MINUTES
MEETING TO RESOLVE LINGERING EPA ISSUES
ATLANTA, GA
JANUARY 25, 2005

LIST OF ATTENDEES

Mike Kelly, USAEC
Ron Levy, Ft. McClellan (FTMC)
Doyle Brittain, EPA Region 4
Shana Decker, Alabama Department of Environmental Management (ADEM)
Lee Coker, USACE-Mobile District
Mark Huston, U.S. Fish & Wildlife Service (USFWS)
Claire Marcussen, Gannett Fleming
Emily Olds, Gannett Fleming
Carol Stein, Gannett Fleming
Ted Simon, EPA Region 4
Paul James, FTMC Army National Guard Training Center
Bernie Case, Alabama Army National Guard (AL-ARNG)
Wayne Sartwell, ALARNG
David Smith, Smith & Associates (facilitator)
William Davis, ALNGB
LaBarron Rudolph, ADEM
Steve Moran, Shaw Environmental, Inc. (Shaw)
Troy Winton, Shaw
Julie Corkran, EPA Region 4
Peter Tuttle, USFWS
Jonathan Myers, Shaw
Richard Prann, Shaw
Karen Thorbjornsen, Shaw
Paul Goetchius, Shaw
Sharon Thoms, EPA Region 4
Deb Barsotti, MACTEC
Dave Erickson, Matrix Environmental Services
Steven Young, Matrix Environmental Services

MEETING AGENDA

9:00 am – 9:30 am	Introductions/Meeting Guidelines
9:30 am – 12:00 pm	Geochemistry/Background • Quantification of Correlations • Uncertainty Associated with Geochemical Evaluations • Use of Slippage Test • Background Data Sets
12:00 pm – 1:00 pm	Lunch
1:00 – 3:00 pm	Ecological Risk/Surface Bullets • Surface Bullets and Risk • Terrestrial Risk Hypotheses • Sampling Procedures • Peddicord-LaKind Input Parameters • Tiered Process for Evaluating Risk from Particulate Lead Ingestion • Development of Cleanup Goals
3:00 pm – 3:15 pm	Break
3:15 pm – 3:45 pm	Aggregation of Data • Statistical Comparison of Site Data to Background • Development of Data Sets
3:45 pm – 4:15 pm	Human Health Risk Assessment
4:15 pm – 4:30 pm	Miscellaneous Issues/Closing

MEETING SUMMARY

Purpose of Meeting – To discuss and resolve EPA's key outstanding issues for Fort McClellan as summarized in comments dated November 22, 2004. The three major areas of concern were human health risk assessment, ecological risk assessment, and background metals evaluations (particularly geochemistry).

0900 – 0930 Check In – Attendees introduced themselves, their affiliations, and areas of expertise. Opening remarks by Mike Kelly, Doyle Brittain, and Ron Levy.

0930 – 0955 Break for private discussion between Mike Kelly, Doyle Brittain, Ron Levy, Shana Decker, and David Smith.

1000 – 1200 Background Evaluations – The group began discussion on the background evaluation of metals used at FTMC. EPA has two major concerns regarding the geochemical portion of the process: (1) does not like the subjectivity of the method, and (2) does not want to use geochemistry as the sole line of evidence for excluding metals of potential concern. In addition, EPA wants more explanation provided regarding the uncertainty associated with the method. The ensuing discussion led to the following resolutions regarding geochemistry (for soils only):

- ✓ Discontinue using the Slippage Test and replace with 95th UTL screen.
- ✓ Provide ratio plots in the evaluations. Need further discussion in the text of the reports justifying placement of the threshold value (vertical line) in the plots.
- ✓ EPA to examine boilerplate uncertainty discussion in geochemical evaluation reports. Supplement/revise existing uncertainty discussion, as appropriate. Begin with qualitative discussion.
- ✓ Use supporting information (i.e., additional lines of evidence).
- ✓ Revise the Background Memo describing the 3-tiered approach (e.g., replace Slippage test, add explanation of ratio plots).

1205 – 1305 Break for lunch

1305 – 1325 Human Health Risk Assessment – the group began discussion on EPA's concerns regarding human health risk assessment. Ted Simon (EPA) and Paul Goetchius (Shaw) led the discussion. As a result of the discussion, Paul will add language to the streamlined risk assessment (SRA) and the response to the "Lingering Issues" comment to further justify developing cleanup levels based on a target hazard

index (HI) of 1.49 rather than the threshold value of 1. Paul will also clarify spatial considerations in the SRAs; i.e., identify the locations where site-related contaminants in soil exceed cleanup levels and may represent a health threat to receptors constrained to small exposure units (e.g., construction worker and on-site resident). Concerning EPA's Comment #2 (re: Army's failure to address comments from Mark Sprenger), these comments may not have been sent to the Army.

At the conclusion of the discussion, Doyle asked the group if there were any remaining issues/concerns regarding human health risk assessment. None were identified. Therefore, it was agreed by all that EPA's concerns regarding human health risk assessment had been adequately addressed.

1325 – 1430 Ecological Risk Assessment – The group began discussion on EPA's concerns regarding ecological risk assessment. The initial discussion focused on the Peddicord and LaKind (P&L) model used in FTMC SLERAs. Based on recent EPA comments that cited a different method/model, the Army was under the impression that EPA did not favor use of the P&L model. However, EPA indicated that it agrees with the use of the P&L model, although further discussion is needed regarding some of the specific input parameters (e.g.., grit retention time, number of pellets causing mortality). After significant discussion, there was agreement that the 83 days (arithmetic mean for the range of grit retention times) would serve as a reasonable estimate. Shaw indicated that it is concerned that the use of overly conservative parameters in the model will not yield useful information for the FS. Additional discussion and rationale for the selection of the grit retention times used in the P&L model will be included in the revised reports.

Protection of individual vs. population: EPA indicated that it does support protection of populations rather than individual and noted that a 20% population impact level is used in the risk assessments. The group was in agreement regarding this issue.

Sharon Thoms (EPA) indicated that Eco Risk Comments 1-8 have been or are being addressed in recent reports and that EPA has no residual concerns. She further indicated that Comments 9 and 10 were more of observations rather than EPA asking for a change in approach. It was suggested by Shana Decker (ADEM) that FYI/observational-type comments be more clearly communicated in the future to minimize misunderstandings. Ron Levy (FTMC) responded to Comment 11 (concerning NEBA) and stated that the NEBA process (CH2M Hill is the NEBA contractor) is moving forward at FTMC albeit slowly. EPA indicated that Comment 12 (EE/CAs vs. RI/FSs) was an "FYI" issue. It was also pointed out that the Army agreed to conduct RI/FSs on small arms ranges almost two years ago so this issue is no longer relevant. While not discussed, the Army is

also conducting RIs at sites transferred to the Army National Guard.

At the conclusion of the discussion, Doyle asked the group if there were any remaining issues/concerns regarding ecological risk assessment. No further concerns/issues were expressed. Therefore, it was agreed by all that EPA's concerns regarding ecological risk assessment had been adequately addressed.

1325 – 1430 Aggregation of Data – The group was in agreement on the two sub-issues concerning (1) statistical comparison of site data with background and (2) development of data sets for the SRA. This issue was largely resolved during the previous geochemistry and human health risk assessment discussions. The concern from the human health risk perspective arises from the fact that aggregating data that represent large geographic areas could result in apparent "dilution" of contaminant concentrations resulting in underestimating risks for receptors likely or largely restricted to smaller exposure units. However, Paul explained that comparing all ambient site-related concentrations to conservatively developed cleanup levels precluded overlooking potentially hazardous concentrations regardless of how the exposure units were gerrymandered.

The "background data set" issue was also discussed. This issue is based on EPA comments related to the potential inadequacy and perceived inconsistency of background data (2x mean values in SAIC report vs. 95th UTLs in IWWP). It was pointed out that the only approved background data for FTMC are those provided in the SAIC Background Survey Report. EPA acknowledged this and indicated that its comment regarding adequacy of the background data was more of a statement rather than a request for change in procedure.

1440 – 1500 Surface Bullets – EPA restated its official position that expended bullets on the ground surface constitute a CERCLA release but noted that EPA will not make an issue of it at this time. Ron noted that most of the surface bullets will be removed during remediation of the various sites. Regarding human health risk assessment, Paul pointed out that particulate lead on the ground surface has few implications to human health under the ***current*** site-conditions scenario because (1) the ***acute*** accidental ingestion of a lead fragment would have little effect on human health because fragments of metallic lead have very low bioavailability, and (2) the hand-to-mouth activity considered to be the major phenomenon resulting in ***chronic*** incidental soil ingestion may result in ingestion of "fines" but not metallic lead fragments. Uncertainty arises regarding ***future*** site use or conditions because further weathering may increase the mobility of metallic lead in the fragments. The rate and extent to which this may occur, and the extent to which weathering may attenuate further weathering is unclear. In a side conversation, therefore, Paul and Ted agreed that a sufficient response to this issue is to continue identifying sites or ranges with particulate lead and to qualitatively state that a major source of uncertainty arises from the potential for further weathering to

increase the concentration and mobility of fine lead in soil.

1500 – 1515 Concluding Remarks – Doyle indicated his preference that the monthly project team meetings resume to improve communication amongst team members and to address/resolve specific issues that arise such as those identified during this meeting (see Attachment B).

ATTACHMENT A

ACTION ITEMS

Item	Action	Responsible Party
1	Revise Background Screening Memo	Shaw
2	Add language to SRAs re: calculation of cleanup levels based on target HI of 1.49 and the implications to exposure units	Shaw
3	Review existing uncertainty language in Geochemical Evaluations	EPA
4	Revise/augment uncertainty language in Geochemical Evaluations based on EPA's review	Shaw
5	Gather info for USFWS re: fate of lead on ranges over time	Army

ATTACHMENT B

UNRESOLVED ISSUES/ITEMS FOR FURTHER DISCUSSION

1. Use of geochemistry for other environmental media (i.e., groundwater, surface water, and sediment).

2. High detection limits for certain metals.

3. High percentage of non-detects for certain metals.

ATTACHMENT C

FACILITATOR NOTES AND OBSERVATIONS

Team: Fort McClellan Tier I

1. **Meeting Location:** Atlanta, EPA Office

2. **Dates:** January 25, 2005

3. **Purpose of the visit:** __ Partnering Workshop __ Partnering Meeting __Planning Session __ Coaching __ Initial Interview Session _X_ Conflict Resolution __ Other

4. **Facilitator:** David G. Smith

5. **Number of attendees and organizations :** See minutes

6. **Guests and Link and their organizational affiliations:** None.

7. **Stage of Team Development:**
   ___ Forming:__ Storming: __ Norming: X- Performing:
   ___High Performing

8. **Significant issues and/or events**:
Goals and Successes: The team had previously agreed upon a major revamping of structure, format and meeting processes. Established facilitated quarterly meetings and monthly conference calls with specialty meetings as .necessary were proposed.. This meeting took the form of a specialty meeting called to address "lingering issues" associated with the restoration process. All agenda issues were discussed and solutions agreed upon or processes established to address details and/or strategies.

9. **Partnering Performance and Training:**
Despite initial skirmishes, the general meeting tone was businesslike and relatively cordial. Positional stances were minimized and conversations were typically issue focused (as opposed to personal). Occasional breakdowns in attending or responding were addressed quickly and easily. The focused meeting agenda, effective meeting management by the co-chairs, and the businesslike working environment all contributed to the meetings success.

10. **Summary**: See above.

11. Recommendations:

The quarterly meetings initially planned for this team were designed to improve team functioning and to make significant headway on resolving outstanding technical issues. It now appears that the team could make good headway by scheduling more frequent (monthly?) highly structured meetings with tightly structured, focused, and highly specific agendas. Conference calls do not appear to be a particularly productive format. Facilitator again recommends building **proactive** (as opposed to reactive) **objective-driven agendas** jointly developed by members of a small Executive Committee well in advance of meeting dates. Technical issues should be addressed as a finite component and technical consultants should participate in that portion of the meeting (only). Pre-meeting review and comment submission for relevant documents will be critical to keeping the process moving.

Additional recommendations include:

- Reconvene subcommittees to address specific issues.
- "Comments" restructuring:
  1. Talk before writing/issuing comments
  2. Identify informational/no action required comments as such
  3. Be aware of comment tone and wording
- **Identify** conclusions when reached **and move on** (don't continue talking them)
- Schedule a sequence of meetings well in advance

12. Goals/Plans/Actions for Next Meeting:. Next BCT should be scheduled promptly.

13. Next meeting dates: tbd

ATTACHMENT D

Technical Review Comments on Selecting Site-Related Chemicals for Human Health and Ecological Risk Assessments for FTMC: Revision 3 (dated March 14, 2005; prepared by Shaw Environmental, Inc.)

The subject of this memorandum is the method for site-to-background comparisons that has been developed and proposed for selection of site-related chemicals at Ft. McClellan. This document states EPA's understanding of what was decided at the 01/25/05 meeting.

