Source	1992 Average	0.0497	362.8	90.04	5.6
8/20/92	4	Multiple Source	1992 Average	0.0497	362.8	99.9	3.4
1/26/98	99d	Multiple Source	1992 Average	0.0497	362.8	93.58	5
8/20/92	4	Single Source	1992 Maximum	0.22	765	75.78	8.01
1/26/98	99d	Single Source	1992 Maximum	0.22	765	59.63	9.3
8/20/92	4	Multiple Source	1992 Maximum	0.22	765	95.54	5.56
1/26/98	99d	Multiple Source	1992 Maximum	0.22	765	67.9	8.3

**Notes:**

Air concentration and soil/dust concentration are the only site specific values used in this lead evaluation. Model defaults were used for all of the other input values.

\* Percent of model population with calculated blood lead levels below 10 ug/dL (goal = 95%).  
 Geometric mean represents mean blood lead level in model population.

**TABLE 4**  
**LEAD LEVELS DERIVED USING INPUTS FROM MAINE GUIDANCE, 1998**  
**SUMMARY OF POTENTIAL RISKS POSED BY LEAD EXPOSURES**  
**CALCULATIONS FOR CHILDREN AGES 0-6 YEARS**  
**PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE**

Date	Lead Model Version	Single or Multiple Source Analysis	Input Description (Avg./UCL/Max.)	Air Concentration (ug/m <sup>3</sup> )	Soil/Dust Concentration (ug/g)	Percent Below 10 ug/dL*	Geometric Mean (ug/dL)*
1/26/98	99d	Single Source	Average	0.00557	253.08	81.38	6.7
1/26/98	99d	Multiple Source	Average	0.00557	253.08	87.19	6
1/26/98	99d	Single Source	95% UCL	0.00691	314	73.14	7.7
1/26/98	99d	Multiple Source	95% UCL	0.00691	314	80.19	6.8
1/26/98	99d	Single Source	Maximum	0.0168	765	27.27	13.9
1/26/98	99d	Multiple Source	Maximum	0.0168	765	35.99	12.3

**Notes:**

Air concentrations and soil/dust concentrations reflect site specific conditions.

Air concentrations were estimated by assuming that:

- (1) the contaminant concentrations in the particulate matter reflect the contaminant concentrations measured in surface soil samples collected at a site and
- (2) the total suspended particulate material in the air is 0.1 mg/m<sup>3</sup>
- (3) the concentration of respirable particulates in air (chronic exposures) = 22 ug/m<sup>3</sup> (State of Maine, June 1994)

The following model inputs have been changed to reflect recommendations in the Guidance Manual for Human Health Risk Assessments and Hazardous Substance Sites, State of Maine, Department of Environmental Protection and Department of Human Services, June 1994:

- (1) water consumption rate (0-6 years) = 1L/day
- (2) soil ingestion rate (0-6 years) = 200 mg/day

\* Percent of model population with calculated blood lead levels below 10 ug/dL (goal = 95%).  
 Geometric mean represents mean blood lead level in model population.

**TABLE 5**

**Calculations of 95th Percentile Fetal Blood Lead Concentrations for Adult Exposure to Soil**

OBJECTIVE: Adult exposure to lead in soil is addressed by an evaluation of the relationship between the site soil lead concentration and the blood lead concentration in the developing fetuses of adult women. This spreadsheet calculates a range of 95th percentile fetal blood lead concentrations from central estimates of blood lead concentrations in pregnant adult women using the exposure parameters identified below (U.S. EPA, Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil, December 1996).

RELEVANT EQUATIONS:  $PbB_{adult, central} = PbB_{adult, 0} + (PbS \times BKSF \times IR_s \times AF_s \times EF_s) / AT$   
 and  
 $PbB_{fetal, 0.95} = PbB_{adult, central} \times GSD_{i, adult}^{1.645} \times R_{fetal/maternal}$

Exposure Parameter	Description (units)	GSD <sub>i</sub> = 1.8 - 2.1; PbB <sub>adult, 0</sub> = 1.7 - 2.2			
		Adult 1	Adult 2	Adult 3	Adult 4
PbB <sub>adult, 0</sub>	Typical blood lead concentration in adult women of child-bearing age in absence of site exposures (ug/dL)	1.7	1.7	2.2	2.2
PbS	Site-specific soil lead concentration (ug/g)	765	765	765	765
BKSF	Biokinetic slope factor (unitless)	0.4	0.4	0.4	0.4
IR <sub>s</sub>	Intake rate of soil, includes outdoor soil and indoor soil-derived dust (g/day)	0.050	0.050	0.050	0.050
AF <sub>s</sub>	Absolute gastrointestinal absorption fraction (unitless)	0.12	0.12	0.12	0.12
EF <sub>s</sub>	Exposure frequency (days/year)	219	219	219	219
AT	Averaging time (days/year)	365	365	365	365
GSD <sub>i, adult</sub>	Estimate of individual geometric standard deviation among adults (unitless)	1.8	2.1	1.8	2.1
R <sub>fetal/maternal</sub>	Constant of proportionality between fetal blood lead concentration at birth and maternal blood lead concentration (unitless)	0.9	0.9	0.9	0.9
PbB <sub>adult, central</sub>	Calculated central estimate of blood lead concentrations in adult women of child-bearing age from site exposures (ug/dL)	2.8016	2.8016	3.3016	3.3016
PbB <sub>fetal, 0.95</sub>	Calculated 95th percentile blood lead concentrations among fetuses born to women having site exposures (ug/dL)	6.63	8.54	7.81	10.07

Note: According to the cited guidance document, this adult exposure model is not applicable for infrequent site exposures, where the EF<sub>s</sub> is less than 1 day/week.

**TABLE 6  
PREDICTED BLOOD LEAD LEVELS  
SUMMARY OF POTENTIAL RISKS POSED BY LEAD EXPOSURES  
CALCULATED FOR CHILDREN AGES 0-6 YEARS  
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE**

Date	Lead Model Version	Scenario	Single or Multiple Source Analysis	Input Description (Avg./Max)	Air Concentration (ug/m <sup>3</sup> )	Soil/Dust Concentration (ug/g)	Percent Below 10 ug/dL*	Geometric Mean (ug/dL)*
9/8/97	99d	No Soil Exposure	Single	Default	0.1	0	100	1.5
9/8/97	99d	No Soil Exposure	Multiple	Default	0.1	0	100	1.6
9/8/97	99d	"N" Residence	Single	Average	0.009	404	87.19	6.0
9/8/97	99d	"N" Residence	Multiple	Average	0.009	404	91.75	5.3
9/8/97	99d	"N" Residence	Single	Maximum	0.017	765	59.63	9.3
9/8/97	99d	"N" Residence	Multiple	Maximum	0.017	765	67.9	8.2
9/8/97	99d	"68" Residence	Single	Average	0.007	337	91.75	5.3
9/8/97	99d	"68" Residence	Multiple	Average	0.007	337	94.68	4.7
9/8/97	99d	"68" Residence	Single	Maximum	0.009	417	86.36	6.1
9/8/97	99d	"68" Residence	Multiple	Maximum	0.009	417	91.21	5.4
9/8/97	99d	"S" Residence	Single	Average	0.005	224	97.3	4.1
9/8/97	99d	"S" Residence	Multiple	Average	0.005	224	98.34	3.7
9/8/97	99d	"S" Residence	Single	Maximum	0.009	395	87.97	5.9
9/8/97	99d	"S" Residence	Multiple	Maximum	0.009	395	92.25	5.2

**Notes:**

Air concentrations and soil/dust concentrations reflect site specific conditions.

Air concentrations were estimated assuming that:

- (1) the contaminant concentrations in the particulate matter reflect the contaminant concentrations measured in surface soil samples collected at a site and
- (2) the total suspended particulate material concentration in the air is 0.1 mg/m<sup>3</sup>.
- (3) the concentration of respirable particulates in air (chronic exposures) = 22 ug/m<sup>3</sup> (State of Maine, June 1994)

\* Percent of model population with calculated blood lead levels below 10 ug/dL (goal = 95%).  
Geometric mean represents mean blood lead level in model population.

**TABLE 7**  
**LEAD LEVELS DERIVED USING INPUTS FROM MAINE GUIDANCE**  
**SUMMARY OF POTENTIAL RISKS POSED BY LEAD EXPOSURES**  
**CALCULATED FOR CHILDREN AGES 0-6 YEARS**  
**PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE**

Date	Lead Model Version	Scenario	Single or Multiple Source Analysis	Input Description (Avg./Max)	Air Concentration (ug/m <sup>3</sup> )	Soil/Dust Concentration (ug/g)	Percent Below 10 ug/dL*	Geometric Mean (ug/dL)*
9/8/97	99d	No Soil Exposure	Single	Default	0.1	0	99.98	1.9
9/8/97	99d	No Soil Exposure	Multiple	Default	0.1	0	99.97	2.1
9/8/97	99d	"N" Residence	Single	Average	0.009	404	59.63	9.1
9/8/97	99d	"N" Residence	Multiple	Average	0.009	404	69.74	8.1
9/8/97	99d	"N" Residence	Single	Maximum	0.017	765	27.27	13.9
9/8/97	99d	"N" Residence	Multiple	Maximum	0.017	765	35.99	12.3
9/8/97	99d	"68" Residence	Single	Average	0.007	337	69.74	8.0
9/8/97	99d	"68" Residence	Multiple	Average	0.007	337	77.61	7.2
9/8/97	99d	"68" Residence	Single	Maximum	0.009	417	59.63	9.3
9/8/97	99d	"68" Residence	Multiple	Maximum	0.009	417	67.9	8.2
9/8/97	99d	"S" Residence	Single	Average	0.005	224	85.48	6.2
9/8/97	99d	"S" Residence	Multiple	Average	0.005	224	90.04	5.5
9/8/97	99d	"S" Residence	Single	Maximum	0.009	395	61.84	8.9
9/8/97	99d	"S" Residence	Multiple	Maximum	0.009	395	69.74	7.9

**Notes:**

Air concentrations and soil/dust concentrations reflect site specific conditions.

Air concentrations were estimated assuming that:

- (1) the contaminant concentrations in the particulate matter reflect the contaminant concentrations measured in surface soil samples collected at a site and
- (2) the total suspended particulate material concentration in the air is 0.1 mg/m<sup>3</sup>.
- (3) the concentration of respirable particulates in air (chronic exposures) = 22 ug/m<sup>3</sup> (State of Maine, June 1994)

The following model inputs have been changed to reflect recommendations in the Guidance Manual for Human Health Risk Assessments and Hazardous Substance Sites, State of Maine, Department of Environmental Protection and Department of Human Services, June 1994:

- (1) water consumption rate (0-6 years) = 1 L/day
- (2) soil ingestion rate (0-6 years) = 200 mg/day

\* Percent of model population with calculated blood lead levels below 10 ug/dL (goal = 95%).  
 Geometric mean represents mean blood lead level in model population.

**ATTACHMENT A**  
**IEUBK LEAD MODEL PRINTOUTS**  
**1992 EVALUATION**

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.050 ug Pb/m3  
 Indoor AIR Pb Conc: 30.0 percent of outdoor.  
 Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT  
 WATER Consumption: DEFAULT

SOIL & DUST:

Soil: constant conc.  
 Dust: constant conc.

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	362.8	362.8
1-2	362.8	362.8
2-3	362.8	362.8
3-4	362.8	362.8
4-5	362.8	362.8
5-6	362.8	362.8
6-7	362.8	362.8

Additional Dust Sources: None DEFAULT

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model  
 Maternal Blood Conc: 2.50 ug Pb/dL

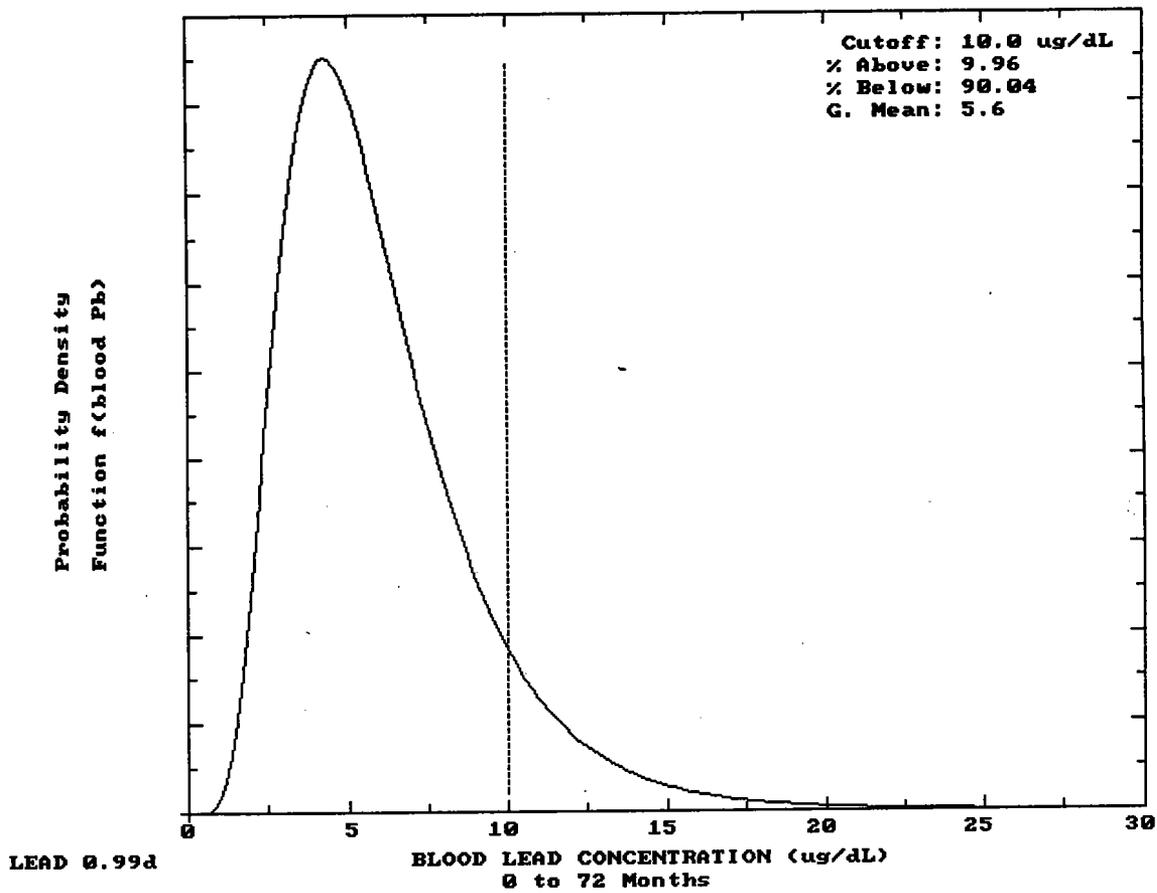
CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	5.9	10.95	8.15
1-2:	6.6	16.12	12.73
2-3:	6.2	16.76	12.95
3-4:	5.9	16.96	13.18
4-5:	4.9	13.92	10.08
5-6:	4.2	13.29	9.18
6-7:	3.8	13.18	8.72

YEAR	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	2.44	0.35	0.00	0.01
1-2:	2.50	0.87	0.00	0.02
2-3:	2.86	0.92	0.00	0.03
3-4:	2.80	0.95	0.00	0.03
4-5:	2.78	1.02	0.00	0.03
5-6:	2.97	1.09	0.00	0.05
6-7:	3.30	1.11	0.00	0.05

00001

RJD 4/21/98



00002

RJJ 4/21/98

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.050 ug Pb/m3

Indoor AIR Pb Conc: 30.0 percent of outdoor.

Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT

WATER Consumption: DEFAULT

SOIL & DUST:

Soil: constant conc.

Dust: Multiple Source Analysis

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	362.8	259.0
1-2	362.8	259.0
2-3	362.8	259.0
3-4	362.8	259.0
4-5	362.8	259.0
5-6	362.8	259.0
6-7	362.8	259.0

Additional Dust Sources: None DEFAULT

Soil contribution conversion factor: 0.70

Air contribution conversion factor: 100.0

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model

Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

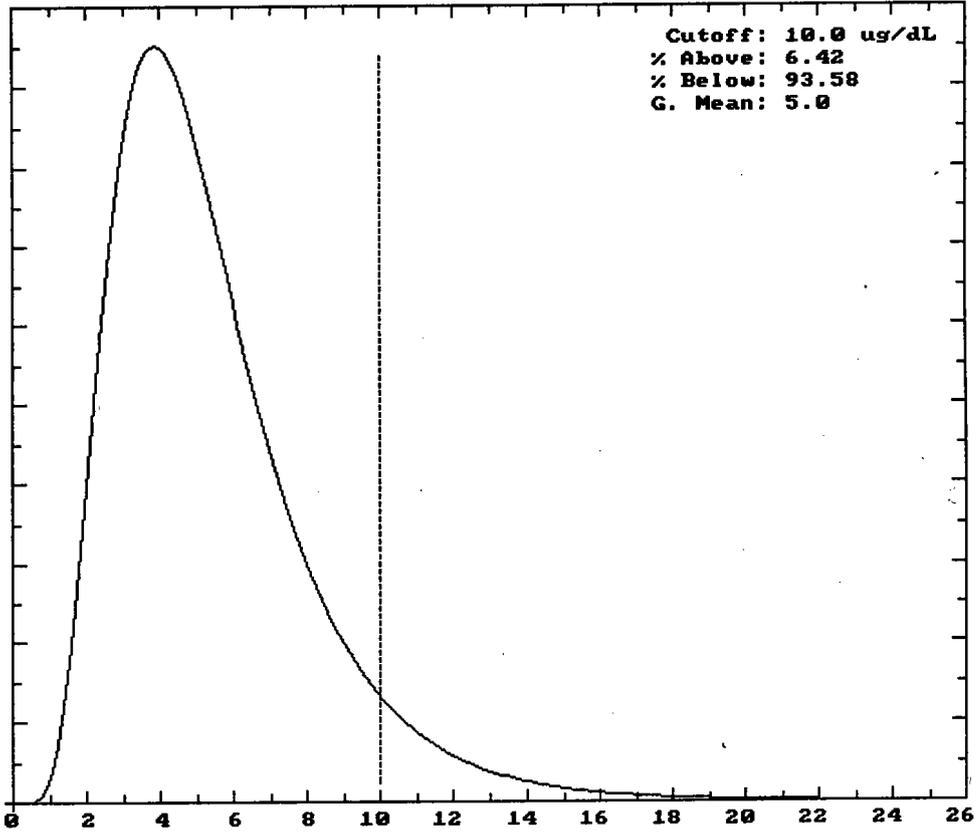
YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	5.3	9.80	6.96
1-2:	5.9	14.34	10.90
2-3:	5.5	14.93	11.07
3-4:	5.3	15.07	11.24
4-5:	4.4	12.43	8.57
5-6:	3.8	11.92	7.79
6-7:	3.4	11.88	7.39

YEAR	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	2.47	0.36	0.00	0.01
1-2:	2.54	0.88	0.00	0.02
2-3:	2.90	0.93	0.00	0.03
3-4:	2.83	0.96	0.00	0.03
4-5:	2.81	1.03	0.00	0.03
5-6:	2.99	1.09	0.00	0.05
6-7:	3.32	1.12	0.00	0.05

00003

RH 4/21/98

Probability Density  
Function f(blood Pb)



LEAD 0.99d

BLOOD LEAD CONCENTRATION (ug/dL)  
0 to 72 Months

00004

RJJ 4/21/98

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.220 ug Pb/m3  
Indoor AIR Pb Conc: 30.0 percent of outdoor.  
Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT  
WATER Consumption: DEFAULT

SOIL & DUST:

Soil: constant conc.  
Dust: constant conc.

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	765.0	765.0
1-2	765.0	765.0
2-3	765.0	765.0
3-4	765.0	765.0
4-5	765.0	765.0
5-6	765.0	765.0
6-7	765.0	765.0

Additional Dust Sources: None DEFAULT

PAINT Intake: 0.00 ug Pb/day DEFAULT

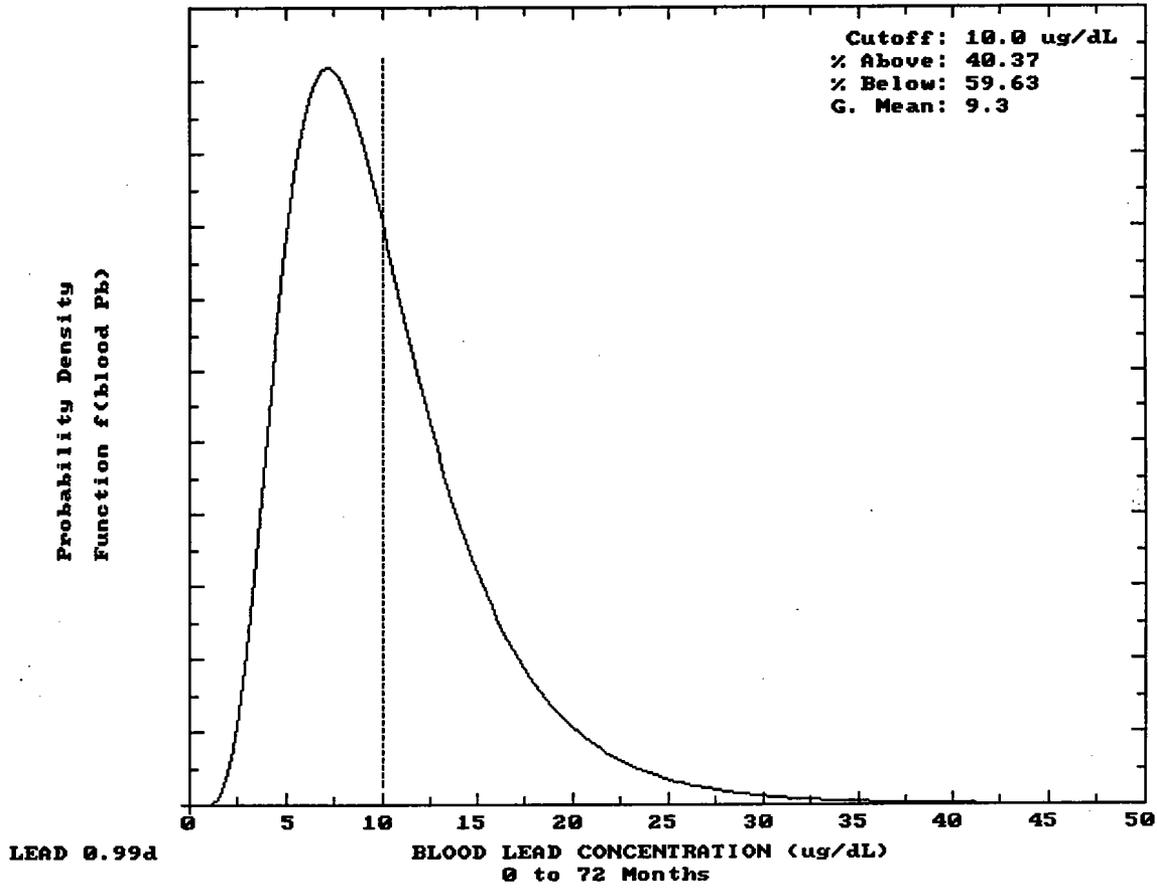
MATERNAL CONTRIBUTION: Infant Model  
Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	9.7	18.35	15.75	2.23	0.32	0.00	0.05
1-2:	11.1	27.32	24.21	2.26	0.78	0.00	0.08
2-3:	10.4	28.51	24.92	2.61	0.84	0.00	0.14
3-4:	10.0	29.23	25.63	2.58	0.88	0.00	0.15
4-5:	8.4	23.85	20.11	2.63	0.96	0.00	0.15
5-6:	7.1	22.58	18.50	2.84	1.04	0.00	0.21
6-7:	6.3	22.12	17.67	3.17	1.07	0.00	0.21

00005

RH 4/21/98



00006

RJ 4/21/98

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.220 ug Pb/m3  
Indoor AIR Pb Conc: 30.0 percent of outdoor.

Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT  
WATER Consumption: DEFAULT

SOIL & DUST:

Soil: constant conc.  
Dust: Multiple Source Analysis

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	765.0	557.5
1-2	765.0	557.5
2-3	765.0	557.5
3-4	765.0	557.5
4-5	765.0	557.5
5-6	765.0	557.5
6-7	765.0	557.5

Additional Dust Sources: None DEFAULT  
Soil contribution conversion factor: 0.70  
Air contribution conversion factor: 100.0

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model  
Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

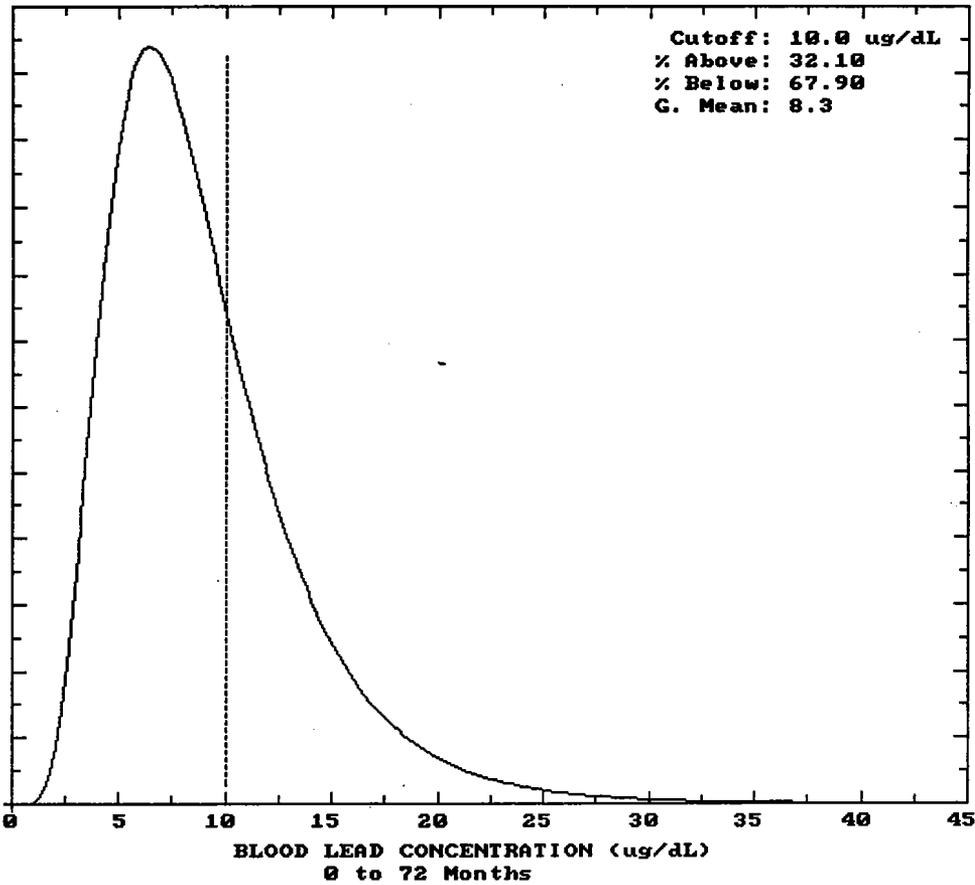
YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	8.7	16.38	13.72
1-2:	9.9	24.37	21.17
2-3:	9.3	25.40	21.73
3-4:	9.0	25.97	22.29
4-5:	7.5	21.17	17.37
5-6:	6.3	20.07	15.94
6-7:	5.7	19.70	15.20

YEAR	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	2.29	0.33	0.00	0.05
1-2:	2.32	0.80	0.00	0.08
2-3:	2.68	0.86	0.00	0.14
3-4:	2.64	0.90	0.00	0.15
4-5:	2.67	0.98	0.00	0.15
5-6:	2.88	1.05	0.00	0.21
6-7:	3.21	1.08	0.00	0.21

00007

RJF 4/21/98

Probability Density  
Function f(blood Pb)



00008

**ATTACHMENT B**  
**IEUBK LEAD MODEL PRINTOUTS**  
**1998 EVALUATION**

RJD 4/21/98

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.006 ug Pb/m3  
 Indoor AIR Pb Conc: 30.0 percent of outdoor.  
 Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT  
 WATER Consumption: DEFAULT

SOIL & DUST:  
 Soil: constant conc.  
 Dust: constant conc.

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	253.1	253.1
1-2	253.1	253.1
2-3	253.1	253.1
3-4	253.1	253.1
4-5	253.1	253.1
5-6	253.1	253.1
6-7	253.1	253.1

Additional Dust Sources: None DEFAULT

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model  
 Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

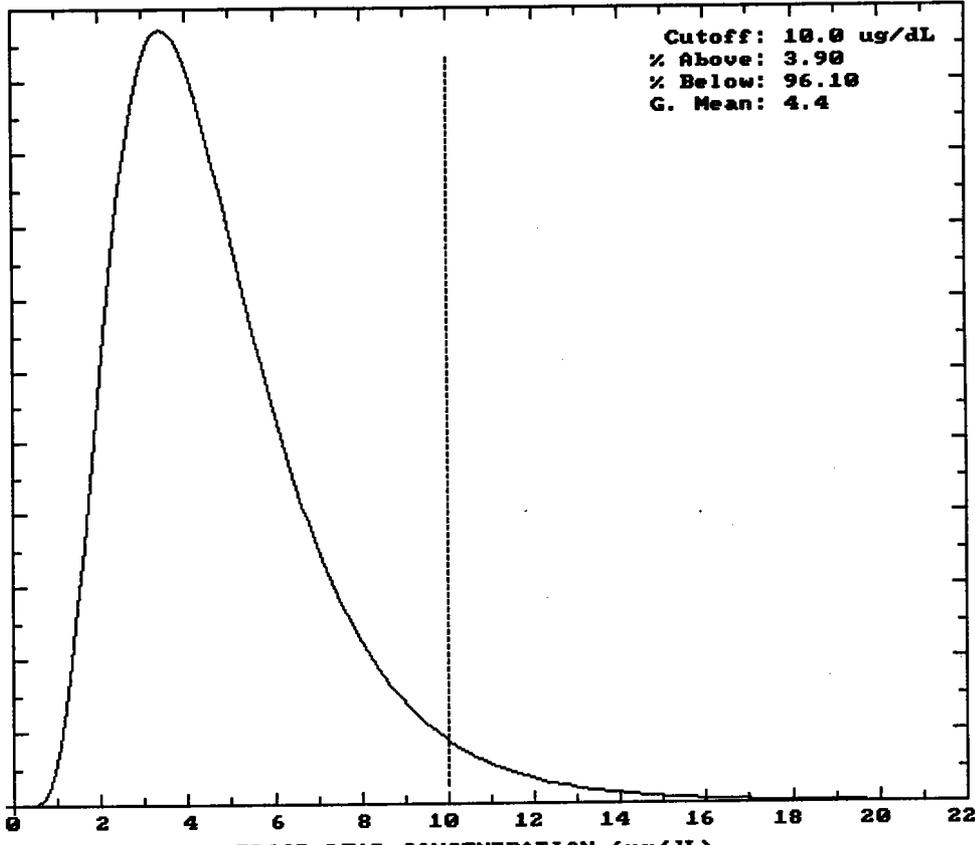
YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	4.7	8.71	5.84
1-2:	5.2	12.64	9.16
2-3:	4.9	13.17	9.28
3-4:	4.6	13.26	9.42
4-5:	3.9	11.01	7.15
5-6:	3.4	10.61	6.49
6-7:	3.0	10.62	6.15

YEAR	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	2.50	0.36	0.00	0.00
1-2:	2.58	0.89	0.00	0.00
2-3:	2.94	0.94	0.00	0.00
3-4:	2.87	0.97	0.00	0.00
4-5:	2.83	1.04	0.00	0.00
5-6:	3.01	1.10	0.00	0.01
6-7:	3.34	1.13	0.00	0.01

00001

RJ 4/21/98

Probability Density  
Function f(blood Pb)



LEAD 0.99d

BLOOD LEAD CONCENTRATION (ug/dL)  
0 to 72 Months

00002

RJ 4/21/98

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.006 ug Pb/m3

Indoor AIR Pb Conc: 30.0 percent of outdoor.

Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT

WATER Consumption: DEFAULT

SOIL & DUST:

Soil: constant conc.

