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TECHNICAL MEMORANDUM SURFACE SOIL BACKGROUND DIELDRIN  
CONCENTRATIONS MILLINGTON SUPPACT TN  
6/3/1997  
ENSAFE/ ALLEN AND HOSHALL

## TECHNICAL MEMORANDUM

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FROM: Brian Mulhearn, EnSafe/Allen & Hoshall

DATE: June 3, 1997

RE: **Surface Soil (0 to 1 foot) Background Dieldrin Concentrations at  
NSA Memphis**

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During the July 24, 1996 BRAC Cleanup Team (BCT) meeting, the BCT decided that the June 2, 1995 *Soil Dieldrin Technical Memorandum* should be re-submitted and finalized to clarify how the anthropogenic background reference concentration (RC) will be used that should be considered when making risk management decisions involving dieldrin. This memo addresses USEPA and TDEC's comments on dieldrin memos submitted in the past. Two-times the arithmetic mean soil dieldrin concentrations, resulting in an RC of 0.262 mg/kg for dieldrin, will not be used to eliminate dieldrin as a chemical of potential concern in baseline risk assessments. Dieldrin will be retained as a chemical of potential concern in human health risk assessments unless it is eliminated based on comparisons to USEPA's risk-based screening concentrations. However, the maximum dieldrin concentration reported at a site will be compared to the RC, and exceedances will be discussed as appropriate. The dieldrin RC was determined as discussed in the June 2 memo, which is the source of the text below.

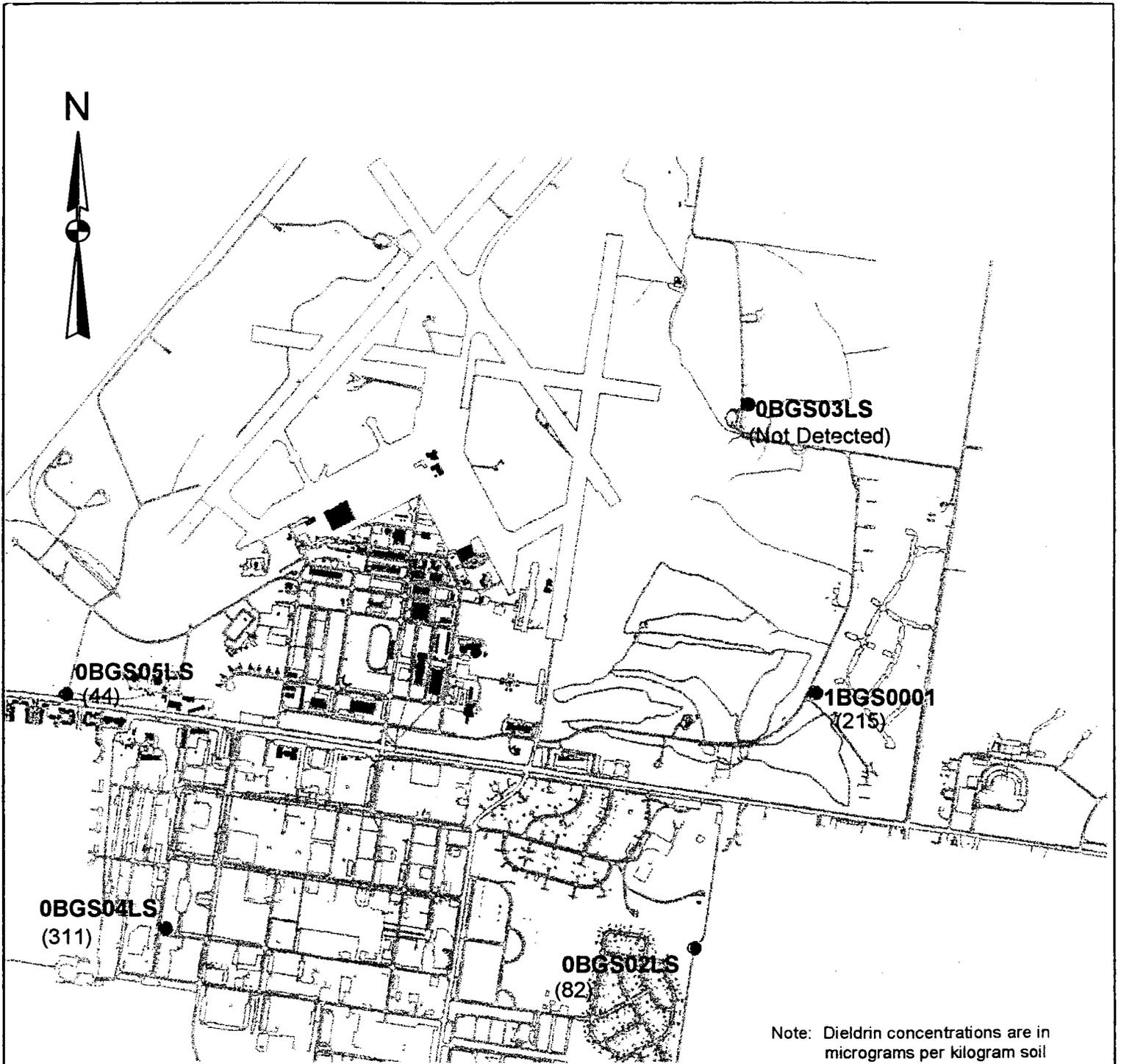
Chlorinated pesticides (specifically dieldrin) were used extensively in the 1950s and 1960s during a U.S. Department of Agriculture white fringed beetle quarantine. NSA Memphis has record that the agents were applied aerially for their intended purpose over the majority of the facility. During the RCRA Facility Investigation, dieldrin and other chlorinated pesticides were detected in most surface soil and some subsurface soil samples collected at both SWMUs and background locations. Due to the ubiquitous presence of dieldrin in site soil, the following assessment was

performed to support risk management decisions to be made by the BCT. Figure 1 shows reported surface soil dieldrin concentrations at the original NSA Memphis background locations.

