THE MEMPHIS DEPOT TENNESSEE

ADMINISTRATIVE RECORD COVER SHEET

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CH2MHILL

September 9, 1997

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Julian Savage
U.S. Army Engineer Division, Huntsville
4820 University Square
Huntsville, AL 35816-1822

Dear Julian:

Subject: Transmittal of Responses to Comments on the Background Characterization
           Technical Memorandum; Defense Distribution Depot, Memphis.

Please find attached three copies of the subject document prepared in response to
regulatory review of the Background Characterization Technical Memorandum for the
Defense Distribution Depot, Memphis. This work was performed under Delivery Order 3
of Contract DACA87-94-D-0009.

Please contact me at (423) 483-9005, extension 543, if you have any questions.

Sincerely,

CH2M HILL

Greg Underberg
Project Manager

ORO/DOCUMENT1
Enclosure
c: Mike Harris/CH2M HILL/ATL

EPA Comments on the Draft Background
Sampling Program Technical Memorandum

1. Units

Comment: Several of the tables were presented without units. Units should be included in all tables.

Response: Units were included for most of the tables as footnotes. The revised report will include units in the table or the table headers.

2. Proximity of Sampling locations to Railroad Tracks

Comment: Background samples locations BS02, BW14, BS15, and BS16 appear to be close to railroad tracks in Figure 2-1. This issue requires some discussion in the text to assure that the locations have not been impacted by rail traffic and associated contamination.

Response: All four samples listed in the comment are at least 50 meters from the closest railroad tracks. Due to the condensed scale used in Figure 2-1, it may appear that these samples are within the railroad track areas. Text will be modified to included a discussion of the location of these samples and their proximity to the railroad tracks.

3. Non-parametric approach to sample size determination

Comment: The text (pp. 2-9, 10) discusses the non-parametric tolerance interval used to determine a level of confidence associated with sampling coverage. The formula on p. 2-10 requires more explanation vis-à-vis its applicability here. This section should be expanded to include all relevant equations and explanations.

A related question is the determination of a 90% confidence for each medium. How was this determined? The choice of sampling confidence levels is close to being a risk management decision is needed.

Response: In place of a random non-specific sampling approach, a statistical approach to sampling was implemented, with a pre-specified confidence level in selecting a representative data set for the background. This approach has been approved during the work plan. The confidence limits for each media were identified and discussed in Section 5.3.2 of the approved Remedial Investigation Workplan (Generic Remedial Investigation/Feasibility Study Workplan, Defense Distribution Depot Memphis, 1995).

4. Table 3-1, use of the term RME

Comment: The 95% upper confidence limit (UCL) on the mean is used as a health-protective surrogate for the true mean of a set of environmental samples. Because it is inappropriate to call the Exposure Point Concentration an RME. The acronym RME stands for "Reasonable Maximum Exposure." It pertains to exposure assumptions such as daily water intake, incidental soil ingestion, etc. The use of the 95% UCL on the mean represents a health-protective estimate of the mean concentration in the face of unavoidable uncertainty in sampling the site characterization. Because the 95% UCL is an estimate of the mean, it should not be considered as a reasonable maximum. In short, the acronym RME should not be used to determine the concentration term.

Response: The term RME will be replaced with UCL95% concentration. Although these (UCL95%) values are provided for reference, they are not used as background values.

5. Table 3-2, PRG criteria used

Comment: The reviewer spot-checked this table and was not able to duplicate calculations for several of the criteria. For example, the criterion (labeled a PRG) for arsenic in surface soil is 0.000876 mg/kg. This value is three orders of magnitude lower than other PRG/screening values with which the reviewer was familiar. Details of these calculations should be provided here, perhaps as an appendix, rather than as a reference to another document.

Some of the criteria are labeled 'ARARs." This term is not sufficiently specific. For example, dioxin/furan TEQ in surface soil are shown to have an ARAR of 4 ppt. This reviewer is unaware of statutory requirements regarding dioxin in surface soil from either the federal government or Tennessee. More explanation is needed.

Response: The arsenic PRG is based on groundwater protection (GWP) value calculated for soil, using carcinogenicity health based drinking water standard which is lower than an MCL and a Kd value from the literature. A direct exposure based PRG value included in the work plan for arsenic is 0.231 mg/kg. Lower of these two values was included in the background report. The revised report will include additional information on PRG values either in an appendix or within the text, as appropriate.