The memorandum reviewed herein describes the three-tiered protocol for site-to-background screening and includes modifications to previous versions (dated April 28, 2003 and June 24, 2003). Tier 1, comparison of the maximum concentration detected in site samples to the background screening criterion (it is assumed that this is twice the arithmetic mean of background values), is identical to previous versions. The section that describes the Tier 2 testing has been changed in light of discussion at the 1/25/05 meeting; the slippage test has been replaced by comparison of the maximum detected concentration of site data to the 95th Upper Tolerance Limit (UTL) or 95th percentile. As indicated in previous versions, the Tier 2 analysis also recommends use of the Wilcoxon Rank Sum test. Tier 3 describes a number of geochemical mechanisms that affect the behavior of major and trace elements of interest. These include the 'reference' elements iron, aluminum, and manganese, and trace metals that may be constituents of particular concern at FTMC sites (e.g., As, Cd, Ni, Pb, Zn, Cr, etc.). Although the Tier 3 section is not specifically broken out by media, it is apparent that the discussion of geochemical mechanisms is intended to address the application of this method to sediments, surface water, and groundwater, in addition to soils. The text discussing the Tier 3 evaluation methodology has only minor changes from the June 24, 2003, version, with the exception of the addition of a paragraph describing 'ratio plots.'

General Comments:

1. *Uncertainty in the geochemical evaluation should be acknowledged and a section addressing uncertainty should be added to the proposed methodology.* EPA has indicated previously that discussion of the underlying geochemical principles should reflect uncertainty in both the proposed geochemical mechanisms and the conclusions drawn from them. In particular, EPA has suggested in previous review comments and in the revised 1/25 Meeting Minutes that their 'boilerplate' text be amended to reflect the fact that the observed associations are *empirical* evidence that any of a number of processes has occurred, but presentation of the correlation plots as evidence of particular processes is overly simplistic. In addition, EPA suggests that this methodology be modified to state how site-specific geochemical conditions will be incorporated into the geochemical evaluation.

2. *The slippage test has been replaced by the 95th UTL.* The slippage test, part of the statistical screening used in the evaluation process, may fail to recognize single, high-concentration samples that should be identified as potential contamination. It was agreed at the 1/25 meeting that the slippage test would be replaced by the 95th UTL, to ensure capture of such samples. However, because the Upper Tolerance Limit is a confidence limit on a percentile, it will generally be greater than the 95th percentile of a population. If the population is small, the UTL may be quite large. Please be aware that the UTL may not be a conservative upper bound, and the size of the data set should be considered in accepting UTL values.

   EPA recommends expansion of the uncertainty discussion to address this issue. One suggestion is to rate the results of the Tier 2 analysis as having high, medium, or low certainty. When the sample size is small and/or if the data contain a high percentage of non-detects or high detection limits, the certainty probably should be rated low. If the Tier 3 results were similarly assessed as to high, medium, or low certainty, the "weight of evidence" would be considered (General Comment 3). Although assigning degree of certainty in this manner is qualitative, use of these descriptors and the reasons supporting their selection would assist in interpreting the results of the geochemical evaluation. EPA cautions against the results of either Tier 2 or Tier 3 being interpreted with too high a degree of confidence. None of these tests will perform flawlessly in all situations. Please expand the uncertainty section to address the limitations of these tests and how results are to be qualified. The technical working group may wish to discuss development of a more conservative screen, including criteria to be considered for establishing levels of uncertainty, to prevent the problem of elevated concentrations being identified as background (as experienced with the slippage test).

3. *The geochemical evaluation results should be considered as only part of a "weight of evidence" approach for identifying contaminated samples.* EPA does not recommend using the 'geochemical evaluation' as the sole method for eliminating elements as potential COCs; rather, as discussed at the 1/25 meeting, the results of this methodology should be considered along with all other pertinent 'lines of evidence.' These additional 'lines of evidence' may include all available supporting information, such as:

   - Estimates of analytical uncertainty for samples identified by the geochemical evaluation as "suspect"
   - Consideration of laboratory qualifiers for "suspect" results
   - Associations and concentrations of other trace metals in "suspect" samples
   - Historical records, including site use, known releases, or disposal practices
   - Geographic/spatial distribution of outliers (i.e., indicative of a "hot spot" or located near a suspected source)
   - Nature and distribution of soil types (in background as well as site samples) and distribution of background and site samples with respect to areal extent of soil types
   - Any other site-specific information (grain-size analysis; information from boring logs; other analytical results such as soil pH, organic content, etc.)

4. *No consensus was reached during the 1/25/05 meeting on use of the ratio plots and the method to be used for locating the 'discriminator' or threshold value.* The Tier 3 portion of the geochemical evaluation lacks statistical rigor and relies on a visual assessment of scatter plots to determine which points are 'on the trend' (and therefore consistent with background) and which points are 'off the trend' (possibly indicative of contamination). This evaluation is subjective and is not recommended for screening out COPCs, particularly in cases involving data sets exhibiting a lot of scatter and poor correlations, or for small data sets. In response to this, Shaw Environmental has offered a new type of plot, showing the relationship between the trace metal concentration on the y-axis and the ratio of the trace metal to a reference element on the x-axis. The background sample with the highest ratio is proposed as the discriminator; any site samples with ratios above this value are anomalous, in comparison to the background population, and therefore "suspect." This method may either over- or under-predict outliers, and further modifications have been suggested (Additional comments on the Training Area T-5 draft RI report are appended below, as Attachment 1).

5. *The geochemical evaluation method is not suitable in its present form for application to sediments, surface water, or groundwater.* EPA has questioned the applicability of the 'geochemical evaluation' method to surface water, groundwater, and sediment, due to the greater number of parameters that affect the behavior of trace metals, and the greater spatial and temporal variability of these parameters, in these media.

   The application of the 'geochemical evaluation' method, as proposed, to unfiltered aqueous samples contributes little information that cannot be derived from routine analyses for sample turbidity and/or measurement of total suspended solids. Correlations between trace metals and a reference element may provide information about the <u>solid</u> phases causing the observed associations (e.g., suspended particulates such as oxyhydroxides or clay minerals, with sorbed trace metals). However, these correlations do not yield insight into aqueous geochemical processes that may determine solute concentrations. Apparent anomalies cannot be explained without additional information, including consideration of pH, oxidation-reduction potential (ORP), speciation of the elements of interest, degree of saturation with respect to phases that may be controlling solubility of key constituents, presence and concentration of relevant ligands, complexation by dissolved organic matter, microbial effects, etc.

   Because the relevant physical, geochemical, and microbial processes in streams, ponds, wetlands and other aquatic or semi-aquatic environments are different from those in soils, this approach cannot be extrapolated to sediments without substantial additional information. Sediments vary widely in pH and redox conditions, type and amount of organic matter, microbial processes, mineralogy, etc. In addition, sediment geochemistry is often influenced by upward-discharging groundwater and processes that take place upon mixing with downward-migrating surface water at a redox interface. In between soils and sediments, hydric soils form under conditions of intermittent saturation or

standing water for periods that are long enough for anaerobic conditions to develop in the near-surface. Hydric soils are also characterized by hydrophytic vegetation.

The uncertainty associated with inferring geochemical mechanisms from trace metal correlations in hydric soils and sediments is therefore greater than in non-hydric soils. EPA recommends consideration of a "lines of evidence" approach for evaluation of sediments, surface water, and groundwater, similar to that suggested for soils. The technical working group may wish to develop both an approach and an outline of the key parameters to be assessed for these media.

6. *A high percentage of non-detects and/or high detection limits exist for certain metals in both background and site data sets.* A consistent method for addressing this condition as part of the screening procedure needs to be established. This issue was not resolved during the 1/25 meeting, but should be discussed by the technical working group and an acceptable method developed.

7. *Formation of a technical working group may be warranted.* In order to resolve these issues, EPA wishes to consider convening a technical 'working group' for further discussion.

Additional, Specific Comments on the subject memorandum are offered below.

Specific Comments:

1. p. 1, Tier 1. The text states that "... the maximum detected concentration (MDC) of site data is compared with the background screening criterion (BSC)" where the BSC is twice the arithmetic mean of the background values. A high percentage of non-detects and/or high detection limits exists for certain metals (e.g., Sb, Cd, Tl) in the FTMC background data set. A more well-defined method for handling these conditions in the screening procedure needs to be discussed by the technical working group.

2. p. 1, Tier 2 states that the site MDC will be compared to the background 95th UTL (please see General Comment #2 above). Because the UTL is a confidence limit on a percentile, the 95th UTL will generally be larger than the 95th percentile; for small data sets, the UTL may be unreasonably large. How will the size of the data set be considered in computing the UTL for various elements?

3. p. 2-4, Tier 3. This section provides brief descriptions of generic geochemical mechanisms that influence the behavior of a number of trace metals of interest at FTMC sites. The uncertainty inherent in identifying a specific mechanism from associated pairs of elements in site data should be acknowledged and discussed in a separate section (please see General Comment #1, above).

4. p. 3, last paragraph. The text indicates that samples plotting "...off of the trend established by the background samples" suggest contamination. The proposed method to be used to decide which samples are consistent with the background trend and which are not should be explained here. Also, please explain how iron contamination will be identified, and how 'alternate reference elements' are selected.

5. p. 4, paragraph 3. This paragraph suggests that a scatter plot of Fe and Al can be "...used to identify the presence of local reducing conditions in groundwater..." The basis for this assertion seems to be that unfiltered, oxidizing groundwater will exhibit one Fe:Al ratio that is due to suspended particulates, but under reducing conditions, samples will have "...a higher Fe/Al ratio than oxic areas because iron becomes soluble under reducing conditions but aluminum does not." This statement illustrates one of the limitations of the application of the 'geochemical evaluation' method to groundwater. If Fe and Al are present in a constant ratio in <u>un</u>filtered, oxic groundwater, there may be several reasons, including: presence of Fe-oxides or oxyhydroxides onto which Al is sorbed; presence of discrete Fe- and Al-oxides or oxyhydroxides; and/or presence of clay minerals with sorbed Fe. Under low-ORP conditions, reductive dissolution will dissolve Fe-oxides/oxyhydroxides and sorbed Al will be released. Moreover, under very low-ORP conditions (below approximately -250 mV), the aqueous concentration of Fe may decrease due to the precipitation of ferrous sulfide phases. In summary, under reducing conditions the Fe/Al ratio may be *different* from what was observed under oxidizing conditions, but will not necessarily be higher. In addition, under reducing conditions, it will not be possible to discriminate among these mechanisms that determine the Fe/Al ratio if only <u>un</u>filtered samples are examined. Because the explanation for relationships between Fe and Al in unfiltered aqueous samples may be non-unique, any comparison of site to background groundwater data sets must acknowledge these uncertainties in interpreting the associations. This comment does not require a response in its own right, but is intended to be addressed in the context of General Comment 5.

6. p. 4, paragraph 3. The last sentence of this paragraph suggests that independent confirmation of local reducing conditions can be obtained by "...evaluating manganese versus aluminum because manganese and iron have similar redox behavior." It should be noted that Mn requires a considerably higher redox potential than Fe, at any given pH value, to be present as MnO_2. An apparent association of Mn and Al may also be due to reductive dissolution of ferric oxide phases and release of sorbates, not a direct mechanistic relationship between Mn and Al. No response to this comment is necessary, but any discussion of manganese in groundwater or surface water should acknowledge all sources of uncertainty in interpreting the data.

7. p. 4, paragraph 4. The text states that "[F]ield measurements of oxidation-reduction potential and concentrations of dissolved oxygen, ferrous iron, and sulfide are useful in identifying natural or contaminant-induced changes in redox conditions that may alter elemental ratios." How will these measurements be used to explain the observed ratios, especially with respect to discriminating between which are natural and which are contamination?

8. p. 5, Ratio Plots. The last sentence of this paragraph asserts that the ratio plots "...permit easy identification of samples with anomalously high elemental ratios..." Please elaborate on how these plots are to be used to identify anomalies. It is assumed from the discussion at the 1/25 meeting that the highest background ratio is used as the threshold value, and site samples with ratios above this value are considered to be suspect. EPA may wish to propose the use of these plots, and placement of the threshold value, as topics for further discussion among the technical working group. Attachment 1 contains additional discussion of the proposed ratio plots.

Attachment 1.