Dust: Multiple Source Analysis

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	253.1	177.7
1-2	253.1	177.7
2-3	253.1	177.7
3-4	253.1	177.7
4-5	253.1	177.7
5-6	253.1	177.7
6-7	253.1	177.7

Additional Dust Sources: None DEFAULT

Soil contribution conversion factor: 0.70

Air contribution conversion factor: 100.0

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model

Maternal Blood Conc: 2.50 ug Pb/dL

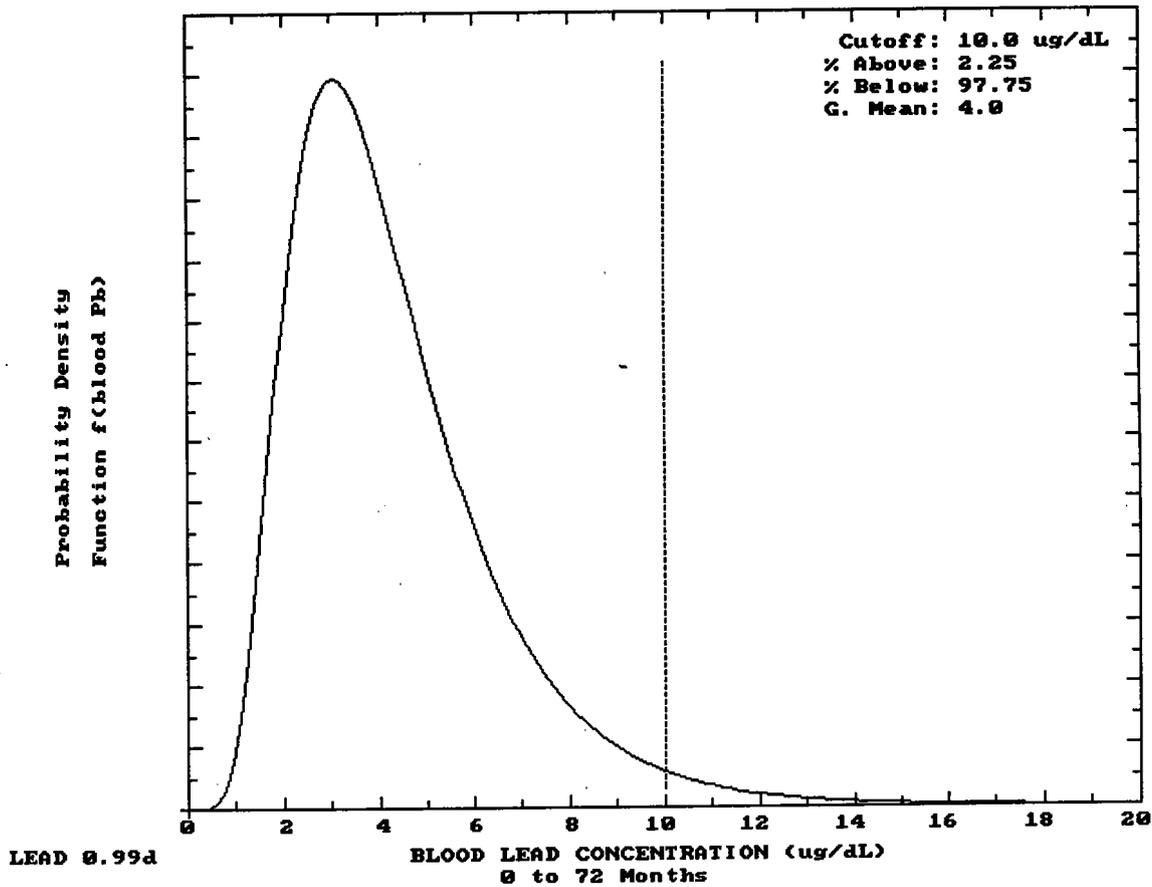
CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	4.2	7.83	4.93
1-2:	4.7	11.28	7.76
2-3:	4.4	11.77	7.85
3-4:	4.1	11.83	7.95
4-5:	3.5	9.90	6.01
5-6:	3.0	9.59	5.45
6-7:	2.8	9.66	5.17

YEAR	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	2.53	0.37	0.00	0.00
1-2:	2.62	0.91	0.00	0.00
2-3:	2.97	0.95	0.00	0.00
3-4:	2.89	0.98	0.00	0.00
4-5:	2.85	1.04	0.00	0.00
5-6:	3.03	1.11	0.00	0.01
6-7:	3.35	1.13	0.00	0.01

00003

RJH 4/21/98



00004

R/D 4/21/98

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.007 ug Pb/m3

Indoor AIR Pb Conc: 30.0 percent of outdoor.

Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT

WATER Consumption: DEFAULT

SOIL & DUST:

Soil: constant conc.

Dust: constant conc.

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	314.0	314.0
1-2	314.0	314.0
2-3	314.0	314.0
3-4	314.0	314.0
4-5	314.0	314.0
5-6	314.0	314.0
6-7	314.0	314.0

Additional Dust Sources: None DEFAULT

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model

Maternal Blood Conc: 2.50 ug Pb/dL

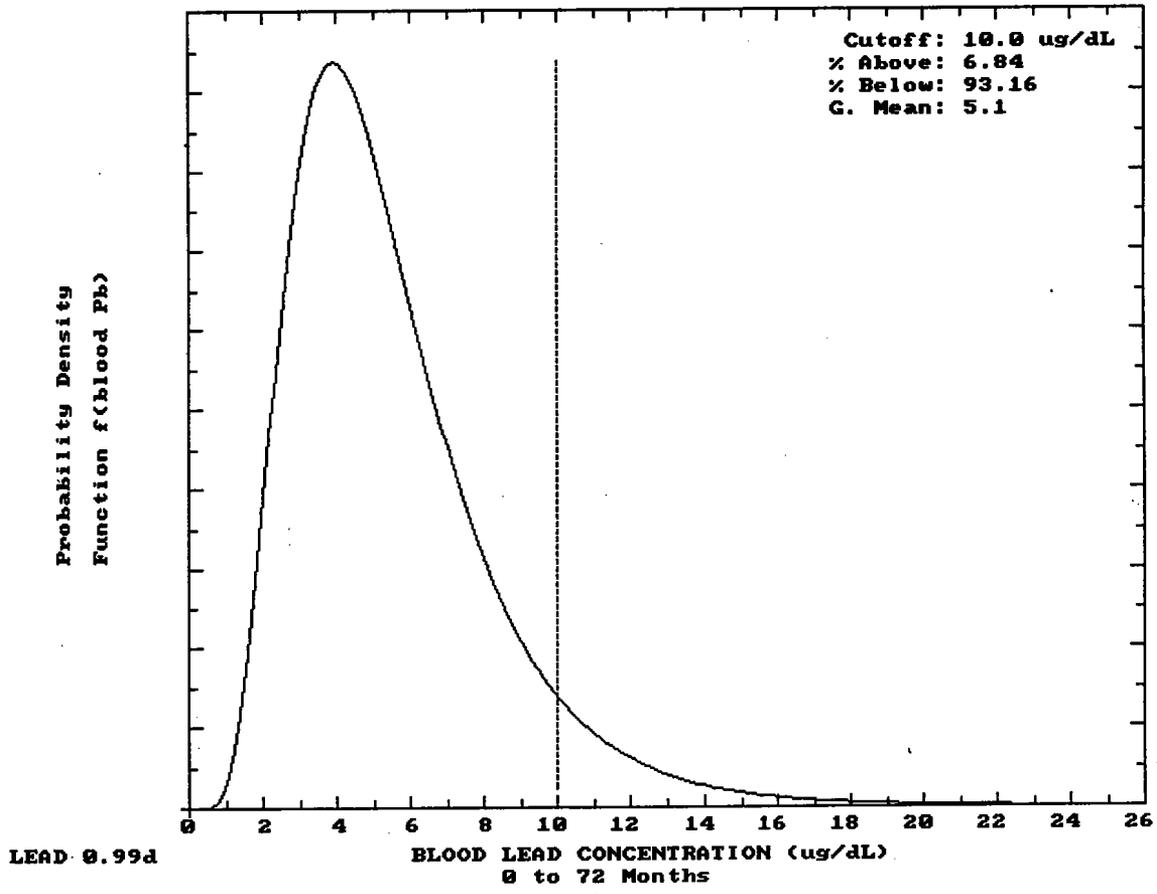
CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	5.4	9.96	7.14
1-2:	6.0	14.59	11.17
2-3:	5.6	15.17	11.34
3-4:	5.3	15.32	11.53
4-5:	4.5	12.62	8.79
5-6:	3.8	12.08	7.99
6-7:	3.4	12.03	7.59

YEAR	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	2.47	0.36	0.00	0.00
1-2:	2.54	0.88	0.00	0.00
2-3:	2.89	0.93	0.00	0.00
3-4:	2.83	0.96	0.00	0.00
4-5:	2.80	1.03	0.00	0.00
5-6:	2.99	1.09	0.00	0.01
6-7:	3.32	1.12	0.00	0.01

00005

RJA 4/21/98



00006

8/21/98

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.007 ug Pb/m3

Indoor AIR Pb Conc: 30.0 percent of outdoor.

Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT

WATER Consumption: DEFAULT

SOIL & DUST:

Soil: constant conc.

Dust: Multiple Source Analysis

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	314.0	220.5
1-2	314.0	220.5
2-3	314.0	220.5
3-4	314.0	220.5
4-5	314.0	220.5
5-6	314.0	220.5
6-7	314.0	220.5

Additional Dust Sources: None DEFAULT

Soil contribution conversion factor: 0.70

Air contribution conversion factor: 100.0

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model

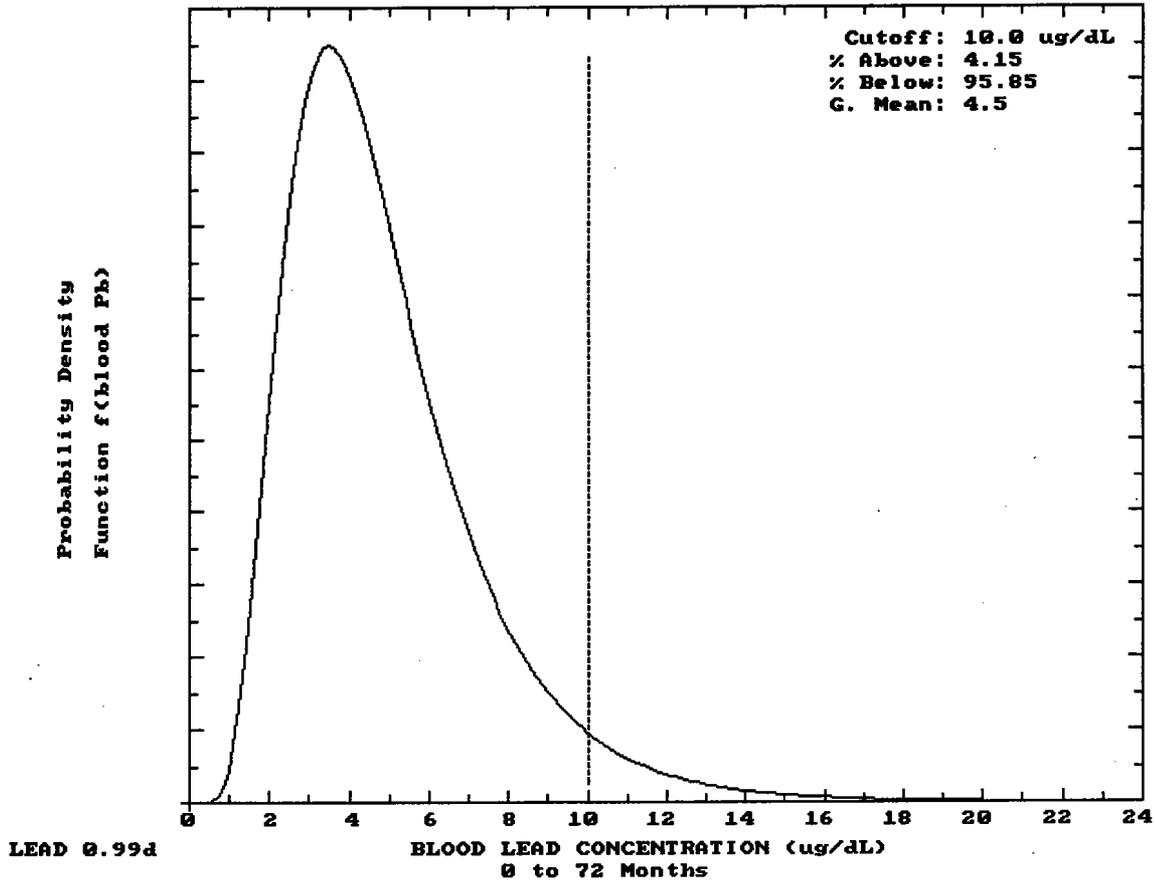
Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	4.8	8.90	6.04	2.50	0.36	0.00	0.00
1-2:	5.4	12.95	9.48	2.58	0.89	0.00	0.00
2-3:	5.0	13.49	9.61	2.93	0.94	0.00	0.00
3-4:	4.8	13.59	9.75	2.86	0.97	0.00	0.00
4-5:	4.0	11.27	7.40	2.82	1.03	0.00	0.00
5-6:	3.4	10.84	6.73	3.01	1.10	0.00	0.01
6-7:	3.1	10.84	6.38	3.33	1.12	0.00	0.01

00007

RJ 4/11/98



00008

RJD 4/21/98

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.017 ug Pb/m3  
Indoor AIR Pb Conc: 30.0 percent of outdoor.

Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT  
WATER Consumption: DEFAULT

SOIL & DUST:

Soil: constant conc.  
Dust: constant conc.

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	765.0	765.0
1-2	765.0	765.0
2-3	765.0	765.0
3-4	765.0	765.0
4-5	765.0	765.0
5-6	765.0	765.0
6-7	765.0	765.0

Additional Dust Sources: None DEFAULT

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model  
Maternal Blood Conc: 2.50 ug Pb/dL

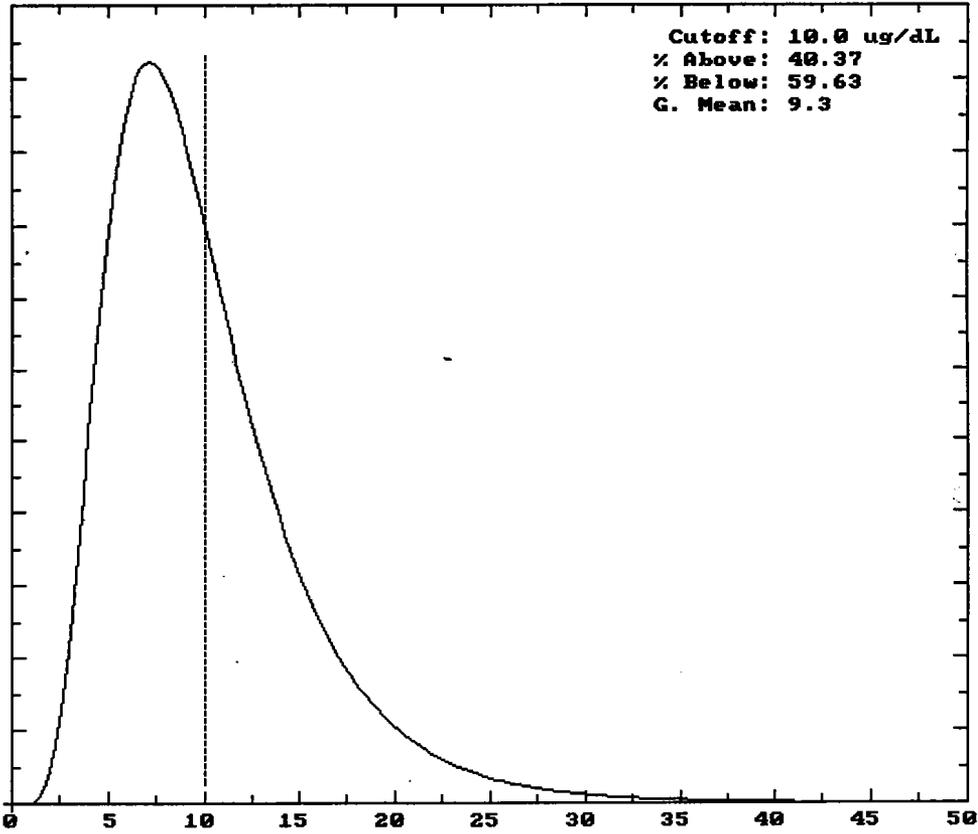
CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	9.6	18.31	15.75	2.23	0.32	0.00	0.00
1-2:	11.1	27.25	24.21	2.26	0.78	0.00	0.01
2-3:	10.4	28.38	24.92	2.61	0.84	0.00	0.01
3-4:	10.0	29.10	25.63	2.58	0.88	0.00	0.01
4-5:	8.4	23.72	20.11	2.63	0.96	0.00	0.01
5-6:	7.1	22.39	18.50	2.84	1.04	0.00	0.02
6-7:	6.3	21.93	17.67	3.17	1.07	0.00	0.02

00009

RJL 4/21/98

Probability Density  
Function f(blood Pb)



LEAD 0.99d

BLOOD LEAD CONCENTRATION (ug/dL)  
0 to 72 Months

00010

RJF 4/21/98

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.017 ug Pb/m3

Indoor AIR Pb Conc: 30.0 percent of outdoor.

Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT

WATER Consumption: DEFAULT

SOIL & DUST:

Soil: constant conc.

Dust: Multiple Source Analysis

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	765.0	537.2
1-2	765.0	537.2
2-3	765.0	537.2
3-4	765.0	537.2
4-5	765.0	537.2
5-6	765.0	537.2
6-7	765.0	537.2

Additional Dust Sources: None DEFAULT

Soil contribution conversion factor: 0.70

Air contribution conversion factor: 100.0

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model

Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

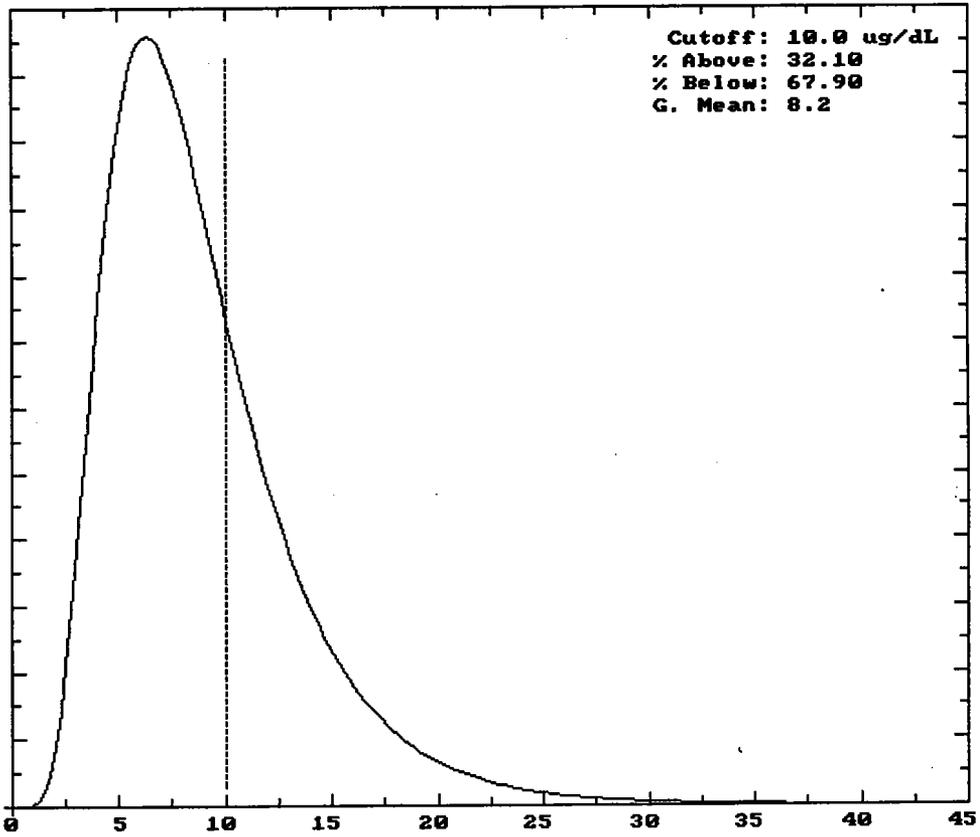
YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	8.5	16.14	13.52
1-2:	9.8	24.01	20.87
2-3:	9.2	24.96	21.41
3-4:	8.8	25.50	21.95
4-5:	7.3	20.77	17.10
5-6:	6.2	19.63	15.68
6-7:	5.5	19.27	14.96

YEAR	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	2.29	0.33	0.00	0.00
1-2:	2.33	0.81	0.00	0.01
2-3:	2.68	0.86	0.00	0.01
3-4:	2.64	0.90	0.00	0.01
4-5:	2.68	0.98	0.00	0.01
5-6:	2.88	1.05	0.00	0.02
6-7:	3.21	1.08	0.00	0.02

00011

RJF 4/21/98

Probability Density  
Function f(blood Pb)



LEAD 0.99d

BLOOD LEAD CONCENTRATION (ug/dL)  
0 to 72 Months

00012

**ATTACHMENT C**  
**SAMPLE IDENTIFICATION NUMBERS**  
**1998 EVALUATION**

**ATTACHMENT C  
DATA SET USED TO DERIVE CONCENTRATIONS  
FOR 1998 LEAD EVALUATION  
PORTMOUTH NAVAL SHIPYARD, KITTERY, MAINE**

<b>Sample Identification Number</b>	<b>Concentration (mg/kg)</b>
SS-06 (0-1.0)	417
SS-07 (0-1.0)	257
SS-14 (12-14")	262
SS-15D (1-1.5')	18.6
SS-15S (0-0.5')	128
SS-16 (18-20")	23.4
SS-16D (1-1.5')	34
SS-16S (0-0.5')	53
SS-17D (1-1.5')	85.4
SS-17S (0-0.5')	396
SS-18D (1-1.5')	101
SS-19D (1-1.5')	215
SS-19S (0-0.5')	467
SS-20D (1-1.5')	236
SS-20S (0-0.5')	245
SS-21D (1-1.5')	284
SS-21S (0-0.5')	370
SS-22 (20-22")	60.9
SS-22D (1-1.5')	296
SS-22S (0-0.5')	383
SS-23 (12-14")	472
SS-23 (18-20")	172
SS-23S (0-0.5')	765
SS-14s (0-0.5') – AVG	395
SS-18s (0-0.5') – AVG	200
<b>Average</b>	253
<b>Maximum</b>	765
<b>95% UCL</b>	314

- 1 Duplicates were average and counted as one sample.
- 2 A values equal to one-half of the detection limit was substituted for non-detects.
- 3 The depth of the sample is integral to the sample identification number (i.e., it is presented in parentheses). Sample SS-06 (0-1.0) was collected in the 0 to 1 foot interval.

**ATTACHMENT D**  
**IEUBK LEAD MODEL PRINTOUTS USING MAINE GUIDANCE**  
**1998 EVALUATION**

RJH 4/21/98

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.006 ug Pb/m3  
Indoor AIR Pb Conc: 30.0 percent of outdoor.  
Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT

Other WATER Parameters (non-default):

Age	Water Consumption (L/day)
0-1	1.00
1-2	1.00
2-3	1.00
3-4	1.00
4-5	1.00
5-6	1.00
6-7	1.00

SOIL & DUST:

Soil: constant conc.  
Dust: constant conc.

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	253.1	253.1
1-2	253.1	253.1
2-3	253.1	253.1
3-4	253.1	253.1
4-5	253.1	253.1
5-6	253.1	253.1
6-7	253.1	253.1

Additional Dust Sources: None DEFAULT

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model  
Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	8.7	16.47	12.53
1-2:	7.5	17.22	13.02
2-3:	6.6	17.85	13.27
3-4:	6.3	18.08	13.52
4-5:	6.0	18.25	13.72
5-6:	5.7	18.59	13.86
6-7:	5.3	19.00	13.94

YEAR	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	2.28	1.65	0.00	0.00

00 01

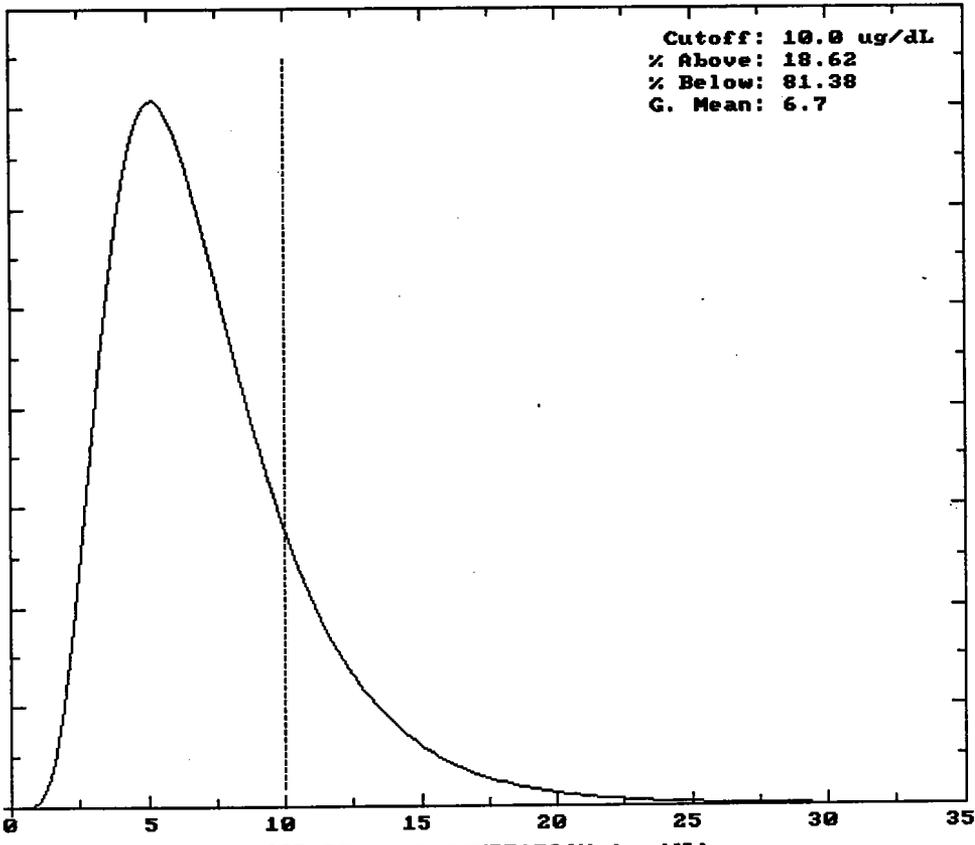
RJH 4/21/98

1-2:	2.48	1.72	0.00	0.00
2-3:	2.84	1.75	0.00	0.00
3-4:	2.78	1.78	0.00	0.00
4-5:	2.72	1.81	0.00	0.00
5-6:	2.89	1.83	0.00	0.01
6-7:	3.21	1.84	0.00	0.01

00002

RJD 4/21/98

Probability Density  
Function f(blood Pb)



LEAD 0.99d

BLOOD LEAD CONCENTRATION (ug/dL)  
0 to 72 Months

00003

RJD 4/21/98

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.006 ug Pb/m3  
Indoor AIR Pb Conc: 30.0 percent of outdoor.  
Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT  
Other WATER Parameters (non-default):

Age	Water Consumption (L/day)
0-1	1.00
1-2	1.00
2-3	1.00
3-4	1.00
4-5	1.00
5-6	1.00
6-7	1.00

SOIL & DUST:

Soil: constant conc.  
Dust: Multiple Source Analysis

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	253.1	177.8
1-2	253.1	177.8
2-3	253.1	177.8
3-4	253.1	177.8
4-5	253.1	177.8
5-6	253.1	177.8
6-7	253.1	177.8

Additional Dust Sources: None DEFAULT  
Soil contribution conversion factor: 0.70  
Air contribution conversion factor: 100.0

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model  
Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	7.8	14.72	10.70
1-2:	6.7	15.35	11.08
2-3:	5.9	15.92	11.26
3-4:	5.6	16.08	11.45
4-5:	5.3	16.19	11.61
5-6:	5.1	16.49	11.71
6-7:	4.8	16.88	11.77

00004

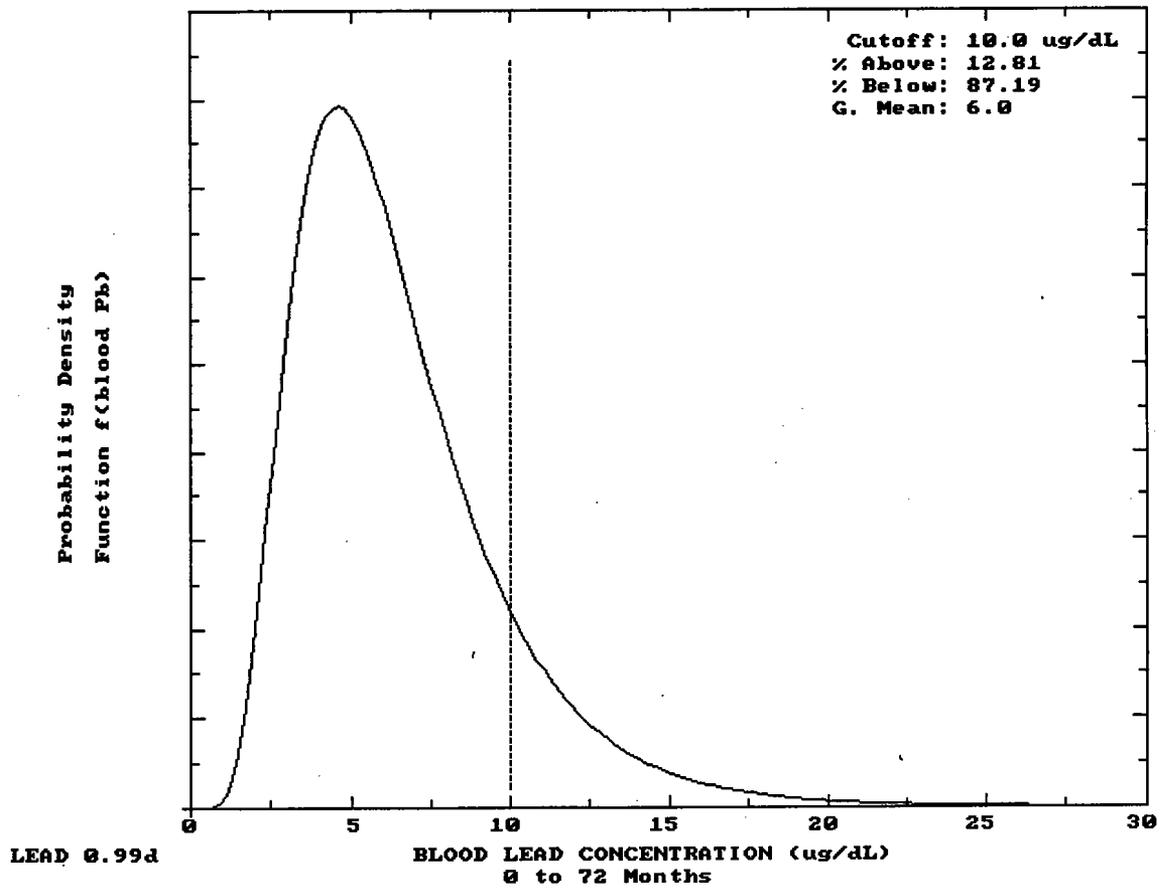
YEAR	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
------	----------------------	-----------------------	-----------------------	---------------------

RJD 4/21/48

-----	-----	-----	-----	-----
0.5-1:	2.33	1.69	0.00	0.00
1-2:	2.52	1.74	0.00	0.00
2-3:	2.88	1.77	0.00	0.00
3-4:	2.81	1.80	0.00	0.00
4-5:	2.75	1.83	0.00	0.00
5-6:	2.92	1.84	0.00	0.01
6-7:	3.24	1.85	0.00	0.01

00005

RJD 4/21/98



00006

RJH 4/21/98

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.007 ug Pb/m3  
Indoor AIR Pb Conc: 30.0 percent of outdoor.  
Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT  
Other WATER Parameters (non-default):

Age	Water Consumption (L/day)
0-1	1.00
1-2	1.00
2-3	1.00
3-4	1.00
4-5	1.00
5-6	1.00
6-7	1.00

SOIL & DUST:  
Soil: constant conc.  
Dust: constant conc.