Table 1 shows concentrations ranged from below quantitation limits to 0.311 mg/kg with a mean of 0.131 mg/kg at background locations. Standard risk assessment methods were used to evaluate the significance of the reported concentrations. Default assumptions for residential and occupational exposure scenarios were used to project dieldrin-related carcinogenic risk through incidental ingestion and dermal contact soil pathways, which were detailed in the November 15, 1996 Technical Memorandum, *General Human Health Risk Assessment (HHRA) Approach for NSA Memphis*. For each exposure scenario, risk was estimated using the maximum and mean SWMU-specific dieldrin concentrations. The results of this process are provided in Table 2, including concentrations at SWMUs ranging from below quantitation limits to 0.609 mg/kg (average of the duplicate results at SWMU 5, boring 4).

As shown in Table 2, SWMU 5 had the highest projected soil pathway risk associated with dieldrin at maximum concentrations ( $2.2E-5$ ). The SWMU 5 risk estimate was approximately twice that of the corresponding background. When mean concentrations were used as the exposure point concentration, SWMU 8 dieldrin risk was found to be the highest although it did not differ appreciably from background. USEPA's generally acceptable range for carcinogenic risk is  $1E-6$  to  $1E-4$ . In no instance (onsite or background) did dieldrin risk projections exceed  $1E-4$ . This finding indicates that dieldrin concentrations reported at each SWMU do not necessitate remedial action in the absence of other significant carcinogenic risk contributors.

Soil dieldrin is not expected to pose a substantial threat to shallow groundwater at any SWMU or background location. This conclusion is based on the strong soil binding properties of the compound as well as empirical data for subsurface soil that show significant vertical migration has not occurred.



1000 0 1000 2000 Feet



Figure 1

Surface Soil Dieldrin Concentrations  
Reported in Background Samples  
NSA Memphis

*Surface Soil (0 to 1 foot) Background Dieldrin Concentrations at NSA Memphis  
Revised Soil Dieldrin Technical Memorandum  
June 3, 1997*

**Table 1  
Summary of Dieldrin Concentrations  
Reported at NSA Memphis  
Background Locations**

Location	Concentration (mg/kg)	Qualifier
1BGS000101	0.215	D
OBGS02LS01	0.082	D
OBGS03LS01	0.004	U
OBGS04LS01	0.311	D
OBGS05LS01	0.044	

*Notes:*

D = sample diluted by Laboratory

U = analyte not detected

The arithmetic mean dieldrin concentration (i.e., 0.131 mg/kg) was calculated assuming one-half of the detection limit was present in sample OBGS03LS01.

**Table 2  
NSA Memphis Dieldrin Risk Estimates**

Location	Maximum Dieldrin (mg/kg)	Mean Dieldrin (mg/kg)	Residential Risk-Based Max.	Residential Risk-Based Mean	Occupational Risk-Based Max.	Occupational Risk-Based Mean
SWMU 1	0.192	NA	7.04E-6	NA	1.12E-6	NA
SWMU 3	0.023	0.0072	8.43E-7	2.64E-7	1.34E-7	4.19E-8
SWMU 5	0.609	0.126	2.23E-5	4.62E-6	3.54E-6	7.33E-7
SWMU 7	0.055	0.0095	2.02E-6	3.48E-7	3.20E-7	5.52E-8
SWMU 8	0.471	0.144	1.73E-5	5.28E-6	2.74E-6	8.37E-7
SWMU 60	0.069	0.0155	2.53E-6	5.68E-7	4.01E-7	9.01E-8
Background	0.311	0.131	1.14E-5	4.80E-6	1.81E-6	7.62E-7

*Note:*

The calculations above are based on a slope factor of 16 kg-day/mg.

A historical use discussion is also helpful to provide a frame of reference for evaluating reported soil dieldrin (and other chlorinated pesticide) concentrations. Information provided by NSA Memphis states that chlorinated pesticides (primarily chlordane) were previously used until

the late 1980's for termite control around buildings. Although chlordane was used as a single active ingredient application, mixtures including dieldrin, aldrin, and heptachlor were also common in the pest control trade. Standard application rates resulted in soil concentrations of 500 to 1,000 mg/kg total chlorinated pesticides. For comparison, a 10:1 chlordane:dieldrin mixture used for general subterranean termite control would have resulted in residual soil dieldrin concentrations of 50 to 100 mg/kg. These residual application concentrations are 50 to 100 times higher than the maximum soil dieldrin concentration reported in NSA Memphis surface soil.

This memo is intended to provide an RC for dieldrin and a risk-based framework for decision making regarding how the dieldrin issue is resolved. Although standard risk assessment techniques will be applied, final resolution of this issue will require a consensus risk management decision. Of paramount importance is the determination of what level of risk is acceptable in light of the extent of dieldrin. EnSafe/Allen & Hoshall as the contractor can only provide the facts and suggestions for a viable risk management strategy. The following paragraph outlines suggestions based on currently available information and the preceding risk evaluation.

Dieldrin was used at NSA Memphis as intended, which has been documented and has resulted in dieldrin's widespread extent. Consequently, institutional controls are considered to be the most appropriate means of dealing with the dieldrin issue from a human health perspective. These controls may include (but are not limited to) public/worker awareness, access restrictions and maintenance of adequate vegetative cover to minimize contact. The focus of future investigative efforts should center around prevention of further migration (i.e., surface runoff), and evaluation of sensitive ecological receptor points (i.e., terrestrial habitats, drainage systems, streams, and lakes.) These areas should be emphasized as little control can be exercised over the animals who use them.