# PRELIMINARY

# Health Assessment for

SAPP BATTERY SALVAGE

CERCLIS NO. FLD980602882

JACKSON COUNTY, FLORIDA

JULY 11, 1986

Agency for Toxic Substances and Disease Registry
U.S. Public Health Service

## THE ATSDR HEALTH ASSESSMENT: A NOTE OF EXPLANATION

Section 104(i)(7)(A) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, states "...the term 'health assessment' shall include preliminary assessments of potential risks to human health posed by individual sites and facilities, based on such factors as the nature and extent of contamination, the existence of potential pathways of human exposure (including ground or surface water contamination, air emissions, and food chain contamination), the size and potential susceptibility of the community within the likely pathways of exposure, the comparison of expected human exposure levels to the short-term and long-term health effects associated with identified hazardous substances and any available recommended exposure or tolerance limits for such hazardous substances, and the comparison of existing morbidity and mortality data on diseases that may be associated with the observed levels of exposure. The Administrator of ATSDR shall use appropriate data, risk assessments, risk evaluations and studies available from the Administrator of EPA."

In accordance with the CERCLA section cited, ATSDR has conducted this preliminary health assessment on the data in the site summary form. Additional health assessments may be conducted for this site as more information becomes available to ATSDR.

STATE OF FLORIDA
DEPARTMENT OF HEALTH AND REHABILITATIVE SERVICES

July 11, 1986

Brent Hartsfield
Bureau of Operations
Department of Environmental Regulation
2600 Blairstone Road
Tallahassee, Florida 32301

Dear Mr. Hartsfield:

Andy Reich and I have discussed the suggested changes to the calculation of acceptable soil levels (ASL) for priority heavy metals at the Sapp Battery NPL site in Jackson County. We agree with those changes listed below.

Our original calculations had assumed the most sensitive population for exposure would be small children in the area and that as a result of "hand-to-mouth" behavior, a 15 kg child might ingest 10 grams of contaminated soil per day. This value was based upon an evaluation by the Centers for Disease Control in their assessment of dioxin exposure routes. Though no one can say with certainty what the magnitude of this ingestion parameter might be, we agree with your contractor's comment that our assumption might be excessive. It is agreed that 1 gram per day is a more appropriate assumption for intake of contaminated soil.

For lead, use of the USEPA's recommended maximum contaminant level (RMCL) of 20 ug/l of drinking water and an assumed soil ingestion of 1 gram will result in a calculated ASL of 80 mg/kg (ppm). Using the population based recommendation of your contractor, there appears to be only a 15% difference in the two values. Since no information is available on the variation of the estimate of Stark, **et al.**, and their correlation coefficient for the regression of log (blood lead) on log (near soil concentration) was only 0.22, we recommend that the value of 80 ppm (extrapolated from a proposed drinking water level) be used to establish clean-up levels at the site.

Modifications to the ASLs for cadmium and antimony are required due to the change in the assumption of soil ingestion. Each of the ASLs reported in our earlier letter will have to be multiplied by a factor of 10 resulting in values of 5.9 and 250 ppm for cadmium and antimony, respectively. Since your contractor calculated an essentially identical ASL for cadmium, we recommend the cadmium ASL be set to 5 ppm.

By setting clean-up standards to these ASL values, persons possibly coming into daily contact with the Sapp Battery site will not be expected to suffer short- or long-term detriments to health.

Sincerely,

Richard W. Freeman

Richard W. Freeman, Ph.D.
Toxicologist, Epidemiology Program
Preventive Health Services

RWF:rf

cc: PDHECE (Dr. Prather)
ATSDR (Mr. Pietrosewicz)

STATE OF FLORIDA
DEPARTMENT OF HEALTH AND REHABILITATIVE SERVICES

May 7, 1986

Brent Hartsfield, P.E.
Bureau of Operations
Florida Department of Environmental Regulation
2601 Blairstone Road
Tallahassee, Florida 32301

Dear Mr. Hartsfield:

Per your request of March 4, 1986, Richard Freeman and I have reviewed the risk assessment in the feasibility study report on the Sapp Battery Site written by Ecology and Environment, Inc. (E&E). The following is our critique and comments.