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	314.0	314.0
1-2	314.0	314.0
2-3	314.0	314.0
3-4	314.0	314.0
4-5	314.0	314.0
5-6	314.0	314.0
6-7	314.0	314.0

Additional Dust Sources: None DEFAULT

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model  
Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	9.9	18.92	15.10
1-2:	8.6	19.86	15.77
2-3:	7.6	20.60	16.11
3-4:	7.3	20.93	16.46
4-5:	7.0	21.20	16.74
5-6:	6.6	21.59	16.94
6-7:	6.2	22.04	17.06

00007

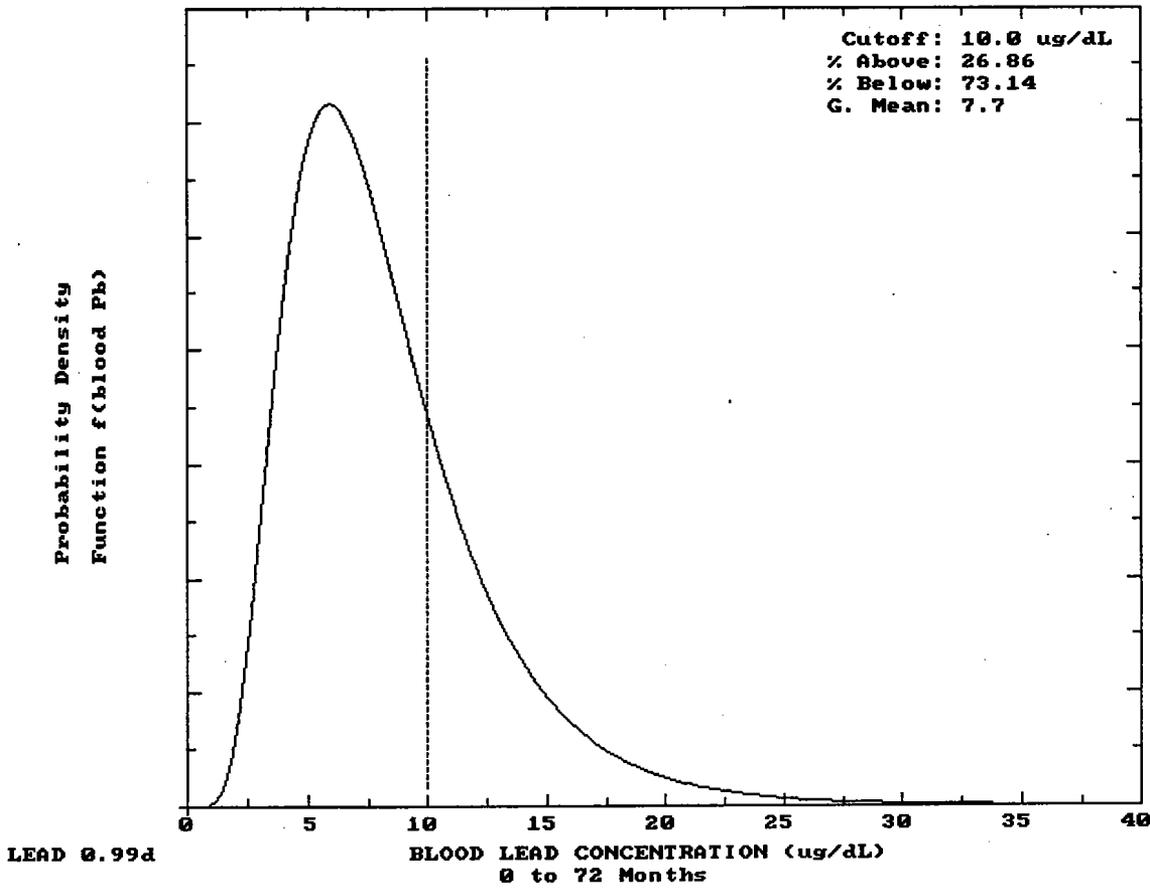
YEAR	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	2.22	1.60	0.00	0.00

RJD 4/21/98

1-2:	2.42	1.67	0.00	0.00
2-3:	2.78	1.71	0.00	0.00
3-4:	2.73	1.75	0.00	0.00
4-5:	2.67	1.78	0.00	0.00
5-6:	2.85	1.80	0.00	0.01
6-7:	3.17	1.81	0.00	0.01

00008

RD 4/21/98



00009

RJD 4/21/98

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.007 ug Pb/m3  
Indoor AIR Pb Conc: 30.0 percent of outdoor.  
Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT  
Other WATER Parameters (non-default):

Age	Water Consumption (L/day)
0-1	1.00
1-2	1.00
2-3	1.00
3-4	1.00
4-5	1.00
5-6	1.00
6-7	1.00

SOIL & DUST:

Soil: constant conc.  
Dust: Multiple Source Analysis

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	314.0	220.5
1-2	314.0	220.5
2-3	314.0	220.5
3-4	314.0	220.5
4-5	314.0	220.5
5-6	314.0	220.5
6-7	314.0	220.5

Additional Dust Sources: None DEFAULT  
Soil contribution conversion factor: 0.70  
Air contribution conversion factor: 100.0

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model  
Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	8.9	16.86	12.94
1-2:	7.7	17.64	13.46
2-3:	6.8	18.29	13.72
3-4:	6.4	18.53	13.98
4-5:	6.2	18.72	14.20
5-6:	5.8	19.06	14.35
6-7:	5.5	19.48	14.43

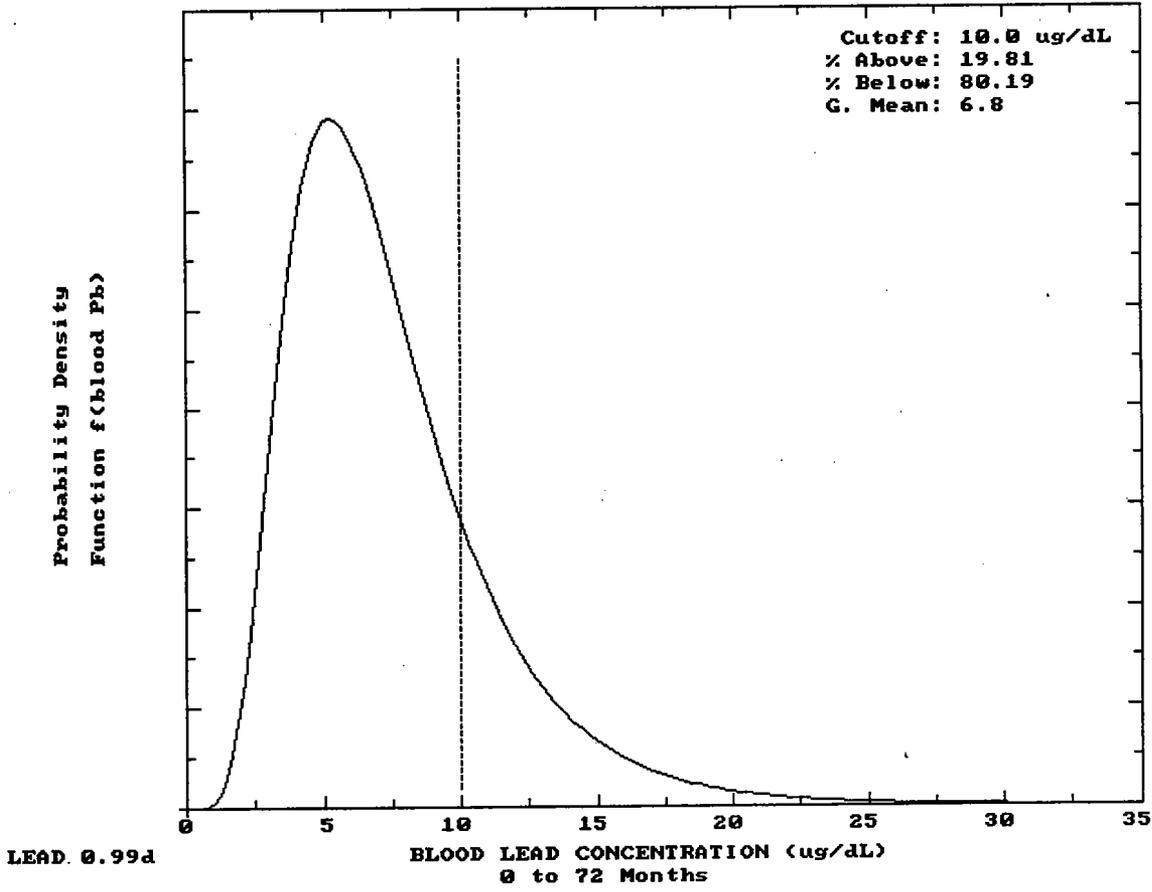
00010

YEAR	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
------	----------------------	-----------------------	-----------------------	---------------------

-----	-----	-----	-----	-----
0.5-1:	2.27	1.64	0.00	0.00
1-2:	2.47	1.71	0.00	0.00
2-3:	2.83	1.74	0.00	0.00
3-4:	2.77	1.77	0.00	0.00
4-5:	2.71	1.80	0.00	0.00
5-6:	2.89	1.82	0.00	0.01
6-7:	3.21	1.83	0.00	0.01

RJD 4/21/98

RJA 4/21/98



00012

RM 4/21/98

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.017 ug Pb/m3  
Indoor AIR Pb Conc: 30.0 percent of outdoor.  
Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT  
Other WATER Parameters (non-default):

Age	Water Consumption (L/day)
0-1	1.00
1-2	1.00
2-3	1.00
3-4	1.00
4-5	1.00
5-6	1.00
6-7	1.00

SOIL & DUST:  
Soil: constant conc.  
Dust: constant conc.

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	765.0	765.0
1-2	765.0	765.0
2-3	765.0	765.0
3-4	765.0	765.0
4-5	765.0	765.0
5-6	765.0	765.0
6-7	765.0	765.0

Additional Dust Sources: None DEFAULT

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model  
Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	17.3	33.87	30.68
1-2:	15.5	36.42	32.91
2-3:	13.8	38.09	34.18
3-4:	13.4	39.37	35.41
4-5:	13.0	40.48	36.49
5-6:	12.5	41.49	37.28
6-7:	11.7	42.33	37.79

YEAR	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	1.85	1.34	0.00	0.00

00013

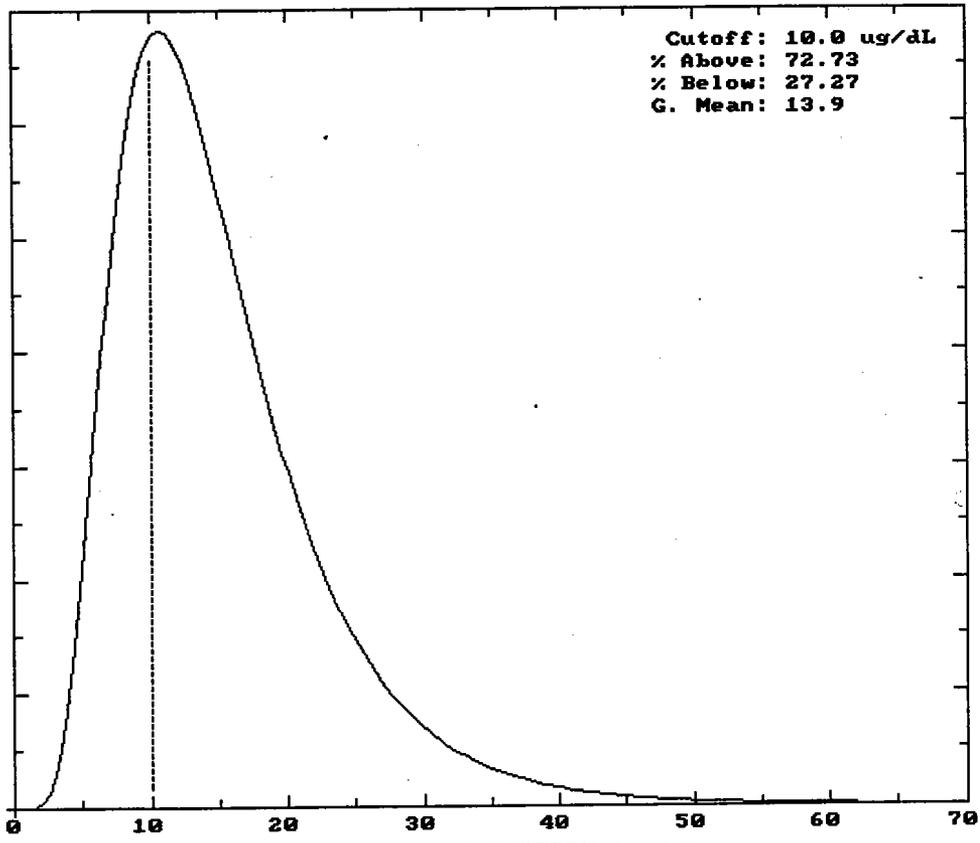
1-2:	2.07	1.43	0.00	0.01
2-3:	2.42	1.49	0.00	0.01
3-4:	2.41	1.54	0.00	0.01
4-5:	2.39	1.59	0.00	0.01
5-6:	2.57	1.62	0.00	0.02
6-7:	2.88	1.65	0.00	0.02

RJD 4/21/98

00014

RJA 4/21/98

Probability Density  
Function f(blood Pb)



LEAD 0.99d

BLOOD LEAD CONCENTRATION (ug/dL)  
0 to 72 Months

00015

RJD 4/21/98

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.017 ug Pb/m3  
Indoor AIR Pb Conc: 30.0 percent of outdoor.  
Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT

Other WATER Parameters (non-default):

Age	Water Consumption (L/day)
0-1	1.00
1-2	1.00
2-3	1.00
3-4	1.00
4-5	1.00
5-6	1.00
6-7	1.00

SOIL & DUST:

Soil: constant conc.  
Dust: Multiple Source Analysis

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	765.0	537.2
1-2	765.0	537.2
2-3	765.0	537.2
3-4	765.0	537.2
4-5	765.0	537.2
5-6	765.0	537.2
6-7	765.0	537.2

Additional Dust Sources: None DEFAULT  
Soil contribution conversion factor: 0.70  
Air contribution conversion factor: 100.0

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model  
Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	15.5	30.16	26.83				
1-2:	13.8	32.26	28.61				
2-3:	12.3	33.66	29.61				
3-4:	11.9	34.66	30.57				
4-5:	11.5	35.52	31.41				
5-6:	11.0	36.34	32.01				
6-7:	10.3	37.06	32.40				

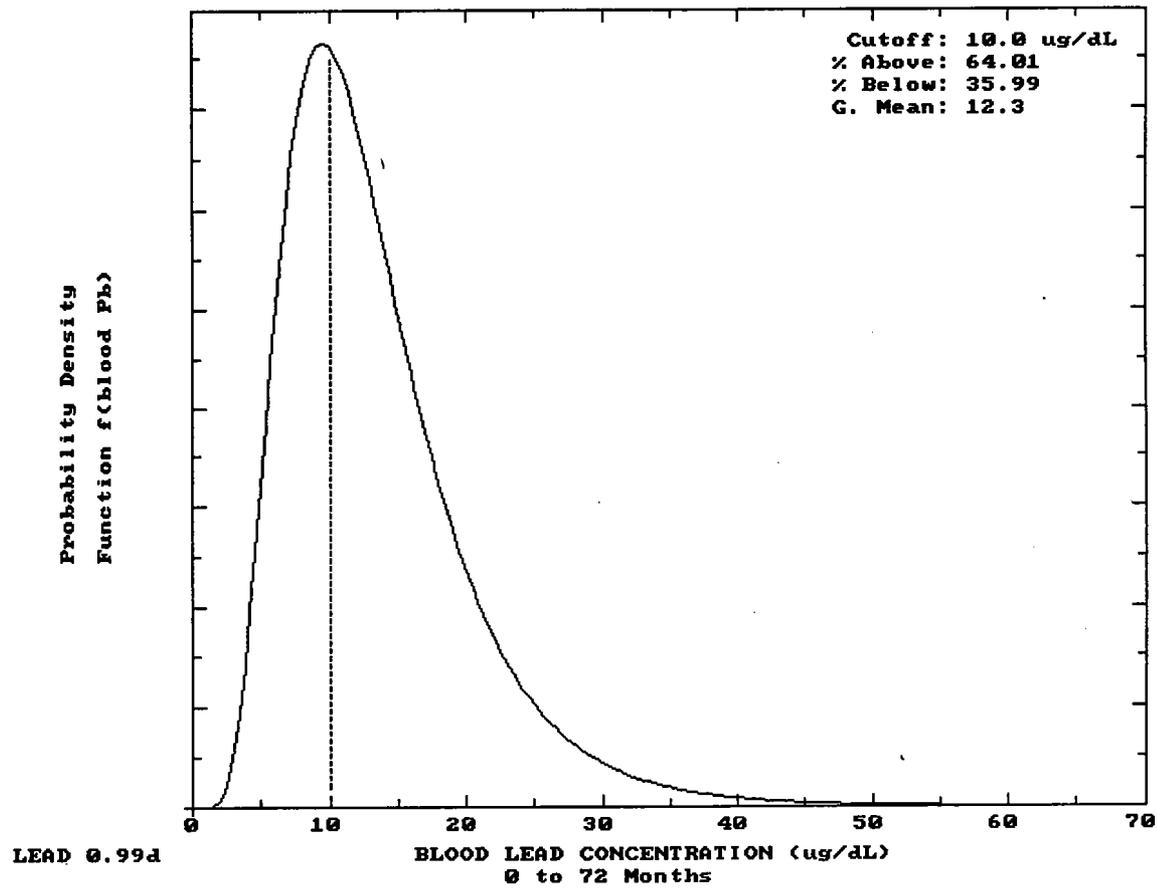
00016

RJD 4/21/98

-----	-----	-----	-----	-----
0.5-1:	1.93	1.40	0.00	0.00
1-2:	2.15	1.49	0.00	0.01
2-3:	2.50	1.54	0.00	0.01
3-4:	2.49	1.59	0.00	0.01
4-5:	2.46	1.64	0.00	0.01
5-6:	2.64	1.67	0.00	0.02
6-7:	2.95	1.69	0.00	0.02

00017

RJA 4/21/98



00010

**ATTACHMENT E**  
**SAMPLE CALCULATION**  
**BLOOD LEAD CONCENTRATIONS FOR ADULT AND FETUS**

CLIENT	Portsmouth Naval Shipyard		JOB NUMBER	6515
SUBJECT	Calculation of Blood Lead Concentrations for Adult & Fetus			
BASED ON	USEPA December 1996		DRAWING NUMBER	
BY	LHJ	CHECKED BY	RH	APPROVED BY
				DATE 1/30/98

Purpose: To calculate central estimate of blood lead levels in adult women and subsequent blood lead levels in fetuses born to women exposed to lead.

Equations:  $PbB_{adult} = PbB_0 + (PbS \times BKSF \times IR_s \times AF_s \times EF_s) / AT$   
 and  $PbB_{fetal} = PbB_{adult} \times GSD_{i,adult}^{1.645} \times R_{fetal/maternal}$

Where:  
 $PbB_0$  = typical blood lead concentration in adult women; baseline (ug/dL)  
 $PbS$  = site-specific soil lead concentration (ug/g)  
 $BKSF$  = biokinetic slope factor (unitless)  
 $IR_s$  = ingestion rate-soil (g/day)  
 $AF_s$  = gastrointestinal absorption factor (unitless)  
 $EF_s$  = exposure frequency (days/year)  
 $AT$  = averaging time (days/year)  
 $GSD_{i,adult}$  = individual geometric standard deviation among adults  
 $R_{fetal/maternal}$  = constant of proportionality between fetal blood lead concentration at birth and maternal blood lead concentration (unitless)

Examples: ("worst case")

$PbB_{adult} = 2.2 \text{ ug/dL} + (765 \text{ ug/g} \times 0.4 \times 0.050 \text{ g/day} \times 0.12 \times 219 \text{ days/yr}) / 365 \text{ days/yr}$   
 $PbB_{adult} = 2.2 \text{ ug/dL} + 1.1016 \text{ ug/dL} = 3.3016 \text{ ug/dL}$   
 $PbB_{fetus} = 3.3016 \text{ ug/dL} \times 2.1^{1.645} \times 0.9$   
 $PbB_{fetus} = 10.0697 = 10.07 \text{ ug/dL}$

001101

**ATTACHMENT F**  
**IEUBK LEAD MODEL PRINTOUTS USING INDIVIDUAL RESIDENCES**  
**1998 EVALUATION**

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.009 ug Pb/m3

Indoor AIR Pb Conc: 30.0 percent of outdoor.

Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT

WATER Consumption: DEFAULT

SOIL & DUST:

Soil: constant conc.

Dust: constant conc.

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	404.0	404.0
1-2	404.0	404.0
2-3	404.0	404.0
3-4	404.0	404.0
4-5	404.0	404.0
5-6	404.0	404.0
6-7	404.0	404.0

Additional Dust Sources: None DEFAULT

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model

Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	6.3	11.76	8.99
1-2:	7.1	17.35	14.01
2-3:	6.7	18.02	14.28
3-4:	6.4	18.27	14.55
4-5:	5.3	14.95	11.16
5-6:	4.5	14.22	10.18
6-7:	4.0	14.08	9.67

00001

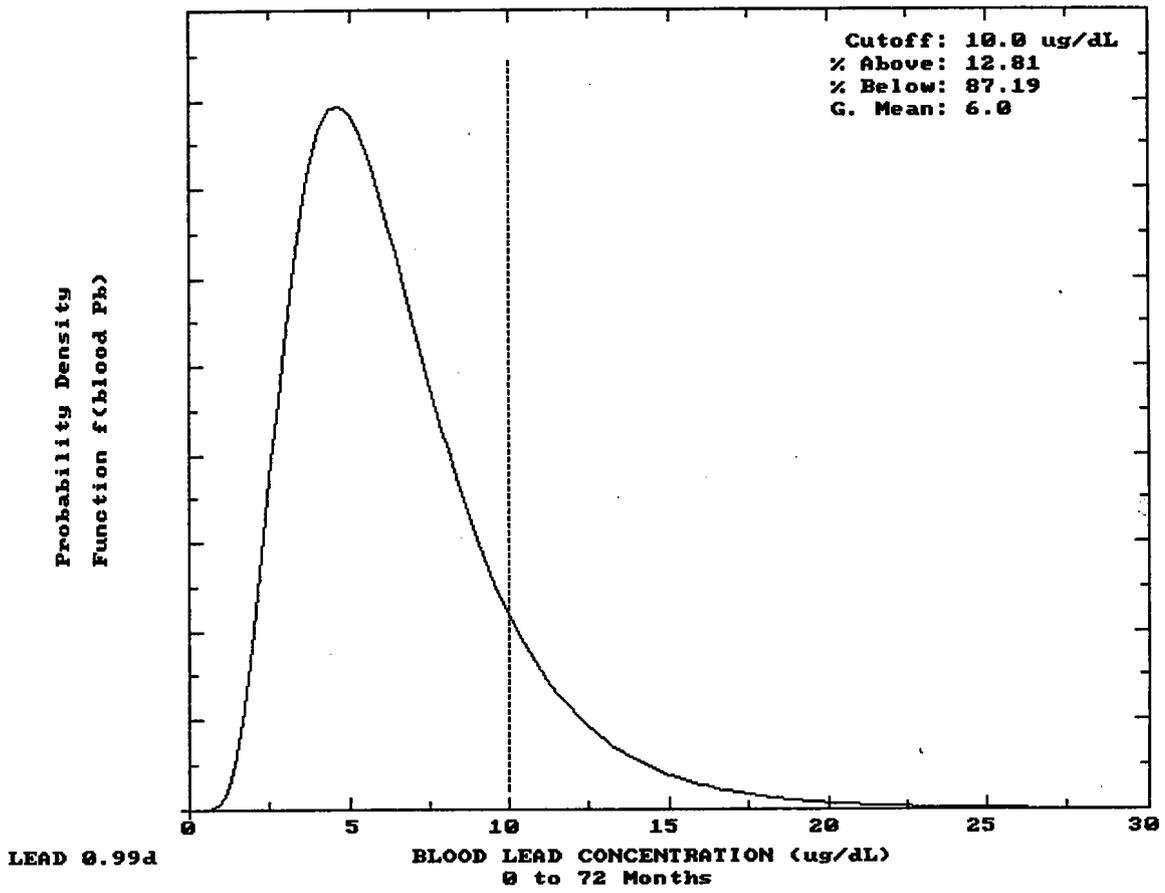
YEAR	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	2.41	0.35	0.00	0.00
1-2:	2.48	0.86	0.00	0.00
2-3:	2.83	0.91	0.00	0.01

"N" Residence

3-4:	2.77	0.94	0.00	0.01
4-5:	2.77	1.01	0.00	0.01
5-6:	2.96	1.08	0.00	0.01
6-7:	3.29	1.11	0.00	0.01

00002

"N" Residence



00003

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.009 ug Pb/m3

Indoor AIR Pb Conc: 30.0 percent of outdoor.

Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT

WATER Consumption: DEFAULT

SOIL & DUST:

Soil: constant conc.

Dust: Multiple Source Analysis

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	404.0	283.7
1-2	404.0	283.7
2-3	404.0	283.7
3-4	404.0	283.7
4-5	404.0	283.7
5-6	404.0	283.7
6-7	404.0	283.7

Additional Dust Sources: None DEFAULT

Soil contribution conversion factor: 0.70

Air contribution conversion factor: 100.0

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model

Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	5.6	10.45	7.64
1-2:	6.3	15.33	11.94
2-3:	5.9	15.94	12.13
3-4:	5.6	16.11	12.34
4-5:	4.7	13.24	9.42
5-6:	4.0	12.65	8.58
6-7:	3.6	12.58	8.14

00004

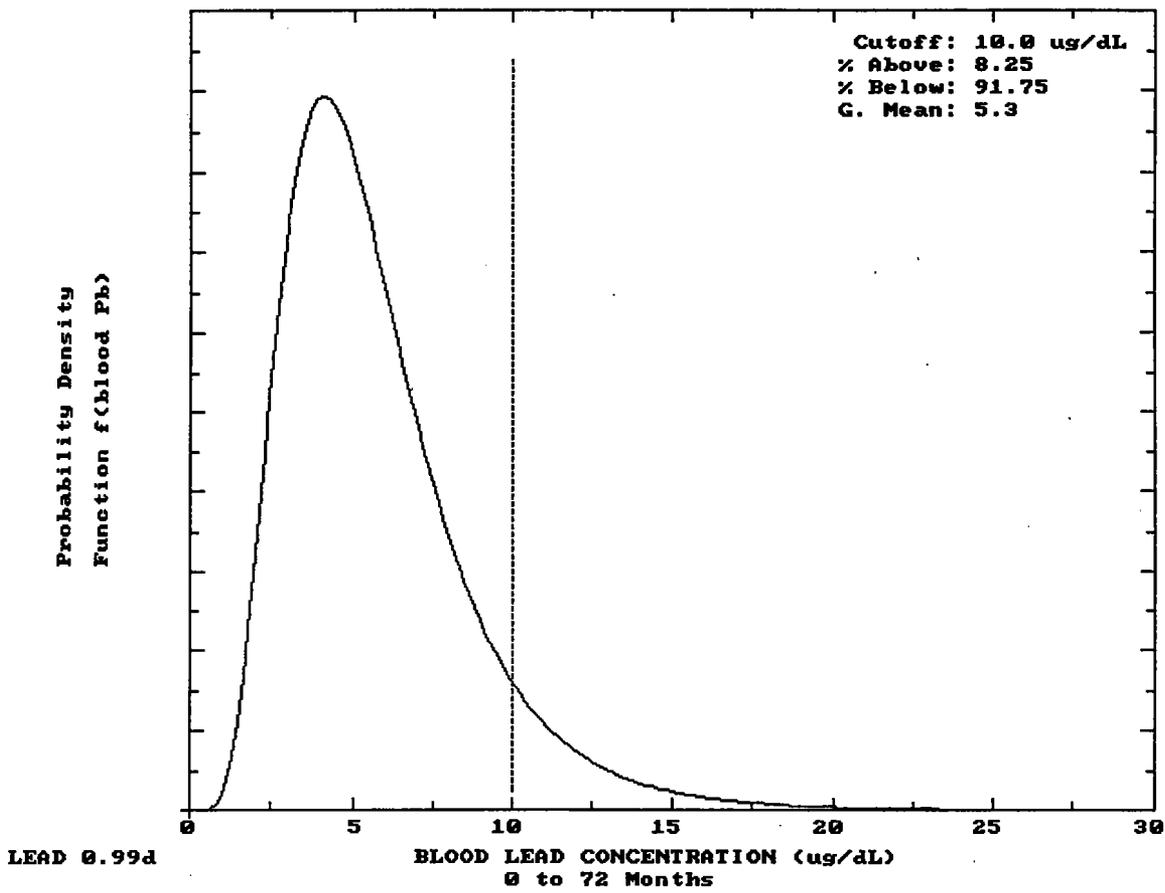
YEAR	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	2.45	0.35	0.00	0.00

"p" Residence

1-2:	2.52	0.87	0.00	0.00
2-3:	2.88	0.92	0.00	0.01
3-4:	2.81	0.96	0.00	0.01
4-5:	2.79	1.02	0.00	0.01
5-6:	2.98	1.09	0.00	0.01
6-7:	3.31	1.12	0.00	0.01

00005

"N" Residence



00006

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.017 ug Pb/m3

Indoor AIR Pb Conc: 30.0 percent of outdoor.

Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT

WATER Consumption: DEFAULT

SOIL & DUST:

Soil: constant conc.

Dust: constant conc.