The available dioxin PRG value from EPA Region IV could perhaps be considered a "to-be considered, (TBC)" ARAR. However, this may not be critical issue and reference in the table will be changed in the revised report to read as PRG.

6. Tables 3-5 and 3-6, use of the t-test

Comment: This common statistical test was used to determine whether off-site and perimeter soil samples could be considered as coming from the same population. The use of t-test assumes that both groups of samples are normally distributed. This assumption is in conflict with the assumptions underlying the use of non-parametric methods earlier in the document. Non-parametric methods can be used for any distribution and make no assumptions regarding distribution. Therefore, the appropriate choice for statistical test would have been the non-parametric Mann-Whitney U test or a variant.

Response: The statistical evaluation of the off-site and perimeter soil samples will be performed with the Mann-Whitney U-test, as suggested by the reviewer.

7. Page 3-21, Units

Comment: Metals concentrations in the sediment are given in ug/L (micrograms/L). This is incorrect. The reviewer believes that the intended units are ug/kg. Assuming these values are in ug/kg, both lead and zinc are considerably above Region 4 sediment screening levels. Therefore, Cane Creek should not be used as a background sampling location - it has probably been impacted by non-DoD human activities.

Response: The correct units for the reported concentrations are mg/kg. We agree with the comment that the reported lead concentration in the Cane Creek (147 mg/kg) are higher than sediment screening value of 30.2 mg/kg from EPA Region IV. So also for zinc the maximum detected concentrations in the background locations are above Region IV

screening value of 124 mg/kg. The revised background values will eliminate the outlier samples identified through the boxplots, which could eliminate these samples from inclusion in the background value calculation.

8. Table 3-12, background levels dioxin/furan

Comment: The reviewer points out that the national surface soil background for dioxin/furan TEQ is about 8 ppt. The mean level here of 6 ppt is equal to the national background level. The third paragraph on page 3-37 ends with the statement about elevated dioxin levels. This statement should be removed.

Response: Agree with the comment. The referenced statement will be modified in the revised report. The statement in the text refers to the elevated concentrations in samples BW16 through BW19, which is relatively high compared to the other samples within the population. No comparisons to national averages were made.

9. Figure 3-11 and accompanying text

Comment: This figure is misleading because it suggests two soil groups. The text does not bear this out (p. 3-43). The text should be left as is, and the figure should be removed from the document.

Response: The dioxin statistical analysis in reference was performed to correlate surface soil and subsurface soil. The conclusion of the analysis was that there is no apparent reason to split the sample groups. The entire analysis will be eliminated from the report, as the text by itself is not self-explanatory. Therefore, both the figure and the text associated with it in the paragraph will be removed from the revised report.

Tennessee Department of Environment and Conservation
Comments on the Draft Background
Sampling Program Technical Memorandum

General Comments

TDEC/DSF is concerned about the submission date of this document (April 1997) compared to its publication date (September 1996). In addition, considering the nature and length of this document, TDEC/DSF views it as a report, not a Technical Memorandum.

TDEC/DSF reserves the right to further review any or all of the statistics presented in the report.

Response: The revised report will be titled "Background Sampling Program Report."

Specific Comments

1. **Section 1.0, page 1-1, second paragraph**

Please strike the word "the" before "Section 1.1."

Response: Suggested change will be made in the revised report.

2. **Section 1.2, page 1-3, last sentence**

Has the referenced report been submitted to TDEC/DSF?

Response: This report has not been submitted for regulatory review. The reference to it will be removed.

3. **Section 2.1, page 2-8, Figure 2-3**

It is noted on page 2-12 that monitoring well MW-23 was dropped as a background well. Should it be removed from this figure?

Response: Agree with the comment. MW-23 will be removed from this figure in the revised report.

4. **Section 2.2, page 2-9, first paragraph**

Should the word "forming" in the next to last line of this paragraph actually be "farming?"

Response: Yes. Typographical error will be corrected in the revised report.

5. **Section 2.2.3, page 2-13, Figure 2-4**

The following item in the legend has no symbol (which should presumably be an arrow): "GROUNDWATER GRADIENT DIRECTION IN THE FLUVIAL AQUIFER."

Response: Figure will be corrected as suggested in the revised report.

6. **Section 3.0, page 3-1**

The paragraph in this section does not mention groundwater data, although groundwater data is included in the later sections, tables, etc.

Response: Agree with the comment. Information on groundwater will be added to the introduction in the revised report.

7. Section 3.1.1, page 3-2, Table 3-1

The word "anti-logarith" in the definition of "Geometric-Mean" should be "anti-logarithm."

