N00639.AR.002414
NSA MID SOUTH
5090.3a

TECHNICAL MEMORANDUM SUPPLEMENTARY SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT SOLID WASTE MANAGEMENT UNITS 14 AND 46 FORMER HAZARDOUS WASTE ACCUMULATION AREA AND BUILDING S-140 MILLINGTON SUPPACT TN
12/22/2005
ENSAFE

ENSAFE
a global professional services company
creative thinking. **custom solutions.**®

5724 Summer Trees Drive | Memphis, Tennessee 38134 | Telephone 901-372-7962 | Facsimile 901-372-2454 | www.ensafe.com

TECHNICAL MEMORANDUM

To: Bill Hill, NAVFAC EFD SOUTH
Jennifer Tufts, USEPA Region 4
Roger Donovan, TDEC
Rob Williamson, NSA Mid-South
Jim Heide, NSA Mid-South
Jack Carmichael, USGS

From: Brian Mulhearn, EnSafe Inc.

Date: December 22, 2005

Re: Supplementary Screening Level Ecological Risk Assessment
SWMUs 14 and 46 — Former Hazardous Waste Accumulation Area and Building S-140

INTRODUCTION

This memorandum provides a supplementary screening level ecological risk assessment (SLERA) for the Statement of Basis for SWMUs 14 and 46 — Former Hazardous Waste Accumulation Area and Building S-140. Building S-140 is SWMU 14, which was used for training Navy personnel in painting processes and included a paint spray booth, paint removing area, and paint wash-down area. Paint-related wastes collected in floor drains, which emptied into a combination of sumps, outdoor wash basins, and, eventually, into either the storm sewer or sanitary sewer. SWMU 46 is a former hazardous waste accumulation area on NSA Memphis' South side that was associated with Building S-140. Both SWMUs were operational from 1943 until 1985, when Building S-140 was demolished and the hazardous waste accumulation area was removed.

The Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) for this site evaluated soil and groundwater impacts at both SWMUs 14 and 46 due to their proximity (EnSafe 2000). The RFI concluded that no quality habitat was available at SWMU 46, limiting the exposure of potential ecological receptors. Therefore, no quantitative ecological assessment was performed (EnSafe, 1999a). Corrective measures were determined to be warranted due to chlorinated solvents in shallow loess groundwater. A subsequent Corrective Measures Study (CMS) recommended a groundwater remedy of enhanced bioremediation with natural attenuation monitoring (EnSafe 2003). Contaminant transfer from groundwater to sediment/surface water was addressed in the fate and transport discussion of the RFI and is beyond the scope of this SLERA.

Because a quantitative ecological risk assessment was not completed as part of the RFI or CMS, and exposure to terrestrial species could occur, this SLERA has been developed to evaluate ecological risks to terrestrial receptors based on site soil data. Information in this memorandum is provided as part of the administrative record to clarify the decision-making process for this site.

After this initial COPC screening, the SLERA process was used to refine the COPC list. Contaminants with hazard quotients greater than 1 and that exceeded the background reference concentration were compared to the food chain models derived from the *Toxicological Benchmarks for Wildlife* from Oak Ridge National Laboratory (Sample et al., 1996). Table 2 provides the detected concentrations and food chain screening values used for the SLERA surface soil.

Food-chain hazards quotients for polycyclic aromatic hydrocarbons (PAHs) were based on total PAHs as shown in Table 2. Similarly, phthalates were evaluated as total phthalates, and DDD, DDE, and DDT were combined to evaluate the total DDT compounds in food chain models.

It should be noted that ecological features at SWMUs 14 and 46 are minimal. The site is a flat, grass-covered area on the NSA Mid-South Southside. The grassy area would likely represent the only area with potential for exposure to most upper-level predatory species. Based on the terrestrial food-chain model hazard quotients in Table 2, there are no unacceptable ecological risks to terrestrial receptors associated with this site.

REFERENCES

EnSafe/Allen & Hoshall. (1996, August 27). *Reference Concentration Technical Memorandum, Naval Support Activity Memphis*. Memphis, Tennessee.

EnSafe/Allen & Hoshall. (1997, June 3). *Surface Soil (0 to 1 foot) Background Dieldrin Concentrations at NSA Memphis*. Memphis, Tennessee.

EnSafe/Allen & Hoshall. (1996, December 11). *Addendum to the September 18, 1996 Assemblies A through D Background Reference Concentrations Technical Memorandum*. Memphis, Tennessee.