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	765.0	765.0
1-2	765.0	765.0
2-3	765.0	765.0
3-4	765.0	765.0
4-5	765.0	765.0
5-6	765.0	765.0
6-7	765.0	765.0

Additional Dust Sources: None DEFAULT

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model

Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	9.6	18.31	15.75
1-2:	11.1	27.25	24.21
2-3:	10.4	28.38	24.92
3-4:	10.0	29.10	25.63
4-5:	8.4	23.72	20.11
5-6:	7.1	22.39	18.50
6-7:	6.3	21.93	17.67

00007

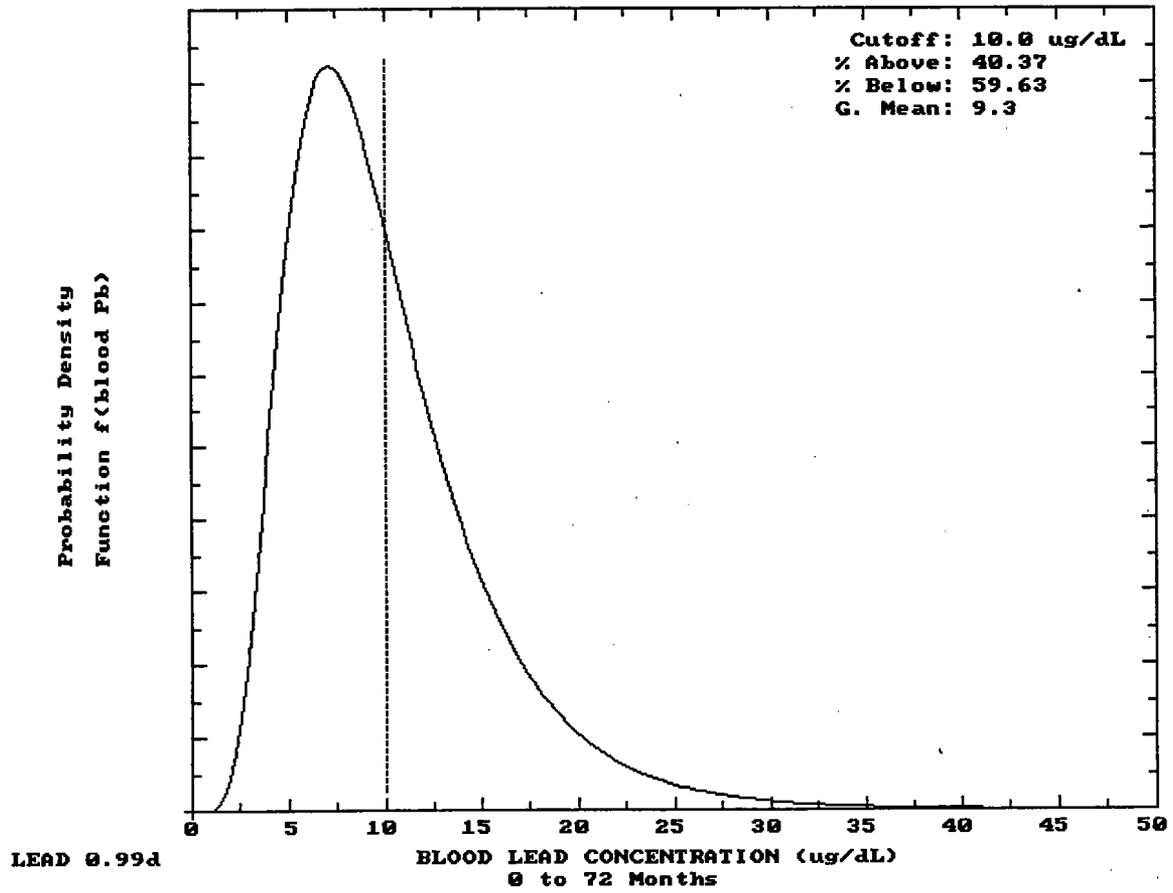
YEAR	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	2.23	0.32	0.00	0.00
1-2:	2.26	0.78	0.00	0.01
2-3:	2.61	0.84	0.00	0.01

"P" Residence

3-4:	2.58	0.88	0.00	0.01
4-5:	2.63	0.96	0.00	0.01
5-6:	2.84	1.04	0.00	0.02
6-7:	3.17	1.07	0.00	0.02

00008

"P" Residence



00009

"N" Residence

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.017 ug Pb/m3  
Indoor AIR Pb Conc: 30.0 percent of outdoor.  
Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT  
WATER Consumption: DEFAULT

SOIL & DUST:

Soil: constant conc.  
Dust: Multiple Source Analysis

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	765.0	537.2
1-2	765.0	537.2
2-3	765.0	537.2
3-4	765.0	537.2
4-5	765.0	537.2
5-6	765.0	537.2
6-7	765.0	537.2

Additional Dust Sources: None DEFAULT  
Soil contribution conversion factor: 0.70  
Air contribution conversion factor: 100.0

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model  
Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

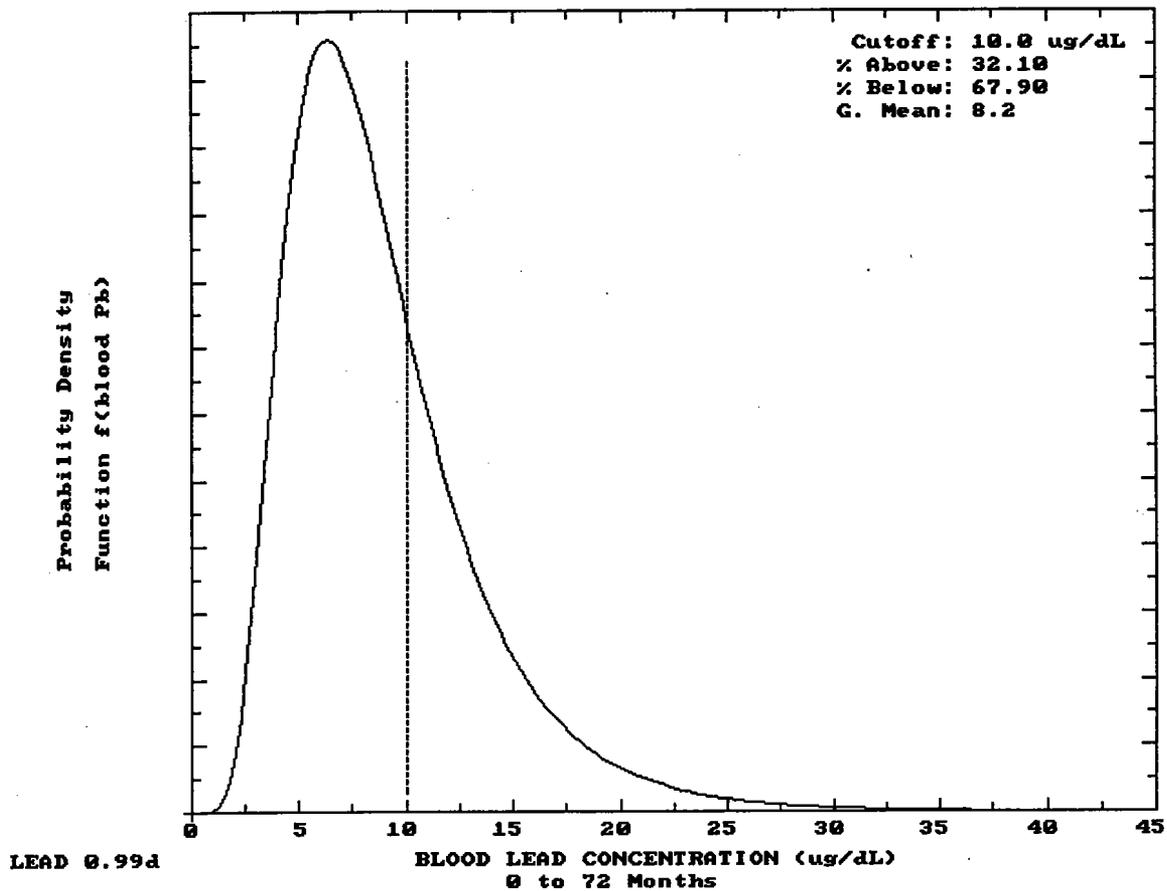
YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	8.5	16.14	13.52	2.29	0.33	0.00	0.00
1-2:	9.8	24.01	20.87				
2-3:	9.2	24.96	21.41				
3-4:	8.8	25.50	21.95				
4-5:	7.3	20.77	17.10				
5-6:	6.2	19.63	15.68				
6-7:	5.5	19.27	14.96				

00010

"p" Residence

1-2:	2.33	0.81	0.00	0.01
2-3:	2.68	0.86	0.00	0.01
3-4:	2.64	0.90	0.00	0.01
4-5:	2.68	0.98	0.00	0.01
5-6:	2.88	1.05	0.00	0.02
6-7:	3.21	1.08	0.00	0.02

00011



LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.007 ug Pb/m3

Indoor AIR Pb Conc: 30.0 percent of outdoor.

Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT

WATER Consumption: DEFAULT

SOIL & DUST:

Soil: constant conc.

Dust: constant conc.

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	337.0	337.0
1-2	337.0	337.0
2-3	337.0	337.0
3-4	337.0	337.0
4-5	337.0	337.0
5-6	337.0	337.0
6-7	337.0	337.0

Additional Dust Sources: None DEFAULT

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model

Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	5.6	10.43	7.62
1-2:	6.3	15.31	11.91
2-3:	5.9	15.91	12.11
3-4:	5.6	16.08	12.31
4-5:	4.7	13.22	9.40
5-6:	4.0	12.63	8.56
6-7:	3.6	12.56	8.12

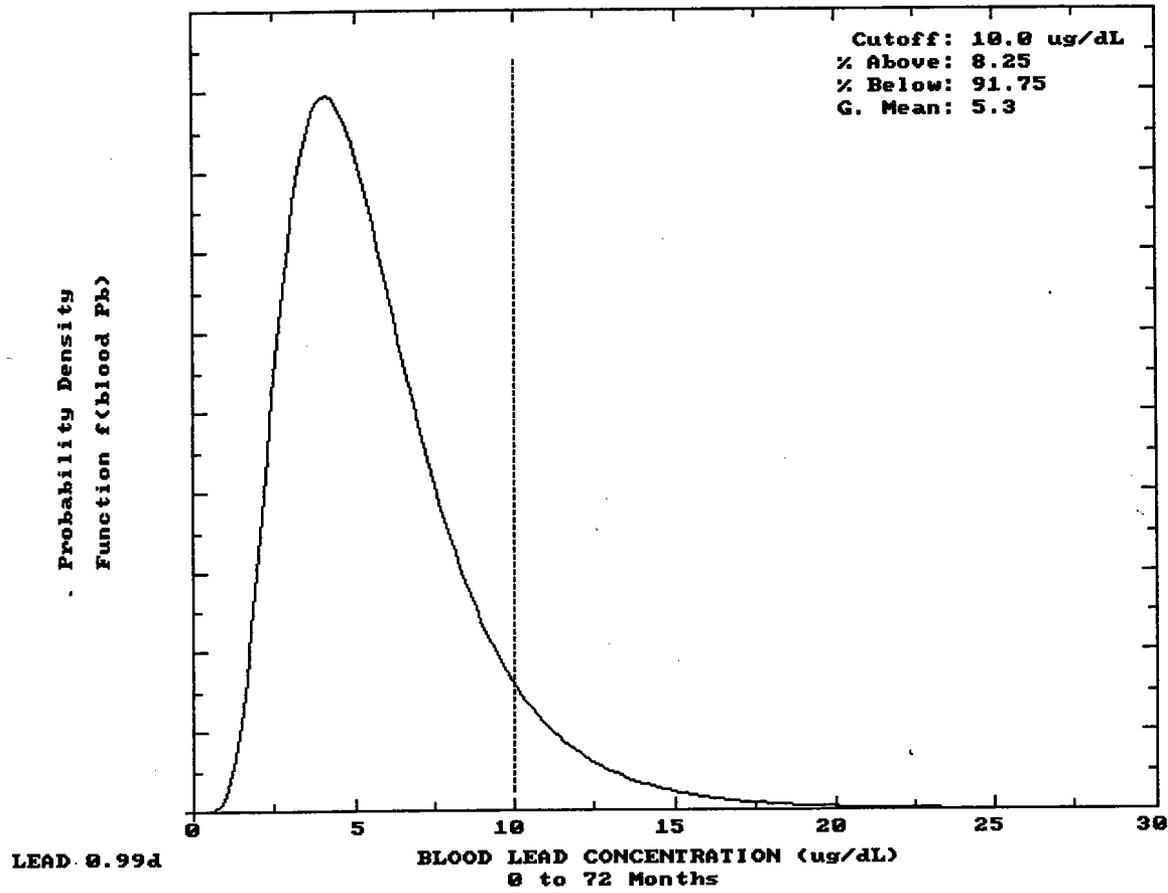
00013

YEAR	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	2.45	0.35	0.00	0.00
1-2:	2.52	0.87	0.00	0.00
2-3:	2.88	0.92	0.00	0.00

"68" Residence

3-4:	2.81	0.96	0.00	0.00
4-5:	2.79	1.02	0.00	0.00
5-6:	2.98	1.09	0.00	0.01
6-7:	3.31	1.12	0.00	0.01

00014



"68" Residence

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.007 ug Pb/m3

Indoor AIR Pb Conc: 30.0 percent of outdoor.

Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT

WATER Consumption: DEFAULT

SOIL & DUST:

Soil: constant conc.

Dust: Multiple Source Analysis

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	337.0	236.6
1-2	337.0	236.6
2-3	337.0	236.6
3-4	337.0	236.6
4-5	337.0	236.6
5-6	337.0	236.6
6-7	337.0	236.6

Additional Dust Sources: None DEFAULT

Soil contribution conversion factor: 0.70

Air contribution conversion factor: 100.0

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model

Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

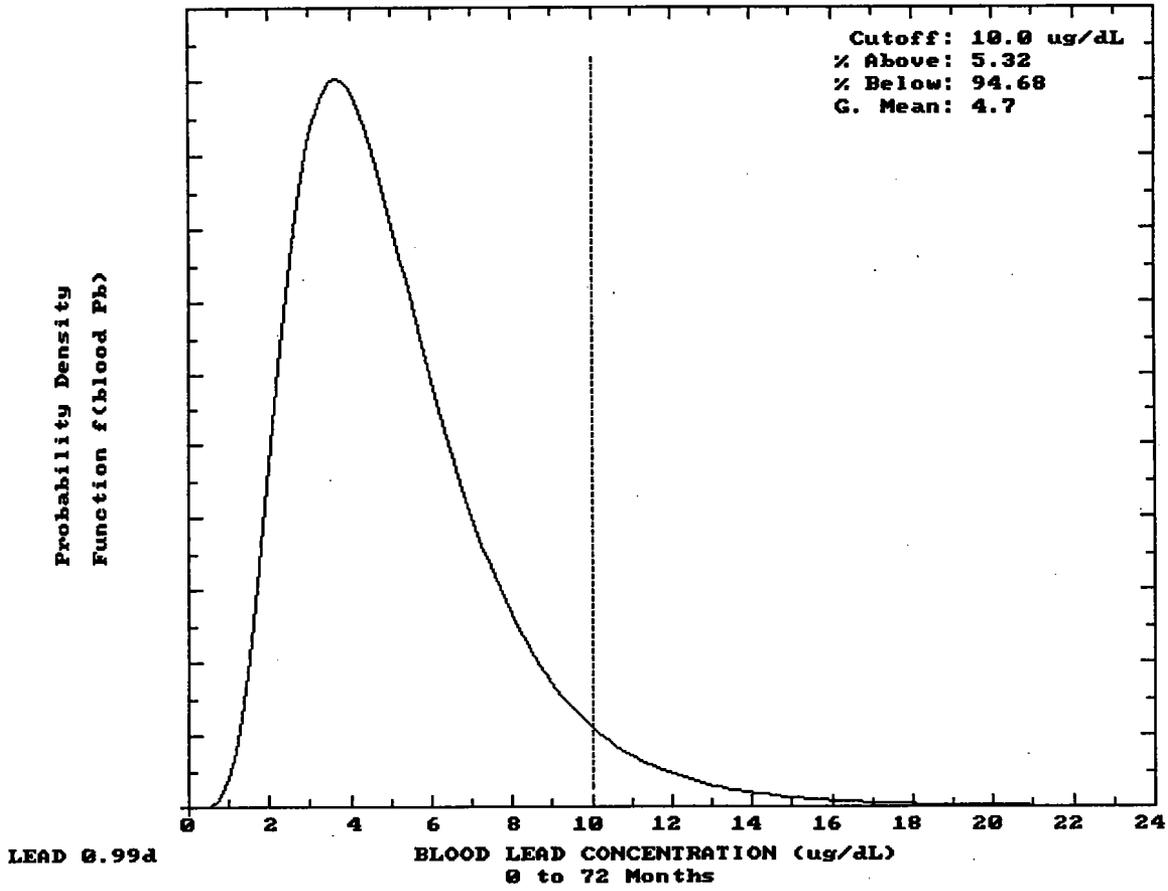
YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	5.0	9.30	6.46	2.48	0.36	0.00	0.00
1-2:	5.6	13.57	10.12				
2-3:	5.2	14.12	10.26				
3-4:	5.0	14.24	10.42				
4-5:	4.2	11.78	7.92				
5-6:	3.6	11.31	7.20				
6-7:	3.2	11.29	6.83				

00016

"68" Residence

1-2:	2.56	0.89	0.00	0.00
2-3:	2.92	0.94	0.00	0.00
3-4:	2.85	0.97	0.00	0.00
4-5:	2.82	1.03	0.00	0.00
5-6:	3.00	1.10	0.00	0.01
6-7:	3.33	1.12	0.00	0.01

"68" Residence



00018

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.009 ug Pb/m3

Indoor AIR Pb Conc: 30.0 percent of outdoor.

Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT

WATER Consumption: DEFAULT

SOIL & DUST:

Soil: constant conc.

Dust: constant conc.

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	417.0	417.0
1-2	417.0	417.0
2-3	417.0	417.0
3-4	417.0	417.0
4-5	417.0	417.0
5-6	417.0	417.0
6-7	417.0	417.0

Additional Dust Sources: None DEFAULT

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model

Maternal Blood Conc: 2.50 ug Pb/dL

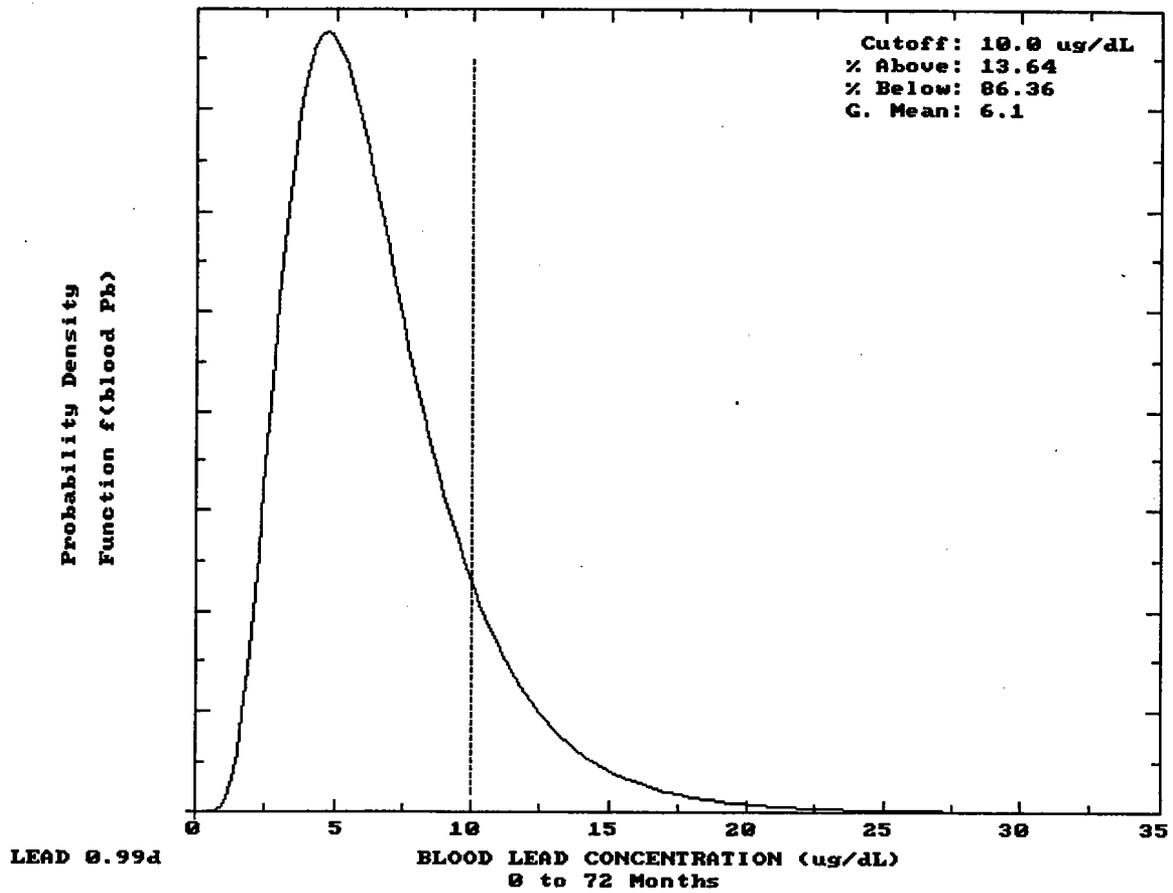
CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	6.4	12.01	9.25
1-2:	7.3	17.74	14.41
2-3:	6.8	18.42	14.69
3-4:	6.5	18.69	14.97
4-5:	5.4	15.28	11.50
5-6:	4.6	14.53	10.49
6-7:	4.1	14.37	9.97

00019

YEAR	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	2.41	0.35	0.00	0.00
1-2:	2.47	0.85	0.00	0.00
2-3:	2.82	0.90	0.00	0.01

"68" Residence



00020

"68" Residence

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.009 ug Pb/m3

Indoor AIR Pb Conc: 30.0 percent of outdoor.

Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT

WATER Consumption: DEFAULT

SOIL & DUST:

Soil: constant conc.

Dust: Multiple Source Analysis

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	417.0	292.8
1-2	417.0	292.8
2-3	417.0	292.8
3-4	417.0	292.8
4-5	417.0	292.8
5-6	417.0	292.8
6-7	417.0	292.8

Additional Dust Sources: None DEFAULT

Soil contribution conversion factor: 0.70

Air contribution conversion factor: 100.0

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model

Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	5.7	10.66	7.86
1-2:	6.5	15.67	12.28
2-3:	6.0	16.29	12.49
3-4:	5.7	16.47	12.70
4-5:	4.8	13.53	9.71
5-6:	4.1	12.91	8.84
6-7:	3.7	12.82	8.40

00021

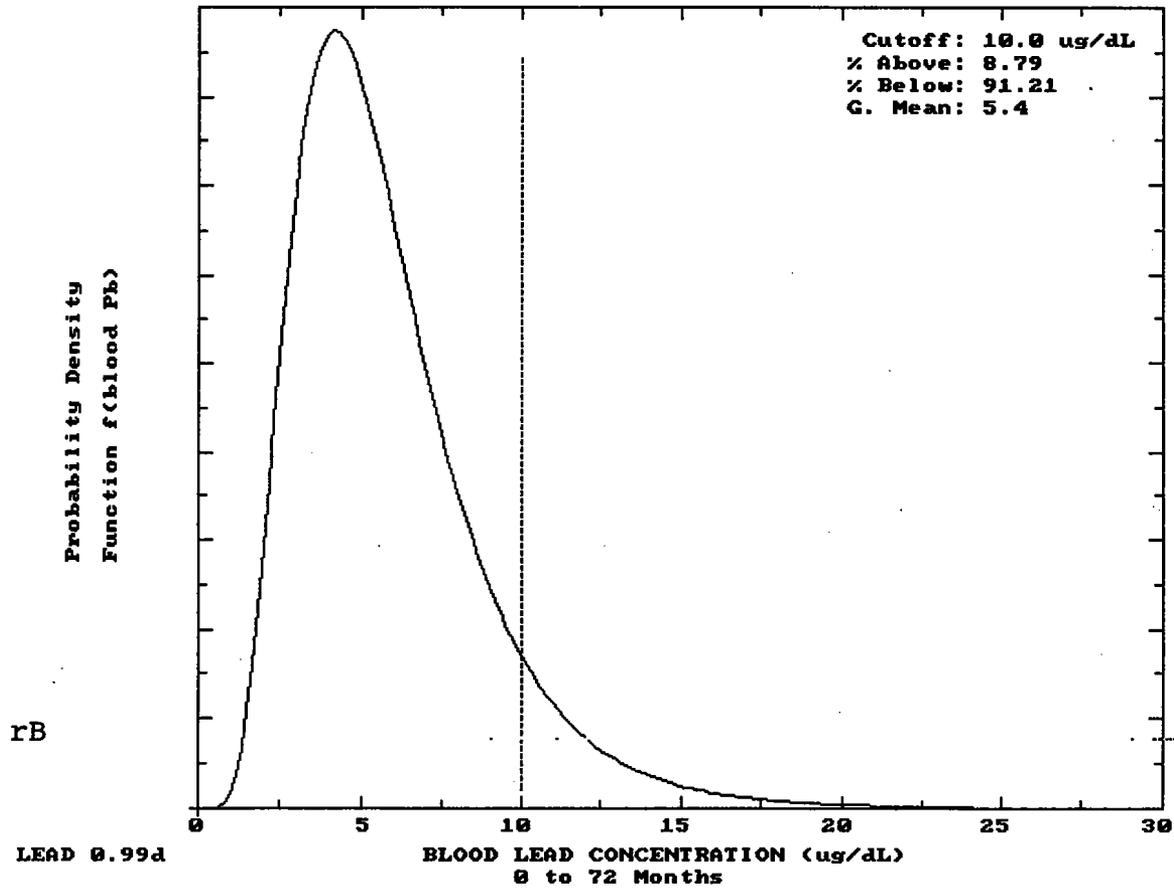
YEAR	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	2.45	0.35	0.00	0.00

68" Residence

1-2:	2.51	0.87	0.00	0.00
2-3:	2.87	0.92	0.00	0.01
3-4:	2.81	0.95	0.00	0.01
4-5:	2.79	1.02	0.00	0.01
5-6:	2.98	1.09	0.00	0.01
6-7:	3.31	1.11	0.00	0.01

00022

"68" Residence



00023

"5" Residence

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.005 ug Pb/m3

Indoor AIR Pb Conc: 30.0 percent of outdoor.

Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT

WATER Consumption: DEFAULT

SOIL & DUST:

Soil: constant conc.

Dust: constant conc.

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	224.0	224.0
1-2	224.0	224.0
2-3	224.0	224.0
3-4	224.0	224.0
4-5	224.0	224.0
5-6	224.0	224.0
6-7	224.0	224.0

Additional Dust Sources: None DEFAULT

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model

Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

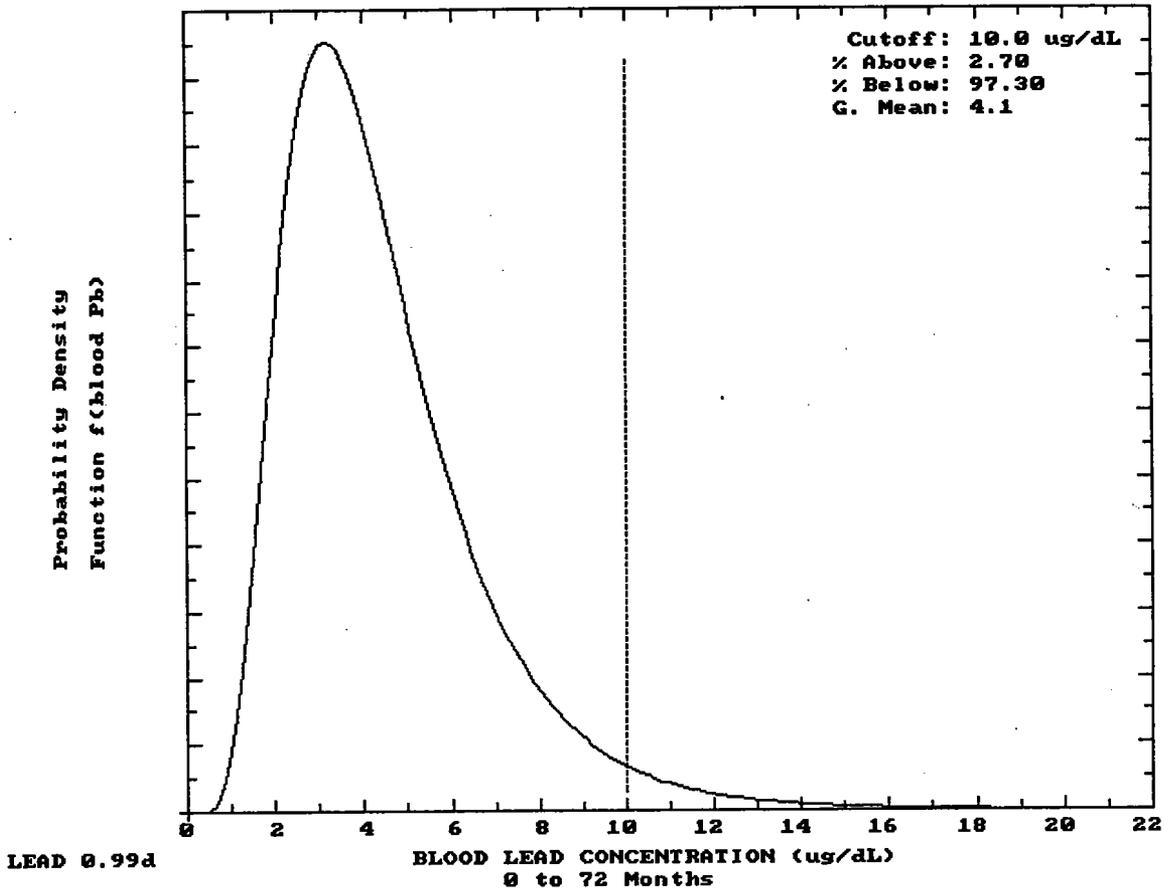
YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	4.4	8.09	5.21	2.52	0.36	0.00	0.00
1-2:	4.8	11.69	8.18	2.61	0.90	0.00	0.00
2-3:	4.5	12.19	8.28	2.96	0.95	0.00	0.00
3-4:	4.3	12.26	8.39				
4-5:	3.6	10.24	6.35				
5-6:	3.1	9.90	5.76				
6-7:	2.8	9.95	5.46				

00024

"S" Residence

3-4:	2.89	0.98	0.00	0.00
4-5:	2.84	1.04	0.00	0.00
5-6:	3.02	1.11	0.00	0.00
6-7:	3.35	1.13	0.00	0.00

"5" Residence



00026

"S" Residence

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.005 ug Pb/m3

Indoor AIR Pb Conc: 30.0 percent of outdoor.

Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT  
WATER Consumption: DEFAULT

SOIL & DUST:

Soil: constant conc.  
Dust: Multiple Source Analysis

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	224.0	157.3
1-2	224.0	157.3
2-3	224.0	157.3
3-4	224.0	157.3
4-5	224.0	157.3
5-6	224.0	157.3
6-7	224.0	157.3

Additional Dust Sources: None DEFAULT  
Soil contribution conversion factor: 0.70  
Air contribution conversion factor: 100.0

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model  
Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	4.0	7.31	4.39	2.54	0.37	0.00	0.00
1-2:	4.3	10.47	6.92				
2-3:	4.1	10.94	6.99				
3-4:	3.9	10.97	7.07				
4-5:	3.3	9.25	5.34				
5-6:	2.8	8.99	4.84				
6-7:	2.6	9.09	4.59				

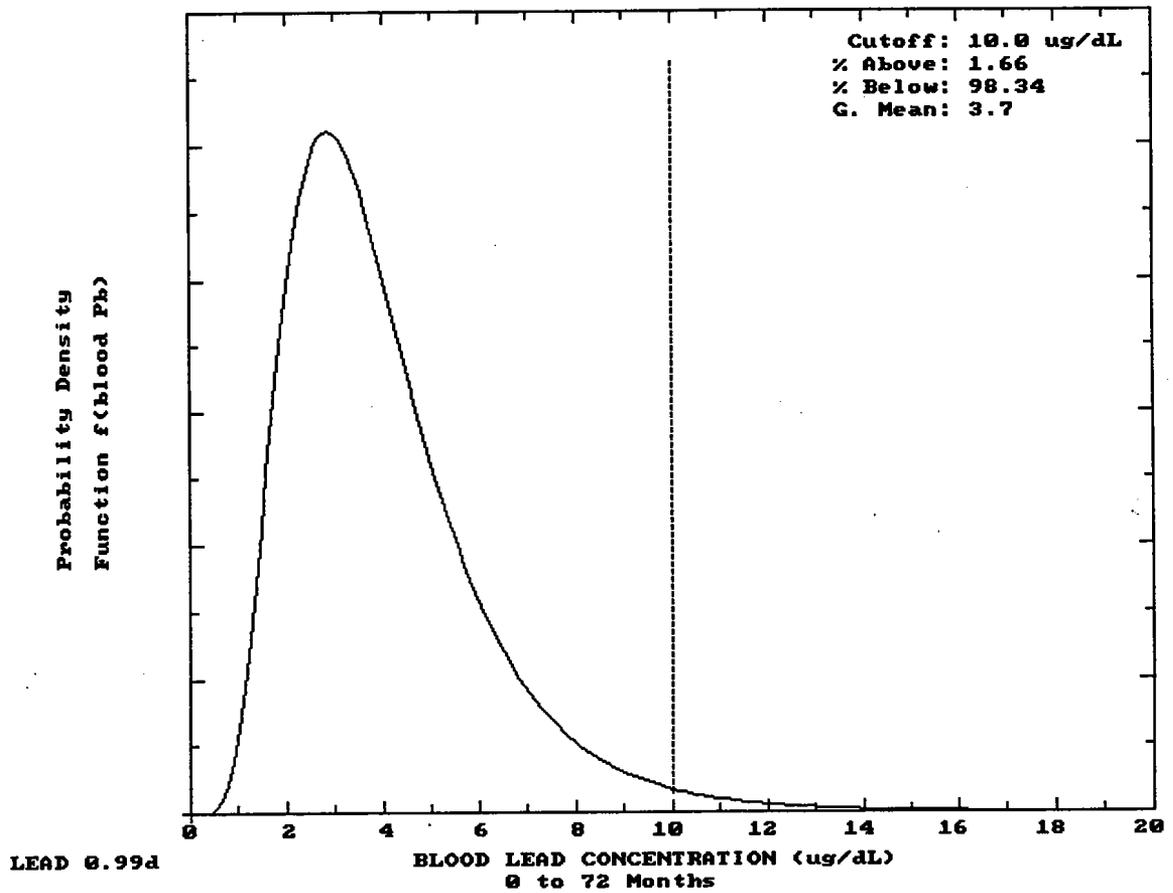
00027

"S" Residence

1-2:	2.64	0.91	0.00	0.00
2-3:	2.99	0.96	0.00	0.00
3-4:	2.91	0.99	0.00	0.00
4-5:	2.86	1.05	0.00	0.00
5-6:	3.03	1.11	0.00	0.00
6-7:	3.36	1.13	0.00	0.00

00020

"5" Residence



00029

"S" Residence

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.009 ug Pb/m3

Indoor AIR Pb Conc: 30.0 percent of outdoor.

Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT

WATER Consumption: DEFAULT

SOIL & DUST:

Soil: constant conc.

Dust: constant conc.