Additional Notes on Placement of the Threshold Value for the Ratio Plots

To supplement the scatter plots that constitute Tier 3 of the geochemical evaluation, Shaw Environmental has proposed a new type of plot, using the same data used in the scatter plots. The purpose of these "ratio plots" is to show that the trace metal:reference element ratio of samples consistent with background (and thus naturally occurring) fall within a narrow band (the "vertical line") on a plot of the trace metal on the y-axis vs. the ratio, on the x-axis. Shaw has proposed to use the background sample with the highest ratio as the "discriminator" or threshold value; any site samples with ratios above this value are anomalous, in comparison to the background population, and therefore "suspect." This type of plot raises some questions:

1. On the plots distributed by Shaw at the 1/25 project meeting, showing soil data from the Choccolocco Corridor Ranges, the ratio data do not always fall on a narrow vertical line or as a cluster of points randomly distributed around a specific value (see, for example, the two plots showing the Cr/Fe and Ni/Fe ratios). The Cr/Fe ratios of both site and background soils appear to cluster around 0.001, while the Ni/Fe ratios appear to be linear and span an order of magnitude on the log-log plot. Why? [This suggests that the Ni/Fe association is not first-order, so the geochemical mechanism involved produces a ratio that is not truly constant, but increases with increasing trace element concentration. What are the implications?]
2. This reviewer does not have the data and cannot verify, but it seems that the samples that appear visually as outliers in the scatter plots of Cr vs. Fe and Ni vs. Fe are likely the same samples that fall to the right of the vertical line drawn through the background datum with the highest X:Fe ratio on the ratio plots. These are the samples with anomalous ratios, but it is not obvious that using the highest background ratio as a discriminator is necessarily a more robust identifier of anomalies than the visual assessment. In other words, it is not clear that these ratio plots offer substantially more information, or less ambiguous results, than the scatter plots. The proposed use of the highest background ratio as the discriminator is similar to EPA's proposed use of the 95% prediction interval to bound the background data set, but yields a number that is higher than the calculated upper prediction limit as the screening value.
3. Use of a single datum – the highest background ratio – may either under- or over-predict the number of outliers. Taking the former as one possible scenario, the highest background ratio may be erroneously high due to analytical error (e.g., the trace metal concentration is biased high or the reference element concentration is biased low). In the latter case, background samples that are collected over a geographic area that is small in relation to the areal distribution of site samples may not adequately represent all of the naturally occurring conditions across the site (i.e., higher background ratios *could* be present but were not sampled).

EPA suggests meeting with Army to discuss this issue. An alternative strategy to address quantification of the 'geochemical evaluation' might be a more rigorous statistical analysis of the ratios. For example, if the Fe and trace metal data are lognormally distributed, for both background and site data sets, then the distributions of the ratios can be compared in the same manner as other populations – that is, by comparison of central tendencies (Student t-test, 95% UCL, etc.) or upper-bound estimates (95th percentile, 95th UTL, etc.)

As an example, the plot (please see Figure 1, below) shows the distribution of the zinc:iron ratios in FTMC background surface soil data ("FTMC BG") and soil data from the Baby Bains Gap Road Ranges ("BBGR"). The Zn/Fe ratio of the background data set is lognormally distributed, but the Zn/Fe ratio of the BBGR data set is non-parametric. In any case, it is the samples at the upper end of the distribution of the site data that are of most interest as these are the ones with ratios that are anomalous in comparison to the background data. Rather than use the highest background ratio as the cutoff for distinguishing between contamination and background, it seems appropriate and more statistically defensible to propose another upper-bound measure, for example, the 95th percentile or the 95th UTL.

Figure 1.

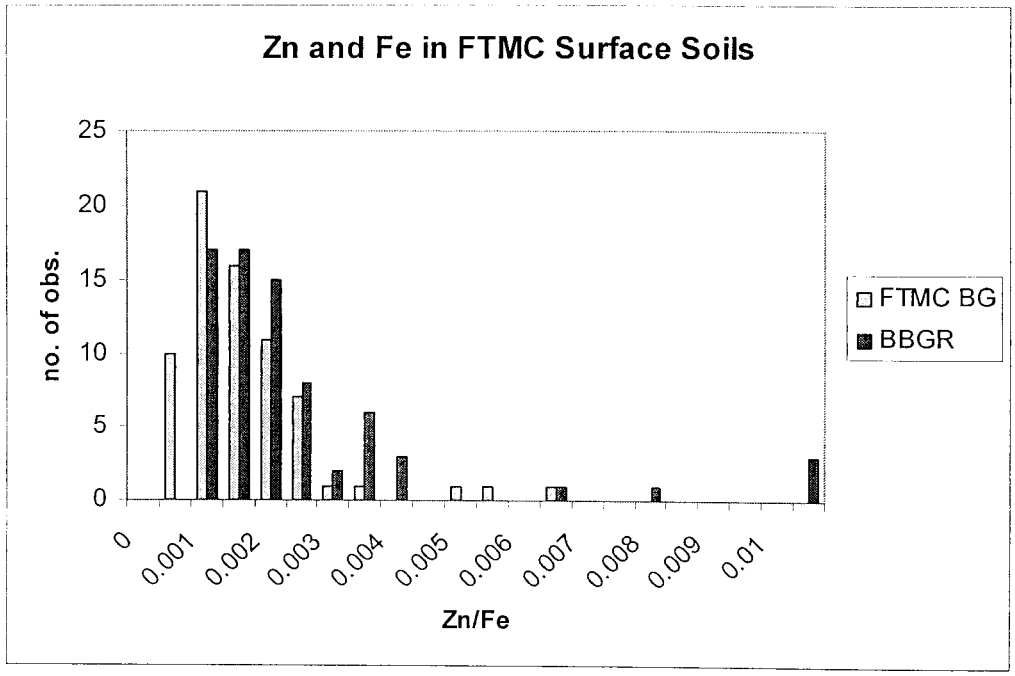
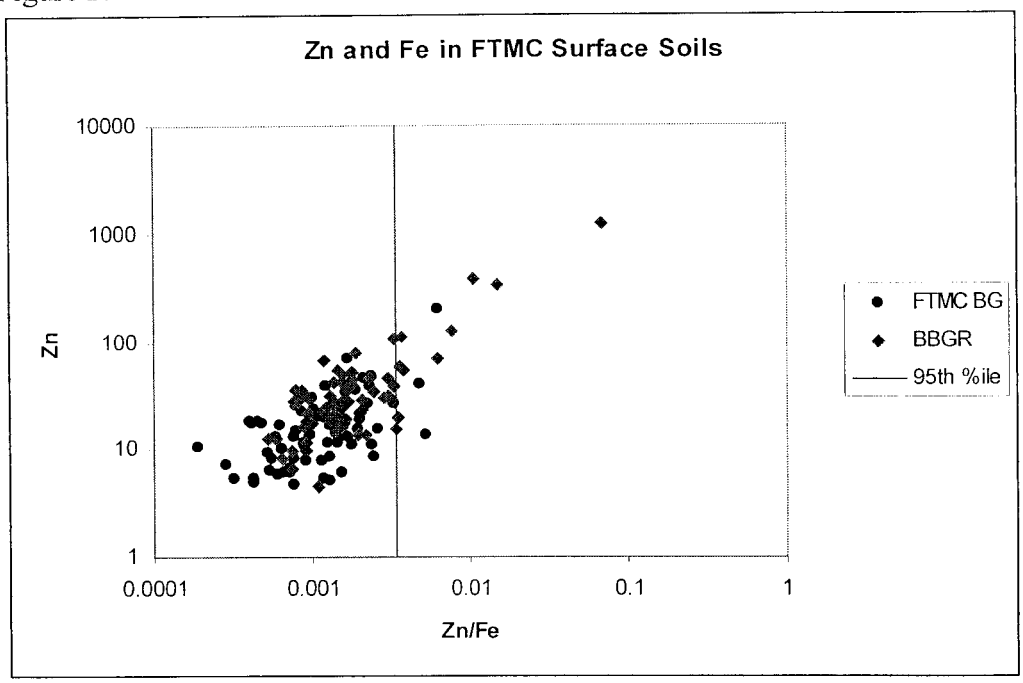


Figure 2 shows the data replotted according to the scheme proposed by Shaw, i.e., Zn concentrations (in mg/kg) on the y-axis and the Zn/Fe ratios on the x-axis, for

the Ft. McClellan background data ("FTMC BG") and for soils from the Baby Bains Gap Road Ranges ("BBGR"). For the FTMC background data shown in this figure, the 95th percentile of the background data (calculated as the mean plus 1.669 times the standard deviation, for n = 70) is 0.003436, as shown by the red line in Figure 2.

Figure 2.



There are 4 BBGR site values with Zn/Fe ratios greater than the highest Zn/Fe ratio in the background data set, with concentrations ranging from 131 mg/kg to 1250 mg/kg, and there are 9 BBGR site values higher than the 95th percentile, corresponding to zinc concentrations ranging from 56 mg/kg to 1250 mg/kg. In this case, Shaw's scheme under-predicts the number of outliers. For comparison, the current regulatory screening levels for zinc in Ft. McClellan surface soils (from Shaw, 2003) are:

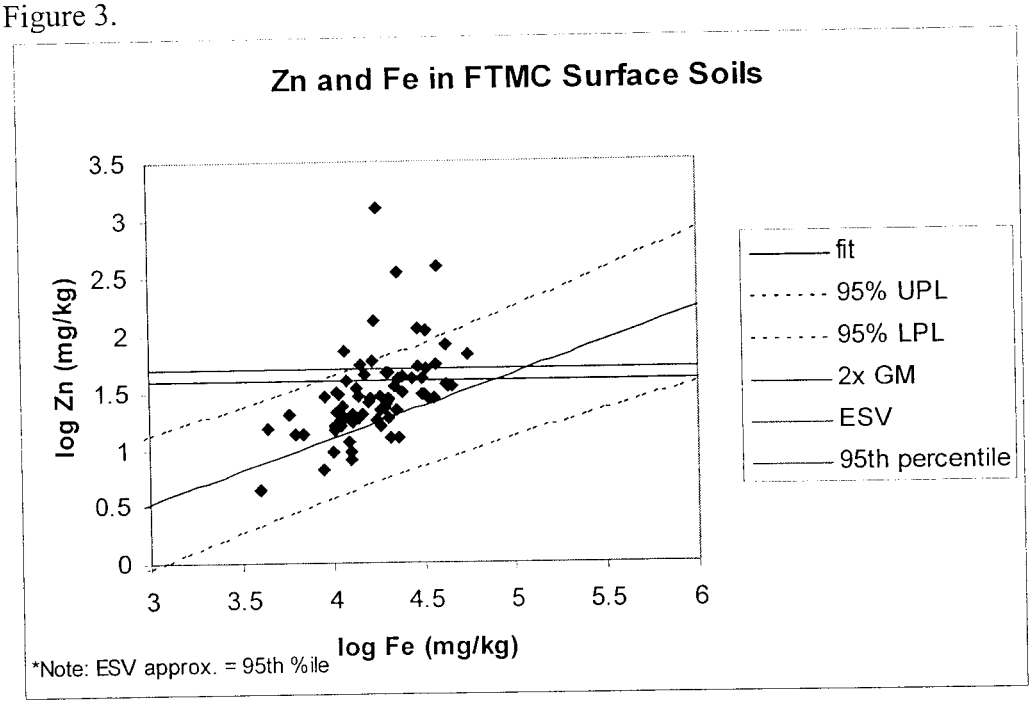
- 40.6 mg/kg = twice the arithmetic background value
- 2340 mg/kg = residential human-health site-specific screening level (SSSL)
- 50 mg/kg = ecological screening value (ESV)

In this example, the 95th percentile appears to offer a more conservative upper-bound estimate than the highest background value, yet this approach retains the appropriate geochemical information – that is, comparison of the ratios acknowledges the geochemical association. We are aware that in some cases involving non-parametric distributions, the upper-bound estimate defaults to the

highest value. However, this default value should be used only where appropriate.

Finally, EPA suggests that FTMC use the method proposed by EPA for Avon Park AFR (GF, 2005). Here (please see Fig. 3), the linear fit and 95% prediction interval has been calculated for the Zn:Fe association in Ft. McClellan background soils and plotted on surface soil data from the Baby Bains Gap Road Ranges (Shaw, 2003).

Figure 3.



It can be seen from Figure 3 that most of the site data fall within the 95% prediction interval that has been computed from the background data. For comparison, the relevant single-value criteria (for twice the background mean, the Ecological Screening Value, and the 95th percentile) are also shown. Nine samples lie above these screening criteria <u>and</u> above the 95$^{\%}$ Upper Prediction Limit and require closer scrutiny. It should be noted that the samples identified by this method are the same as those lying to the right of the 95th percentile line in Figure 2.

ATTACHMENT E

REVIEW OF DRAFT MINUTES
MEETING TO RESOLVE LINGERING EPA ISSUES
ATLANTA, GA
JANUARY 25, 2005

Gannett Fleming reviewed the Draft Minutes provided by the Army for the Meeting to Resolve Lingering EPA Issues, held January 25, 2005. Comments on the Meeting Minutes are provided below in Section 1. A discussion of unresolved issues is provided in Section 2.

1.0 Comments on Meeting Minutes

The following sections summarize the comments that Gannett Fleming, Inc. and EPA had on the meeting minutes prepared by Shaw Environmental.