EnSafe Inc. (2000, October 6). *RCRA Facility Investigation Report; Assembly E – SWMUs 2, 9, 14, 38, 59, and 65. NSA Mid-South — Millington, Tennessee.* Revision 2. Memphis, Tennessee.

EnSafe Inc. (2001, June 29). *Voluntary Corrective Action Report, RCRA Facility Investigation, Naval Support Activity Mid-South, Petroleum-Contaminated Soil Removal Buildings S-362/ SWMU 65, S-235, S3-94, N-114/SWMU 24, N-1211, N-105, N-108, S-203, SWMU 41, SWMU 43, SWMU 47, SWMU 48, and SWMU 49*. Revision 1. Memphis, Tennessee.

Sample, B.E., Opresko D.M., Sutter G.W. II. (1996, June). *Toxicological Benchmarks for Wildlife: 1996 Revision*. Department of Energy. Oak Ridge National Laboratory. Oak Ridge, Tennessee.

U.S. Environmental Protection Agency. (2001). Supplemental *Guidance to RAGS: Region 4 Bulletins, Ecological Risk Assessment*. Retrieved at http://www.epa.gov/region4/waste/ots/ecolbul.htm

U.S. Environmental Protection Agency. (2003). *RCRA Ecological Screening Levels*. USEPA Region 5. Retrieved at http://www.epa.gov/reg5rcra/ca/edql.htm

Tables

Table 1
SWMU 46 NSA Mid-South
Ecological Chemicals of Potential Concern (COPCs) — Surface Soil

Parameter	Maximum Detection (mg/kg)	ESV[a] (mg/kg)	Source	Screening HQ[b]	Reference Conc. (mg/kg)	Reference Conc. Source	HQ > 1	Max Conc. > Ref. Conc.
Arsenic	10.6	10	Reg 4	1.06	13.1	c	**Yes**	No
Barium	407.0	165	Reg 4	2.5	191	c	**Yes**	**Yes**
Beryllium	0.6	1.1	Reg 4	0.51	0.96	c	No	No
Cadmium	3.7	1.6	Reg 4	2.3	—	—	**Yes**	NC
Chromium	24.2	0.4	Reg 4	60.5	26.4	c	**Yes**	No
Cobalt	19.4	20	Reg 4	1.0	15	c	No	Yes
Copper	24.3	40	Reg 4	0.6	23.6	c	No	Yes
Lead	84.9	50	Reg 4	1.7	28.7	c	**Yes**	**Yes**
Mercury	0.1	0.1	Reg 4	1.4	1.1	c	**Yes**	NC
Nickel	20.6	30	Reg 4	0.7	—	—	No	NC
Selenium	0.6	0.81	Reg 4	0.75	—	—	No	NC
Tin	46.2	53	Reg 4	0.9	—	—	No	NC
Vanadium	32.1	2	Reg 4	16.1	49.6	c	**Yes**	No
Zinc	121.0	50	Reg 4	2.4	88.3	c	**Yes**	Yes
Aroclor-1260	0.0310	0.020	Reg 4	1.6	—	—	**Yes**	NC
Aldrin	0.0084	0.0025	Reg 4	3.4	—	—	**Yes**	NC
alpha-Chlordane (Chlordane)	0.026	0.224	Reg 5	0.1	—	—	No	NC
gamma-Chlordane (Chlordane)	0.022	0.224	Reg 5	0.1	—	—	No	NC
2,4-DB	0.051	NA	—	—	—	—	NC	NC
4,4'-DDD	0.024	0.0025	Reg 4	9.6	—	—	**Yes**	NC
4,4'-DDE	0.049	0.0025	Reg 4	19.6	—	—	**Yes**	NC
4,4'-DDT	0.071	0.0025	Reg 4	28.4	—	—	**Yes**	NC
DDT/DDE/DDD (total)	0.144	0.0025	Reg 4	57.6	—	—	**Yes**	NC
Dibenzofuran	0.19	NA	—	—	—	—	NC	NC
Dieldrin	0.091	0.0005	Reg 4	182	0.262	d	**Yes**	No
heptachlor epoxide	0.007	0.152	Reg 5	0.043421053	—	—	No	No
2,4,5-TP-Silvex	0.024	0.109	Reg 5	0.2	—	—	No	NC
Pesticides (Total)	0.7	0.1	Reg 4	7.07	—	—	**Yes**	NC
2,4-D	0.0098	0.027	Reg 5	0.4	—	—	No	NC
Dichlorprop (4(2,4-Dichlorophenoxy)butyric acic	0.0048	NA	—	—	—	—	NC	NC
MCPS	1.1	NA	—	—	—	—	NC	NC
MCPP	5.8	NA	—	—	—	—	NC	NC
Anthracene	0.38	0.01	Reg 4	38.0	—	—	**Yes**	NC
BEQ	0.806	0.1	Reg 4	—	—	—	**Yes**	NC
Benzo(g,h,i)perylene	0.42	119	Reg 5	0.004	—	—	No	NC
Fluorene	0.26	30	Reg 4	0.01	—	—	No	NC
Fluoranthene	1.5	0.1	Reg 4	15.0	—	—	**Yes**	NC
Indeno(1,2,3-cd)pyrene	0.36	109	Reg 5	0.0033	—	—	No	NC
Naphthalene	0.39	0.1	Reg 4	3.9	—	—	**Yes**	NC
Phenanthrene	1.5	0.1	Reg 4	15.0	—	—	**Yes**	NC
Pyrene	1.2	0.1	Reg 4	12	—	—	**Yes**	NC
Acenaphthene	0.098	20	Reg 4	0.005	—	—	No	NC
Total PAHs	6.91	1.0	Reg 4	6.9	—	—	**Yes**	NC
Carbazole	0.2	NA	—	—	—	—	NC	NC
2-Butanone-MEK	1.5	89.6	Reg 5	0.0167	—	—	No	NC
2-Methylnaphthalene	0.12	3.24	Reg 5	0.0370	—	—	No	NC
4-Methyl-2-Pentanone (MIBK)	0.17	443	Reg 5	0.0004	—	—	No	NC
Butylbenzylphthalate	0.5	0.239	Reg 5	1.8828	—	—	**Yes**	NC
bis(2-Ethylhexyl)phthalate (BEHP)	2.0	0.925	Reg 5	2.2	—	—	**Yes**	NC
Total Phthalates	2.5	0.1	Reg 4	24.5	—	—	**Yes**	NC
Acetone	16.0	2.5	Reg 5	6.4	—	—	**Yes**	NC
Tetrachloroethene	0.002	0.01	Reg 4	0.2	—	—	No	NC
Xylene (Total)	0.018	0.05	Reg 4	0.4	—	—	No	NC