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	395.0	395.0
1-2	395.0	395.0
2-3	395.0	395.0
3-4	395.0	395.0
4-5	395.0	395.0
5-6	395.0	395.0
6-7	395.0	395.0

Additional Dust Sources: None DEFAULT

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model

Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	6.2	11.58	8.81
1-2:	7.0	17.08	13.74
2-3:	6.6	17.74	13.99
3-4:	6.3	17.98	14.25
4-5:	5.2	14.72	10.93
5-6:	4.4	14.01	9.96
6-7:	4.0	13.87	9.47

00030

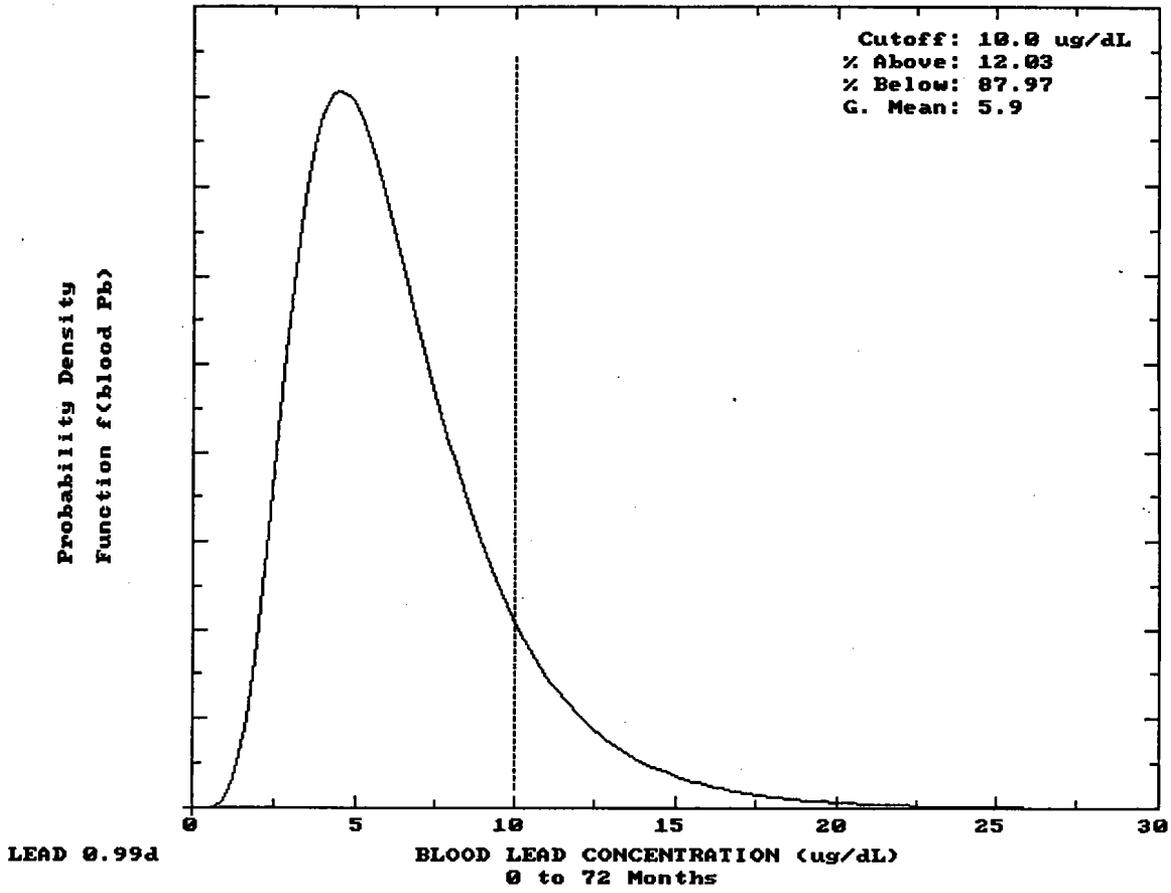
YEAR	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	2.42	0.35	0.00	0.00
1-2:	2.48	0.86	0.00	0.00
2-3:	2.84	0.91	0.00	0.01

"5" Residence

3-4:	2.78	0.94	0.00	0.01
4-5:	2.77	1.01	0.00	0.01
5-6:	2.96	1.08	0.00	0.01
6-7:	3.29	1.11	0.00	0.01

00031

"5" Residence



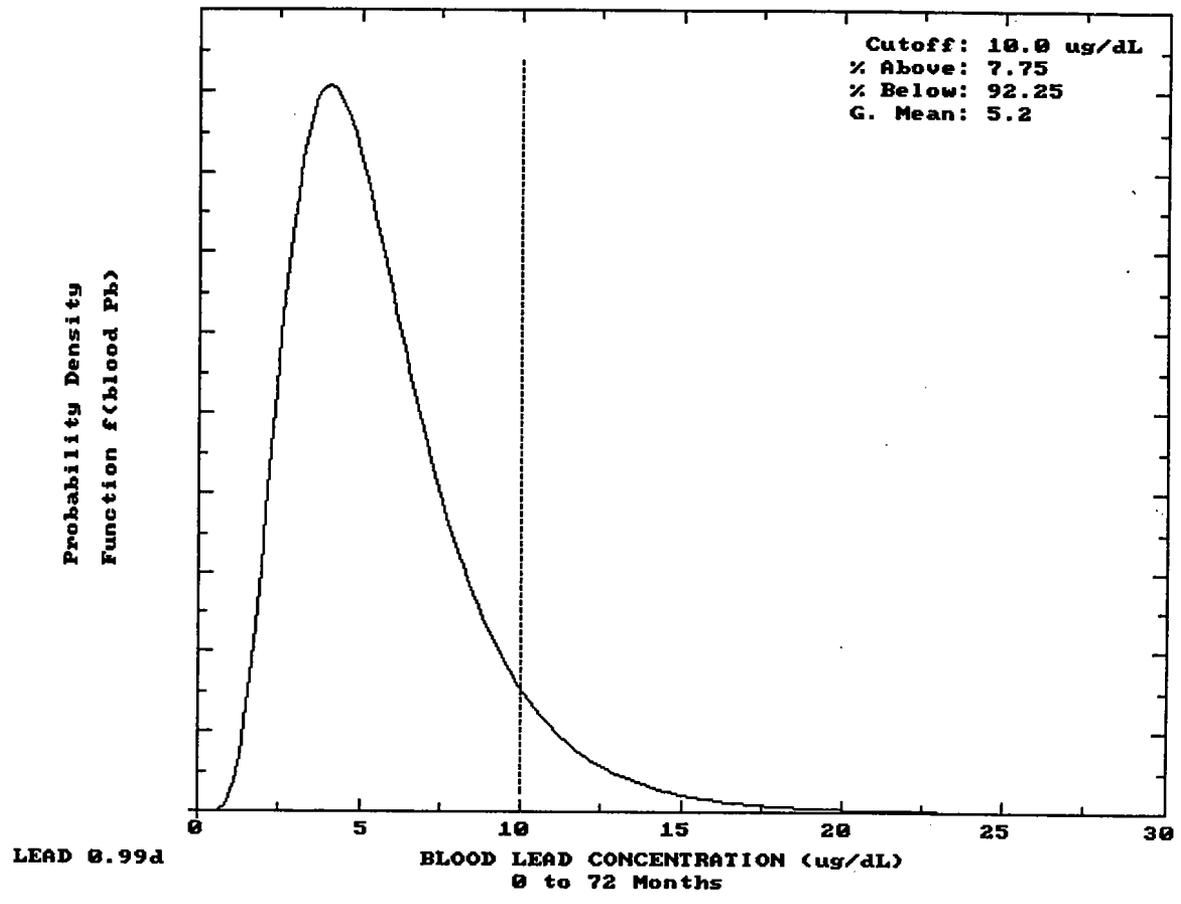
00032

"S" Residence

1-2:	2.53	0.87	0.00	0.00
2-3:	2.88	0.92	0.00	0.01
3-4:	2.82	0.96	0.00	0.01
4-5:	2.80	1.02	0.00	0.01
5-6:	2.98	1.09	0.00	0.01
6-7:	3.31	1.12	0.00	0.01

00033

"S" Residence



00034

"N" Residence  
Maine Guidance

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.009 ug Pb/m3

Indoor AIR Pb Conc: 30.0 percent of outdoor.

Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT

Other WATER Parameters (non-default):

Age	Water Consumption (L/day)
0-1	1.00
1-2	1.00
2-3	1.00
3-4	1.00
4-5	1.00
5-6	1.00
6-7	1.00

SOIL & DUST:

Soil: constant conc.

Dust: constant conc.

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	404.0	404.0
1-2	404.0	404.0
2-3	404.0	404.0
3-4	404.0	404.0
4-5	404.0	404.0
5-6	404.0	404.0
6-7	404.0	404.0

Additional Dust Sources: None DEFAULT

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model

Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	11.6	22.31	18.64
1-2:	10.2	23.56	19.60
2-3:	9.0	24.47	20.11
3-4:	8.6	24.97	20.61
4-5:	8.3	25.38	21.03
5-6:	7.9	25.88	21.33

00035

"N" Residence  
Mare Guidance  
21.51

6-7:

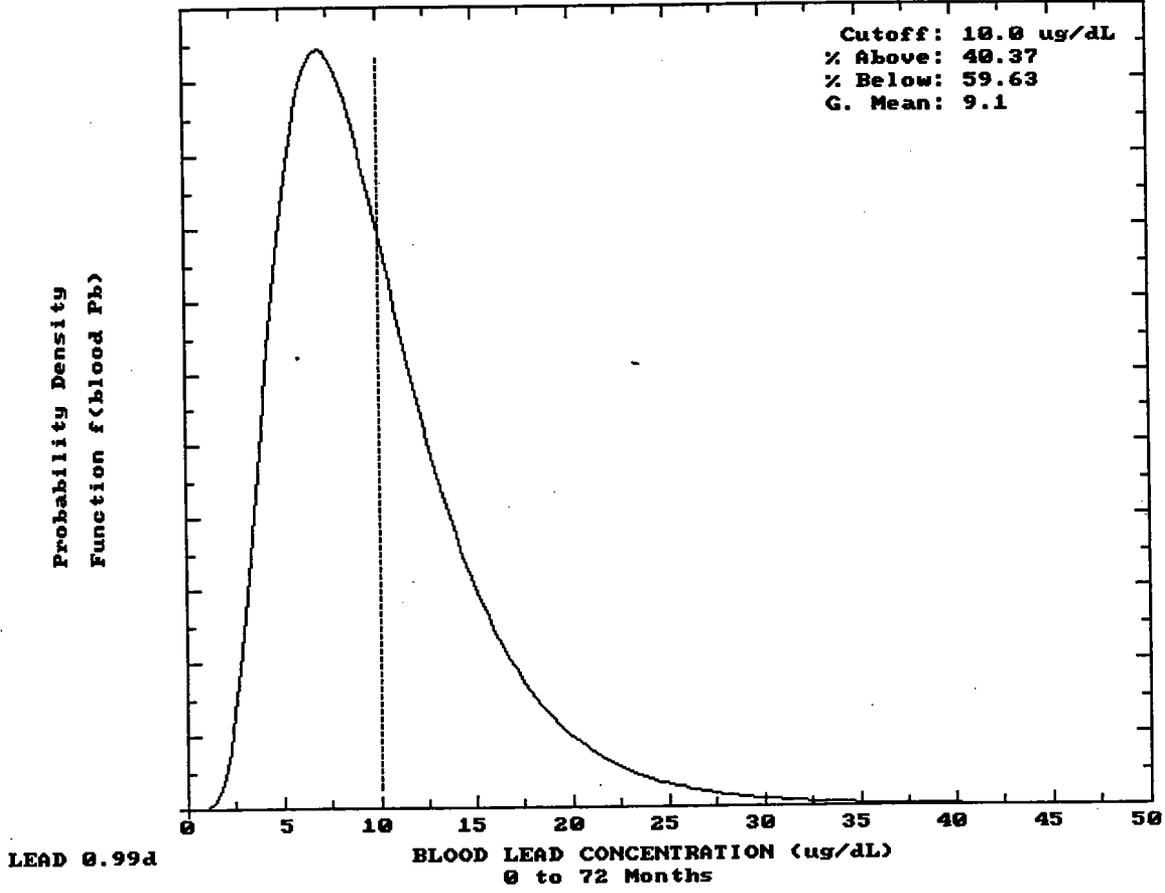
7.4

26.40

YEAR	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	2.13	1.54	0.00	0.00
1-2:	2.34	1.62	0.00	0.00
2-3:	2.69	1.66	0.00	0.01
3-4:	2.65	1.70	0.00	0.01
4-5:	2.61	1.74	0.00	0.01
5-6:	2.79	1.76	0.00	0.01
6-7:	3.11	1.77	0.00	0.01

00036

"p" Residence  
Maine Guidance



00037

"N" Residence  
Maine Guidance

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.009 ug Pb/m<sup>3</sup>

Indoor AIR Pb Conc: 30.0 percent of outdoor.

Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m <sup>3</sup> /day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT

Other WATER Parameters (non-default):

Age	Water Consumption (L/day)
0-1	1.00
1-2	1.00
2-3	1.00
3-4	1.00
4-5	1.00
5-6	1.00
6-7	1.00

SOIL & DUST:

Soil: constant conc.

Dust: Multiple Source Analysis

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	404.0	283.7
1-2	404.0	283.7
2-3	404.0	283.7
3-4	404.0	283.7
4-5	404.0	283.7
5-6	404.0	283.7
6-7	404.0	283.7

Additional Dust Sources: None DEFAULT

Soil contribution conversion factor: 0.70

Air contribution conversion factor: 100.0

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model

Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	10.4	19.84	16.06
1-2:	9.1	20.87	16.81
2-3:	8.0	21.65	17.19
3-4:	7.6	22.02	17.58

00038

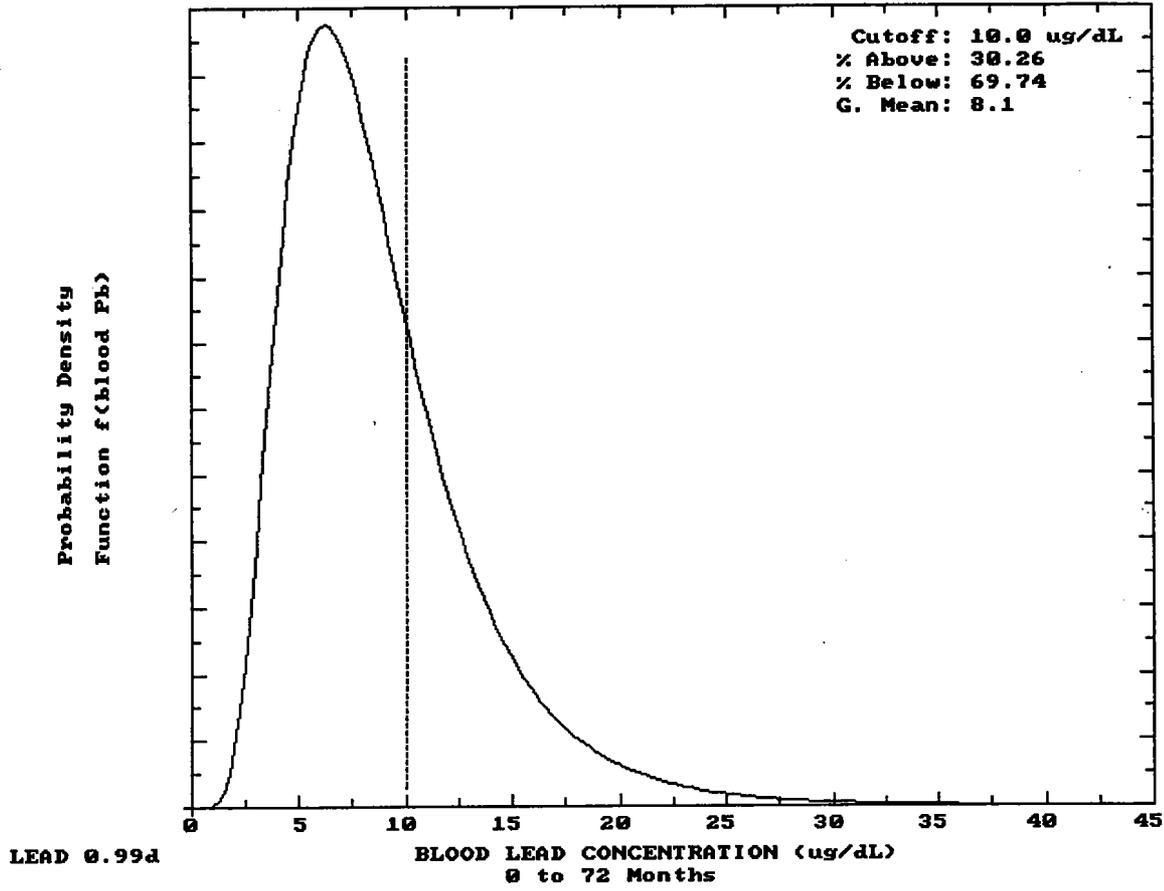
4-5:	7.3	22.33
5-6:	6.9	22.75
6-7:	6.5	23.21

"N" Residence  
 Max Guidance  
 17.90  
 18.12  
 18.25

YEAR	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	2.19	1.58	0.00	0.00
1-2:	2.40	1.66	0.00	0.00
2-3:	2.75	1.70	0.00	0.01
3-4:	2.71	1.73	0.00	0.01
4-5:	2.65	1.77	0.00	0.01
5-6:	2.83	1.79	0.00	0.01
6-7:	3.15	1.80	0.00	0.01

00039

"P" Residence  
Maine Guidance



00040

"p" Residence  
Hawai'i Guidance

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.017 ug Pb/m<sup>3</sup>

Indoor AIR Pb Conc: 30.0 percent of outdoor.

Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m <sup>3</sup> /day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT

Other WATER Parameters (non-default):

Age	Water Consumption (L/day)
0-1	1.00
1-2	1.00
2-3	1.00
3-4	1.00
4-5	1.00
5-6	1.00
6-7	1.00

SOIL & DUST:

Soil: constant conc.

Dust: constant conc.

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	765.0	765.0
1-2	765.0	765.0
2-3	765.0	765.0
3-4	765.0	765.0
4-5	765.0	765.0
5-6	765.0	765.0
6-7	765.0	765.0

Additional Dust Sources: None DEFAULT

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model

Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	17.3	33.87	30.68
1-2:	15.5	36.42	32.91
2-3:	13.8	38.09	34.18
3-4:	13.4	39.37	35.41
4-5:	13.0	40.48	36.49
5-6:	12.5	41.49	37.28

00041

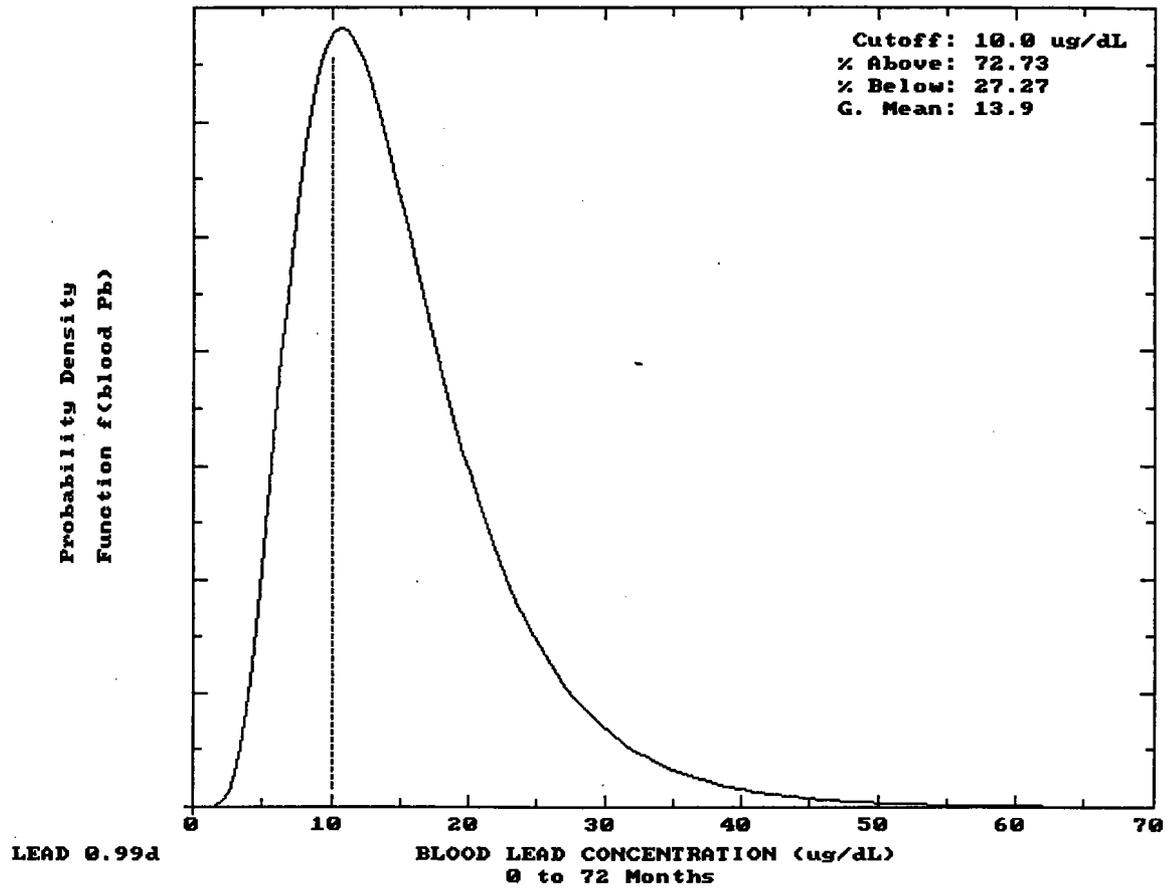
"D" Residence  
Maive Guidance  
37.79

6-7: 11.7 42.33

YEAR	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	1.85	1.34	0.00	0.00
1-2:	2.07	1.43	0.00	0.01
2-3:	2.42	1.49	0.00	0.01
3-4:	2.41	1.54	0.00	0.01
4-5:	2.39	1.59	0.00	0.01
5-6:	2.57	1.62	0.00	0.02
6-7:	2.88	1.65	0.00	0.02

00042

"N" Residence  
Maine Guidance



00043

"N" Residence  
Maine Guidance

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.017 ug Pb/m<sup>3</sup>

Indoor AIR Pb Conc: 30.0 percent of outdoor.

Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m <sup>3</sup> /day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT

Other WATER Parameters (non-default):

Age	Water Consumption (L/day)
0-1	1.00
1-2	1.00
2-3	1.00
3-4	1.00
4-5	1.00
5-6	1.00
6-7	1.00

SOIL & DUST:

Soil: constant conc.

Dust: Multiple Source Analysis

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	765.0	537.2
1-2	765.0	537.2
2-3	765.0	537.2
3-4	765.0	537.2
4-5	765.0	537.2
5-6	765.0	537.2
6-7	765.0	537.2

Additional Dust Sources: None DEFAULT

Soil contribution conversion factor: 0.70

Air contribution conversion factor: 100.0

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model

Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	15.5	30.16	26.83
1-2:	13.8	32.26	28.61
2-3:	12.3	33.66	29.61
3-4:	11.9	34.66	30.57

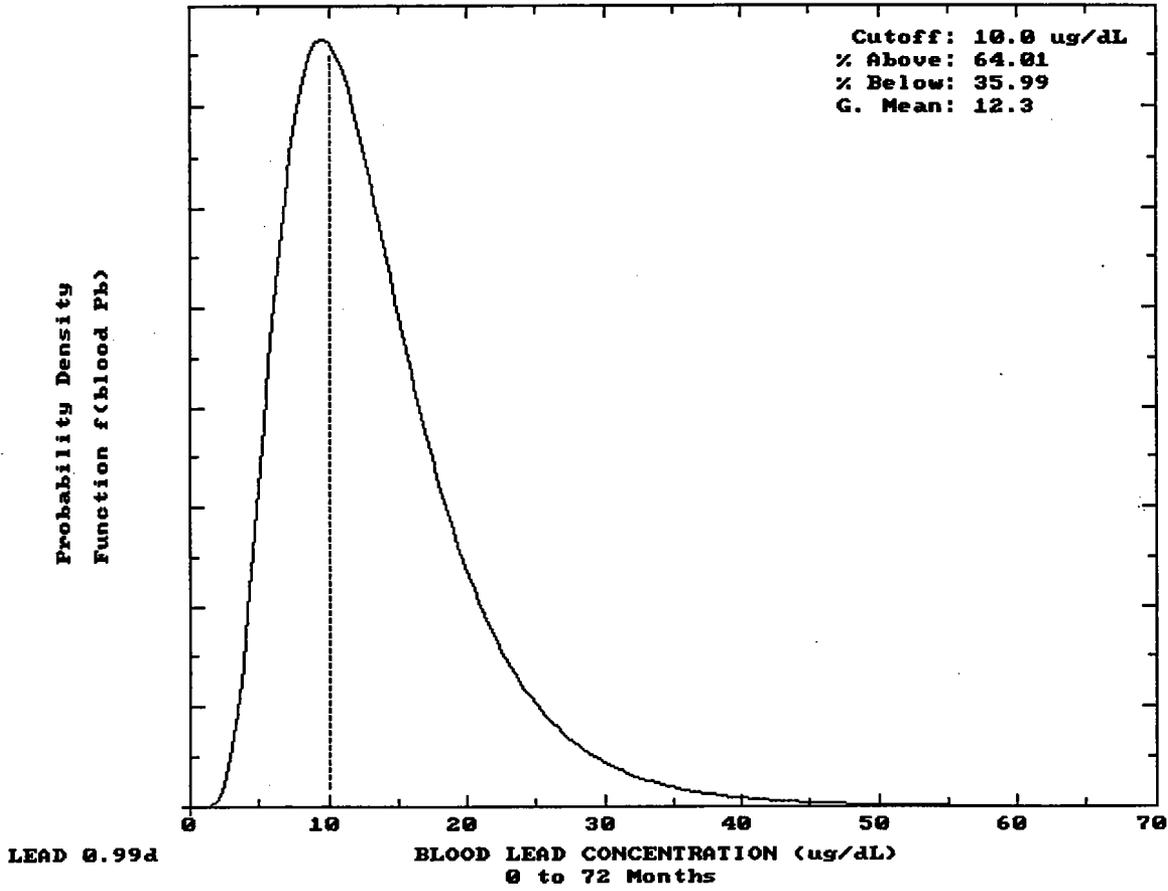
*M Residence  
Have Guidance*

4-5:	11.5	35.52	31.41
5-6:	11.0	36.34	32.01
6-7:	10.3	37.06	32.40

YEAR	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	1.93	1.40	0.00	0.00
1-2:	2.15	1.49	0.00	0.01
2-3:	2.50	1.54	0.00	0.01
3-4:	2.49	1.59	0.00	0.01
4-5:	2.46	1.64	0.00	0.01
5-6:	2.64	1.67	0.00	0.02
6-7:	2.95	1.69	0.00	0.02

00045

"N" Residence  
Maine Guidance



00046

"68" Residence  
Hawke Guidance

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.007 ug Pb/m3

Indoor AIR Pb Conc: 30.0 percent of outdoor.

Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT

Other WATER Parameters (non-default):

Age	Water Consumption (L/day)
0-1	1.00
1-2	1.00
2-3	1.00
3-4	1.00
4-5	1.00
5-6	1.00
6-7	1.00

SOIL & DUST:

Soil: constant conc.

Dust: constant conc.

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	337.0	337.0
1-2	337.0	337.0
2-3	337.0	337.0
3-4	337.0	337.0
4-5	337.0	337.0
5-6	337.0	337.0
6-7	337.0	337.0

Additional Dust Sources: None DEFAULT

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model

Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	10.4	19.81	16.03
1-2:	9.0	20.83	16.77
2-3:	8.0	21.61	17.16
3-4:	7.6	21.98	17.54
4-5:	7.3	22.29	17.86
5-6:	6.9	22.71	18.08

00047

"68" Residence  
Maine Guide  
18.21

6-7:

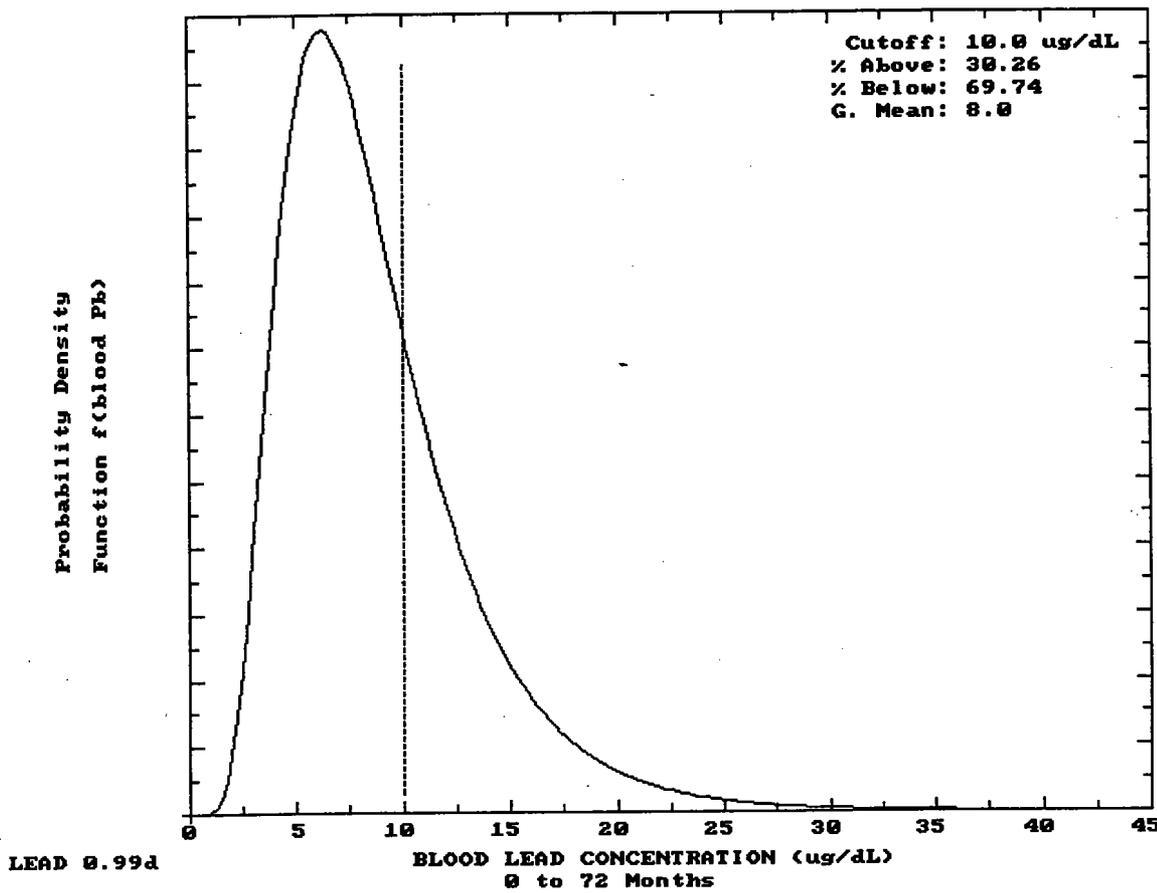
6.5

23.17

YEAR	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	2.19	1.59	0.00	0.00
1-2:	2.40	1.66	0.00	0.00
2-3:	2.75	1.70	0.00	0.00
3-4:	2.71	1.73	0.00	0.00
4-5:	2.65	1.77	0.00	0.00
5-6:	2.83	1.79	0.00	0.01
6-7:	3.15	1.80	0.00	0.01

00048

"68" Residence  
Have Guidance



00049

"68" Residence  
Maine Guidance

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.007 ug Pb/m3

Indoor AIR Pb Conc: 30.0 percent of outdoor.

Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT

Other WATER Parameters (non-default):

Age	Water Consumption (L/day)
0-1	1.00
1-2	1.00
2-3	1.00
3-4	1.00
4-5	1.00
5-6	1.00
6-7	1.00

SOIL & DUST:

Soil: constant conc.