1.1 Comments from Gannett Fleming

a. **Meeting Summary, Page 3, Check List, Item 2.** The second item on the check list was not resolved. This bullet states that further discussion in the text of the reports will be added to justify the placement of the threshold value (vertical line). There were lengthy discussions on the rationale for determining where the "break-line" should be but no resolution had been achieved. EPA's primary concern was that this line not be based on a single point (i.e., the maximum background ratio). The path forward for this bullet should be that additional discussions with the technical team are required to gain consensus on the appropriate approach to establishing the "threshold value." EPA RPM encouraged a separate working meeting to resolve geostatistic issues.

b. **Meeting Summary, Page 3, Check List item 3.** This item requires additional clarification regarding expanding the discussions of the uncertainties associated with the geochemical evaluation. Discussions indicated that site-specific uncertainty analysis language is needed in addition to the "boiler plate language" to place the geochemical results in proper perspective, qualitatively and quantitatively.

c. **Meeting Summary, Page 3, Check List Item 4**. Additional lines of evidence need to be considered, in addition to the geochemical evaluations. These may include supplemental analytical evaluations and discussions that address the different soil types and their composition, soil properties, boring log evaluation, grain-size measurements, site history, etc. to support interpretations of outliers as either contaminated or uncontaminated.

d. **Meeting Summary, Page 3, Check List Item 5.** Revision of the background memo should include replacement of the slippage test and an explanation of the ratio plots. In addition,

revisions should include identification of the lines-of-evidence and how they were used, as well as the uncertainties associated with the 3-tiered approach.

e. **Meeting Summary, Page 3, Check List.** An additional check mark needs to be added on 1000-1200 to indicate that all concurred when the EPA RPM indicated that he had no problems with Shaw talking directly with Gannett Fleming and other EPA technical support staff to resolve or clarify any issues that arise rather than wait for a formal meeting to occur.

f. **Site close-out report.** The meeting minutes did not mention that a key topic of concern to the EPA RPM was regarding what type of information he will require in order to sign the site close-out report. The RPM indicated that he is required to prepare a site-closeout report which states that ""all property investigated is protective of human health and the environment." He emphasized that he must be furnished all relevant information with regard to the disposition of the other parcels of the land that EPA has not had oversight on (i.e., JPA property, Property transferred to the National Guard and USFWS, etc.) in order that EPA can sign the closeout report.

1.2 Comments from EPA

a. **0930-0955.** Opening Remarks by EPA.

b. **1000-1200.** Opening Remarks by the Army

After opening remarks by EPA and the Army the meeting got underway.

c. **1325 – 1430.** Please replace the first paragraph with the following information.

The history of the particle ingestion model's use at Fort McClellan was summarized. The two issues were (1) the particle retention time in the Peddicord and Lakind model (2) the number of lead fragments ingested by a bird necessary to cause mortality. Out of expediency to finish the reports, to honor past agreements, and because the acceptable levels of grit to be used as cleanup goals fall within the range of acceptable soil concentrations for other assessment endpoints in the ERA, EPA is willing to accept the 83-day particle retention time for the fragments at ranges at Fort McClellan. EPA, however, expressed concerns regarding the P&L model such that EPA is not willing to entertain any assumption less conservative than a single lead fragment to cause mortality. EPA stated this opinion because of the concern that the simplicity of the P & L model does not allow the model to account for other than a single fragment mortality assumption. The assumption of single fragment mortality and the particle retention time are intrinsically linked in the P & L model, such that if one were to deviate from the single particle mortality assumption, one would also need to reevaluate the particle retention time. It was suggested that the team might need to bolster the choice of the retention time by providing more justification.

d. **Protection of Individual vs. population:** Please add to the existing paragraph.

In addition to what Shaw summarized in the meeting minutes, include that the group concluded that the P & L model assesses the risk to populations not individuals.

e. **1440 – 1500 Surface Bullets:** Please restate the paragraph as follows:

EPA's position is that spent surface bullets are a CERCLA §104(c) release. EPA indicated that they were under the opinion that surface bullets would be taken care of by addressing the lead in soil. EPA indicated that while the Agency agrees that large particles of lead may not be bioavailable upon consumption that very little data is available to support this assumption. There is also uncertainty in how rapidly the bullets will break down over time. EPA gave an example of a former skeet range in northern Florida of 1940's vintage where within 40 years EPA saw total breakdown of the lead fragments. Soils had no fragments and up to 65,000 ppm lead. The acid soils in the pine forest were suggested as a factor. Soil lead concentrations versus particle density relationships were needed to address this issue. The USFWS expressed a need to know how the gradual breakdown of fragments would affect the long-term management of the refuge. EPA and Army agreed to look for data on the weathering of lead bullets at former ranges.

f. **Meeting Summary Page 3, Background Evaluation.** To promote consensus building and teamwork amongst EPA, the Army and all the support contractors, it is recommended that the Background Evaluation paragraph from the meeting minutes be revised to read as follows:

The group began discussion on the background evaluation of metals used at FTMC. Two major concerns regarding the geochemical portion of the process were raised by EPA: (1) the current method appears to be based primarily on subjectivity, and (2) geochemistry is used as the sole line of evidence for excluding metals of potential concern. In addition, EPA indicated the need for additional explanation regarding the uncertainty associated with the geochemistry methods. The ensuing discussion led to the following resolutions regarding geochemistry (for soils only):

g. **Meeting Summary Page 3, Check Item 2.** To improve the consistent use of the geochemical methods for background soil evaluations, EPA would like to see statistical applications used to set the dividing line between contaminated and non-contaminated samples on the new ratio plots. However, this will require discussion amongst the technical work group and it was agreed that a separate technical meeting would be required to come to consensus on this item.

h. **Meeting Summary Page 3, Check Item 4.** EPA would like to use the geochemistry

evaluation as one of several lines-of-evidence such as soil grain size, that will provide additional support, as is done at Redstone Arsenal. EPA also expressed concern over the ability to apply the background/geochemistry evaluation to small data sets. (This comment referred specifically to geochemistry plots consisting of two points on a line and with data sets containing large numbers of nondetects).

i. **Meeting Summary Page 3, Check Item 3.** EPA's expectation on the uncertainty analysis is that site-specific discussions versus boilerplate language be included in the background evaluation. For example, EPA is looking for an evaluation of how certain we are that a chemical eliminated from background was actually background or that a detection in a sample that was identified as contamination was actually contamination. This item requires further discussions and resolution at a follow-on technical meeting specifically addressing the background evaluation. EPA and Army are working together to begin by addressing the qualitative discussion in the boilerplate section. Shaw will contact risk assessors at EPA to discuss the qualitative uncertainty discussion.

j. **Meeting Summary Page 4.** EPA concurred that the ERAs could be completed with the 83 days particle retention time but discussed that the 10- to 156-day range is too broad to be used as a cleanup goal. For the FS, EPA recommended revisiting the retention time numbers to determine how they were derived, with the aim to come to a consensus on what retention time to use for the FS.

k. **Meeting Summary Page 5.** EPA has indicated that expended bullets on the ground surface constitute a CERCLA release and thus, must be addressed further as part of the CERCLA remedial response process. EPA has had the understanding that at FTMC a majority of the surface bullets would be taken care of by addressing the cleanup of lead in soil, such that there was less emphasis placed on this issue at the meeting. EPA wants to re-emphasize that the presence of surface bullets is a significant issue and will continue to be an issue of concern.

2.0 Unresolved Issues

EPA provided comments on lingering issues to the Army entitled *Summary of Key Outstanding Issues for Ft. McClellan, Calhoun County, Alabama, November 22, 2004.* These issues were subdivided into five major categories each with a subset of comments/issues/concerns that include:

1. Human Health Risk
2. Ecological Risk Assessment Review
3. Background Evaluations
4. Geochemical Review, and
5. Miscellaneous

The meeting held in January 2005 was intended to address these issues. To a large extent, most of

the issues were discussed or were consciously deferred for later discussions to be held during separate technical work group meetings. The agenda used in the January 2005 meeting and the meeting minutes did not precisely follow the original comments submitted by EPA, as the Army had also presented a tabulation of comments that they wanted to discuss during the meeting. To evaluate the extent to which EPA's original comments were addressed and resolved, a cross-walk table between the original comments and the meeting minutes has been included with this review to assist EPA in targeting follow-up activities on issues that still remain outstanding or unresolved.

The attached table is broken into 5 notebook pages to cover the 5 major topics summarized above. Within each notebook page is listed the original EPA comment, and if the comment was a multi-part comment, the comment was further sub-divided (noted as bullets in the original comment document) into letters. The table includes the following columns of information:

- The text of the original comment (*Summary of Key Outstanding Issues for Ft. McClellan, Calhoun County, Alabama)*,
- An evaluation of whether the stated issue was resolved or not resolved,
- The Army's resolution statement or statement of non-resolution from their meeting minutes,
- An indication of whether the issue was discussed,
- Text of additional notes from the discussions at the meeting and
- Further comments from EPA, where needed.

As can be seen from this table, the five major topics were broken down into a total of 63 items requiring discussion and resolution based on EPA's original comments. Of the 63 items, 18 comments remain unresolved (see "unresolved or partially unresolved" in bold in second column of each notebook page) in the categories of human health risk assessment, background evaluation, geochemistry, and miscellaneous items dealing with site characterization. A subset of these requires limited but further discussion including input from the risk management team. It is recommended that work groups be held between technical teams to resolve these issues.

The Unresolved Issues/Partially Resolved issues and the proposed resolution path forward are summarized below.

2.1 Human Health Risk

1 b. Use of time-weighted averages for evaluation of sensitive child and youth receptors.

Resolution: EPA indicated that, while a work plan had been established, if new guidance was produced after the development of the Work Plan for the FTMC Human Health Risk Assessment, EPA requires that the Work Plan be modified accordingly.

d. Consideration of soil sample handling to obtain representative and appropriate soil sample for obtaining lead results for use in the human health risk assessment. Note that these samples

may differ from those optimized for evaluation of risks to ecological receptors.

Resolution with follow-up: While the Army had indicated that sampling issues had been addressed in the work plan, EPA had indicated that the work plan should be changed if new guidance became available. The work plan should incorporate new guidance much like what is being done at Redstone Arsenal. Shaw indicated that the geochemistry evaluation allowed the Army to identify specific sample locations where contamination occurs. EPA did not totally agree with this approach due to geospatial issues. Whether this was an RI issue or an FS issue, cleanup decisions needed to be linked to exposure units according to EPA.

2 b. Improper calculation of the cleanup goal using a target hazard quotient of 1.49.

Resolution: The EPA risk manager has decided that cleanup goals will be calculated using a target hazard quotient of 1.00. This change is being made because a target hazard quotient of 1.49 is inconsistent with the spirit of RAGS.

2.2 Ecological Risk Assessment

All comments appeared to have been resolved.

2.3 Background

1. The ' weight of evidence' approach should be used in site to background comparisons. The weight of evidence approach, which includes traditional statistical comparisons between site and background results, should be retained for background comparisons. These methods typically include comparisons of means/medians, tests for outliers, comparisons of site data to background UTLs, box and whisker plot comparisons and others. Each statistical test, however, should be designed to control Type I and Type II errors with the same alpha and beta. Progression to successive tiers should not imply a reduction in statistical power. These methods are valuable tools in discerning occurrences of metals (and possibly some PAH or pesticide compounds) at natural background or anthropogenic background concentrations.

Resolution with follow-up: Control of Type 1 and Type II errors was unresolved for geochemical methods. Further discussion within the working group is required to arrive at a method for justifying placement of the threshold value (vertical line) in the new ratio plots.

4. Constituents above ecological screening criteria but below background should be considered for risk potential. Contaminants that exceeded the ESVs but occurred at levels below background should be mentioned as presenting potential risk, although not related to the site as per OSWER Directive 9285.7 41.

Resolution with follow-up: EPA discussed that this point was unclear in the ERA and that further clarification is required in the ERA. This item requires further discussion and resolution

within the working group. EPA had mentioned that at other sites, risks from constituents screened as background are qualitatively or semi-quantitatively addressed in the uncertainty section. In addition, EPA has furnished comments on the T-5 Training Area Draft RI Report which contains further direction in this area.

5. Communication of contaminant presence is dictated by EPA Background Policy. The presence of concentrations of lead or other constituents detected at levels above risk assessment benchmarks must be communicated to the public in the baseline risk assessment as per OSWER Directive 9285.6-07P.

Resolution with follow-up: EPA discussed that this point was unclear in the ERA and that further clarification is required in the ERA. This item requires further discussion and resolution with the Work Group.

7. Issues with the current background data sets for Ft. McClellan:

a. Although we have agreed to use a Base-wide background data set, it may not meet the needs of every site. Potential issues include differences in detection limits and analytical methods, sparse data, and differences in soil types. These factors may occasionally limit our ability to screen out chemicals detected at sites. This is an uncertainty we must accept unless we want to collect more data.

Resolution: A high percentage of non-detects and/or high detection limits exists for certain metals. A more well-defined method for handling these conditions in the screening procedure needs to be established as part of a work group discussion.

c. High detection limits in the Ft. McClellan background data sets yield values that are biased high (i.e., the FTMC background values for antimony, cadmium, and thallium), but which have been used in the site-to-background comparisons. Where the background data set is inadequate to yield valid background comparison values, the constituent in question should be evaluated in the risk assessments.

Resolution: EPA indicated that elevated detection limits cannot be overlooked even when all samples are below detection and may require a more sensitive method or more thorough analysis in the uncertainty section.