**LEAD**

As was noted in the report, young children are the most susceptible population with respect to adverse health effects from exposure to lead in the environment. We agree with E&E's rationale that, generally, an increase in blood lead (PbB) of 1.9 ug/dl could be tolerated by children without adverse effects, based on the national average PbB of 13.1 ug/dl in children between the ages of 0.5 to 5 years and a safe level of 15-20 ug/dl. In fact the lead screening study performed by Jackson County Public Health Unit (1) in December 1985 identified only one child under the age of five with a erythrocyte protoporphyrin (E.P.) value greater than 50 ug/dl (E.P. is a indicator of PbB and is used as a screening device on individual with possible increased lead exposure). Therefore, the 1.9 ug/dl increase in PbB is a conservative safeguard and would appear to constitute an adequate margin of safety. One caveat is that CDC (2) now recommends individuals with erythrocyte protoporphyrin levels of 35 ug/dl or greater be tested for PbB, whereas before, the level was 50 as was done during the screening. This leaves open the possibility that 16 children previously studied in Jackson County below the age of 5 years who had EP values between 35 and 50 had increased PbB, however their PbB was never directly tested. The acceptable 1.9 ug/dl increase in PbB may not contain as large a margin of safety as was initially indicated by the screening study, because this increased number of children are at risk for elevated PbB levels.

The crux of the assessment on lead resides in a use of an Environmental Protection Agency (EPA) (3) document which relates an increase in the soil lead concentration of 1000 ug/g to a 1.9 ug/dl rise in PbB. E&E uses this model to derive an acceptable soil lead concentration (PbS): if children can tolerate an increase in PbB of 1.9 ug/dl without adverse health effects, then a PbS upper limit of 950 ug/g would be sufficient to protect public health. A safety factor of 10 was also used by E&E to reach an acceptable PbS of 95 ug/g at the Sapp Battery site.

The validity of this model with respect to the Sapp site depends on a number of variables. One is the amount of contaminated soil children would ingest each day. EPA does not cite ingestion amounts. The CDC (4) has estimated an ingestion rate of 10 grams of soil per day by a 15 kg child. A difference between the EPA and CDC ingestion amounts would affect the acceptable PbS.

Secondly, even though E&E distinctly related the 1.9 ug/dl increase in PbB to ingestion of contaminated soil, they do not address the impact of other, possibly confounding exposures such as inhalation of lead-laden dust or ingestion of contaminated groundwater or paint. Additionally, EPA (3) was unclear as to whether these imputs would modify the model appreciably.

A third area of concern is raised by a statement from EPA that sampling methodologies and depth, "may produce a dilutional effect of the major lead concentration contribution from dust, which is located primarily in the top 2 cm of soil." This caveat is surely applicable to Sapp Battery where PbS exceed 900 ug/g at 7.5 - 10 feet deep and 160,000 ug/g at the surface (0 - 0.5 feet deep). This statement by EPA also brings up another point: the EPA document was written for the development of an air quality standard for lead. As the the statement indicates, the major contributor of lead in the soil would be atmospheric deposition. PbS concentrations from this route of contamination would be much lower than from an industrial landfill. It raises the question of whether a model based on ingestion of soil contaminated at relatively low levels is applicable to a grossly contaminated site like Sapp Battery. It is likely that, like most models, the EPA model is of less predictive value at exteme conditions (either very low or very high soil concentrations).

In order to properly assess the health risk presented by the soils contaminated by lead at the Sapp Battery site, an acceptable soil level (ASL) has been calculated as shown below. The following assumptions have been used in the derivation:

(a) ingestion of 2 liters (l) of water per day by a 70 kg individual.

(b) 20% of the acceptable daily intake (ADI: amount of a substance which can be ingested in one day) value contributed via water ingestion

(c) soil ingestion by a 15 kg child of 10 grams per day (4).

(d) minimal intake of the metal except via ingestion of water and soil.