Dust: Multiple Source Analysis

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	337.0	236.6
1-2	337.0	236.6
2-3	337.0	236.6
3-4	337.0	236.6
4-5	337.0	236.6
5-6	337.0	236.6
6-7	337.0	236.6

Additional Dust Sources: None DEFAULT

Soil contribution conversion factor: 0.70

Air contribution conversion factor: 100.0

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model

Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	9.3	17.64	13.76
1-2:	8.0	18.48	14.33
2-3:	7.1	19.16	14.62
3-4:	6.8	19.44	14.92

00050

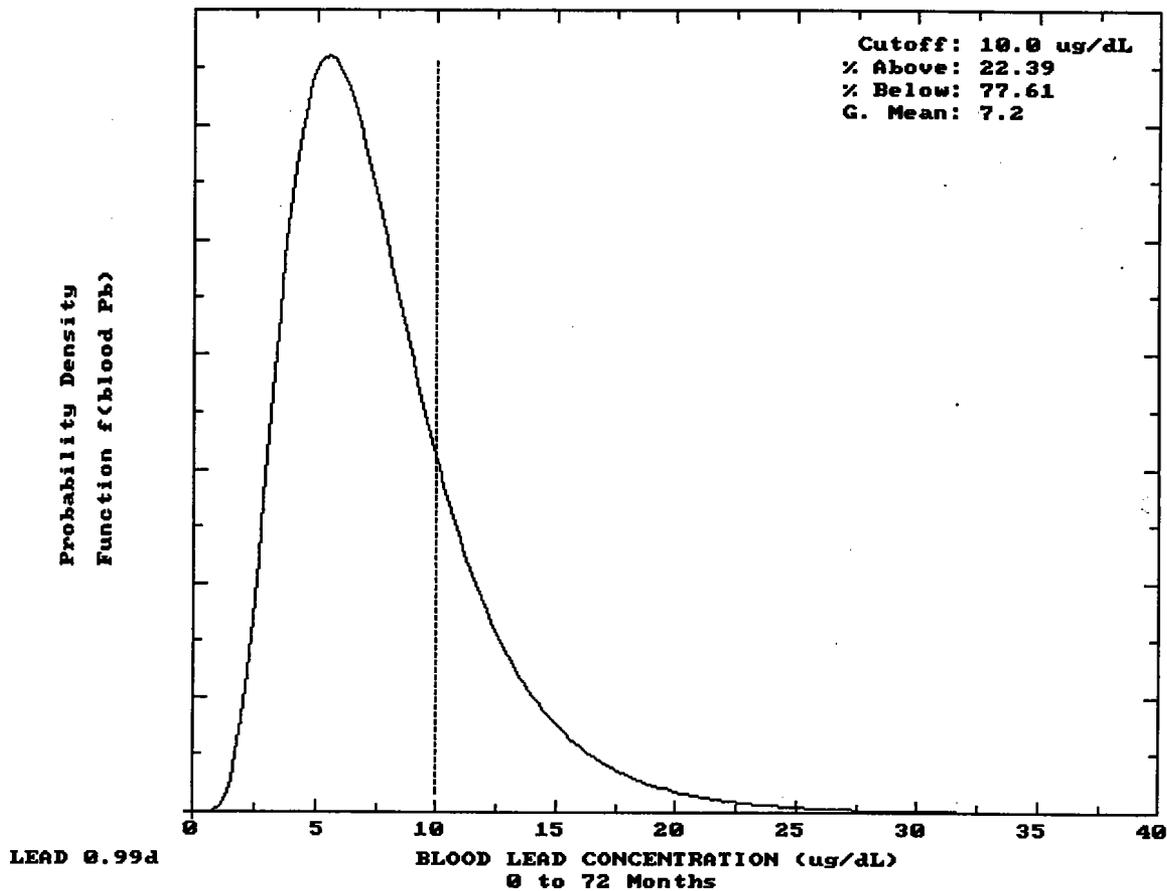
4-5:	6.5	19.65
5-6:	6.1	20.02
6-7:	5.7	20.44

68" Residence  
 Home Guidance  
 15.16  
 15.32  
 15.42

YEAR	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	2.25	1.63	0.00	0.00
1-2:	2.45	1.70	0.00	0.00
2-3:	2.81	1.73	0.00	0.00
3-4:	2.75	1.76	0.00	0.00
4-5:	2.69	1.79	0.00	0.00
5-6:	2.87	1.81	0.00	0.01
6-7:	3.19	1.82	0.00	0.01

00051

"68" Residence  
Hawke Guidance



00052

"68" Residence  
Maine Guidance

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.009 ug Pb/m3  
Indoor AIR Pb Conc: 30.0 percent of outdoor.  
Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT  
Other WATER Parameters (non-default):

Age	Water Consumption (L/day)
0-1	1.00
1-2	1.00
2-3	1.00
3-4	1.00
4-5	1.00
5-6	1.00
6-7	1.00

SOIL & DUST:

Soil: constant conc.  
Dust: constant conc.

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	417.0	417.0
1-2	417.0	417.0
2-3	417.0	417.0
3-4	417.0	417.0
4-5	417.0	417.0
5-6	417.0	417.0
6-7	417.0	417.0

Additional Dust Sources: None DEFAULT

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model  
Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	11.9	22.78	19.13
1-2:	10.4	24.08	20.14
2-3:	9.2	25.01	20.67
3-4:	8.8	25.54	21.19
4-5:	8.5	25.97	21.64
5-6:	8.1	26.49	21.95

00053

"68" Residence  
Marie Guidence  
22.14

6-7:

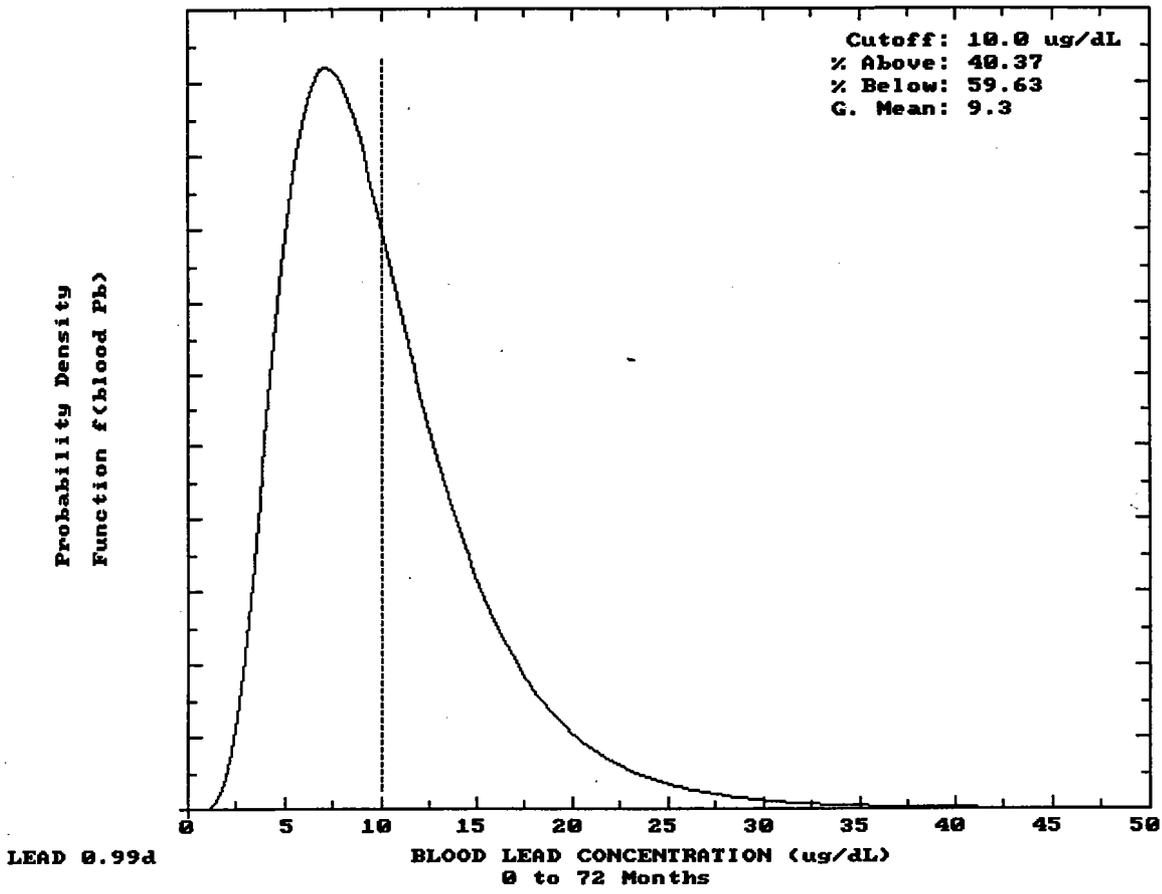
7.6

27.01

<u>YEAR</u>	<u>Diet Uptake (ug/day)</u>	<u>Water Uptake (ug/day)</u>	<u>Paint Uptake (ug/day)</u>	<u>Air Uptake (ug/day)</u>
0.5-1:	2.11	1.53	0.00	0.00
1-2:	2.33	1.61	0.00	0.00
2-3:	2.68	1.65	0.00	0.01
3-4:	2.64	1.69	0.00	0.01
4-5:	2.60	1.73	0.00	0.01
5-6:	2.78	1.75	0.00	0.01
6-7:	3.10	1.77	0.00	0.01

00054

*"68" Residence  
Home Guidance*



00055

"66" Residence  
Maine Guidance

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.009 ug Pb/m3

Indoor AIR Pb Conc: 30.0 percent of outdoor.

Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT

Other WATER Parameters (non-default):

Age	Water Consumption (L/day)
0-1	1.00
1-2	1.00
2-3	1.00
3-4	1.00
4-5	1.00
5-6	1.00
6-7	1.00

SOIL & DUST:

Soil: constant conc.

Dust: Multiple Source Analysis

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	417.0	292.8
1-2	417.0	292.8
2-3	417.0	292.8
3-4	417.0	292.8
4-5	417.0	292.8
5-6	417.0	292.8
6-7	417.0	292.8

Additional Dust Sources: None DEFAULT

Soil contribution conversion factor: 0.70

Air contribution conversion factor: 100.0

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model

Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	10.6	20.25	16.50
1-2:	9.2	21.32	17.28
2-3:	8.2	22.12	17.68
3-4:	7.8	22.52	18.08

00056

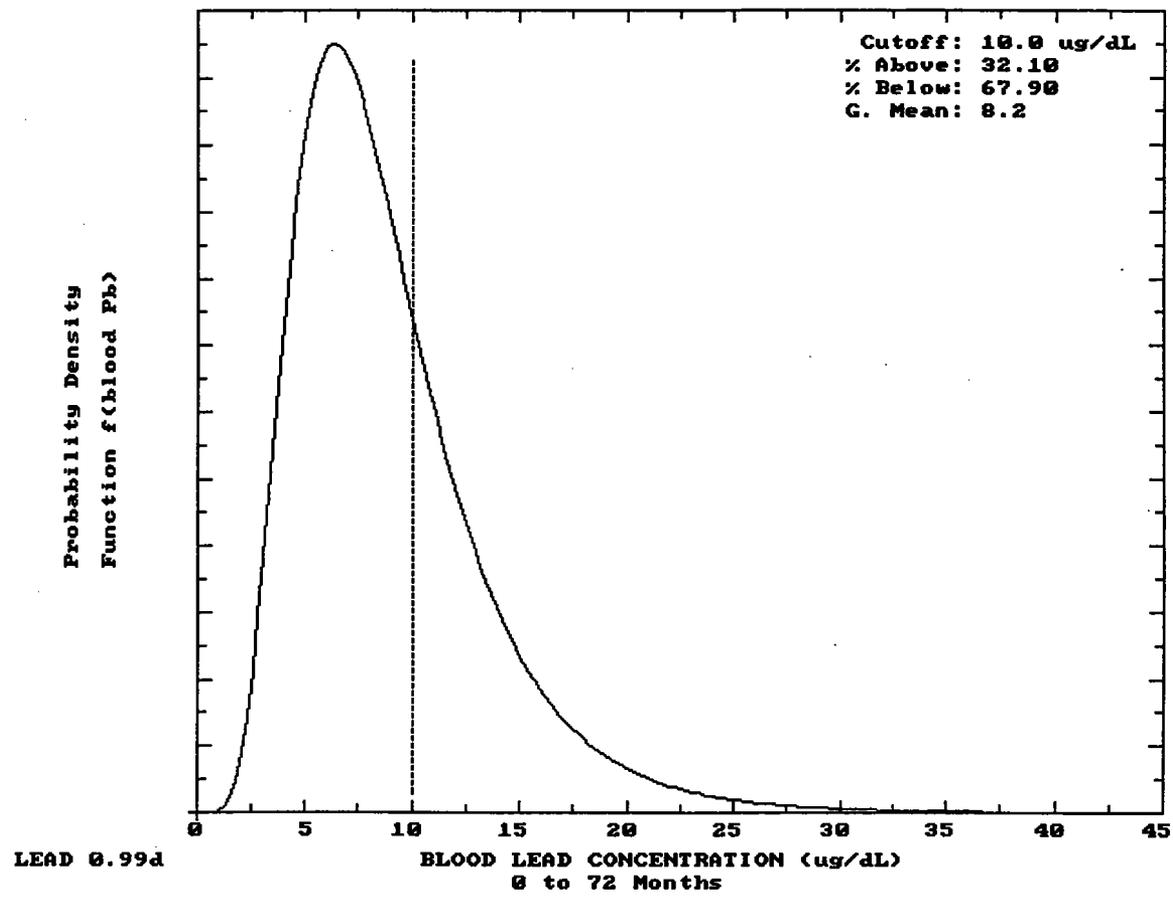
"A" Residence  
Maine Guidance  
18.42  
18.65  
18.79

4-5:	7.5	22.84
5-6:	7.1	23.27
6-7:	6.7	23.74

<u>YEAR</u>	<u>Diet Uptake (ug/day)</u>	<u>Water Uptake (ug/day)</u>	<u>Paint Uptake (ug/day)</u>	<u>Air Uptake (ug/day)</u>
0.5-1:	2.18	1.58	0.00	0.00
1-2:	2.39	1.65	0.00	0.00
2-3:	2.74	1.69	0.00	0.01
3-4:	2.70	1.73	0.00	0.01
4-5:	2.65	1.76	0.00	0.01
5-6:	2.83	1.78	0.00	0.01
6-7:	3.14	1.80	0.00	0.01

00057

"08" Residence  
Maine Guidance



00058

"S" Residence  
Moine Gubauo

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.005 ug Pb/m3

Indoor AIR Pb Conc: 30.0 percent of outdoor.

Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT

Other WATER Parameters (non-default):

Age	Water Consumption (L/day)
0-1	1.00
1-2	1.00
2-3	1.00
3-4	1.00
4-5	1.00
5-6	1.00
6-7	1.00

SOIL & DUST:

Soil: constant conc.

Dust: constant conc.

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	224.0	224.0
1-2	224.0	224.0
2-3	224.0	224.0
3-4	224.0	224.0
4-5	224.0	224.0
5-6	224.0	224.0
6-7	224.0	224.0

Additional Dust Sources: None DEFAULT

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model

Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	8.1	15.25	11.26
1-2:	6.9	15.91	11.66
2-3:	6.1	16.50	11.87
3-4:	5.8	16.68	12.07
4-5:	5.5	16.81	12.25
5-6:	5.2	17.12	12.36

00059

S" Residence  
Maive Gulouce

6-7:

4.9

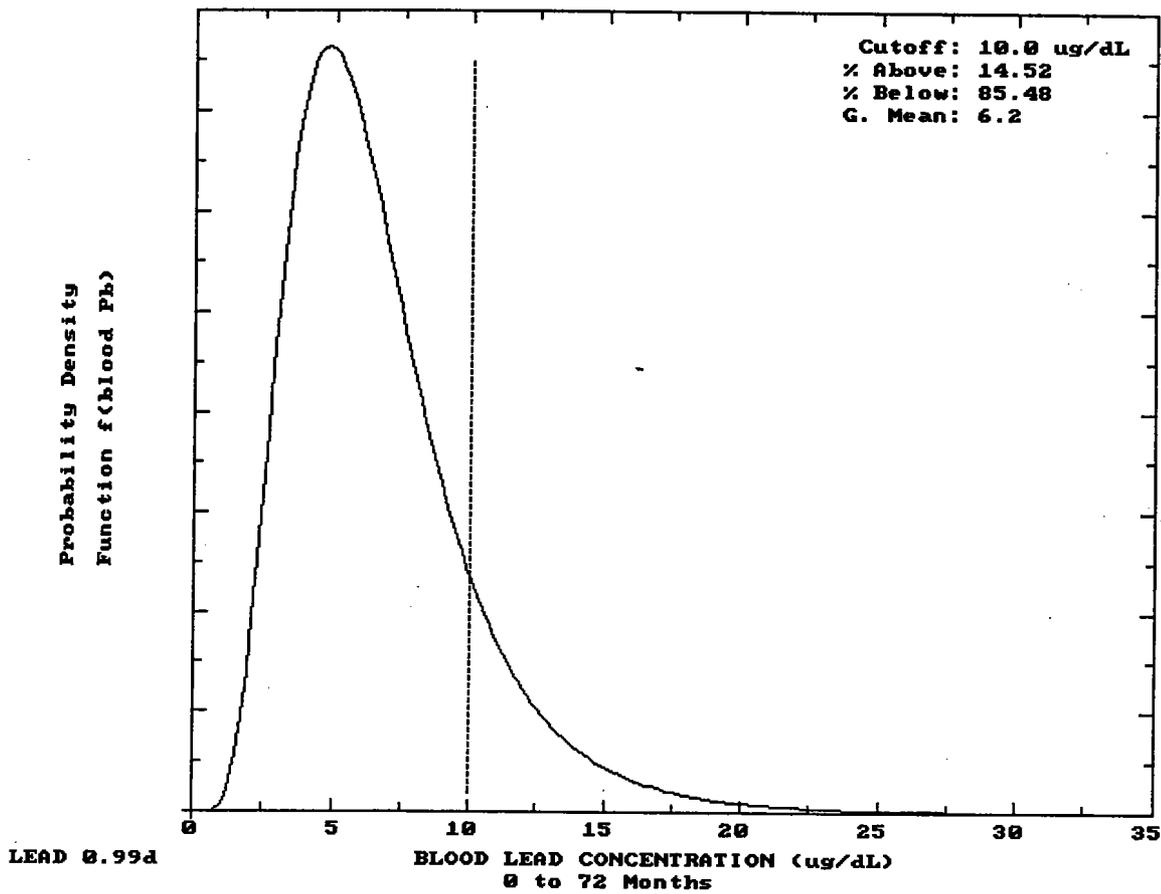
17.51

12.42

YEAR	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	2.32	1.67	0.00	0.00
1-2:	2.51	1.74	0.00	0.00
2-3:	2.87	1.77	0.00	0.00
3-4:	2.80	1.80	0.00	0.00
4-5:	2.74	1.82	0.00	0.00
5-6:	2.91	1.84	0.00	0.00
6-7:	3.24	1.85	0.00	0.00

00060

"S" Residence  
Maine Guidance



00061

*571 Residence  
Maine Guidance*

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.005 ug Pb/m<sup>3</sup>

Indoor AIR Pb Conc: 30.0 percent of outdoor.

Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m <sup>3</sup> /day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT

Other WATER Parameters (non-default):

Age	Water Consumption (L/day)
0-1	1.00
1-2	1.00
2-3	1.00
3-4	1.00
4-5	1.00
5-6	1.00
6-7	1.00

SOIL & DUST:

Soil: constant conc.

Dust: Multiple Source Analysis

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	224.0	157.3
1-2	224.0	157.3
2-3	224.0	157.3
3-4	224.0	157.3
4-5	224.0	157.3
5-6	224.0	157.3
6-7	224.0	157.3

Additional Dust Sources: None DEFAULT

Soil contribution conversion factor: 0.70

Air contribution conversion factor: 100.0

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model

Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	7.3	13.66	9.59
1-2:	6.2	14.22	9.91
2-3:	5.5	14.75	10.06
3-4:	5.2	14.87	10.22

00062

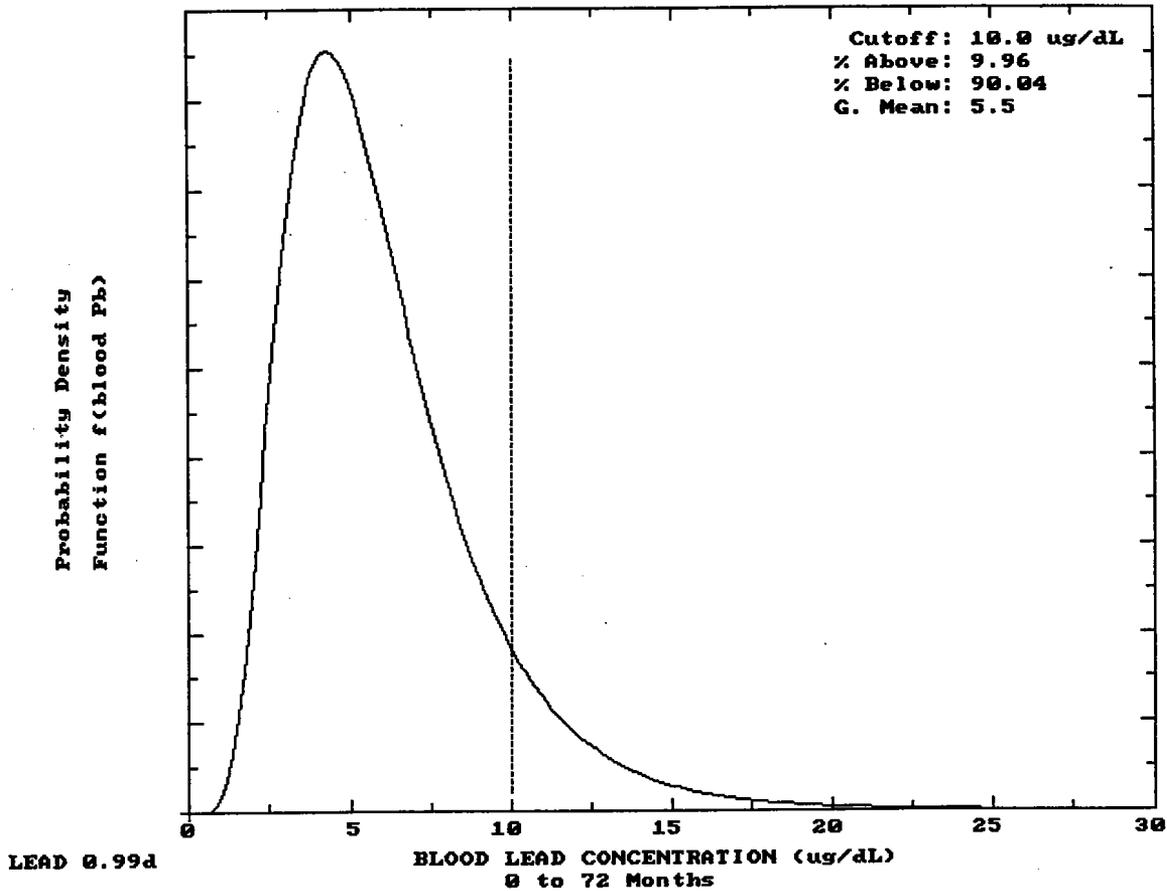
5 Residence  
Main Guidance

4-5:	4.9	14.96	10.35
5-6:	4.7	15.23	10.43
6-7:	4.4	15.61	10.48

YEAR	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	2.36	1.71	0.00	0.00
1-2:	2.55	1.76	0.00	0.00
2-3:	2.90	1.79	0.00	0.00
3-4:	2.84	1.82	0.00	0.00
4-5:	2.77	1.84	0.00	0.00
5-6:	2.94	1.86	0.00	0.00
6-7:	3.26	1.86	0.00	0.00

00063

"S" Residence  
Maine Guidance



00064

"S" Residence  
Maine Guidance

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.009 ug Pb/m3

Indoor AIR Pb Conc: 30.0 percent of outdoor.

Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT

Other WATER Parameters (non-default):

Age	Water Consumption (L/day)
0-1	1.00
1-2	1.00
2-3	1.00
3-4	1.00
4-5	1.00
5-6	1.00
6-7	1.00

SOIL & DUST:

Soil: constant conc.

Dust: constant conc.

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	395.0	395.0
1-2	395.0	395.0
2-3	395.0	395.0
3-4	395.0	395.0
4-5	395.0	395.0
5-6	395.0	395.0
6-7	395.0	395.0

Additional Dust Sources: None DEFAULT

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model

Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	11.5	21.98	18.30
1-2:	10.0	23.20	19.23
2-3:	8.9	24.09	19.72
3-4:	8.5	24.58	20.21
4-5:	8.2	24.97	20.61
5-6:	7.8	25.46	20.90

00065

*S residence  
Maine Gulch  
21.07*

6-7:

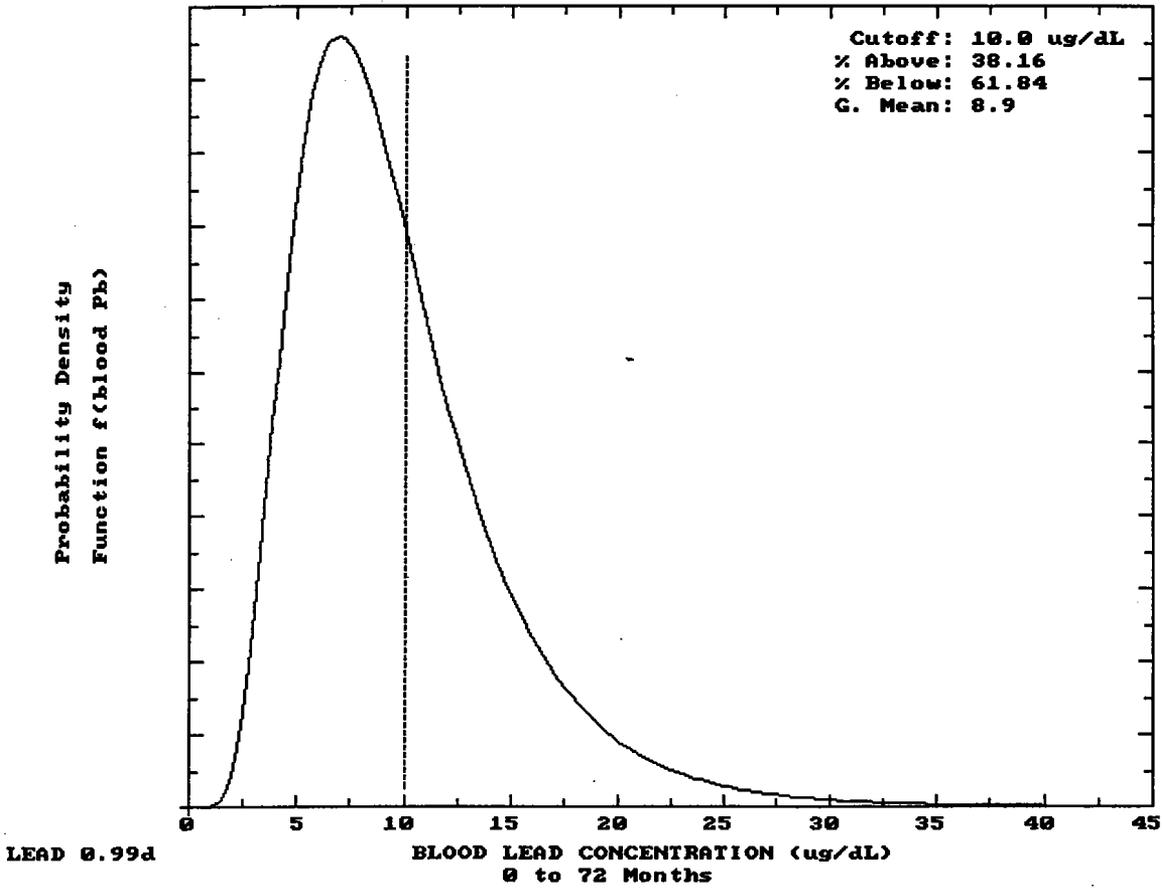
7.3

25.97

YEAR	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	2.13	1.54	0.00	0.00
1-2:	2.35	1.62	0.00	0.00
2-3:	2.70	1.66	0.00	0.01
3-4:	2.66	1.71	0.00	0.01
4-5:	2.61	1.74	0.00	0.01
5-6:	2.80	1.76	0.00	0.01
6-7:	3.11	1.78	0.00	0.01

00066

"S" Residence  
Home Guidance



00067

"S" Residence  
Maine Guidance

LEAD MODEL Version 0.99d

AIR CONCENTRATION: 0.009 ug Pb/m3  
Indoor AIR Pb Conc: 30.0 percent of outdoor.  
Other AIR Parameters:

Age	Time Outdoors (hr)	Vent. Rate (m3/day)	Lung Abs. (%)
0-1	1.0	2.0	32.0
1-2	2.0	3.0	32.0
2-3	3.0	5.0	32.0
3-4	4.0	5.0	32.0
4-5	4.0	5.0	32.0
5-6	4.0	7.0	32.0
6-7	4.0	7.0	32.0

DIET: DEFAULT

DRINKING WATER Conc: 4.00 ug Pb/L DEFAULT  
Other WATER Parameters (non-default):

Age	Water Consumption (L/day)
0-1	1.00
1-2	1.00
2-3	1.00
3-4	1.00
4-5	1.00
5-6	1.00
6-7	1.00

SOIL & DUST:

Soil: constant conc.  
Dust: Multiple Source Analysis

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
0-1	395.0	277.4
1-2	395.0	277.4
2-3	395.0	277.4
3-4	395.0	277.4
4-5	395.0	277.4
5-6	395.0	277.4
6-7	395.0	277.4

Additional Dust Sources: None DEFAULT  
Soil contribution conversion factor: 0.70  
Air contribution conversion factor: 100.0

PAINT Intake: 0.00 ug Pb/day DEFAULT

MATERNAL CONTRIBUTION: Infant Model  
Maternal Blood Conc: 2.50 ug Pb/dL

CALCULATED BLOOD Pb and Pb UPTAKES:

YEAR	Blood Level (ug/dL)	Total Uptake (ug/day)	Soil+Dust Uptake (ug/day)
0.5-1:	10.3	19.55	15.76
1-2:	8.9	20.55	16.48
2-3:	7.9	21.32	16.85
3-4:	7.5	21.68	17.23

00068

51 Residence  
Maine Guidance

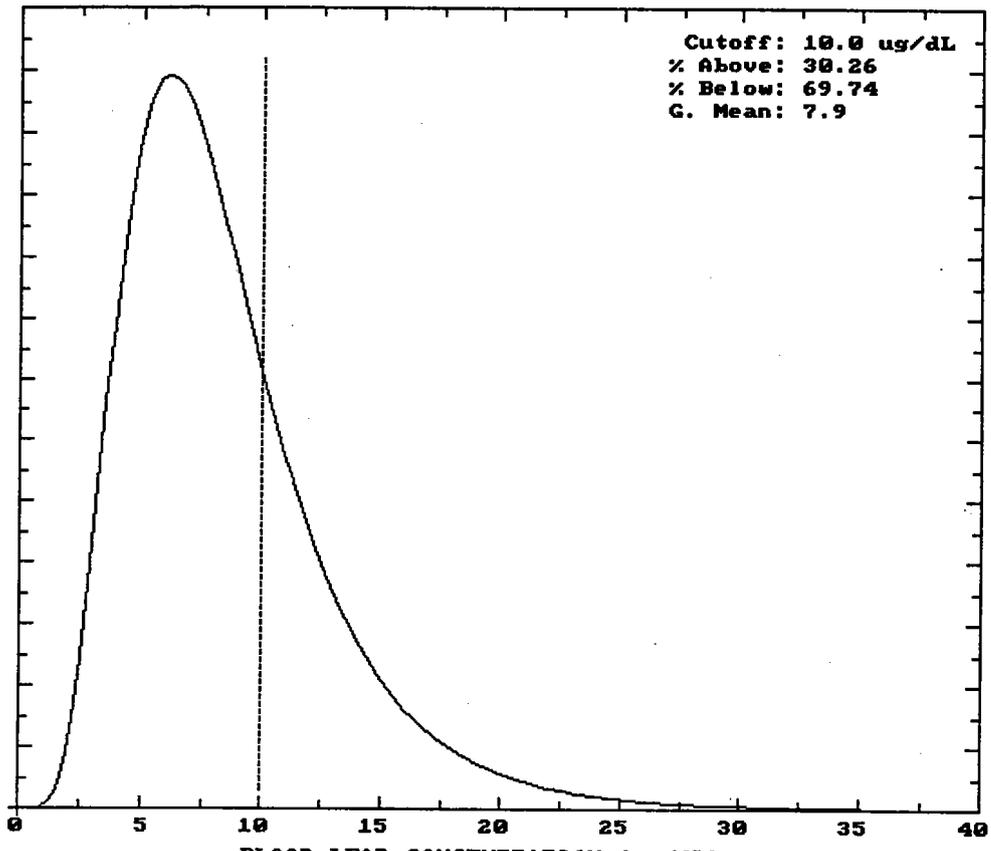
4-5:	7.2	21.97	17.54
5-6:	6.8	22.39	17.75
6-7:	6.4	22.84	17.88

YEAR	Diet Uptake (ug/day)	Water Uptake (ug/day)	Paint Uptake (ug/day)	Air Uptake (ug/day)
0.5-1:	2.20	1.59	0.00	0.00
1-2:	2.40	1.66	0.00	0.00
2-3:	2.76	1.70	0.00	0.01
3-4:	2.71	1.74	0.00	0.01
4-5:	2.66	1.77	0.00	0.01
5-6:	2.84	1.79	0.00	0.01
6-7:	3.16	1.80	0.00	0.01

00069

"S" Residence  
Maine Gudowæ.