2.4 Geochemistry

1a. Effects of large numbers of non-detects and/or high detection limits in the site data sets

Resolution: Work group discussion to determine how best to conduct the geochemical evaluation when there is a high percentage of non-detects.

1b. Lack of statistical rigor; the Tier 3 portion of the geochemical evaluation procedure relies

on visual assessment of scatter plots to make qualitative determinations of data that are either consistent with background (i.e., 'on the background trend') or signifying potential contamination (i.e., 'apparent outliers'). Without any statistical analysis, this method of discriminating between trace-metal concentrations that are naturally occurring and levels that are due to site-related activities is subjective and may lead to erroneous conclusions.

> ***Resolution:*** Part of this comment was resolved by discontinuing the use of the Slippage Test and replacing it with the 95th UTL screen; however, it was not resolved how to clearly demonstrate that a data point is an outlier, contaminated, or uncontaminated. This will required a work group discussion to resolve.

2. The geochemical evaluation is not applicable to aqueous samples. The geochemical evaluation procedure, as presented, cannot and should not be applied to surface water or to groundwater data.

2a. Interpretation of data from aqueous samples involves a larger number of variables than for soils

2b. Geochemical processes that control trace metal behavior in surface water and groundwater are more heterogeneous in space and time than processes affecting soil geochemistry.

> ***Resolution for 2, a and b.:*** This topic was not discussed as the focus of the background evaluation was on soils. Thus, this is a new topic to be discussed at a work group meeting to gain consensus on the approach to these other media, or obtain agreement among all parties that the method is not applicable to media other than soils.

3d. Exceptions (data that are not consistent with a linear relationship) must be explained, and there must be a consistent rationale for examination of potential 'outliers' before a decision is made regarding inclusion or exclusion of suspect data.

> ***Resolution:*** EPA is preparing detailed recommendations in their FTMC Training Area T-5 review which are relevant to this comment. In addition, this is a topic that should be further discussed and resolved with a follow-on work group meeting.

4. Effects of different soil types should be incorporated. The different soil types found across Ft. McClellan should be described, and the effects of these different soil types on the geochemical evaluation should be acknowledged and discussed.

4a. If the site data fall on a line with a steeper slope or the same slope but a greater intercept than the background data set, this may mean that the soil types are different. When soil types appear to be different, this is a data quality objectives problem. The background data set may not be representative of the site. Site-specific background data should be collected to address this uncertainty, if necessary.

Resolution with caveat 4 and 4a: Further clarification is necessary even though this was a resolved comment. The current background data set may not be representative of the site and as a consequence, there may be instances where evidence is insufficient to screen out a constituent as background. Please see comment 7b regarding background evaluations.

5. Problems with detection limits should be acknowledged and discussed. Elements are dropped from consideration as Constituents of Potential Concern (COPCs) if the reported values are non-detects. Elements that may be dropped as COPCS due to consistent NDs are antimony (Sb), selenium (Se), cadmium (Cd), silver (Ag), and thallium (Tl).

5a. High detection limits for certain trace metals may yield inaccurate conclusions regarding contaminant distributions and concentrations.

5b. Trace metals with detection limits higher than the screening criteria should not be eliminated as COCs in the geochemical evaluations. Antimony, known to be present with lead in site soils, is often eliminated as a COC because all reported values for a given site are non-detects.

Resolution with caveat 5 a and b: EPA expressed concern regarding nondetects when the detection limits were above the screening values. Just because all samples are below detection does not permit exclusion of the chemical as a COPC. As an example, antimony was detected in very few site samples; often, all site samples were reported as non-detects, at detection limits above the background criterion (twice the arithmetic mean), the site-specific screening level, and the ecological screening value. In such cases, EPA's position was that there was not enough evidence to eliminate it on the basis of comparison to background. Non-parametric tests were suggested. EPA also suggested collection of additional data, with lower detection limits, in instances where the presence of site-related antimony was suspected. Further discussion/resolution is required by the working group to address the process for eliminating/including metals due to elevated detection limits.

6. Alteration of metallic lead to more soluble phases should be considered. Effects of weathering reactions on lead that is left in place must be identified and incorporated into risk evaluations. Phases such as lead carbonates, hydrous carbonates, sulfates, oxyhydroxides, etc. can form under on-site surficial conditions and these phases have different solubilities and therefore different transport behaviors.

Resolution: EPA would like to see additional detailed discussion and site-specific application of fate and transport methodologies to demonstrate to the potential mobility or lack there of, of lead in site soils. EPA has provided a proposal on methods (see Attachment 1) that may be necessary in order to address this issue. Consideration of the potential application of such methods at FTMC requires further discussions with the working group.

8. The rigorous statistical analysis should consider both Type I and Type II errors. The transformation of the data to a log-log plot should be considered in terms of its effect on the residual errors. Confidence limits around a prediction made at the upper range of the graph are so large that the uncertainty in the method increases exponentially at the upper end of the distribution of naturally-occurring concentrations. At the upper end of the distribution the method loses the power to distinguish Type II errors that are important to regulators. The method has limited usefulness in a regulatory context unless Type II errors can be controlled.

8a. As part of controlling Type II errors, a requirement of a minimum number of data points is needed. Application of the geochemical analysis to two background data points and one site data point is inappropriate, as the number of data points is insufficient.

> ***Resolution to 8 and a.*** This issue appeared to be resolved at the meeting; however, confirmation is required from the Army with respect to minimizing Type II errors as well as concurrence on a minimum number of data points to be used in the geochemical analysis. A path forward to address this comment needs to be identified. In addition, EPA wants to further clarify that if there is uncertainty regarding whether a chemical is site-related, the prudent approach is to include the chemical in the risk assessment.

2.5 Misc

1. Adequacy of Site Characterization is questionable. It appears that many of the ranges in this document have not been fully characterized. This comment is true for various media associated with any given site. The potential for off-site migration of contaminants has not been sufficiently addressed. In addition, it is unclear that all ranges have been identified.

> ***Resolution:*** EPA had indicated that there are a number of ranges that still remain at the site but have not been addressed; however, there were not further discussions on how these ranges would be identified and addressed such that a close-out report can be signed by EPA. While some of the land has been transferred to other entities, EPA still needs evidence that the ranges on these parcels have been adequately addressed.

3. Sampling methodology introduces inaccuracy in surface soil characterization. The removal of bullets and/or fragments prior to collection of sample serves to bias the sample and underestimates actual concentration of lead present in surface soil (OSWER Directive #9285.7-37). Risk associated with Pb left in place may be underestimated due to lack of knowledge of Pb-bearing phases formed by soil weathering processes.

> ***Resolution:*** EPA restated its official position that expended bullets on the ground surface constitute a CERCLA release but noted that EPA will not make an issue of it at this time. The Army noted that most of the surface bullets will be removed during remediation of the various sites. EPA's primary concern is that uncertainty arises regarding future site use or conditions because further weathering may increase the mobility of metallic lead in the fragments. Thus,

EPA requires a more thorough discussion and demonstration on the mobility of lead at site soils. Gannett Fleming has submitted a proposed approach for addressing the issues of lead mobility and treatability (see Attachment 1). This topic requires further discussion in a working group meeting.

Attachment 1

Determining the Potential Mobility of Lead in Soil at Ft. McClellan, Calhoun County, Alabama

Introduction

Toward the close of the meeting between EPA and Army in Atlanta on 25 January 2005, Pete Tuttle (US Fish & Wildlife) expressed concern for the ecological risks posed by lead (in the form of spent bullets etc.) that is to be left in place in a 7000-acre parcel that has been transferred to F&W. During the discussion of this issue, which was limited due to time constraints, Army's contractors stated that the environmental behavior of lead cannot be predicted due to the large number of unknowns that affect lead mobility under site-specific conditions.

The weathering of lead in soils is beginning to appear in the geochemical and environmental literatures (e.g., Cao et al., 2003; Korshin et al., 2005; Voegelin et al, 2003). Cao and colleagues (soil scientists at the University of Florida) examined material from shooting ranges in Florida, identified lead phases formed by weathering, performed TCLP analyses, and identified site-specific conditions that affected lead mobility. A similar, but relatively narrowly focused, study could be performed at FTMC to investigate site-specific factors controlling lead mobility in site soils. Results from this study would provide critical information for assessing potential future risks to lead in soil. A summary outline of this proposed study is presented below.

Methods

Characterization of the potential mobility of lead in soils can be evaluated via a 6-pronged approach as summarized below:

1. Characterization of lead in place.
   - More accurate evaluation of total mass of lead in FTMC soils. Sieving surface soil prior to laboratory analyses yields results that are biased low, because macroscopic particles are removed. Alternative methods for characterization of total lead in soil may be preferable and may be more rapid and more cost-effective, e.g., field-deployed x-ray fluorescence spectroscopy (with laboratory confirmation sampling).
   - Characterization of lead-bearing weathering products. Any assessment of the behavior of lead under site-specific conditions requires identification of solid phases containing lead which form due to weathering reactions in surficial soils. Some non-standard analytical procedures may be required in order to identify and characterize these phases. These may include: x-ray diffraction; electron diffraction by transmission electron microscopy; scanning electron microscopy with energy-dispersive x-ray spectrometry; and analysis by electron microprobe.

2. Grain-size measurements and lead analysis of the respective size fractions. These data would quantify the distribution of lead in soil with respect to grain size.

3, Sequential extraction of site soils. These analytical procedures yield insight into the partitioning of lead among various mineral phases present in site soils (e.g., crystalline or amorphous iron and/or aluminum oxides, clays, carbonates, sulfides, etc.)

4. TCLP analysis of site soils. Data obtained through Toxicity Characteristics Leaching Procedures (TCLP) enable assessment of mobility and bioavailability under site-specific conditions and may be needed for selection of remedial alternatives.

5. Column leaching studies. These could provide potentially vital site-specific information on the lead concentrations that could be mobilized, and conditions that enhance or limit mobilization. Column studies provide data that help to constrain the length and time scales involved in transport of lead; the site-specific parameters (cation exchange capacity, organic complexation, type and concentration of other sorbents, etc.) that promote or inhibit mobility; and the extent to which lead can be transported and re-precipitated. With additional knowledge of the solid phases present under pre- and post-test conditions, results of column studies would be supplemented with geochemical modeling. Ultimately, the objective is to determine whether or not lead is likely to reach groundwater and/or other ecological receptors at concentrations that pose risks, and to be able to estimate these risks using site-specific data to benchmark model predictions.

   While the emphasis is on lead mobility, column studies would also address the transport behavior of a number of other potential contaminants that are expected to be associated with solid-phase lead at firing ranges. These may include arsenic, antimony, PAHs, and other potentially toxic constituents associated with firing-range activities.

6. Site remediation. Bench-scale treatability studies and/or a field-scale pilot test would provide insight into possible remediation strategies tailored to site-specific conditions. These may include: treatment with phosphate or other materials to sequester lead in relatively insoluble phases; soil washing and chelation; isolation with clean soil; phytoremediation; etc.

Conclusions

While this proposal is beyond the mainstream ROC-type work, it is prompted by direct experience.

References:

Cao, X., Ma, L. Q., Chen, M., Hardison, D. W., Jr., and Harris, W. G., 2003, Weathering of lead bullets and their environmental effects at outdoor shooting ranges. *J. Environ. Qual.* **32**:526-534.

Korshin, G. V., Ferguson, J. F., and Lancaster, A. N., 2005, Influence of natural organic matter on the morphology of corroding lead surfaces and behavior of lead-containing particles. *Water Research* **39**(5):811-818.

Voegelin, A., Barmettler, K., and Kretzschmar, R., 2003, Heavy metal release from contaminated

soils: comparison of column leaching and batch extraction results. *J. Environ. Qual.* **32**:865-875.

ATTACHMENT F

25 JANUARY 2005 MEETING SUMMARY
EPA PERSPECTIVE

Purposes of Meeting: (1) To discuss key issues at Fort McClellan as identified by the Army and EPA (2) To promote consistency with risk assessment activities at Avon Park and Redstone Arsenal.

(Note: Between Doyle=s 11 January E-mail to call the meeting and the development of the Agenda by the Army, the purpose of the meeting switched to resolving the Army Eco Risk Issues summarized in Mike Kelly=s 7 January E-mail. EPA=s issues were summarized in comments dated 22 November 2004. The Army Eco Risk Issues were different than issues identified by EPA in specifics but similar in general topic or theme.)

Opening Remarks By Mike Kelly, Doyle Brittain, and Ron Levy.

The Army expressed concern that Shaw was performing the geochemistry analysis correctly at Redstone and Avon Park but not at Fort McClellan. The Army indicated that some investigations such as Bains Gap Road Ranges were doing RI reports. Sites going to the National Guard will be investigated under the active sites program. SIs and RIs will continue. It was not the Army=s decision for the state to be the overseer of property transferred to the JPA.

Background Evaluations:

EPA expressed concern over the subjectivity of the geochemistry evaluation and was not willing to accept geochemistry as the sole line of evidence or Afinal word@ in the background evaluation. EPA would like to see use of supporting information as is done at Redstone.