An acceptable maximum contaminant level (MCL: the highest concentration of a substance allowed in community potable water supplies) has been recommended by EPA at 0.02 mg/l (5).

Calculations:

a. 0.02 mg/l x 2 l/day = 0.04 mg/day from ingestion of water

b. 0.04 mg/day divided by 20% = 0.20 mg/day from all sources

c. 0.20 mg/day - 0.04 mg/day = 0.16 mg/day from all sources excluding water ingestion

d. 0.16 mg/day divided by 70 kg = 0.002 mg/kg/day = ADI

e. 0.002 mg/kg/day x 15 kg = 0.03 mg/day

f. 0.03 mg/day divided by 10 g/day = 0.003 mg/g = 3 ug/g

g. **ASL = 3 ug/g (parts per million, ppm)**

As can be seen, there is a 32 fold difference between the ASL's of E&E versus HRS. This difference is not as large as it first appears when one notes that the safety factor of 10 used by E&E is a subjective figure and is open to question (should possibly be greater or less).

Lead concentrations throughout the sampling profiles of both soil and sediment exceeded the HRS ASL of 3 ug/g (322/327: 99% and 85/88: 97% for soil and sediment, respectively; 5 soil and 2 sediment analyses had detection limits greater than the ASL and were not used in the calculation).

**CADMIUM**

In no instances would clean-up to the HRS lead ASL fail to protect against appreciable cadmium levels (greater than or equal to 1 ug/g). However, E&E's ASL, would leave untouched four soil and two sediment sites where lead levels would be acceptable (less than or equal to 95 ug/g), but where appreciable amounts of cadmium are also present. (Due to varying detection limits for cadmium, many in excess of 1 ug/g, this figure is most likely an underestimate of the true number.)

It is obvious, therefore, that cadmium soil concentrations (Cd) at the Sapp Battery site also need to be addressed. The brief review of cadmium toxicity was fine, however, the absence of a complete risk assessment and the lack of a derived ASL is not acceptable. Granted, at most sampling sites the lead concentrations were vastly greater than cadmium levels and the lead clean-up criterion would also indirectly address the cadmium clean-up. However, due to the toxicity and carcinogenic potential of cadmium, it deserves an independent assessment. In the following derivation of an ASL the same assumptions were used as with lead.

A water quality criterion of 10 ug/l has been set by th EPA for the protection of human health (6).

Calculations:

a. 0.01 mg/l x 2 l/day = 0.02 mg/day from ingestion of water

b. 0.2 mg/day divided by 20% = 0.1 mg/day from all sources

c. 0.1 mg/day - 0.02 mg/day = 0.08 mg/day from all sources excluding water ingestion

d. 0.08 mg/day divided by 70 kg = 0.00114 mg/kg/day

e. 0.00114 mg/kg/day = 1.14 ug/kg/day = ADI

f. 1.14 ug/kg/day x 15 kg = 17.14 ug/day

g. 17.14 ug/day divided by 10 g/day = 1.71 ug/g

h. **ASL = 1.71 ug/g**

In addition, the World Health Organization/Food and Agricultural Organization (WHO/FAO) (7) and EPA (5) have recommended an MCL of 5 ug/l:

**ASL = ½ (1.71 ug/g) = 0.59 ug/g**

Cadmium concentrations are of much lower public health risk compared to lead since only 5/125 (4%) and 7/82 (9%) of the soil and sediment samples, respectively, exeeed the HRS ASL of 1.71 ug/g (1 soil and 8 sediment samples had detection limits greater than the ASL and were not used in the calculation; 206 (62%) of the samples were not analyzed for cadmium; the ASL of 0.57 ug/g could not be assessed due to detection limits greater than or equal to 1 ug/g. The E&E ASL for lead of 95 ug/g would result in no soil samples and 2 sediment samples having acceptable lead levels and cadmium concentrations greater than the HRS ASL.