Probability Density  
Function f(blood Pb)



LEAD 0.99a

BLOOD LEAD CONCENTRATION (ug/dL)  
0 to 72 Months

00070

**ATTACHMENT G**

**NAVY RESPONSE TO COMMENTS (AND FOLLOW-UP COMMENTS)  
DRAFT IEUBK LEAD MODEL TECHNICAL MEMORANDUM**

**RESPONSE TO USEPA FOLLOW-UP COMMENTS DATED 1/14/99  
DRAFT IEUBK LEAD MODELING AT DRMO IMPACT AREA  
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE**

**Follow-up to EPA Comments #1 and #2:** Responses to comments are fine. Please be sure to add the appropriate information to clarify the text.

**Follow-up Response:** The Navy agrees to add the appropriate information to clarify the text.

**Follow-up to EPA Comment #3:** Although no revision to the model may be necessary due to the previously apparently missing sample SS-15-S, sample SS-15S should still be added to the figure.

The response to the rest of the comment appears to be appropriate, but in order to understand the response, the tables (referred to as "A and B" in the response text), inputs and model results would enable a clearer understanding of the final part of the response. Please provide this information to EPA.

**Follow-up Response:** The figure from the March 1994 Public Health and Environmental Risk Evaluation (PHERE), used to determine sample locations, will not be updated at this time. However, future figures developed by the Navy for Operable Unit 2 will depict Sample SS-15-S. For informational purposes, SS-15 is located south of Quarters "S."

Refer to the attached tables "A" and "B", which will be renamed as "Table 6" and "Table 7", respectively, in the Draft Final version of the technical memorandum.

00001

**TABLE A**  
**PREDICTED BLOOD LEAD LEVELS**  
**SUMMARY OF POTENTIAL RISKS POSED BY LEAD EXPOSURES**  
**CALCULATED FOR CHILDREN AGES 0-6 YEARS**  
**PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE**

Date	Lead Model Version	Scenario	Single or Multiple Source Analysis	Input Description (Avg./Max)	Air Concentration (ug/m <sup>3</sup> )	Soil/Dust Concentration (ug/g)	Percent Below 10 ug/dL*	Geometric Mean (ug/dL)*
9/8/97	99d	No Soil Exposure	Single	Default	0.1	0	100	1.5
9/8/97	99d	No Soil Exposure	Multiple	Default	0.1	0	100	1.6
9/8/97	99d	"N" Residence	Single	Average	0.009	404	87.19	6.0
9/8/97	99d	"N" Residence	Multiple	Average	0.009	404	91.75	5.3
9/8/97	99d	"N" Residence	Single	Maximum	0.017	765	59.63	9.3
9/8/97	99d	"N" Residence	Multiple	Maximum	0.017	765	67.9	8.2
9/8/97	99d	"68" Residence	Single	Average	0.007	337	91.75	5.3
9/8/97	99d	"68" Residence	Multiple	Average	0.007	337	94.68	4.7
9/8/97	99d	"68" Residence	Single	Maximum	0.009	417	86.36	6.1
9/8/97	99d	"68" Residence	Multiple	Maximum	0.009	417	91.21	5.4
9/8/97	99d	"S" Residence	Single	Average	0.005	224	97.3	4.1
9/8/97	99d	"S" Residence	Multiple	Average	0.005	224	98.34	3.7
9/8/97	99d	"S" Residence	Single	Maximum	0.009	395	87.97	5.9
9/8/97	99d	"S" Residence	Multiple	Maximum	0.009	395	92.25	5.2

**Notes:**

Air concentrations and soil/dust concentrations reflect site specific conditions.

Air concentrations were estimated assuming that:

- (1) the contaminant concentrations in the particulate matter reflect the contaminant concentrations measured in surface soil samples collected at a site and
- (2) the total suspended particulate material concentration in the air is 0.1 mg/m<sup>3</sup>.
- (3) the concentration of respirable particulates in air (chronic exposures) = 22 ug/m<sup>3</sup> (State of Maine, June 1994)

\* Percent of model population with calculated blood lead levels below 10 ug/dL (goal = 95%).

Geometric mean represents mean blood lead level in model population.

00002

**TABLE B**  
**LEAD LEVELS DERIVED USING INPUTS FROM MAINE GUIDANCE**  
**SUMMARY OF POTENTIAL RISKS POSED BY LEAD EXPOSURES**  
**CALCULATED FOR CHILDREN AGES 0-6 YEARS**  
**PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE**

Date	Lead Model Version	Scenario	Single or Multiple Source Analysis	Input Description (Avg./Max)	Air Concentration (ug/m <sup>3</sup> )	Soil/Dust Concentration (ug/g)	Percent Below 10 ug/dL*	Geometric Mean (ug/dL)*
9/8/97	99d	No Soil Exposure	Single	Default	0.1	0	99.98	1.9
9/8/97	99d	No Soil Exposure	Multiple	Default	0.1	0	99.97	2.1
9/8/97	99d	"N" Residence	Single	Average	0.009	404	59.63	9.1
9/8/97	99d	"N" Residence	Multiple	Average	0.009	404	69.74	8.1
9/8/97	99d	"N" Residence	Single	Maximum	0.017	765	27.27	13.9
9/8/97	99d	"N" Residence	Multiple	Maximum	0.017	765	35.99	12.3
9/8/97	99d	"68" Residence	Single	Average	0.007	337	69.74	8.0
9/8/97	99d	"68" Residence	Multiple	Average	0.007	337	77.61	7.2
9/8/97	99d	"68" Residence	Single	Maximum	0.009	417	59.63	9.3
9/8/97	99d	"68" Residence	Multiple	Maximum	0.009	417	67.9	8.2
9/8/97	99d	"S" Residence	Single	Average	0.005	224	85.48	6.2
9/8/97	99d	"S" Residence	Multiple	Average	0.005	224	90.04	5.5
9/8/97	99d	"S" Residence	Single	Maximum	0.009	395	61.84	8.9
9/8/97	99d	"S" Residence	Multiple	Maximum	0.009	395	69.74	7.9

**Notes:**

Air concentrations and soil/dust concentrations reflect site specific conditions.

Air concentrations were estimated assuming that:

- (1) the contaminant concentrations in the particulate matter reflect the contaminant concentrations measured in surface soil samples collected at a site and
- (2) the total suspended particulate material concentration in the air is 0.1 mg/m<sup>3</sup>.
- (3) the concentration of respirable particulates in air (chronic exposures) = 22 ug/m<sup>3</sup> (State of Maine, June 1994)

The following model inputs have been changed to reflect recommendations in the Guidance Manual for Human Health Risk Assessments and Hazardous Substance Sites, State of Maine, Department of Environmental Protection and Department of Human Services, June 1994:

- (1) water consumption rate (0-6 years) = 1 L/day
- (2) soil ingestion rate (0-6 years) = 200 mg/day

\* Percent of model population with calculated blood lead levels below 10 ug/dL (goal = 95%).  
 Geometric mean represents mean blood lead level in model population.

00003

**RESPONSE TO MEDEP FOLLOW-UP COMMENT DATED 1/05/99  
DRAFT IEUBK LEAD MODELING AT DRMO IMPACT AREA  
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE**

**Follow-up to MEDEP Adult/Fetal Lead Model General Comment:** The response to DEP comment number 1 regarding the Adult/Fetal lead model indicates that exposure frequency was assumed to be 219 days/year rather than 350 days/year, because the assessment is for workers rather than residents. It is unclear why this is assumed, given that a residential exposure scenario was used for other receptors (i.e., children). This question need not be addressed in an additional memorandum responding to comments. Instead, absent a more detailed and compelling explanation, please include model results based on residential exposures in the final version of the technical memorandum.

**Follow-up Response:** No revisions are planned. As stated in the guidance for the adult/fetal lead exposures (Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil, USEPA, December 1996), the methodology was developed for "assessing nonresidential exposure scenarios for assessing most sites where places of employment are (or will be ) situated on lead contaminated soils." The guidance also recognizes that the IEUBK model "is the recommended approach for assessing residential lead risks." Also, the exposure frequency is identified as 219 day/yr in Table 1 of this document.

00004

**RESPONSE TO SAPL FOLLOW-UP COMMENTS DATED 1/11/99 (by Dr. Brown)  
DRAFT IEUBK LEAD MODELING AT DRMO IMPACT AREA  
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE**

**Follow-up to SAPL General Comment:** Information has been provided on Blood Lead levels in children and the models have been rerun with 0-1 foot soil samples, which was requested by both SAPL and EPA.

**Follow-up Response:** Comment acknowledged.

**Follow-up to SAPL Comment 1:** EPA asked essentially the same question. Based on the answer to EPA comment 3, it appears that estimates of possible blood lead meet the criteria. Thus at least 95% are less than 10 ug/dL for all sites when only the surface sample data are used. It was necessary to test this hypothesis because the surface sample leads are considerably higher than the average lead levels. Tables A and B should be included in the technical memorandum.

**Follow-up Response:** Please refer to the Navy's follow-up response to USEPA follow-up to their Comment No. 3 agreeing to provide the tables. Also, please review the Navy's initial response again. It is true for the individual residences that estimated geometric means are all acceptable (less than the 10 ug/dL goal). However, as previously stated, the IEUBK results for some scenarios indicated that less than 95% of the population would have blood lead levels less than this goal, which is not within acceptable levels; however, the response goes on to say that, with the exception of the maximum lead concentration for the "N" residence, average and maximum lead concentrations in soil were less than or only slightly exceeded the OSWER residential screening level of 400 mg/kg. Furthermore, if the OSWER residential screening level of 400 mg/kg is inputted into the IEUBK model, the results indicate that only 87.19 percent of the population will have blood lead levels less than 10 ug/dL.

**Follow-up to SAPL Comment 2:** With one exception, a sample over 700 mg/kg, the soil levels are generally less than the widely used guidance level for clean-up, 500 mg/kg. However, the presence of a community lead exposure problem from another pathway could have been a basis for concern from this moderately contaminated site. The blood level lead studies conducted by the Naval Environmental Health Center do not indicate a lead poisoning problem in the Portsmouth area and provide valuable support to the conclusions of the technical memorandum. This and the development of background concentrations will allow determination that the average blood level in the community are less than the Maine default level and the 2.0 to 4.0 US background levels for non-exposed populations.

**Follow-up Response:** Comment acknowledged. Of note, the 500 mg/kg residential screening level for lead is now 400 mg/kg.

**Follow-up to SAPL Comment 3:** Please send a copy of Tables A and B. That data should show that the estimated exposures are well below levels of concern

00005

**Follow-up Response:** Please refer to the Navy's follow-up response to USEPA follow-up to their Comment No. 3 agreeing to provide the tables.

**Follow-up to SAPL Comment 4:** With respect to the Navy response to comment 4, SAPL should support the Halliburton NUS 1995 recommendation but only if evidence is found indicating the need for and excavation.

**Follow-up Response:** Comment acknowledged.

**Follow-up to SAPL Comments 5 and 6:** My point was that the use of this outlier value would have overestimated the seriousness of the soil lead problem. The Navy response is noted.

**Follow-up Response:** The Navy agrees.

**General Concluding Follow-up Comment:** My (Dr. Brown) expectation is the findings in the technical memorandum will be sufficient for the remediation determination. Except for removal of "hot" spots, I am generally cautious about excavation of sites potentially contaminated with lead in soil. Based on the comment responses to SAPL, USEPA and MEDEP it does not appear that there is sufficient information to determine the need for a time sensitive removal.

SAPL should also support MEDEP's request for inclusion of residential exposures scenarios for the adult/fetal exposure.

**Follow-up Response:** The Navy acknowledges the findings of the technical memorandum and the caution on soil excavation.

Please refer to the Navy's follow-up response to the MEDEP follow-up comment concerning the Adult/Fetal lead model.

00006



DEPARTMENT OF THE NAVY

NORTHERN DIVISION  
NAVAL FACILITIES ENGINEERING COMMAND  
10 INDUSTRIAL HIGHWAY  
MAIL STOP, #82  
LESTER, PA 19113-2080

5090 IN REPLY REFER TO  
Code- 1823/FE

10 DEC 1998

Ms. Meghan Cassidy  
U.S. Environmental Protection Agency  
Region 1  
JFK Federal Building HBT  
Boston, MA 02203-2211

Mr. Iver McLeod  
Maine Department of Environmental Protection  
State House Station 17  
Augusta, ME 04333-0017

Subj: IEUBK Lead Modeling at DRMO Impact Area, Portsmouth Naval Shipyard,  
Kittery, Maine

Dear Ms. Cassidy and Mr. McLeod:

Enclosed please find our responses to USEPA comments dated August 6, 1998  
comments, Maine Department Of Environmental Protection's comments dated July  
29, 1998, and Lepage Environmental Services comments dated August 6, 1998.  
Your comments on our responses are requested on or before January 11, 1998.

If additional information is required, please contact me at (610) 595-0567,  
x159.

For the Community Restoration Advisory Board (RAB) members; if you have any  
comments or questions on these issues, they can be provided to the Navy at a  
RAB meeting, by calling the Public Affairs Office at (207) 438-1140 or by  
writing to:

Portsmouth Naval Shipyard  
Code 106.3R Building 44  
Attn Ms Marty Raymond  
Portsmouth, NH 03804-5000

Sincerely,

  
FREDERICK J. EVANS, P.E.  
Remedial Project Manager  
By direction of the  
Commanding Officer

Encl:  
(1) Response to Comments

00007

Subj: IEUBK Lead Modeling at DRMO Impact Area, Portsmouth Naval Shipyard,  
Kittery, Maine

Distribution:

NOAA (K. Finkelstein)	US Fish & Wildlife Service (K. Munney)
ME Dept. of Marine Resources (D. Card)	NH Fish & Game (J. Nelson)
PNS (Code 106.3R, M. Raymond)	COMSUBGRU TWO (R. Jones)
MESO (R. Johnston)	UNH JEL (F. Short)
Ms. Juanita Bell	Mr. Doug Bogen
Mr. Jeff Clifford	Ms. Michele Dionne
Ms. Eileen Foley	Ms. Mary Marshall
Mr. Phil McCarthy	Mr. Jack McKenna
Mr. Onil Roy	Mr. Peter Vandermark
Ms. Carolyn Lepage	PNS (100PAO) w/o encl
Brown and Root Environmental (L. Klink, B. Horne)	

00008

**RESPONSE TO USEPA COMMENTS DATED 8/06/98  
DRAFT IEUBK LEAD MODELING AT DRMO IMPACT AREA  
PNS, KITTEERY, MAINE**

**Specific Comments**

1. **Comment:** What were the sampling depths of samples SS-06 and SS-07? Please change information in text and in models (see comment #3) as appropriate.

**Response:** The sampling depth for both samples SS-06 and SS-07 were from 0-1 foot depth interval.

2. **Comment:** Since the maximum lead concentration, which gave Integrated Exposure Uptake Biokinetic (IEUBK) blood lead level model results greater than 10 ug/dl, was detected at sample location SS-23S, please describe the area this sample represents (i.e., is it on a hill?, is the soil easily accessed/a garden/highly vegetated?, are there any reasons why a child would prefer to play in this area of the yard versus the rest of the yard?, etc). Please address this in the text.

**Response:** Sample location SS-23S is located on a hill, which is densely covered with grass, no bare spots were apparent. There was no indication of children's toys on the hill nor was there any indication of the lawn having unusual wear in that area.

3. **Comment:** Since the lead concentration input for IEUBK Model should represent a potential exposure area, please rerun the model at the 0 to 0.5 foot surface soil depth (Surface soil is defined as 0 to 1 foot for human health evaluations) for each of the three residences:

- (·) at the "N" residence (samples SS- 17S, 18S, 19S, 20S, 21S, 22S, and 23S),
- (·) at the 68 residence (samples SS-06S and 07S),
- (·) and the "S" residence (Samples SS- 14S and 16S).

Please also include sample SS-15S in the appropriate residence evaluation (this sample was not depicted on figure 2-9 of the March 1994 Public Health and Environmental Risk Evaluation used to determine sample locations). Please also recalculate the indoor air concentration for inclusion in the IEUBK model.

**Response:** The Navy had included sample SS-15S (0-0.5' depth) in the model so no revision is required concerning this request.

The EPA appears to be requesting supplemental information, considering each of the three areas individually and only considering 0 - 0.5 foot samples. EPA guidance recommends the "top layers of soil" be considered in developing the exposure concentration for input to the model. The Navy interpreted this as surface soils from 0-2 foot depth to ensure data was not being "left out." Note that the 1992 assessment considered samples up to 1.5 depth.

00009

The model additional runs were conducted using the individual area surface soil data sets requested in the EPA comment. Note, however, the 68 residence requested samples are 0-1 foot deep (please see the Navy response to EPA comment no. 1). The model additional runs also reflect separate results for each of the three individual areas as requested in the EPA comment. Exposures to lead in surface soil at the individual residences ("N", "68", and "S") were evaluated following the methodology presented in the technical memorandum. Note that the 1992 assessment considered the samples as a whole rather than splitting sample data specific to each of the three areas. The small data sets for each area resulted in the 95% UCL input concentrations equal to the maximum concentration; therefore, average and maximum input concentration model runs were conducted. Indoor air concentrations were calculated using the average and maximum soil concentrations and were used as an input to the model. The IEUBK model was run using the EPA recommended input assumptions and input assumptions recommended by the state of Maine. Results of the evaluation are summarized in Tables A and B. The results of this evaluation will be inserted in the appropriate sections of the technical memorandum.

The IEUBK model results derived using the average soil/dust lead concentration are within acceptable levels for the "S" residence (at least 95 percent of the population has blood lead levels below 10 ug/dL). The geometric mean blood lead level concentration based on an average soil/dust lead concentration was less than the acceptable level of 10 ug/dL. The average soil/dust concentration is the input value recommended by the IEUBK guidance as the most appropriate concentration for evaluating lead in children.

The geometric mean blood lead levels based on the maximum soil/dust lead concentrations for the "S" residence and average and maximum soil/dust concentrations for the "N" and "68" residences were less than the acceptable level of 10 ug/dL. However, the IEUBK model results for some scenarios indicated that less than 95 percent of the population would have blood lead levels less than 10 ug/dL which is not within acceptable levels. It should be noted that with the exception of the maximum lead concentration for the "N" residence, average and maximum lead concentrations in soil were less than or only slightly exceeded the OSWER residential screening level of 400 mg/kg. Furthermore, if the OSWER residential screening level of 400 mg/kg is inputted into the IEUBK model the results indicate that only 87.19 percent of the population will have blood lead levels less than 10 ug/dL.

00010

**RESPONSE TO MEDEP COMMENTS DATED 7/29/98  
DRAFT IEUBK LEAD MODELING AT DRMO IMPACT AREA  
PNS, KITTEERY, MAINE**

**IEUBK Model**

1. **Comment:** Concentration of lead in air; Actual air monitoring data were used in the 1992 assessment. In the 1998 assessment, concentrations were estimated using MEDEP guidance. It is assumed that the air monitoring stations that provided data from the 1992 assessment were relatively local, whereas the MEDEP guidance combines measured state-wide concentrations of dust in the air with site-specific concentrations of contaminants in soil. Directly measured, local values are preferred over estimated concentrations. Whether the average or maximum concentrations should be used depends in part on the temporal distribution of the data. Average is satisfactory if it can be shown that concentrations approaching the maximum do not occur for extended periods of time.

**Response:** The following sentence will be added to the first paragraph of Section 2.0: *"An interim corrective measure was conducted at the DRMO in 1993, which included capping to prevent exposure to significantly elevated concentrations of lead in surface soil. Air monitoring prior to 1993 is not considered reflective of current day conditions."*

2. **Comment:** Concentration of lead in the soil; Average and maximum lead concentrations observed in soils of the DRMO area were evaluated in the 1992 assessment, whereas the average, maximum and upper 95% confidence limit (UCL) concentrations were used in the 1998 assessment. Considering that the model is for children of ages where movement about the DRMO area may be limited, it is considered most appropriate to use average concentrations observed in soils near individual sets of quarters (e.g., at stations 14 - 18 near S Quarters). Additionally, only surface samples from zero to 0.5 ft depth should be considered for use in the model.

**Response:** As noted in Section 6.1, the Navy agrees that average concentration is the governing scenario in evaluating model results; maximum and 95% UCL concentrations are provided as supplemental information.

Refer to the Navy response to EPA comment 3 concerning sample depths and additional model runs for the three individual areas.

3. **Comment:** Drinking water consumption rate; The MEDEP guidance recommends that the drinking water consumption rate for children be 1.0 L/day. This is an upper percentile value for children under the age of five that consume tap water and foods and beverages prepared with tap water. The default value used in the IEUBK model is graded, ranging from approximately 0.24 L/day for infants to approximately 0.6 L/day for children of six years and represents median (50<sup>th</sup> percentile) consumption rates. Although an upper percentile consumption rate may be preferred for risk assessments at hazardous materials sites in Maine, it is considered appropriate and acceptable to defer to the EPA default value as a measure of drinking water consumption in the IEUBK model.

00011

**Response:** Agree. The following sentence will be added to the end of Section 4.0: *"Although the highly conservative drinking water consumption rate and soil ingestion rates may be preferred by MEDEP for baseline risk assessments, the MEDEP finds it appropriate and acceptable to defer to the EPA default values for use in the IEUBK model, as stated in the MEDEP's attached comment letter dated July 29, 1998."*

- 4. Comment:** The MEDEP guidance recommends that the soil ingestion rate for children be 200 mg/day. This is near the average soil consumption rate for children (approximately 160 mg soil/day). Upper percentile rates average approximately 550 mg/day and children that exhibit pica behavior consume more than 1,000 mg/day. The default value used in the IEUBK model is graded, reaching a maximum of 135 mg/day. Although not preferred for baseline risk assessments at hazardous materials sites in Maine, it is considered appropriate and acceptable to defer to the EPA default value for soil consumption in the IEUBK model.

**Response:** Agree. Please see the Navy response to MEDEP comment no. 3.

- 5. Comment: Conclusions;** Certain site-specific values are recommended in this section for use in the IEUBK model. However, the values recommended in the preceding comments are considered to be preferable. These would be to use the average lead concentration for soils adjacent to each of the Quarters, measured concentrations of lead in the air, and EPA defaults for soil and water consumption.

It is stated that "at least 95% of the population has blood lead levels below 10 mg/dL." This should be changed to read "at least 95% of the population has estimated blood lead levels below 10 mg/dL." The former version suggests that blood lead levels have been measured, which they have not. Similar statements occur elsewhere in the technical memorandum and should be adjusted accordingly.

**Response:** As discussed in the Navy response to comment no. 1, the model will not be changed to use measured concentrations of lead in the air. MEDEP guidance was included as supplemental information in the technical memorandum and EPA defaults are emphasized. The requested model runs for each of the three individual areas has been conducted; please refer to the Navy's response to comment no. 2.

The Navy agrees to clarify the technical memorandum to make clear that the model results are estimated concentrations.

#### **Adult/Fetal Lead Model**

- 1. General Comment:** The adult/fetal lead exposure model is summarized in the technical memorandum. The model was developed by the EPA Technical Workgroup on adult lead exposure. This model was not available for review, therefore any comments at this time may be considered preliminary.

The model, as summarized in the technical memorandum, uses standard equations for estimating exposure of a pregnant female to lead in the soil. This is combined with a slope

factor that relates the blood lead level in the pregnant woman to that of the fetus. The assumptions that were used appear to be acceptable, with the exception that exposure frequency was assumed to be 219 days/year. This needs further justification. An exposure frequency of 350 days/year is generally recommended by the MEDEP when estimating exposure for the future residential use scenario.

**Response:** The adult/fetal lead exposure model evaluates nonresidential adult exposures to lead in soil. The default parameter of 219 days/year is based on EPA guidance for average time spent at work by both full-time and part-time workers (EPA, 1993. "Superfund's Standard Default Exposure Factors for the Central Tendency and RME-Draft. Working Draft, November 1993.)

00013

**RESPONSE TO SAPL COMMENTS DATED 8/06/98  
DRAFT IEUBK LEAD MODELING AT DRMO IMPACT AREA  
PNS, KITTEERY, MAINE**

**General Comment:** The document concludes in paragraph 3 section.6.1 page 4 that "The 1998 IEUBK results.... Are well within acceptable levels (at least 95% of the population has blood lead levels below 10 ug/dL)." This conclusion is based on data reported in Table 2 and Attachment B. More information is needed before accepting this conclusion.

**Response:** Comment noted.

- 1. Comment:** The finding reported in Table 2 row 4, that the percent of the population below 10 ug/dL is 95.85%, (column 7 row 4) is based on a 95 % Upper confidence Limit (UCL) soil/dust concentration of 316 ug/g and an air concentration of 0.00691 ug/cubic meter. The soil/dust calculation is partially based on soil lead levels at the surface and partially on levels one foot or more below the surface (Attachment C). The average value of surface lead levels is 340 ug/g with 95% UCL exceeding 400 ug/g. The average measured levels of lead in the air are 0.0497 ug/cubic meter, (Table 1) compared with 0.00691 UCL used in the model (Table 2 row 4 column 5). Therefore, as shown on Table 3 for air levels, these differences could mean that less than 95% of the estimated blood levels would be below 10 ug/dL. What is the justification for combining surface and deeper soil data? Why weren't actual air concentrations, rather than estimates, used? The model should be rerun using surface soil data only.

**Response:** Please see the Navy response to EPA comment no. 3.

- 2. Comment:** Although the average soil lead level is higher for surface soil samples (340 ug/g) than for the overall sample set (253 ug/g) in Attachment C, both values are below the level of 500 ug/g widely used to guide cleanup for residential soil. Do the background lead exposures or the average childhood blood levels in Kittery indicate that there is a lead problem?

**Response:** Development of background concentrations is underway. Although there were previously some "outliers" included in the McLaren/Hart developed background set, these "outliers", including an elevated detection of lead at 1100 mg/kg, are currently being removed based on statistical evaluation.

Blood level studies were conducted by the Navy Environmental Health Center (NEHC) in 1995 and 1997. The analyses were conducted by the Child Care Clinic Naval Medical Clinic, Portsmouth, New Hampshire. Please refer to Attachment 1 of the subject comment response letter for detailed documentation. The analytical results indicate all blood level results are acceptable (less than 10 ug/dl) except for one test result in 1993:

1993 Testing Report Summary (combined results from 2<sup>nd</sup> and 3<sup>rd</sup> quarter 1993):

- Two test results are available for children from on-base housing. One of the test results was from a child in the 2-4 years old age bracket and the other result was

00114

from a child in the 4-6 years old age bracket . The test report indicates that the blood level result was acceptable (less than 10 ug/dl) for the 2-4 years old age bracket test result but results (10-19 ug/dl) exceeded the target for the 4-6 years old age bracket test result.

- No tests were conducted for children from off-base housing

1993/1994 Testing Report Summary (combined results from 4<sup>th</sup> quarter 1993; 1<sup>st</sup>, 2<sup>nd</sup> & 3<sup>rd</sup> quarter 1994):

- One test result is available for children from on-base housing associated with a child from the 2-4 year age bracket. The test report indicates that the blood level result was acceptable (less than 10 ug/dl)
- Six test results are available for children from off-base housing; all of the test results were for children less than 2 years old. The test report indicates that all of the blood level results were acceptable (less than 10 ug/dl)

1994/1995 Testing Report Summary (combined results from 4<sup>th</sup> quarter 1994; 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> quarter 1995):

- Nine test results are available for children from on-base housing considered to be "high risk." Seven of the test results were for children less than 2 years old and two results were from the 2-3 years old age bracket. The test report indicates that all of blood level results were acceptable (less than 10 ug/dl)
- Three test results are available for children from off-base housing considered to be "high risk." All of the test results were for children less than 2 years old. The test report indicates that all of the blood level results were acceptable (less than 10 ug/dl)
- Twenty test results are available for children from on-base housing considered to be "low risk." Nineteen of the test results were for children less than 2 years old and one result was from the 2-3 years old age bracket. The test report indicates that all of the blood level results were acceptable (less than 10 ug/dl)
- Two test results are available for children from off-base housing considered to be "low risk." One of the test results was from a child less than 2 years old and the other result was from a child in the 2-3 years old age bracket. The test report indicates that both of the blood level results were acceptable (less than 10 ug/dl)

1997 Testing Report Summary (combined results from 2<sup>nd</sup>, 3<sup>rd</sup>, and 4<sup>th</sup> quarter; no testing conducted for 1<sup>st</sup> quarter):

- Four test results are available for children from on-base housing considered to be "high risk." One test result each is indicated from children less than 2 years old, 2-3 years old, 4-5 years old and more than 6 years old. The test report indicates that all of blood level results were acceptable (less than 10 ug/dl)

00015

- Two test results are available for children from off-base housing considered to be "high risk." One of the test results was from a child less than 2 years old and the other result was from a child from the 4-5 years old age bracket. Both of the test results indicate that all of the blood level results were acceptable (less than 10 ug/dl)
- Four test results are available for children from on-base housing considered to be "low risk." For children from less than 2 years old, 4-5 years old, and more than 6 years old there were two, one, and one test results available, respectively. The test report indicates that all of the blood level results were acceptable (less than 10 ug/dl).
- Two test results are available for children from off-base housing considered to be "low risk." One of the test results was from a child less than 2 years old and the other result was from a child more than 6 years old. The test report indicates that both of the blood level results were acceptable (less than 10 ug/dl).

3. **Comment:** In cases where other routes of exposure are present, a model is used to compensate for the higher blood lead exposures from background. In this case, EPA and other health agencies recommend that the acceptable level is less than 10 ug/dL for 95% of the population. Mean soil lead levels are used as inputs to the model unless the sample size is small in which case the upper confidence level of the mean is used. The models are sensitive to selection of default values, background air levels, time playing out-of-doors, etc. Since background lead levels for non-exposed children in the United States are 2-4 ug/dL, the model should be run to show that outcomes without soils exposure are near this range. If the estimated levels are too low, it means that the default values are not correct. We recommend the report include a non-exposed soil run of the model to determine whether the default values are realistic.

**Response:** The default values are conservative. The Navy was directed by the EPA to use these default values. The IEUBK lead model was run assuming that there was no exposure to soil by a child and the results are included in Tables A and B. The estimated geometric mean blood lead levels for the non-exposed soil runs based on the EPA model default exposure assumptions were 1.5 and 1.6 g/dL. The estimated geometric mean blood lead levels for the non-exposed soil runs based on Maine default exposure assumptions were 1.9 and 2.0 g/dL. These values are comparable to SAPL suggested background levels of 2-4 g/dL for non-exposed children.

4. **Comment:** The last paragraph in Section 6.1 notes that using maximum concentrations, the blood levels estimated are in excess of acceptable results but that results using the 95% UCL are not. This conclusion does not offer much comfort. There are a limited number of soil lead levels from the surface (a dozen) all of which are under the 500 ug/g level except for the one high value. Has the site been adequately sampled.

**Response:** The data set size appears to be adequate for the generally small area. The Navy was considering additional sampling in the near term only if a problem were evident from the IEUBK modeling. Of note, the Draft On-Shore Feasibility Study Report

00016

(Halliburton NUS, 1995) did recommend additional sampling to refine the limits of excavation if an excavation alternative were decided upon. This recommendation was developed based on site conditions and an action level that might be near background.

5. **Comment:** Paragraph 6.2 also bases a conclusion on the maximum value. The 95% UCL is a more appropriate basis for the conclusion.

**Response:** The mean is the most appropriate basis for the conclusion. Please see the Navy response to MEDEP comment no. 2.

6. **Comment:** Finally, even if the findings from these models were to indicate a level in the non-acceptable range, a decision to attempt a time-critical removal action should be considered carefully because of the risks of exposure during removal may exceed the benefits.

**Response:** Comment noted.

00017

Blind Copy to w/encl:

Code 1823/FE  
Code 1831/DRB  
Code 1831/JAS  
Code 1822/TAB  
Code 1823/FAL

00018

RCS DD-HA(A)1899

Department of Defense Blood Lead Level Reporting Form

REPORTING PERIOD: APRIL 1993 - 30 Sept 1993

CATCHMENT AREA FORSTMOUTH, NH UIC 00105

HOUSING	AGE	LEAD LEVEL				
		<10	10-19	20-44	45-69	>70
ON BASE						
	0-2					
	2-4	1				
	4-6		1			
	>6					
OFF BASE						
	0-2					
	2-4					
	4-6					
	>6					

NOTE: If a child turns either 2, 4, or 6 years old on the day of testing, the child is counted in the older category; i.e., a child turning 2 on the day of testing is counted in the 2-4 category.

NOTE: CHILDREN SCREENED LIVED OFF BASE FOR A YEAR PRIOR TO MOVING INTO ENLISTED HOUSING.