It was agreed that use of the slippage test would be discontinued. It would be replaced by the 95th UTL test.

EPA agreed to take a look at the ratio plots in the next submitted document. EPA expressed the need for further discussion on the placement of the vertical line to discriminate background on the ratio plots. Agreement on the placement of the vertical line was not reached. The new ratio plots were not unilaterally accepted but were adopted in a trial stage.

EPA expressed that an uncertainty discussion was needed for the geochemistry evaluation. EPA expressed the desire for both a qualitative discussion in the boilerplate section of the geochemistry appendix and site-specific discussions. EPA and Army were to work together to begin by addressing the qualitative discussion in the boilerplate section. Shaw would contact risk assessors at EPA to discuss the qualitative uncertainty discussion.

EPA expressed concern over the ability to apply the background/geochemistry evaluation to

small data sets. (This had to do with geochemistry plots with two points on a line and with sparse data caused by frequent nondetects.)

EPA expressed concern regarding nondetects when the detection limits was above the screening value, such as antimony. Because Sb was only detected in a few background samples or perhaps was not detected at all in background, EPA=s position was that there was not enough evidence to eliminate it on the basis of background. Non-parametric tests were suggested. EPA also suggested to take additional data with lower detection limits in instances where antimony was site-related.

Human Health

Shaw indicated that the geochemistry evaluation allowed the Army to identify specific sample locations where contamination occurs. EPA did not totally agree with this approach due geospatial issues. Whether this was an RI issue or an FS issue, cleanup decisions needed to be linked to exposure units according to EPA. (Note the rest of the Shaw notes on the human health risk assessment EPA agrees with.)

Ecological Risk

P & L Model

The history of the particle ingestion model=s use at Fort McClellan was summarized. The two issues were (1) the particle retention time in the Peddicord and Lakind model (2) the number of lead fragments ingested by a bird necessary to cause mortality. Out of expediency to finish the reports, to honor past agreements, and because the acceptable levels of grit to be used as cleanup goals fall within the range of acceptable soil concentrations for other assessment endpoints in the ERA, EPA is willing to accept the 83-day particle retention time for the fragments at ranges at Fort McClellan. EPA, however, expressed concerns regarding the P&L model such that EPA is not willing to entertain any assumption less conservative than a single lead fragment to cause mortality. EPA stated this opinion because of the concern that the simplicity of the P & L model does not allow the model to account for other than a single fragment mortality assumption. The assumption of single fragment mortality and the particle retention time are intrinsically linked in the P & L model, such that if one were to deviate from the single particle mortality assumption, one would also need to reevaluate the particle retention time. EPA thinks that the particle retention time would need to be much more conservative if the project team were to assume it took more than one fragment to cause mortality. It was suggested that the team might need to revisit the retention time issue by providing more justification. (Note: This summary contains interpretation beyond what was expressed at the meeting, which was developed after the meeting in E-mail to Mark Huston.)

Protection of Individuals Versus Populations:

In addition to what Rich Prann summarized in Shaw=s meeting minutes, which EPA agrees with, EPA would like to include that the group concluded that the P & L model assesses the risk to populations not individuals.

EPA agrees with the long second to last paragraph on Page 4 of Shaw=s summary of the meeting minutes.

Based on Mark Huston=s comment transmitted by E-mail, he has a problem with the statement that all ecological risk concerns were addressed as being too broad.

EPA agrees with the summary of the meeting minutes prepared by Shaw regarding the Aggregation of Data.

Surface Bullets:

We need to clarify that EPA=s position is that spent surface bullets are a CERCLA ' 104(c) release. EPA indicated that they were under the opinion that surface bullets would be taken care of by addressing the lead in soil. EPA indicated that while the Agency agrees that large particles of lead may not be bioavailable upon consumption that we have very little data to support this assumption. There is also uncertainty in how rapidly the bullets will break down over time. EPA gave an example of a former skeet range in northern Florida of 1940's vintage where within 40 years EPA saw total breakdown of the lead fragments. Soils had no fragmetns and up to 65,000 ppm lead. The acid soils in the pine forest were suggested as a factor. Soil lead concentrations versus particle density relationships were needed to address this issue. The USFWS expressed a need to know how the gradual breakdown of fragments would affect the long-term management of the refuge. EPA and Army agreed to both look for data on the weathering of lead bullets at former ranges.

Concluding Remarks and Issues that did not fit into categories:

EPA suggested monthly project team meetings to identify and resolve issues.

HUMAN HEALTH RISK ASSESSMENT

Original EPA Comment	Was Issue Resolved at the Meeting?	Resolutions from Army's Meeting Summary	Listed as Unresolved in Meeting Summary	Was Topic Discussed?	Additions to Army's Meeting Summary	Further EPA Comment
1. Evaluation of Risks from Lead exposure. New guidance on addressing intermittent exposure at lead sites and performing human health risk assessment at shooting ranges has been developed by EPA and recently published (late 2003 and 2004). Recommendations in these documents should be applied to risk assessments of lead at Ft McClellan. Doing so would greatly assist in addressing previous comments by EPA on development of soil lead clean up goals. Documents are: USEPA. 2003. TRW Recommendations for Performing human health risk analysis on small arms shooting ranges. OSWER 9285.7-37. March 2003. USEPA 2004. Assessing Intermittent or Variable Exposures at lead sites. OSWER 9285.7-76. Undated but release to the TRW website in 2004. Key points include:	See details of issue below	See Below	See Below	See Below	See Below	
a. Use of area weighted average concentrations for appropriate exposure units so that the site is broken into relatively homogeneous" areas for evaluation.	YES	Shaw will also clarify spatial considerations in the SRAs; i.e., identify the locations where site-related contaminants in soil exceed cleanup levels and may represent a health threat to receptors constrained to C4small exposure units (e.g., construction worker and on-site resident).		Yes		

Enclosure 1

HUMAN HEALTH RISK ASSESSMENT

Original EPA Comment	Was Issue Resolved at the Meeting?	Resolutions from Army's Meeting Summary	Listed as Unresolved in Meeting Summary	Was Topic Discussed?	Additions to Army's Meeting Summary	Further EPA Comment
b. Use of time-weighted averages for evaluation of sensitive child and youth receptors	**NO, NOT ENTIRELY RESOLVED**			Yes	Shaw indicated that HHRAs will follow the work plan and that comment is not relevant.	It is appropriate to change procedures based on new guidance. Change management should be included in work plans for Ft McClellan. FYI, change management is being incorporated into work plans for Redstone.
c. Consideration on when to use an upper bound estimate of the mean for lead	YES			Yes	EPA indicated that the use of a mean of the lead EPC was sufficient	
d. Consideration of soil sample handling to obtain representative and appropriate soil sample for obtaining lead results for use in the human health risk assessment. Note that these samples may differ from those optimized for evaluation of risks to ecological receptors.□	**NO, NOT ENTIRELY RESOLVED**	While the Army had indicated that sampling issues had been addressed in the work plan, EPA had indicated that the work plan should be changed if new guidance became available. The work plan should incorporate new guidance much like what is being done at Redstone Arsenal. Shaw indicated that the geochemistry evaluation allowed the Army to identify specific sample locations where contamination occurs. EPA did not totally agree with this approach due to geospatial issues. Whether this was an RI issue or an FS issue, cleanup decisions needed to be linked to exposure units according to EPA		Yes	Army indicated that sampling issues were addressed in the work plan. No change is planned	It is appropriate to change procedures based on new guidance. Change management should be included in work plans for Ft McClellan. FYI, change management is being incorporated into work plans for Redstone.
2. The issues identified for human health so far do not incorporate the comments received from the contractor to ERT through Mark Sprenger on Baby Bains Gap Ranges. For example:	See below			See Below		

HUMAN HEALTH RISK ASSESSMENT

Original EPA Comment	Was Issue Resolved at the Meeting?	Resolutions from Army's Meeting Summary	Listed as Unresolved in Meeting Summary	Was Topic Discussed?	Additions to Army's Meeting Summary	Further EPA Comment
a. Comments regarding lack of justification for risk assessment assumptions	YES			Yes	Army indicated that parameter assumptions were in work plan	Team needs to ensure that reviewers have access to work plans- possibly new action item
b. The improper calculation of the cleanup goal using a target hazard quotient of 1.49	NO, NOT ENTIRELY RESOLVED	As a result of the discussion, Shaw will add language to the streamlined risk assessment (SRA) and the response to the "Lingering Issues" comment to further justify developing cleanup levels based on a target hazard index (HI) of 1.49 rather than the threshold value of 1.		Yes		EPA risk manager has decided that a target hazard quotient of 1.49 is inconsistent with the spirit of RAGS and shall not be used to develop cleanup goals at Fort McClellan. A target hazard quotient of 1.00 shall be used.

HUMAN HEALTH RISK ASSESSMENT

Original EPA Comment	Was Issue Resolved at the Meeting?	Resolutions from Army's Meeting Summary	Listed as Unresolved in Meeting Summary	Was Topic Discussed?	Additions to Army's Meeting Summary	Further EPA Comment
c. The use of all four ranges as an exposure unit is unrealistic. Each range, at most, should be one exposure unit. Small exposure units to evaluate residential receptors should be selected as well.	YES	Shaw will also clarify spatial considerations in the SRAs; i.e., identify the locations where site-related contaminants in soil exceed cleanup levels and may represent a health threat to receptors constrained to small exposure units (e.g., construction worker and on-site resident).		Yes		
d. The criterion used to select media of concern to carry into the FS should be clearly defined	YES			Yes	Army indicated that they had not previously received this comment	The Army did not indicate in the meeting that they disagreed with this comment.
e. The FTMC risk assessments rely on work plan information which is not included in the RI/FS reports. This information must be provided with each document in some fashion. Electronic methods for providing this information, for example, posting work plans on a website or including a CD with the work plan along with the RI/FS reports, are acceptable.	YES			Yes	Army indicated that they had not previously received this comment	The Army did not indicate in the meeting that they disagreed with this comment.
f. Conclusions of the risk assessments must clearly follow from risk assessment results	YES			Yes	Army indicated that they had not previously received this comment	The Army did not indicate in the meeting that they disagreed with this comment.

ECOLOGICAL RISK ASSESSMENT REVIEW

Original EPA Comment	Was Issue Resolved at the Meeting?	Resolutions from Army's Meeting Summary	Listed as Unresolved in Meeting Summary	Was Topic Discussed?	Additions to Army's Meeting Summary	Further EPA Comment
1. If risk is found in PERA then the next step is to proceed from Step 3a to full BERA (Steps 3b through 8). In many cases, risk is not appropriately dealt with in decisions concerning sites.	YES	EPA indicated that Eco Risk Comments 1-8 have been or are being addressed in recent reports and that EPA has no residual concerns.		Yes		
2. Future Human Use Considerations have been used to state "No Further Action" for ecological risk. Regardless of future human use plans for sites, ecological risks should be addressed independently.	YES	EPA indicated that Eco Risk Comments 1-8 have been or are being addressed in recent reports and that EPA has no residual concerns.		Yes		
3. Risk Management Decisions must be removed from the Risk Assessment sections of reports.	YES	EPA indicated that Eco Risk Comments 1-8 have been or are being addressed in recent reports and that EPA has no residual concerns.		Yes		
4. Previous comments have not been addressed in revisions to documents. Examples of unresolved comments are listed in the following items.	YES	EPA indicated that Eco Risk Comments 1-8 have been or are being addressed in recent reports and that EPA has no residual concerns.		Yes		
5. Selection of receptors of concern - conceptual site model development. A discussion of the toxicity of lead via direct exposure to ecological receptors needs to be addressed. The conceptual site model should also address potential exposure via the groundwater pathway.	YES	EPA indicated that Eco Risk Comments 1-8 have been or are being addressed in recent reports and that EPA has no residual concerns.		Yes		
6. Selection of appropriate screening benchmarks and PRGs: Justification must be provided for screening benchmarks and PRGs used in ERAs.	YES	EPA indicated that Eco Risk Comments 1-8 have been or are being addressed in recent reports and that EPA has no residual concerns.		Yes		
7. Inconsistencies in selection of risk based remedial goals (RBRGs): Justification for all values selected as a basis for RBRGs must be provided. Selection should be as consistent as possible. Where RBRGs are based on a variety of values, the text should support the selection and explain the degree to which the selected value is protective.	YES	EPA indicated that Eco Risk Comments 1-8 have been or are being addressed in recent reports and that EPA has no residual concerns.		Yes		