Response: typographical error will be corrected in the revised report.

8. Section 3.1.2, pages 3-1 & 3-2

Some of the paragraphs that discuss various matrices refer to table 3-3 and other do not (e.g. groundwater). Please review the text and references for consistency.

Response: Comment noted. References will be added to the text as suggested in the revised report.

9. Section 3.1.2, page 3-7, Table 3-3

"CRDL" is defined in the footnotes but not used in the table. Is a column missing from the table?

Response: The Definition of the CRDL is provided for the acronym used in the definition of 'U' qualifier. The revised report will clarify the CRDL acronym use.

10. Section 3.2.1, page 3-14, Soil section

Chromium and arsenic are referred to as "man-made" metals. Should the word "anthropogenic" be used in this context?

Response: Agree with the comment. Correction will be made in the revised report.

11. Section 3.2.1, page 3-15, Figure 3-1

Unlike on other similar figures, the red circles representing Total Metals are printed in the foreground and therefore obscure the underlying bar graph that represent the Distribution of Selected Metals. In addition, although the legend indicates that bars are plotted on individual scales, scales for bars on figures 3-4, 3-5, and 3-6 are present. Please consider clarifying the legend.

Response: Comment noted. An attempt will be made to further clarify the figure legend in the revised report.

12. Section 3.2.1, page 3-22 through 3-24, Figures 3-4 through 3-6

Are the units for the red circles symbol the same as for the bars? (See Figure 3-7 for an example of units labeling for both bars and circle symbols).

Response: Yes. Units are the same for circles and the bars. The revised report will have units included for the bars also.

13. Section 3.2.1, page 3-24, Figure 3-6

It is noted on page 2-12 that monitoring MW-23 was dropped as a background well. Should it be removed from this figure?

Response: Yes. MW-23 will be dropped from the referenced figure in the revised report.

14. Section 3.2.4, page 3-3, Table 3-11

No units are provided for the data in this table.

Response: Units will be included in the revised report.

15. Appendix B

Is there a reason why copies of the log book for the groundwater background sampling are omitted here

Response: Filed sampling logs for monitoring well sampling will be included in the revised report

16. Appendix D

Why is the analytical Data Summary for Groundwater omitted.

Response: The revised report will include groundwater data summaries.

17. Appendix E

Please consider a cover page for this table that explains among other things, the following:

a) does a total column represent total samples or total detects?

b) does the sum in the Qualifier row equal the number of detects? (the sum in some rows equal the "total" and less that the total in other rows)

c) should qualifier definitions be annotated?

d) is there any need for a summary per sample location

Response:

a) The total represents the number of times a chemical was analyzed.

b) The sum of all qualifiers should be equal to total. Qualifiers '=' and 'J' represent detected number.

c) Qualifier definitions will be provided as footnotes in the revised report.

d) The included summary is by medium, e.g. soil (surface and subsurface, surface water, etc.).

18. Appendix F.

There are several examples in the tables where means are provided for contaminants with no detections reported. Please clarify.

Response: The table included in this appendix represents a data summary of the information used for different statistics. Typically, ½ the detection limit of the chemical not detected is used in calculation of statistics such as UCL 95%. However, if a chemical was never detected, no background value was calculated.

Tennessee Department of Environment and Conservation:
Nashville Central Office
Comments on the Draft Background
Sampling Program Technical Memorandum

1. **Comment:** The report utilized the methodology of combining site boundary data with off-site data prior to the statistical analysis on each chemical. Separate statistics should also have been run for these two data sets for comparison prior to validation of methodology. The possibility of outliers in the site boundary data set jacking up the computed mean detection values is high.

Response: A statistical evaluation of the site boundary and off-site data populations will be performed using the Mann-Whitney U test if the populations are non-parametric or a one-way analysis of variance (ANOVA) if the populations are normally or log-normally distributed. If there is not a significant difference between the populations, both will be combined to represent the entire background dataset. If there is a statistically significant difference between the population means, then the onsite dataset will be excluded. The reason for combining the two populations when they are equivalent is to maintain a 90 percent coverage and a 90 percent confidence of the sample population, as proposed in Section 5.3.2 of the Generic Remedial Investigation/Feasibility Study Work Plan (August, 1995). Outliers will be evaluated and removed from either the off-site only or the combined datasets, as appropriate based on the statistical evaluation.