00019

Encl (1)

TOTAL P. 81

*Intermed*  
*A*

RCS DD-NA(A)1899

Department of Defense Blood Lead Level Reporting Form

REPORTING PERIOD: FY94; OCT93-SEP94

*01C 00105*

CATCHMENT AREA MARRIED OFFICER'S QUARTERS (ON SHIPYARD)  
ENLISTED BASE HOUSING (OUTSIDE SHIPYARD, KITTEBY, ME)

HOUSING	AGE	LEAD LEVEL				
		<10	10-19	20-44	45-69	>70
ON BASE						
	0-2					
	2-4	1				
	4-6					
	>6					
OFF BASE						
	0-2	6				
	2-4					
	4-6					
	>6					

NOTE: If a child turns either 2, 4, or 6 years old on the day of testing, the child is counted in the older category; i.e., a child turning 2 on the day of testing is counted in the 2-4 category.

RECEIVED  
NEHC NORFOLK, VA

7 OCT 94 13 18Z

OPTIONAL FORM # (7-82)

FAX TRANSMITTAL

1 of 1 pages

TO: <i>NAHC-35</i>	FROM: <i>Mr. Bowden</i>
TO: <i>NAHC</i>	FROM: <i>684-2450</i>
TO: <i>604-444-3672</i>	FROM: <i>684-3860</i>

00020

Encl (1)

GENERAL SERVICES ADMINISTRATION

FY 1995 REPORT OF BLOOD LEAD LEVEL RESULT  
ON BASE HOUSING WITH HIGH RISK LEVEL

UIC QTR MTF

Age <2 ug/dl <10    Age <2 10-19    Age <2 20-44    Age <2 45-69    Age 2-3 <10    Age 2-3 10-19    Age 2-3 20-44    Age 2-3 45-69

UIC	QTR	MTF	Age <2 ug/dl <10	Age <2 10-19	Age <2 20-44	Age <2 45-69	Age 2-3 <10	Age 2-3 10-19	Age 2-3 20-44	Age 2-3 45-69
**	00105	NAV MED CLINIC PORTSMOUTH NH								
00105	01	NAV MED CLINIC PORTSMOUTH NH	0	0	0	0	0	0	0	0
00105	02	NAV MED CLINIC PORTSMOUTH NH	1	0	0	0	0	0	0	0
00105	03	NAV MED CLINIC PORTSMOUTH NH	4	0	0	0	1	0	0	0
00105	04	NAV MED CLINIC PORTSMOUTH NH	1	0	0	0	0	0	0	0
00105	01	NAV MED CLINIC PORTSMOUTH NH	0	0	0	0	0	0	0	0
00105	02	NAV MED CLINIC PORTSMOUTH NH	0	0	0	0	0	0	0	0
00105	03	NAV MED CLINIC PORTSMOUTH NH	0	0	0	0	0	0	0	0
00105	04	NAV MED CLINIC PORTSMOUTH NH	0	0	0	0	0	0	0	0
00105	01	NAV MED CLINIC PORTSMOUTH NH	0	0	0	0	0	0	0	0
00105	02	NAV MED CLINIC PORTSMOUTH NH	1	0	0	0	0	0	0	0
00105	03	NAV MED CLINIC PORTSMOUTH NH	0	0	0	0	0	0	0	0
00105	04	NAV MED CLINIC PORTSMOUTH NH	0	0	0	0	1	0	0	0
**	Subtotal **		7	0	0	0	2	0	0	0
***	Total ***		7	0	0	0	2	0	0	0

7574447261

FILE No. 795 09/16 '98 14:08 ID:ENVIRON PROGRAMS DIR

00021

FY 1995 REPORT OF BLOOD LEAD LEVEL RESULTS  
OFF BASE HOUSING WITH HIGH RISK LEVEL

UIC QTR MTF

Age <2 ug/dl	Age <2 <10	Age <2 10-19	Age <2 20-44	Age <2 45-69	Age 2-3 <10	Age 2-3 10-19	Age 2-3 20-44	Age 2-3 45-69
-----------------	---------------	-----------------	-----------------	-----------------	----------------	------------------	------------------	------------------

** 00105NAVMEDCLINIC PORTSMOUTH NH								
00105 01 NAVMEDCLINIC PORTSMOUTH NH	0	0	0	0	0	0	0	0
00105 02 NAVMEDCLINIC PORTSMOUTH NH	2	0	0	0	0	0	0	0
00105 03 NAVMEDCLINIC PORTSMOUTH NH	0	0	0	0	0	0	0	0
00105 04 NAVMEDCLINIC PORTSMOUTH NH	0	0	0	0	0	0	0	0
00105 01 NAVMEDCLINIC PORTSMOUTH NH	0	0	0	0	0	0	0	0
00105 02 NAVMEDCLINIC PORTSMOUTH NH	0	0	0	0	0	0	0	0
00105 03 NAVMEDCLINIC PORTSMOUTH NH	0	0	0	0	0	0	0	0
00105 04 NAVMEDCLINIC PORTSMOUTH NH	0	0	0	0	0	0	0	0
00105 01 NAVMEDCLINIC PORTSMOUTH NH	0	0	0	0	0	0	0	0
00105 02 NAVMEDCLINIC PORTSMOUTH NH	0	0	0	0	0	0	0	0
00105 03 NAVMEDCLINIC PORTSMOUTH NH	0	0	0	0	0	0	0	0
00105 04 NAVMEDCLINIC PORTSMOUTH NH	1	0	0	0	0	0	0	0
** Subtotal **	3	0	0	0	0	0	0	0
*** Total ***	3	0	0	0	0	0	0	0

7574447261

FILE No. 795 09/16 '98 14:08 ID:ENVIRON PROGRAMS DIR

00022

FY 1995 REPORT OF BLOOD LEAD LEVEL RESULT  
ON BASE HOUSING WITH LOW RISK LEVE

UIC QTR MTF

Age <2 Age <2 Age <2 Age <2 Age 2-3 Age 2-3 Age 2-3 Age 2-3  
ug/dl <10 10-19 20-44 45-69 <10 10-19 20-44 45-69

UIC	QTR	MTF	Age <2 ug/dl <10	Age <2 10-19	Age <2 20-44	Age <2 45-69	Age 2-3 <10	Age 2-3 10-19	Age 2-3 20-44	Age 2-3 45-69
**	00105	NAVMECLINIC PORTSMOUTH NH								
00105	01	NAVMECLINIC PORTSMOUTH NH	2	0	0	0	0	0	0	0
00105	02	NAVMECLINIC PORTSMOUTH NH	1	0	0	0	0	0	0	0
00105	03	NAVMECLINIC PORTSMOUTH NH	2	0	0	0	0	0	0	0
00105	04	NAVMECLINIC PORTSMOUTH NH	2	0	0	0	1	0	0	0
00105	01	NAVMECLINIC PORTSMOUTH NH	0	0	0	0	0	0	0	0
00105	02	NAVMECLINIC PORTSMOUTH NH	0	0	0	0	0	0	0	0
00105	03	NAVMECLINIC PORTSMOUTH NH	7	0	0	0	0	0	0	0
00105	04	NAVMECLINIC PORTSMOUTH NH	3	0	0	0	0	0	0	0
00105	01	NAVMECLINIC PORTSMOUTH NH	0	0	0	0	0	0	0	0
00105	02	NAVMECLINIC PORTSMOUTH NH	2	0	0	0	0	0	0	0
00105	03	NAVMECLINIC PORTSMOUTH NH	0	0	0	0	0	0	0	0
00105	04	NAVMECLINIC PORTSMOUTH NH	0	0	0	0	0	0	0	0
**	Subtotal **		19	0	0	0	1	0	0	0
***	Total ***		19	0	0	0	1	0	0	0

757447261

FILE No. 795 09/16 '98 14:09 ID:EWIRON PROGRAMS DIR

00023

FY 1995 REPORT OF BLOOD LEAD LEVEL RESULT  
OFF BASE HOUSING WITH LOW RISK LEVEL

UIC QTR MT7

Age <2 Age <2 Age <2 Age <2 Age 2-3 Age 2-3 Age 2-3 Age 2-3  
ug/dl <10 10-19 20-44 45-69 <10 10-19 20-44 45-69

UIC	QTR	MT7	Age <2 ug/dl <10	Age <2 10-19	Age <2 20-44	Age <2 45-69	Age 2-3 <10	Age 2-3 10-19	Age 2-3 20-44	Age 2-3 45-69
** 00105		NAV MED CLINIC PORTSMOUTH NH								
00105	01	NAV MED CLINIC PORTSMOUTH NH	0	0	0	0	0	0	0	0
00105	02	NAV MED CLINIC PORTSMOUTH NH	0	0	0	0	0	0	0	0
00105	03	NAV MED CLINIC PORTSMOUTH NH	0	0	0	0	0	0	0	0
00105	04	NAV MED CLINIC PORTSMOUTH NH	0	0	0	0	0	0	0	0
00105	01	NAV MED CLINIC PORTSMOUTH NH	0	0	0	0	0	0	0	0
00105	02	NAV MED CLINIC PORTSMOUTH NH	0	0	0	0	0	0	0	0
00105	03	NAV MED CLINIC PORTSMOUTH NH	0	0	0	0	0	0	0	0
00105	04	NAV MED CLINIC PORTSMOUTH NH	0	0	0	0	1	0	0	0
00105	01	NAV MED CLINIC PORTSMOUTH NH	0	0	0	0	0	0	0	0
00105	02	NAV MED CLINIC PORTSMOUTH NH	0	0	0	0	0	0	0	0
00105	03	NAV MED CLINIC PORTSMOUTH NH	0	0	0	0	0	0	0	0
00105	04	NAV MED CLINIC PORTSMOUTH NH	1	0	0	0	0	0	0	0
**		Subtotal **	1	0	0	0	1	0	0	0
***		Total ***	1	0	0	0	1	0	0	0

757447261

FILE No. 795 09/16 '98 14:09 ID:ENVIRON PROGRAMS DIR

00024

Entered  
4-7-97  
A

**Blood Lead Level Reporting Form**

Child Care Clinic

MED 6200-5

Medical Treatment Facility	NAVAL MEDICAL CLINIC PORTSMOUTH, NH	Year	1997	1st Quarter	KX	2nd Quarter	3rd Quarter
	UIC 00105 POB						

NOTE: In all sections, if the child turns either 2, 4, or 6 years old on the day of testing, the child is counted in the older category; i.e., a child turning 2 on the day of testing is counted in the 2-3 category; a child 3 years, 6 months old is counted in the 3-3 category.

**Section A - Blood Lead Levels of High Risk Children**  
(Risk determined from questionnaire or clinical evaluation.)

Total number of children given screening questionnaires: 1

Number of children determined to be "high risk:" 0

Blood Lead Level (µg/dl)

Type of Housing	Age (Years)	<10	10-19	20-44	45-69	≥70
Military	<2					
	2-3					
	4-5					
	≥6					
Nonmilitary	<2					
	2-3					
	4-5					
	≥6					
Total						

Note 1. Enter in the appropriate box the number of children in that age group whose blood lead values fall in that range, e.g., if there are five children less than 2 years of age whose blood lead level is less than 10 (µg/dl), write 5 in the box where <2 years (age) and <10 (blood lead level) intersect.

**Section B - Blood Lead Levels of Low Risk Children**  
(Same matrix as for high risk children.)

Blood Lead Level (µg/dl)

Type of Housing	Age (Years)	<10	10-19	20-44	45-69	≥70
Military	<2					
	2-3	N/A				
	4-5					
	≥6					
Nonmilitary	<2					
	2-3					
	4-5					
	≥6					
Total						

*Entered  
4-24-97*

**Blood Lead Level Reporting Form**

Child Care Clinic

MED 6200-8

Medical Treatment Facility <b>NAVAL MEDICAL CLINIC</b> <b>1 AYRES CIRCLE</b> <b>PORTSMOUTH, NH 03804-5000</b>	Year			
	1997	1st Quarter	2nd Quarter	X
UIC 00105		3rd Quarter	4th Quarter	

NOTE: In all sections, if the child turns either 2, 4, or 6 years old on the day of testing, the child is counted in the older category; i.e., a child turning 2 on the day of testing is counted in the 2-3 category; a child 3 years, 6 months old is counted in the 2-3 category.

**Section A - Blood Lead Levels of High Risk Children**  
(Risk determined from questionnaire or clinical evaluation.)

Total number of children given screening questionnaires: **08**

Number of children determined to be "high risk": **04**

Blood Lead Level (µg/dl)

Type of Reporting	Age (Years)	<10	10-19	20-44	45-69	≥70
Military	<2	01				
	2-3					
	4-5	01				
	≥6					
Nonmilitary	<2					
	2-3					
	4-5					
	≥6					
Total		02				

Note 1. Enter in the appropriate box the number of children in that age group whose blood lead values fell in that range, e.g., if there are five children less than 2 years of age whose blood lead level is less than 10 (µg/dl), write 5 in the box where <2 years (age) and <10 (blood lead level) intersect.

**Section B - Blood Lead Levels of Low Risk Children**  
(Same matrix as for high risk children.)

Blood Lead Level (µg/dl)

Type of Reporting	Age (Years)	<10	10-19	20-44	45-69	≥70
Military	<2	02				
	2-3					
	4-5	01				
	≥6					
Nonmilitary	<2					
	2-3					
	4-5					
	≥6					
Total		03				

NAVMED 6200/1 (9-83)

Note: High Risk: 1 Child is 08 mos and no test performed and 1 child is 2 yrs old and results are pending.

Low Risk: 1 child is 1 year old and results are pending.

00026

Enclosure (1)

**Blood Lead Level Reporting Form**

Child Care Clinic

UIC 00105

MED 8200-5

Medical Treatment Facility <b>NAVAL MEDICAL CLINIC 1 AYRES CIRCLE PORTSMOUTH, NH 03804-5000</b>	Year			
	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
	1997		X	

NOTE: In all sections, if the child turns either 2, 4, or 6 years old on the day of testing, the child is counted in the older category; i.e., a child turning 2 on the day of testing is counted in the 2-3 category; a child 3 years, 8 months old is counted in the 3-5 category.

**Section A - Blood Lead Levels of High Risk Children**  
(Risk determined from questionnaire or clinical evaluation.)

Total number of children given screening questionnaire: **18**

Number of children determined to be "high risk": **6**

Blood Lead Level (µg/dl)

Type of Housing	Age (Years)	<10	10-19	20-44	45-69	≥70
Military	<2					
	2-3					
	4-5					
	≥6	1				
Nonmilitary	<2					
	2-3					
	4-5	1				
	≥6					
Total		2				

Note 1. Enter in the appropriate box the number of children in that age group whose blood lead values fall in that range. e.g., if there are five children less than 2 years of age whose blood lead level is less than 10 (µg/dl), write 5 in the box where <2 years (age) and <10 (blood lead level) intersect.

**Section B - Blood Lead Levels of Low Risk Children**  
(Same matrix as for high risk children.)

Blood Lead Level (µg/dl)

Type of Housing	Age (Years)	<10	10-19	20-44	45-69	≥70
Military	<2					
	2-3					
	4-5					
	≥6					
Nonmilitary	<2					
	2-3					
	4-5					
	≥6					
Total						

NAVMED 8200/1 (9-83)

00027

**Blood Lead Level Reporting Form**

Child Care Clinic

MED 6200-5

UIC 001051

Medical Treatment Facility <b>NAVAL MEDICAL CLINIC 1 AYRES CIRCLE PORTSMOUTH, NH 03804-5000</b>	Year			
	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
			997	XX

NOTE: In all sections, if the child turns either 2, 4, or 6 years old on the day of testing, the child is counted in the older category; i.e., a child turning 2 on the day of testing is counted in the 2-3 category; a child 3 years, 6 months old is counted in the 2-3 category.

**Section A - Blood Lead Levels of High Risk Children**  
(Risk determined from questionnaire or clinical evaluation.)

Total number of children given screening questionnaire: 14

Number of children determined to be "high risk": 4

Blood Lead Level (µg/dl)

Type of Housing	Age (Years)	<10	10-19	20-44	45-69	≥70
Military	<2					
	2-3					
	4-5	1				
	≥6					
Nonmilitary	<2	1				
	2-3					
	4-5					
	≥6					
<b>Total</b>		2				

Note 1. Enter in the appropriate box the number of children in that age group whose blood lead values fall in that range. e.g., if there are two children less than 2 years of age whose blood lead level is less than 10 (µg/dl), write 2 in the box where <2 years (age) and <10 (blood lead level) intersect.

**Section B - Blood Lead Levels of Low Risk Children**  
(Same matrix as for high risk children.)

Blood Lead Level (µg/dl)

Type of Housing	Age (Years)	<10	10-19	20-44	45-69	≥70
Military	<2					
	2-3					
	4-5					
	≥6	1				
Nonmilitary	<2	1				
	2-3					
	4-5					
	≥6					
<b>Total</b>		3				

NAVMED 6200/1 (9-83)

Enclosure (1)

00028

**RESPONSE TO EPA COMMENTS DATED OCTOBER 1, 1999  
DRAFT FINAL TECHNICAL MEMORANDUM FOR LEAD CONTAMINATION  
AT DRMO IMPACT AREA (DATED 07/18/99)  
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE**

**Comment:** The document and responses are adequate. EPA does note that the model results show that for the existing information at the "N" residence, the 0 to 6 year old child is 25 to 35% more likely (i.e., vs. the goal of 95% < 10 ug/dl) to be above the 10 ug/dl blood level goal with an average exposure assumption. In addition, for the average exposure, the adult in residence "N" and the child in the other two residences are also more likely to have blood lead levels of 10 ug/dl at a greater frequency than the goal. EPA agrees that a removal action is not warranted at this time. The analysis of this information in the Feasibility Study will determine whether any further action is warranted to address this issue.

**Response:** Agree.

**RESPONSE TO MEDEP COMMENTS DATED AUGUST 6, 1999  
DRAFT FINAL TECHNICAL MEMORANDUM FOR LEAD CONTAMINATION  
AT DRMO IMPACT AREA (DATED 7/18/99)  
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE**

1. **General Comment:** In the MEDEP's comment letter dated January 5, 1999 we stated,

"The response to DEP comment number 1 [dated July 29, 1998] regarding the Adult/Fetal lead model indicates that exposure frequency was assumed to be 219 days/year rather than 350 days/year, because the assessment is for workers rather than residents. It is unclear why this is assumed, given that a residential exposure scenario was used for other receptors (i.e., children). This question need not be addressed in an additional memorandum responding to comments. Instead, absent a more detailed and compelling explanation, please include model results based on residential exposures in the final version of the technical memorandum."

The Navy apparently did not run this model using residential exposures as requested. The MEDEP stated that the comment need not be addressed in an additional memorandum. However, we would expect that the Navy would have presented some sort of explanation ("absent a more detailed and compelling explanation") if you were opposed to running the model based on residential exposures.

Please explain your decision to not run the model based on residential exposures or rerun the model as previously requested.

**Response:** As previously noted, the Technical Review Workgroup (TRW) for Lead specifically stated in the *Recommendations of the Technical Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil* that "....."This report describes a methodology for assessing risks associated with non-residential adult exposures to lead in soil.....The methodology described in this report is an interim approach that is recommended for use pending further development and evaluation of integrated exposure biokinetic models for adults. The TRW is undertaking review of other models and will provide reviews on other approaches as appropriate. The Integrated Exposure Uptake Biokinetic (IEUBK) Model for lead in Children (U.S. EPA, c) is the recommended approach for assessing residential lead risks." Please note that the IEUBK model (which tends to be more conservative) was used as recommended to evaluate the residential child receptor, which tends to be the most conservative population; results were presented in the Technical Memorandum. In summary, the Navy believes that the TRW model should be used for its intended purpose; specifically the target receptor for the TRW model is industrial and not residential. The IEUBK model effectively determines risks for the child resident.

**RESPONSE TO SAPL COMMENTS DATED 8/19/99  
DRAFT FINAL TECHNICAL MEMORANDUM FOR LEAD CONTAMINATION  
AT DRMO IMPACT AREA (DATED 7/18/99)  
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE**

1. **Comment:** Page 2, Section 2.0, Lead Model Inputs/Approach; "An interim corrective measure was conducted at the DRMO in 1993, which included capping to prevent exposure to significantly elevated concentrations of lead in surface soil. Air monitoring prior to 1993 is not considered reflective of current day conditions."

The Navy recently conducted soil sampling at the DRMO due to a soil erosion problem along the shore. Laboratory results show lead concentration in soil as high as 110,000 mg/kg, or about 11%. Given these new findings, the assumptions above regarding transport of and potential exposure to significantly elevated concentrations of lead since the cap was installed in 1993 do not appear to be valid. These issues must be revisited.

**Response:** The text is correct, as it is currently presented. The text accurately reflects that an interim corrective measure was conducted and that air monitoring conducted prior to the capping would not be reflective of current conditions. Also, the corrective measure would prevent exposure to soils that were capped. These facts do not negate the fact that the elevated lead concentrations were present along the shore. However, control measures are currently underway as part of the DRMO Slope Stabilization that will result in a low potential for air dispersion. The analysis of the samples collected in Summer 1999 will be evaluated for current and future use in the OU2 Risk Assessment currently being prepared.

2. **Comment:** Page 4, Section 5.0, Adult/Fetal Lead Exposures: The model spreadsheet presents/calculates fetal blood concentrations in pregnant women based on non-residential exposures to lead in soil. The three buildings evaluated are residences. What does the model predict based on residential (versus non-residential) exposures? The fact that no children's toys were observed at Residence "N" is not evidence that no pregnant women ever lived at that location, so it is not clear what the statement about toys in the second paragraph means. Please clarify. Was the new adult lead model run using soil concentrations from the 0-0.5 foot depth or the 0-2 foot depth interval? What is the effect of the higher average lead concentrations in the shallower interval on the model outcomes? Would the July 1999 sampling results referred to in comment 1 have an effect on model predictions?

**Response:** No changes in the report are warranted.

- (a) Please note response to follow-up MEDEP comment dated August 6, 1999. The referenced TRW model describes a methodology for assessing risks associated with non-residential adult exposures to lead in soil. The Integrated Exposure Uptake Biokinetic (IEUBK) Model for lead in Children, a more conservative model, is the recommended approach for assessing residential lead risks. The results of the IEUBK model are presented in the Technical Memorandum. A copy of a calculation using the TRW model is included in Attachment E. The calculation is included in the Technical Memorandum for informational purposes only as it is the only EPA model currently recommended for adult exposure. The calculation demonstrates that a typical worker ingesting 50 mg per soil per day containing the *maximum* lead concentration (e.g., a landscaper) is not a receptor of concern.

- (b) The statement that there was "no indication of children's toys on the hill, nor was there any indication of the lawn having unusual wear in that area" is a simple reporting of site conditions at the time the referenced sample was collected. The information was added at the request of the USEPA (see USEPA Comment No. 2 presented in correspondence dated August 6, 1998). "Bare soil", in particular, may be indicative of a high use/high exposure area. However, since the sampling event is a snapshot in time; no conclusions regarding the probability of exposure can be drawn from the sampler's observations. The statement does not alter the approach used to evaluate risks. As with the other residences, the lead concentrations detected at the "N" residence were evaluated assuming residential land use by a hypothetical residential child (i.e., the IEUBK model was used).
- (c) Only the *maximum* lead concentration (regardless of depth) was evaluated using the adult lead model, (the average concentration is the recommended input.) As discussed previously, the model was included as a point of reference only. The IEUBK model is the appropriate model for evaluating a residential land use scenario and is more conservative than the adult lead model. To be specific, the use of the IEUBK Model typically generates a "clean-up" goal of approximately 400 mg/kg; the receptor is a small resident child). The use of the TRW model typically generates a "clean-up" goal *greater than* 400 mg/kg.
- (d) For purposes of the pending risk assessment at OU 2, the eroded soils from the DRMO face will be considered as subsurface soil, based on site conditions. Therefore, the IEUBK model would not be used to evaluate the contamination; the TRW model would be used to evaluate risks to an adult construction worker of child-bearing age.
3. **Comment:** Pages 4 & 5, Section 6.0, Supplemental IEUBK Modeling for Individual Residences: The USEPA requested that the IEUBK model be rerun using only samples from the 0-0.5 foot depth interval (the Navy had previously run the model using soils from the 0-2 foot depth interval). Acceptable lead concentrations in soil are those where at least 95% of the population is predicted to have blood lead levels below 10 ug/dL. The results of the model reruns using the shallower soils requested by the USEPA indicate unacceptable levels would occur. Nine out of the eleven graphs (not including those for model runs using State of Maine guidance values) included in Attachment F show that under 95% of the population would have blood levels less than 10 ug/dL. This is a significant finding as exposure to soil in the upper 6 inches of ground is more likely than exposure to soil over a 2-foot interval. However, in presenting the results of the shallower-soil model runs, the report focuses on the geometric mean, not the percent of the population. For example, the third paragraph on page 5 states "For the "N" and "68" residences, the estimated geometric mean blood level for both the average and maximum soil/dust concentrations were acceptable (less than 10 ug/dL); however, the IEUBK model does estimate that greater than 5 percent of an exposed population would have a blood lead concentration exceeding 10 ug/dL

We find the use of geometric mean in the text and in the tables to be distracting and misleading. In fact, the graphs shown in Attachment F show that up to 40% of the population would have unacceptable blood lead concentrations. The text and tables should be revised to clearly present the potential risks in a consistent manner, and should focus on the risks posed by the shallower-soil interval, not the 0-2 foot depth.

**Response:** The tables presenting the IEUBK results and the text discussing the results **consistently** present both the geometric mean lead concentration and the percentage of the population anticipated to exceed the 10 ug/dL benchmark. Additionally, according to the IEUBK model documentation, the geometric mean blood lead concentration is not a trivial parameter.... it is a critical output of the model: Page 1-27, 4<sup>th</sup> paragraph – “We should emphasize that the IEUBK model is intended to provide the best estimate of geometric mean blood lead”. Basically, the average is the input that should be used for the model.

Regarding the results presented for the individual residences in Attachment F and summarized in Table 6, please note that a number of cases were evaluated (i.e., maximum concentration, average concentration, single source analysis, multiple source analysis, EPA suggested intake values, State of Maine intake values, etc.). The various cases allow a comparison with the McClaren/Hart results presented in 1992 and provide an indication of the impact are varying input parameters (i.e., exposure assumptions). However, based on EPA and State guidance the recommended IEUBK model runs to evaluate/consider are those that use the arithmetic mean concentration (average) as the exposure point concentration and use the soil ingestion rates specified in the IEUBK model. The EPA further suggests “multiple source analysis” with regard to the relationship between the lead concentrations in the soil and the lead concentrations in house dust. The lead model results presented for this case (for 0 to 0.5 foot soils) in Table 6 for the “68” and “S” residences approximate or do not exceed the EPA benchmark (i.e., less 5 percent of the population exceeding the 10 ug/dL blood lead concentration). The Navy believes that the results presented for the “N” residence indicate a “marginal” exceedance of the EPA benchmark. This is based on the fact that the arithmetic mean concentration for the “N” residence marginally exceeds the EPA action level of 400 mg/kg (also, see response to following comment).

4. **Comment:** Page 5, Section 6.0, Supplemental IEUBK Modeling for Individual Residences; “With the exception of the maximum lead concentration for the “N” residence, average and maximum lead concentrations in soil were less than or only slightly exceeded the OSWER residential screening level of 400 mg/kg. Furthermore, if the OSWER residential screening level of 400 mg/kg is inputted into the IEUBK model, the estimated results indicate that only 87.19 percent of the population will have blood levels less than 10 ug/dL.”

We find the wording in this paragraph a bit confusing. The phrasing appears to downplay the concentration of lead and the results of the IEUBK model. If the information in this paragraph is to be included, the text should be revised to clearly state that use of the OSWER [is this acronym defined somewhere in the report?] screening level in the IEUBK model results in unacceptable outcomes – that blood lead levels in greater than 5% of the population exceed the 10 ug/dL criteria – and that measured average and maximum concentrations in soil exceed the OSWER screening levels.

**Response:** Please note that the TetraTech NUS contacted a member of the EPA’s Technical Review Workgroup for Lead regarding the issue of resulting unacceptable outcomes (percentage of population less than 95 percent), even where using the acceptable action level of 400 mg/kg. The text will be revised as follows:

"With the exception of the maximum lead concentration for the "N" residence, average and maximum lead concentrations in soil *at the individual residences* were less than or only slightly exceeded the 400 mg/kg lead screening level (residential land use) published in USEPA Office of Solid Waste and Emergency Response (OSWER) Directive 9355.4-12. It should be noted that the IEUBK model does estimate that greater than 5 percent of an exposed population would have a blood lead concentration exceeding 10 ug/dL when the 400 mg/kg soil screening level is evaluated as the exposure point concentration. (The IEUBK model estimates that exposure to an average concentration of approximately 360 mg/kg lead in soils, which is the threshold value, would not result in a blood lead concentration exceeding 10 ug/dL in greater than 5 percent of the population. It should also be noted that EPA assumes a 0 to 7 year exposure period in the derivation of the 400 mg/kg benchmark which produces a slightly less conservative result than calculated when a 0 to 6 year exposure period is evaluated.) EPA has rounded the 360 mg/kg value up to 400 mg/kg to account for the conservative variability and uncertainty associated with the IEUBK Model."

OSWER Directive 9355.4-12 requires the IEUBK Model for Lead in Children (U.S. EPA b, c) be performed when the maximum lead concentration in soil is greater than 400 mg/kg. The IEUBK Model for Lead in Children (U.S. EPA b, c) recommends the average soil concentration be used when determining the risk to children due to lead.

5. **Comment:** Page 6, Section 7.0, Conclusions; The results of rerunning the model using the shallower soil interval should be presented in Section 7.1, instead of in the Recommendations section. The final sentence in Section 7.1 would also need to be revised to state that unacceptable results were obtained with the shallower soil data. Results of modeling using the State of Maine criteria should also be summarized. We find the presentation of the 0-0.5 foot interval modeling in Section 7.3 to be unacceptable for the reasons given in comment 3, above.

At this time, we do not disagree with the conclusion that a time-critical removal action is not warranted. However, we believe the text does not clearly present the results and support the conclusions, and, therefore, the report requires some revision. We also await the response to our first comment, above, regarding the impact of the July 1999 DRMO soil sampling results on risks at the DRMO Impact Area.

**Response:** The information presented in the second paragraph of the response to preceding SAPL Comment No. 3 will be incorporated into Section 7.1 to provide a summary of the risk assessment results for the lead concentrations in the shallower soils at the individual residences and to focus the reader on the most relevant results.

The results of the evaluation conducted using the State of Maine guidelines will not be reiterated in Section 7.1 because as noted in MEDEP comment 4 dated 7/29/98 (last sentence): "Although not preferred for baseline risk assessments at hazardous materials sites in Maine, it is considered appropriate and acceptable to defer to the EPA default value for soil consumption in the IEUBK model."

The recommendations section will state the following:

The following items summarize the most relevant results of the risk assessment of lead concentrations detected within the study area:

- The IEUBK model evaluation (multi-source analysis mode) of the arithmetic mean lead concentration for all soils in the area evaluated and for the subsets of shallow soil samples collected at the “68” residence and at the “S” residence yield results within the benchmarks established by the EPA (i.e., blood lead concentrations less than 10 ug/dL in at least 95 percent or more of exposed individuals).
- The IEUBK model evaluation (multi-source analysis mode) of the arithmetic mean lead concentration for shallow soils collected at the “N” residence yield results that marginally exceed the benchmarks established by the EPA. The arithmetic mean concentration for these shallow soils (404 mg/kg) marginally exceeds the aforementioned OSWER Directive screening level of 400 mg/kg.

Consequently, a time critical removal action is not warranted. However, all of the lead data and model results presented in this report, in conjunction with all other chemical data from DRMO, will be evaluated further in the pending OU 2 Risk Assessment and Feasibility Study.

6. **Comment:** Tables 1-4, 6 & 7; The results presented in these tables do not appear to support the conclusion in the text (see bottom of page 6) that “...estimated blood levels from exposure to lead in soil at the DRMO Impact Area, as a whole, are within acceptable levels...(i.e., 95% of the population has estimated blood lead levels less than 10 ug/dL).” Instead, the impression is that the model results show unacceptable predicted blood lead levels for the DRMO Impact Area, regardless of which soil interval is used. If the reader focuses on the numbers in the column under the “Percent Below 10 ug/dL” heading, the majority fall under of the goal of 95%, some by quite a margin. This underscores the need to clearly state the model results in the text.

**Response:** Please see response to preceding SAPL Comments Nos. 4 and 5.

7. **Comment:** Attachment C: The table in attachment C should also identify which samples were used in the shallower-soil model runs, and show average, maximum, and 95% UCL for the shallow interval.

**Response:** The samples used in the shallower-soil model runs were specified on page 5 of the technical memorandum. The maximum and average lead concentrations for the shallower-soil samples from the 3 residences are presented in Table 6. The 95 % UCL was not calculated and evaluated because the sample sets were small (i.e., “N” residence – 7 samples; “68” residence – 2 samples; “S” residence – 2 samples).