ECOLOGICAL RISK ASSESSMENT REVIEW

Original EPA Comment	Was Issue Resolved at the Meeting?	Resolutions from Army's Meeting Summary	Listed as Unresolved in Meeting Summary	Was Topic Discussed?	Additions to Army's Meeting Summary	Further EPA Comment
8. Lead Modeling and Other Lead Specific Issues	YES	EPA indicated that Eco Risk Comments 1-8 have been or are being addressed in recent reports and that EPA has no residual concerns.		Yes		
a. Risk Hypothesis- protection of birds from ingestion of lead particles should be included as a risk hypothesis	YES	EPA indicated that Eco Risk Comments 1-8 have been or are being addressed in recent reports and that EPA has no residual concerns.		Yes		
b. Earthworm Toxicity and Bioaccumulation Tests- Uncertainties with the results of these tests need to be addressed.	YES	EPA indicated that Eco Risk Comments 1-8 have been or are being addressed in recent reports and that EPA has no residual concerns.		Yes		
c. Interpretation of Toxicity Testing Results - The uncertainties mentioned above result in ambiguity in the results of the earthworm toxicity tests. These uncertainties need to be addressed.	YES	EPA indicated that Eco Risk Comments 1-8 have been or are being addressed in recent reports and that EPA has no residual concerns.		Yes		
d. Ingestion of Lead by Birds- Consensus is needed on parameter values used in the modeling of risks from this exposure pathway. For example, modification of the ingestion rates and AUFs must be justified and agreed upon with EPA.	YES	After significant discussion, there was agreement that the 83 days (arithmetic mean for the range of grit retention times) would serve as a reasonable estimate. Additional discussion and rationale for the selection of the grit retention times used in the P&L model will be included in the revised reports. Protection of individual vs. population: EPA indicated that it does support protection of populations rather than individual and noted that a 20% population impact level is used in the risk assessments. The group was in agreement regarding this issue.		Yes		

ECOLOGICAL RISK ASSESSMENT REVIEW

Original EPA Comment	Was Issue Resolved at the Meeting?	Resolutions from Army's Meeting Summary	Listed as Unresolved in Meeting Summary	Was Topic Discussed?	Additions to Army's Meeting Summary	Further EPA Comment
9. The particle ingestion model. Interpretation of results of the particle ingestion model is overly simplistic, because it assumes that loss of avians from the local population due to ingestion of a bullet fragment is similar to hunting (i.e., some individuals killed but remaining individuals healthy). The local population of avians is affected when some individuals succumb to ingested bullet fragments combined with the overall adverse health effects on remaining individuals that are exposed to lead in soil and diet. Therefore the local population receives a double whammy that was not evaluated by looking at the endpoints separately. When local population suffers mortality or fails to reproduce due to exposure to lead, this not only affects the local population but will also affect the larger surrounding population by recruiting avians to make up a local population sink. Loss of 10 percent of avians from the local population per year, while it may be a number too small to measure with field surveys, would be a large effect from a resource management perspective, especially if losses accrue from year to year.	YES	EPA further indicated that Comments 9 and 10 were more of observations rather than EPA asking for a change in approach.		Yes		
10. Size of site requiring clean up. EPA has an interest in cleanup of small sites when the ecological risk assessment has determined there is unacceptable risk. Population-level effects are not necessary to trigger action.	YES	EPA further indicated that Comments 9 and 10 were more of observations rather than EPA asking for a change in approach.		Yes		
11. The NEBA approach. Regarding the NEBA approach, active remediation does not automatically translate into injury to a natural resource. Assessment of injury should be conducted in close partnership and cooperation with the natural resource trustees, so that the nature of injury and recovery times are accurate. Efficiency recommends that trustees be involved in drafting the NEBA reports rather than involving trustees in the review when reports are complete.	YES	The Army (FTMC) responded to Comment 11 (concerning NEBA) and stated that the NEBA process (CH2M Hill is the NEBA contractor) is moving forward at FTMC albeit slowly.		Yes		

ECOLOGICAL RISK ASSESSMENT REVIEW

Original EPA Comment	Was Issue Resolved at the Meeting?	Resolutions from Army's Meeting Summary	Listed as Unresolved in Meeting Summary	Was Topic Discussed?	Additions to Army's Meeting Summary	Further EPA Comment
12. EE/CAs versus the RI/FS Process. One the major problem with EE/CAs is that media samples are collected to address potential clean up cost, not to answer risk questions. The result of this approach may be that risks are not adequately addressed. The Army should be aware that additional sampling may be needed following an EE/CA to address risk assessment concerns.	YES	EPA indicated that Comment 12 (EE/CAs vs. RI/FSs) was an "FYI" issue. It was also pointed out that the Army agreed to conduct RI/FSs on small arms ranges almost two years ago so this issue is no longer relevant.		Yes		

BACKGROUND EVALUATIONS

Original EPA Comment	Was Issue Resolved at the Meeting?	Resolutions from Army's Meeting Summary	Listed as Unresolved in Meeting Summary	Was Topic Discussed?	Additions to Army's Meeting Summary	Further EPA Comment
1. The ' weight of evidence' approach should be used in site to background comparisons. The weight of evidence approach, which includes traditional statistical comparisons between site and background results, should be retained for background comparisons. These methods typically include comparisons of means/medians, tests for outliers, comparisons of site data to background UTLs, box and whisker plot comparisons and others. Each statistical test, however, should be designed to control Type I and Type II errors with the same alpha and beta. Progression to successive tiers should not imply a reduction in statistical power. These methods are valuable tools in discerning occurrences of metals (and possibly some PAH or pesticide compounds) at natural background or anthropogenic background concentrations.	Methods of Comparison-Resolved YES Control of Type 1 and Type II error-**NO** for geochemical methods (see Geochemistry Table)	Discontinue using the Slippage Test and replace with 95th UTL screen. Provide ratio plots in the evaluations. Need further discussion in the text of the reports justifying placement of the threshold value (vertical line) in the plots. Revise the Background Memo describing the 3-tiered approach (e.g., replace Slippage test, add explanation of ratio plots).		Yes		
2. Background terminology requires clarification. The terminology used in the geochemical evaluation does not distinguish anthropogenic background from naturally-occurring background. The distinction between naturally-occurring, anthropogenic, and site-related trace metals using geochemistry is not clear. For example, a soil sample with higher clay content can be expected to have higher metals concentrations, but that does not prove that the metals found there are natural. This argues for a weight-of-evidence approach, including agreement among all parties on the appropriate background data set(s).	YES			Yes		
3. Site history/use must be considered when selecting constituents for risk assessment. According to RAGS Part A, background screening is conducted to distinguish site-related contamination from naturally occurring or other non-site related levels of chemicals. Process-related chemicals, i.e., lead bullets at firing ranges, provide undeniable evidence that lead detected at levels exceeding site-specific background is site-related and should be carried forward into the risk assessment. A statistical evaluation, no matter what the degree of statistical significance, cannot substitute for forensic evidence from site history.	YES	EPA restated its official position that expended bullets on the ground surface constitute a CERCLA release but noted that EPA will not make an issue of it at this time. Ron noted that most of the surface bullets will be removed during remediation of the various sites.		Yes		

BACKGROUND EVALUATIONS

Original EPA Comment	Was Issue Resolved at the Meeting?	Resolutions from Army's Meeting Summary	Listed as Unresolved in Meeting Summary	Was Topic Discussed?	Additions to Army's Meeting Summary	Further EPA Comment
4. Constituents above ecological screening criteria but below background should be considered for risk potential. Contaminants that exceeded the ESVs but occurred at levels below background should be mentioned as presenting potential risk, although not related to the site as per OSWER Directive 9285.7 41.	**NO**	EPA discussed that this point was unclear in the ERA and that further clarification is required in the ERA. This item requires further discussion and resolution within the working group. EPA had mentioned that at other sites, risks from constituents screened as background are qualitatively or semi-quantitatively addressed in the uncertainty section. In addition, EPA has furnished comments on the T-5 Training Area Draft RI Report which contains further direction in this area	No	Yes	EPA discussed this point it was unclear if a resolution was reached.	At other sites, risks from constituents screened as background are qualitatively or semi-quantitatively addressed in the uncertainty section. Note that further EPA comments are provided on the T-5 Training Area Draft RI Report.
5. Communication of contaminant presence is dictated by EPA Background Policy. The presence of concentrations of lead or other constituents detected at levels above risk assessment benchmarks must be communicated to the public in the baseline risk assessment as per OSWER Directive 9285.6-07P.	**NO**	EPA discussed that this point was unclear in the ERA and that further clarification is required in the ERA. This item requires further discussion and resolution with the Work Group.		Yes	EPA discussed this point it was unclear if a resolution was reached.	At other sites, risks from constituents screened as background are qualitatively or semi-quantitatively addressed in the uncertainty section.
6. Use of the Upper Background Range requires discussion. Consensus is needed regarding use of the Upper Background Range (comparison of the maximum detected concentration in site media to twice the arithmetic mean, 95th UTL, or 95th percentile of the background data). The only EPA Region 4 approved background comparison is the comparison of the maximum concentration detected for a given chemical to 2 times the arithmetic mean concentration of that chemical detected in background samples. However, a discussion of the UBR is appropriate to provide insight about background concentrations.	YES	Discontinue using the Slippage Test and replace with 95th UTL screen.		Yes		

BACKGROUND EVALUATIONS

Original EPA Comment	Was Issue Resolved at the Meeting?	Resolutions from Army's Meeting Summary	Listed as Unresolved in Meeting Summary	Was Topic Discussed?	Additions to Army's Meeting Summary	Further EPA Comment
7. Issues with the current background data sets for Ft. McClellan:						
a. Although we have agreed to use a Base-wide background data set, it may not meet the needs of every site. Potential issues include differences in detection limits and analytical methods, sparse data, and differences in soil types. These factors may occasionally limit our ability to screen out chemicals detected at sites. This is an uncertainty we must accept unless we want to collect more data.	**NO**	A high percentage of non-detects and/or high detection limits exists for certain metals. A more well-defined method for handling these conditions in the screening procedure needs to be established as part of a work group discussion.	High percentage of non-detects and/or high detection limits for certain metals.	Yes		
b. Background data used in the Site Investigations are from SAIC, 1998, Background Metals Survey Report, not the background data that appear in the Installation-Wide Work Plan. In most cases, differences between the values in these two documents are small (typically of the order of a few percent). Consensus is required for use of the SAIC (1998) background data sets for Ft. McClellan, on an element-by-element basis, for all media of interest.	YES	It was pointed out that the only approved background data for FTMC are those provided in the SAIC Background Survey Report. EPA acknowledged this and indicated that its comment regarding adequacy of the background data was more of a statement rather than a request for change in procedure.		Yes		
c. High detection limits in the Ft. McClellan background data sets yield values that are biased high, but which have been used in the site-to-background comparisons. Where the background data set is inadequate to yield valid background comparison values, the constituent in question should be evaluated in the risk assessments.	**NO**		High percentage of non-detects and/or high detection limits for certain metals.	No		

GEOCHEMISTRY

Original EPA Comment	Was Issue Resolved at the Meeting?	Resolutions from Army's Meeting Summary	Listed as Unresolved in Meeting Summary	Was Topic Discussed?	Additions to Army's Meeting Summary	Further EPA Comment
1. Limitations of the geochemical evaluation methodology: The geochemical evaluation procedure should not be used as the sole basis for either elimination or inclusion of trace metals as Constituents of Concern (COCs). This process, as presented, is inadequate for this purpose due to:	YES	Revise the Background Memo describing the 3-tiered approach (e.g., replace Slippage test, add explanation of ratio plots).		Yes - see further discussion of sources of uncertainty in 3.through 7. (below)		EPA reiterated request for consideration of supporting information ("lines of evidence") in addition to results obtained from geochemical evaluations
a. Effects of large numbers of non-detects and/or high detection limits in the site data sets	**NO**		High percentage of non-detects and/or high detection limits for certain metals (see 5.)	No		Some elements (e.g., antimony) are dropped as COPCs because results are consistently ND. Further discussions are required to decide on an approach to include/exclude nondetected chemicals.
b. Lack of statistical rigor; the Tier 3 portion of the geochemical evaluation procedure relies on visual assessment of scatter plots to make qualitative determinations of data that are either consistent with background (i.e., 'on the background trend') or signifying potential contamination (i.e., 'apparent outliers'). Without any statistical analysis, this method of discriminating between trace-metal concentrations that are naturally occurring and levels that are due to site-related activities is subjective and may lead to erroneous conclusions.	Two points YES One point **NO**	Discontinue using the Slippage Test and replace with 95th UTL screen. Provide ratio plots in the evaluations. Need further discussion in the text of the reports justifying placement of the threshold value (vertical line) in the plots.		Yes	Agreement was reached on discontinued use of the Slippage Test and replacement with 95th UTL; no resolution was reached on ratio plots.	EPA stated that the geochemical evaluation is only "minimally qualitative" and suggested further discussion to evolve to a more quantitative process. EPA also recommended further discussion of ratio plots, and advocated an alternative to using the maximum background ratio as the threshold value. Requires consensus on where the line should be (EPA recommends work group between technical team was mentioned to resolve this).
2. The geochemical evaluation is not applicable to aqueous samples. The geochemical evaluation procedure, as presented, cannot and should not be applied to surface water or to groundwater data.	**NO**		Use of geochemistry for other environmental media (i.e., groundwater, surface water, and sediment).	No	Discussion was limited to soils.	
a. Interpretation of data from aqueous samples involves a larger number of variables than for soils	**NO**			No		