2. **Comment:** Metals data from off-site and chemical compounds commonly deposited via vehicular traffic could represent naturally occurring and anthropogenic background respectively. Plugging in these values into the suggestion given in Comment No. 1 above could serve to verify if generic background assumptions used during Data Quality Evaluation are well suited to the DDMT site.

Response: Comment noted. Considering DDMT is in a highly urban environment, the selected background locations are intended to mimic the site conditions in locations selected offsite and throughout the city. Atmospheric deposition due to vehicular traffic is expected to be similar throughout the area including the background locations in the offsite areas. However, the fence-line is unique, where facility maintenance activities may have localized impact at these locations. The rationale for the selected sampling locations was previously presented in the work plan. The statistical evaluation discussed in response to Question #1 will identify any differences in the perimeter (fence-line) and other off-site samples. If there is an impact on the perimeter of DDMT due to vehicular traffic around DDMT, the perimeter data will be excluded.

3. **Comment:** The DDMT comprises a large expanse of land which may undergo activities under new ownership that could disturb the soil (such as demolition and construction). The response level should consider additional pathways and fugitive dust.

Response: This comment pertains to the baseline risk assessments to be performed at the site. The background values for the surface soils as well as subsurface soils presented in the *Background Sampling Program Report* will be used in the baseline risk assessment to evaluate these exposure scenarios. For areas with known construction, it is appropriate to compare the surface soil values with subsurface background values due to the excavation activities.

4. **Comment:** Under page 3-3, will the current values in the criteria column be the remedial action levels agreed upon between MFO and DDMT?

Response: These proposed values are conservative comparison (screening) criteria protective of human health and the environment under default conservative exposure scenarios. Remedial goals will be developed for the site at a later time for areas that may present risk above acceptable levels.

5. **Comment:** TDSF has compiled non-parametric background metals statistics from ninety (90) Memphis area sites. Outliers were not filtered out during the survey. The data are available for your information upon request.

Response: Comment noted. We may request for a copy of this data for evaluation.9

Alternate Background Data for Quad 3 Parameters.

Parameter	Matrix	Units	Draft Background[1]	Alternate Background	Comments
Arsenic	SB	mg/kg	17		
Arsenic	SD	mg/kg	12		17 detections. No outliers.
Arsenic	SS	mg/kg	21.8	16.5	Offsite locations only. Dropped outlier of 27.7.
Arsenic	SW	ug/L	18		No outliers
Arsenic, Dissolved	SW	ug/L	12.4		No outliers
Barium	SB	mg/kg	300		No outliers
Barium	SS	mg/kg	253	234	Offsite locations only.
Beryllium	SS	mg/kg	1.1		No outliers. Perimeter and offsite values nearly identical.
Cadmium	SD	mg/kg	28.9		Only 3 detections.
Chromium	SB	mg/kg	26.4		No outliers.
Chromium	SD	mg/kg	38	20	Dropped 2 outliers (174 and 40).
Chromium	SS	mg/kg	27.4	24.8	Based on offsite mean of 12.4.
Copper	SD	mg/kg	271	58	Dropped 2 outliers (512 and 1250 -- both are J qualified)
Dieldrin	SS	ug/kg	530	86	Nonparametric distribution -- Maximum value proposed. Alternate value is maximum of three offsite dieldrin detections.
p,p'-DDD	SD	ug/kg	5.1		
p,p'-DDD	SS	ug/kg	6.7		
p,p'-DDE	SD	ug/kg	7.2		
p,p'-DDE	SS	ug/kg	160		
p,p'-DDT	SS	ug/kg	74		
Lead	SD		69	35.2	Removed 2 outliers.
Lead	SS	mg/kg	42.6	30	Offsite values only with 73.3 mg/kg outlier removed.
Lead	SW	ug/L	18.6		Twice mean detected. No outliers.
Lead, Dissolved	SW	ug/L	11.3		Maximum detected. Only one detected.
Mercury	SD	mg/kg	4		Only one detection.
Nickel	SS	mg/kg	33	30	No outliers. Offsite values only.
Nickel	SB	mg/kg	37		No positive outliers.

Alternate Background Data for Quad 3 Parameters.

Parameter	Matrix	Units	Draft Background[1]	Alternate Background	Comments
Vanadium	SS	mg/kg	52	46.4	No outliers. Offsite values only.

Notes: [1]Based on twice the mean detected value for all 22 inorganic samples collected.

Bolded values will be used in BRAC and Screening Site evaluation.

SS = Surface Soil

SB = Subsurface Soil

SW = Surface Water

SD = Sediment

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