Notes:

Reg 4 — USEPA Region 4. 2001. *Supplemental Guidance to RAGS: Region 4 Bulletins, Ecological Risk Assessment.* Originally published November, 1995. Website version last updated November 30, 2001: http://www.epa.gov/region4/waste/ots/ecolbul.htm.

Reg 5 — USEPA Region 5. *RCRA Ecological Screening Levels*, August 22, 2003.

a — Ecological Screening Value

b — Hazard Quotient

c — EnSafe/Allen & Hoshall. *Reference Concentration Technical Memorandum, Naval Support Activity Memphis*, August, 27 1996.

d — EnSafe/Allen & Hoshall. *Surface Soil (0 to 1 foot) Background Dieldrin Concentrations at NSA Memphis*, June 3, 1997.

— — Denotes constituents for which no EPA Region 4 ESV or reference concentration is available.

NC — Denotes contaminants for which there is not sufficient information to calculate a value (primarily used when a constituent was not detected in any background sample).

BEQ — Benzo(a)pyrene equivalent concentrations

Table 2
SWMU 46 NSA Mid-South
Screening Level COPCs and Relative Risk to Simple Food Chain Models — Surface Soil

Parameter	Maximum Detection (mg/kg)	ESV[a] (mg/kg)	Source	Screening HQ[b]	HQ > 1	Reference Conc. (mg/kg)		Max Conc. > Ref. Conc.	Refined HI[e]	BAF mammal	BAF avian	TRV mammal NOAEL	TRV mammal LOAEL	TRV avian NOAEL	TRV avian LOAEL	NOAEL MAM SSL[f] (mg/kg)	NOAEL Bird SSL[g] (mg/kg)	LOAEL MAM SSL[h] (mg/kg)	LOAEL Bird SSL[i] (mg/kg)	Max Food Chain Model HQ[j]
Barium	0.0	407	165	0.0	**No**	2.46666667	c	**No**	0.0	0.22	—	11.80	—	20.80	41.7	75.933	NA	NA	345.258	1 18E+00
Cadmium	0.0	3.7	1.6	0.0	**No**	2.3125	—	NC	—	0.96	—	2.12	21.20	1.45	20.0	3.673	NA	36.729	165.591	2.23E-02
Lead	0.0000	84.9	50	0.000	**No**	1.698	c	**No**	0 0	0.03	—	**17.58**	**79.92**	**1.130**	**11.3**	373 248	NA	1696.815	93.559	**5.00E-02**
Mercury	0.0000	0.14	0.1	0.000	**No**	1.4	c	No	10 0	0.04	—	**2.86**	—	**0.45**	**0.9**	54.167	NA	NA	7.452	**2.58E-03**
Zinc	0.00	121	50	0.00	**No**	2.42	c	**No**	0 0	—	—	**351.70**	**703.3**	**14.5**	**131**	NA	NA	NA	1084.624	**1.12E-01**
Aroclor-1260	0.00	0.031	0.02	0.00	**No**	1.55	—	NC	—	1.13	**1.13**	**0 043**	**0.427**	**0.18**	**1.8**	0.064	0.133	0.633	1.334	**2.32E-02**
Aldrin	0.00	0.0084	0.0025	0.00	**No**	3.36	—	NC	—	—	—	**0 44**	**2.198**	—	—	14.667	NA	NA	NA	**5.73E-04**
DDT/DDE/DDD (total)	0.00	0.144	0.0025	0.00	**No**	57.6	—	NC	—	1.26	**1.26**	**1 76**	**8.79**	**0.003**	**0 028**	2.352	0.002	11.748	0.019	**1.23E-02**
Pesticides (Total)	0.00	0 707	0.1	0.00	**No**	7.07	—	NC	—	—	—	—	—	—	—	3.220	0.002	5.191	2.091	**1.36E-01**