GEOCHEMISTRY

Original EPA Comment	Was Issue Resolved at the Meeting?	Resolutions from Army's Meeting Summary	Listed as Unresolved in Meeting Summary	Was Topic Discussed?	Additions to Army's Meeting Summary	Further EPA Comment
b. Geochemical processes that control trace metal behavior in surface water and groundwater are more heterogeneous in space and time than processes affecting soil geochemistry	**NO**			No		
3. Site-specific conceptual models, using additional information, are needed in order to support the geochemical evaluations. Site-specific conditions and their influence on contaminant mobility, in all media of concern, should be incorporated into discussions of trace metal geochemistry.	YES	Use supporting information (i.e., additional lines of evidence).		Yes	Initially, Shaw said that there was enough lines of evidence in the Stats and geochemistry. EPA is looking for more lines to include soil types, grain size, site history, CSM, etc. Army appeared to agree with the request for these additional supporting data.	Supporting information (i.e., additional lines of evidence) rather than just stats and geochemistry could include: integrate information on site, history, CSM and sites-specific information on soils types based on boring logs, soil properties, grain-size , etc.).
a. The geochemistry analysis does not explain exactly what it represents from a precise scientific standpoint. A specific geochemical mechanism cannot be inferred from trace-element ratios alone. Many mechanisms may contribute to the observed ratios, including sorption onto oxides, hydroxides, or oxyhydroxides of iron, manganese, or aluminum; coprecipitation (e.g., with carbonate or sulfate phases); uptake and/or sorption by sulfide phases; adsorption onto clay minerals; and complexation by naturally occurring soil organic matter. Unless additional information is sought for particular soil types, the fundamental science behind the method is not well defined and the geochemical evaluation process is more or less empirical.	YES **with caveat**			Yes, not in detail	Group discussion of the need to revisit language in text describing the geochemical evaluation to reflect sources of uncertainty; discussion did not address details.	This item requires additional clarification regarding expanding the discussions of the uncertainties associated with the geochemical evaluation. Discussions indicated that site-specific uncertainty analysis language is needed in addiiton to updating the "boiler plate language" to place the geochemical results in proper perspective, qualitatively and quantitatively.
b. The geochemical analysis should be consistent with the wealth of geological information available for Alabama. The geochemical analysis should consider a broader range of information than the point falling on a line to make a determination. This information should include bedrock and/or source material lithology, depositional processes and environments, tectonic setting, local and regional groundwater and surface water hydrology, etc.	YES			Yes, not in detail	Soil characterization needs to be incorporated into interpretations of site data	EPA requested incorporation of additional information, where available (soil types, information from boring logs, grain size data, clays and other mineralogy, etc.)

GEOCHEMISTRY

Original EPA Comment	Was Issue Resolved at the Meeting?	Resolutions from Army's Meeting Summary	Listed as Unresolved in Meeting Summary	Was Topic Discussed?	Additions to Army's Meeting Summary	Further EPA Comment
c. There should be a consistent rationale for choosing the independent variable against which to plot the data. This rationale should be stated clearly and applied consistently; justification for changes to this rationale (for example, due to the nature of the site-specific soil type, localized geochemical conditions, etc.) must be provided.	YES			Yes	Shaw uses correlation coefficients for choosing the reference element (independent variable)	EPA requested incorporation of additional information, where available (soil types, information from boring logs, grain size data, clays and other mineralogy, etc.)
d. Exceptions (data that are not consistent with a linear relationship) must be explained, and there must be a consistent rationale for examination of potential 'outliers' before a decision is made regarding inclusion or exclusion of suspect data.	NO			No	Screening of outliers is based on visual inspection of plots	EPA is providing more detail recommendations in their comments on FTMC Training Area T-5.
4. Effects of different soil types should be incorporated. The different soil types found across Ft. McClellan should be described, and the effects of these different soil types on the geochemical evaluation should be acknowledged and discussed.	YES	Use supporting information (i.e., additional lines of evidence).		Yes, not in detail		
a. If the site data fall on a line with a steeper slope or the same slope but a greater intercept than the background data set, this may mean that the soil types are different. When soil types appear to be different, this is a data quality objectives problem. The background data set may not be representative of the site. Site-specific background data should be collected to address this uncertainty, if necessary.	YES	It was pointed out that the only approved background data for FTMC are those provided in the SAIC Background Survey Report. EPA acknowledged this and indicated that its comment regarding adequacy of the background data was more of a statement rather than a request for change in procedure.		Yes	EPA notes indicated that the Army may continue to use their current background data sets	Further clarification is necessary. The current background data set may not be representative of the site and as a consequence, there may be instances where evidence is insufficient to screen out a constitutent as background. Please see comment 7b regarding background evaluations.
b. Surface and subsurface soils should be plotted separately for both the background and site soils due to differences in surficial processes that include chemical, microbial, and depositional effects unless statistical comparisons indicate that the data sets can be combined.	YES			Yes	EPA notes indicated that the Army agreed to this comment	EPA recommended keeping surface and subsurface soils separate, regardless of the outcome of statistical testing.
5. Problems with detection limits should be acknowledged and discussed. Elements are dropped from consideration as Constituents of Potential Concern (COPCs) if the reported values are non-detects. Elements that might be dropped as COPCS due to consistent NDs are antimony (Sb), selenium (Se), cadmium (Cd), silver (Ag), and thallium (Tl).	NO			Yes		

GEOCHEMISTRY

Original EPA Comment	Was Issue Resolved at the Meeting?	Resolutions from Army's Meeting Summary	Listed as Unresolved in Meeting Summary	Was Topic Discussed?	Additions to Army's Meeting Summary	Further EPA Comment
a. High detection limits for certain trace metals may yield inaccurate conclusions regarding contaminant distributions and concentrations.	NO		High detection limits for certain metals	Yes		
b. Trace metals with detection limits higher than the screening criteria should not be eliminated as COCs in the geochemical evaluations. Antimony, known to be present with lead in site soils, is often eliminated as a COC because all reported values for a given site are non-detects.	NO		High percentage of non-detects for certain metals	Yes	Just because all samples are below detection does not permit exclusion of the chemical as a COPC. As an example, antimony was detected in very few site samples; often, all site samples were reported as non-detects, at detection limits above the background criterion (twice the arithmetic mean), the site-specific screening level, and the ecological screening value. In such cases, EPA's position was that there was not enough evidence to eliminate it on the basis of comparison to background. Non-parametric tests were suggested. EPA also suggested collection of additional data, with lower detection limits, in instances where the presence of site-related antimony was suspected. Further discussion is required to address the process for eliminating/ including metals due to elevated detection limits.	Elements should be retained as COPCs if detection limits are greater than screening criteria or select a more sensitive analytical method.
6. Alteration of metallic lead to more soluble phases should be considered. Effects of weathering reactions on lead that is left in place must be identified and incorporated into risk evaluations. Phases such as lead carbonates, hydrous carbonates, sulfates, oxyhydroxides, etc. can form under on-site surficial conditions and these phases have different solubilities and therefore different transport behaviors.	NO	EPA would like to see additional detailed discussion and site-specific application of fate and transport methodologies to demonstrate to the potential mobility or lack there of, of lead in site soils. EPA has provided a proposal on methods (see Attachment 1) that may be necessary in order to address this issue. Consideration of the potential application of such methods at FTMC requires further discussions with the working group		Yes, not in detail	Shaw stated that fate and transport of Pb in FTMC soil is determined by local geochemical conditions and couldn't be predicted	See 3. on Misc. worksheet

GEOCHEMISTRY

Original EPA Comment	Was Issue Resolved at the Meeting?	Resolutions from Army's Meeting Summary	Listed as Unresolved in Meeting Summary	Was Topic Discussed?	Additions to Army's Meeting Summary	Further EPA Comment
7. Uncertainties and limitations of the geochemistry evaluation should be discussed. Uncertainty regarding the geochemistry evaluation, from the perspective of the fundamental geochemical processes and mechanisms as well as the statistical methods, should be acknowledged.	YES	EPA to examine boilerplate uncertainty discussion in geochemical evaluation reports. Supplement/revise existing uncertainty discussions, as appropriate, with site-specific information. Begin with qualitative discussion.		Yes		EPA requests site-specific discussions of limitations and "unknowns" in the geochemical evaluation as part of the uncertainty analysis.
8. The rigorous statistical analysis should consider both Type I and Type II errors. The transformation of the data to a log-log plot should be considered in terms of its effect on the residual errors. Confidence limits around a prediction made at the upper range of the graph are so large that the uncertainty in the method increases exponentially at the upper end of the distribution of naturally-occurring concentrations. At the upper end of the distribution the method loses the power to distinguish Type II errors that are important to regulators. The method has limited usefulness in a regulatory context unless Type II errors can be controlled.	YES **with caveat**	This issue appeared to be resolved at the meeting; however, confirmation is required from the Army with respect to minimizing Type II errors as well as concurrence on a minimum number of data points to be used in the geochemical analysis. A path forward to address this comment needs to be identified. In addition, EPA wants to further clarify that if there is uncertainty regarding whether a chemical is site-related, the prudent approach is to include the chemical in the risk assessment.		Yes	The Army discussed their desire to minimize false positives (where a false positive means accepting that the site values are greater than background when it is false)	It is important for the Army to acknowledge that the EPA thinks that rejecting that site results are greater than background when it is true is a more serious error than accepting that the site results are greater than background when it is false.When there is uncertainty regarding whether a chemical is site-related or not, the prudent approach is to include the chemical in the risk assessment.

GEOCHEMISTRY

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a. As part of controlling Type II errors, a requirement of a minimum number of data points is needed. Application of the geochemical analysis to two background data points and one site data point is inappropriate, as the number of data points is insufficient.	NO			Yes	EPA reiterated this point. No clear agreement or disagreement from the Army was listed in EPA's notes so it is assumed that the Army agrees with this point.	Data quantity and quality must be sufficient.

MISCELLANEOUS

Original EPA Comment	Was Issue Resolved at the Meeting?	Resolutions from Army's Meeting Summary	Listed as Unresolved in Meeting Summary	Was Topic Discussed?	Additions to Army's Meeting Summary	Further EPA Comment
1. Adequacy of Site Characterization is questionable. It appears that many of the ranges in this document have not been fully characterized. This comment is true for various media associated with any given site. The potential for off-site migration of contaminants has not been sufficiently addressed. In addition, it is unclear that all ranges have been identified.	NO			Yes	No- EPA reiterated concerns that not all ranges are fully characterized or even identified. The Team did not discuss this point in open session.	
2. Inappropriate aggregation of data should be discussed and resolved. Aggregation of data from non-contiguous ranges into a single investigation is inappropriate and will not be accepted.	YES	The concern from the human health risk perspective arises from the fact that aggregating data that represent large geographic areas could result in apparent "dilution" of contaminant concentrations resulting in underestimating risks for receptors likely or largely restricted to smaller exposure units. However, Shaw explained that comparing all ambient site-related concentrations to conservatively developed cleanup levels precluded overlooking potentially hazardous concentrations regardless of how the exposure units were gerrymandered.		Yes		

MISCELLANEOUS

Original EPA Comment	Was Issue Resolved at the Meeting?	Resolutions from Army's Meeting Summary	Listed as Unresolved in Meeting Summary	Was Topic Discussed?	Additions to Army's Meeting Summary	Further EPA Comment
3. Sampling methodology introduces inaccuracy in surface soil characterization. The removal of bullets and/or fragments prior to collection of sample serves to bias the sample and underestimates actual concentration of lead present in surface soil. OSWER Directive #9285.7-37 Risk associated with Pb left in place may be underestimated due to lack of knowledge of Pb-bearing phases formed by soil weathering processes.	NO	EPA restated its official position that expended bullets on the ground surface constitute a CERCLA release but noted that EPA will not make an issue of it at this time. Ron noted that most of the surface bullets will be removed during remediation of the various sites. Regarding human health risk assessment, Paul pointed out that particulate lead on the ground surface has few implications to human health under the current site-conditions scenario because (1) the acute accidental ingestion of a lead fragment would have little effect on human health because fragments of metallic lead have very low bioavailability, and (2) the hand-to-mouth activity considered to be the major phenomenon resulting in chronic incidental soil ingestion may result in ingestion of "fines" but not metallic lead fragments. Uncertainty arises regarding future site use or conditions because further weathering may increase the mobility of		Yes		See GF's suggested approach for resolving this issue. [See Attachment 1 in memo.]
4. Determination of release is adequate but additional steps are required. For most documents, the information included in the subject report adequately document that a CERCLA release has occurred and therefore, a Remedial Investigation and Feasibility Study (RI/FS) with a Baseline Risk Assessment (BRA) is needed to determine the nature and extent of contamination and the associated risk to human health and the environment.	YES			Yes	EPA reiterated concerns that not all ranges are fully characterized or even identified. The Team did not discuss this point in open session.	
5. Chain of Custody Issues. Samples should be collected and retained using appropriate Chain of Custody procedures.	YES			Yes	EPA indicated that this issue is resolved.	