## ANTIMONY

The lack of an antimony assessment is also troublesome due to the presence of significant amounts in the soil samples. The metal is a strong poison exhibiting an apparent threshold of 15 mg/kg in man (8). Cardiovascular changes such as a cardiac edema and myocardial fibrosis, dermatitis, and increased incidence of lung cancer have been found in occupationally exposed workers.

The following calculations have used assumptions previously stated. The EPA recommends an antimony ambient water quality criterion of 146 ug/l for the protection of human health (6).

Calculations:

a. 146 ug/l x 2 l/day = 292 ug/day

b. 292 ug/day divided by 20% = 1,460 ug/day from all sources

c. 1,460 ug/day - 292 ug/day = 1,168 ug/day from all sources except water ingestion

d. 1,168 ug/day divided by 70 kg = 16.69 ug/kg/day

e. 16.69 ug/kg/day x 15 kg = 250 ug/day

f. 250 ug/day divided by 10 g = 25 ug/g

g. **ASL = 25 ug/g**

Sixteen percent (22/126) and 9% (8/90) of the soil and sediment samples, respectively, exceed the 25 ug/g ASL for antimony (206 (62%) of the soil samples were not analyzed for antimony). In none of the samples would the E&E lead ASL fail to protect against elevated antimony levels.

In summary, there appears to be substantial uncertainty relating to the use of an EPA model predicting increases in PbB in small children resulting from the ingestion of lead contaminated soils. There was a lack of information on ingestion amounts, impact of confounding exposures, and doubts as to the applicability of the model to sites highly contaminated via industrial outfalls. HRS prefers to use a conservative approach for the derivation of ASL's which utilizes a CDG ingestion estimate together with extrapolations from water quality standards. ASL's for lead (3 ug/g), cadmium (1.57 ug/g), and antimony (25 ug/g) were, therefore, derived and compared to metal concentrations found in the soil and sediment found at Sapp Battery.

Lead appears to be the compound of concern due to its presence throughout the soil and sediment profiles in high concentrations. The use of E&E's 95 ug/g ASL as a clean-up criterion would significantly reduce exposure to lead via ingestion of contaminated soil. It would also vastly reduce both cadmium and antimony levels and exposure. However, a unknown number of sites would meet the 95 ug/g lead level and still have non-acceptable concentrations of cadmium and/or antimony. Utilizing the HRS ASL for lead, it is most probable that the removal or isolation of lead contaminated soils will reduce the cadmium and antimony concentrations to well below that which would adversely affect human health. The paucity of analytical data for cadmium and antimony in soils is of little overall value in the analysis of risk.

In conclusion, the comments made in this critique need to be addressed in order for HRS to be confident that the health of the individuals presently living near the site and in the future is not being compromised.

Thank you for the opportunity to comment on this important document.

Sincerely,

Andrew Reich

Andrew Reich, M.S., M.S.P.H.
Program Specialist
Environmental Hazards Epidemiology
Preventive Health Services

AR/saf

cc: EPA (Mr. Pietrosewicz)
PDHEC (Dr. Witte)
PDHECE (Drs. Prather, Freeman, Bigler, Atkeson)
DER (Mr. Ruddell, Ms. Hilty)

## REFERENCES


1. Personal communication from Toi Morse, Jackson County Public Health Unit, April 1985

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3. USEPA. Air Quality Criteria for Lead, Volume 1, EPA - 600/8-83-028B, September 1984, Research Triangle Park, N.C., p. 1-101.

4. Kimbrough, R. D. et al. Health Implications of 2,3,7,8 - Tetrachlorodibenzodioxin (TCDD) Contamination of Residential Soil, CDC, Atlanta (date unknown, 198?).

5. USEPA. National Primary Drinking Water Regulations, Fed Register 50; (219), 1985.

6. USEPA. Chemical, Physical, and Biological Properties of Compounds Present at Hazardous Waste Sites, September 27, 1985.

7. WHO/FAO. Evaluation of Certain Food Additives and the Contaminants Mercury, Lead, and Cadmium, WHO #505, FAO #151, Geneva, 1972.

8. NIOSH. Registry of Toxic Effects of Chemical Substances, 1983 Supplement, October 1984, p. 281.