Total PAHs	0.00	6 91442	1	0.00	**No**	6.91442	—	NC	—	—	**0.08**	**100**	**0.08**	**0 08**	0 14	3333.333	0.674	NA	NA	**2.07E-03**
Total Phthalates	0.00	—	—	—	**Yes[a]**	—	—	NC	—	1.0	1.0	21.8	218	1 1	—	36 333	0.911	363.333	NA	—
Acetone	0.00	16	2 5	0.00	**No**	6 4	—	NC	—	—	—	10	50	—	—	333 333	NA	NA	NA	**4.80E-02**

Notes:

Reg 4	—	USEPA Region 4. 2001 *Supplemental Guidance to RAGS Region 4 Bulletins, Ecological Risk Assessment* Originally published November 1995 Website version last updated November 30, 2001 http //www epa gov/region4/waste/ots/ecolbul.htm
Reg 5	—	USEPA Region 5 *RCRA Ecological Screening Levels* , August 22, 2003
a		Ecological Screening Value
b	—	Hazard Quotient
c		EnSafe/Allen & Hoshall *Reference Concentration Technical Memorandum, Naval Support Activity Memphis* , August, 27 1996
d		EnSafe/Allen & Hoshall *Surface Soil (0 to 1 foot) Background Dieldrin Concentrations at NSA Memphis* , June 3, 1997.
e	—	Hazard Index
f	—	No Observed Adverse Effect Level (NOAEL) for mammals soil screening level
g	—	No Observed Adverse Effect Level (NOAEL) for birds soil screening level
h	—	Lowest Observed Adverse Effect Level (LOAEL) for mammals soil screening level
i	—	Lowest Observed Adverse Effect Level (LOAEL) for birds soil screening level
j	—	Maximum Food Chain Model Hazard Quotient
—	—	Information is not available to calculate food chain HQ (e.g , no EPA Region 4 ESV or TRV is available).
NC	—	Insufficient information to calculate a background value

Equation used to calculate soil screening level (SSL)

$$SSL = \frac{TRV \times BW}{AUF \cdot AF \cdot [BAF \times (FIR \cdot f_{soil} \times FIR) + f_{soil} \times FIR]}$$

TRV	—	Toxicity Reference Value (species-specific NOAEL or LOAEL endpoint)
BW	—	Body weight
AUF	—	Area use factor = 1 0
AF	—	Absorbed fraction of contaminant = 1 0
BAF		Bioaccumulation factor
FIR		Total food ingestion rate
fsoil		Fraction soil ingested

	Mammal	Avian
FIR:	0 009 kg/d	0.093 kg/d
fsoil:	0 05	0.10
BW:	0 015 kg	0 077 kg

Contaminant exposure for terrestrial wildlife is expressed as an Exposure Dose in milligram (mg) contaminant per kilogram (kg) body weight (BW) per day or mg/kg BW/day, and the Effect Dose is represented by a toxicity reference value (TRV) expressed in the same units

The SSL is the soil concentration that results in an ecological HQ=1, that is, when the Effect Dose (TRV) and the Exposure Dose are equal.

BAF x (FIR - fsoil x FIR) describes accumulation via the food web

fsoil x FIR describes direct soil ingestion only