RESPONSE TO COMMENTS FROM THE U.S. ENVIRONMENTAL PROTECTION AGENCY ON THE DRAFT 1997 ANNUAL REPORT OF MONITORING EVENTS 8 THROUGH 10 AT SITES 1 AND 3 AND THE EASTERN PLUME, NAVAL AIR STATION, BRUNSWICK, MAINE

COMMENTOR: Michael Barry, Remedial Project Manager **DATE: 3 March 1999**

GENERAL RESPONSE TO COMMENTS

The Final 1997 Annual Report of Sites 1 and 3 and Eastern Plume has been issued with text revisions based on Maine Department of Environmental Protection and U.S. Environmental Protection Agency comments although figures, graphs, and appendix revisions to the 1997 Annual Report was limited. The 1998 Annual Report addresses the comments requesting changes to the figures and graphs of the 1997 Draft Annual Report.

GENERAL COMMENTS

1. Possible Contamination Characterization Gaps; can defer to 1998. Plume behavior in the deep sand layer varies depending upon site. Since DNAPLs were not indicated, hydrodynamic dispersion would be expected to mix much of the contamination in this layer well. While in some areas, this has proven true (e.g., CP-110 near MW-106, Figures 8-20 and 8-28, E.C. Jordan 1991); in others, contamination has existed only in the deepest portions near the top-of-clay surface (e.g., CP-118, Figure 8-20 and 8-29, E.C. Jordan 1991). Since not all monitoring wells were screened to the top-of-clay surface, due to installation prior to the development of this information, there may exist areas where contamination characterization may have been incomplete. Examples include the vicinity of MW-205A and MW-229A.

   Recommendation: Please compare the top-of-clay contour map produced during the Installation Restoration Program with monitoring well screen intervals to determine if and where further contamination characterization may be necessary, and whether mitigating circumstances exist. Well MW-205, in particular, appears to be increasing in VOC detections relative to pre-pumping (EW-1) levels, and beyond the levels recorded historically by upgradient well MW-206A. Please characterize the stratigraphy to the south and southwest of MW-205 on the opposite side of Mere Brook to determine if significant contamination exists in the area (possibly resulting from an unusual preferential flow path [E.C. Jordan 1991]) that has been partially remobilized by pumping EW-1.

   Response—The questions posed in this comment should be discussed at a Technical Meeting devoted to the geology of the Eastern Plume. An enhanced GIS has been completed which will allow 3-dimensional visualization of stratigraphic changes across the Eastern Plume. It is anticipated that this GIS will be a useful tool to address questions such as those in this comment.

2. Southern Extent of the Eastern Plume; can defer to 1998. There is an enigma in the Eastern Plume in that the semi-confined deep sand layer does not appear to have conducted contamination much beyond Mere Brook, despite stratigraphy allowing this. Investigators of E.C. Jordan in 1991 calculated that the plume would flow under Mere Brook and discharge to Harpswell Cove in 5 years. While pumping was not initiated until 3-4 years later, the anticipated expansion of the plume does not seem to have occurred during that time. If the transport estimate was correct, this suggests that either the plume reached a steady state (which is unlikely) or the hydrogeologic system was not fully understood. Three hydrogeologic alternatives are: (a) the overburden stratigraphy south of Mere Brook has not been fully characterized, (b) the southern end of the plume has been discharging to surface water more than estimated, or (c) a major bedrock fracture has been influencing the system. None of these alternatives can be ruled out at this point.

   Evidence for a bedrock role exists in the unusual geomorphology of Mere Brook, as can be seen in an older 15-minute USGS topographic map, developed prior to the base development. On this map, Mere Brook has a relatively straight and deep stream valley, running virtually perpendicular to other streams of the region, and terminating in the Merriconeag Stream Valley. While Mere Brook is thought to have developed simply as a flowing stream incising through the sediments as sea level fell (T. Weddle, Maine Geological Survey, personal communication), this model does not explain its unusual orientation, its significant linear extent, nor the steepness of its valley walls. Consequently, the possibility of bedrock control cannot be ruled out. At least one fracture running northeast-southwest has also been proposed (L. Dearborn memo to M. Barry). As a result, one model of the situation would include a possible bedrock fracture extending northwest-southeast near the southern end of the Eastern Plume, and intersecting a possible fracture running northeast-southwest along the Merriconeag Stream Valley. While bedrock drilling, carried out in the initial remediation investigation, did not identify any deep fractures, this work with the possible exception of MW-308 was not in the immediate vicinity of these sites.

   Recommendations: Section 4.6 of the document includes a recommendation for 2 wells to characterize the overburden and contamination in the plume area south of Mere Brook. To evaluate contaminant flow to surface water, it is recommended that sediment-vapor diffusion samplers be placed at 100-ft intervals along Mere Brook starting at the western edge of the Eastern Plume and running to MW-207A; and from the intersection of Mere Brook and Merriconeag Stream to the predicted intersection of the plume with Harpswell Cove (Figure 8-14, E.C. Jordan 1991) approximately 1,150 ft southwest along the cove from New Gurnet Road. Of particular interest would be the samplers located along the stream between MW-313 and GP-6, where a significant drop in elevation occurs, in alignment with the linear extension of the more upstream Mere Brook. This single event testing should identify those areas where the plume is discharging most significantly to Mere Brook. *This approach is efficient, and can also be used to determine the need and locations for proposed surface water stations.*

In addition, to test for possible contamination, not captured by the extraction system, and reaching surface water, it is recommended that 3 additional samplers be utilized: one on Merriconeag Stream at a point approximately 850 ft west of P-121 (where the plume boundary returns to the stream), one 150 ft above, and one 175 below the dam on Merriconeag Stream.

To evaluate a possible bedrock role, it is recommended that a seismic study be performed to identify if a bedrock low exists under Mere Brook, that intersects one of the two established bedrock minima (Figure 8-7, E.C. Jordan 1991) of the perpendicular Merriconeag Valley. If such an intersection exists, please install a deep bedrock well to identify major fractures and monitor for contamination. One area where such an intersection might exist is in the southern vicinity of MW-229A (where the top-of-clay surface has a narrow northeast-southwest depression, 60-75 ft below sea level), aligned with a linear extension of the Mere Brook valley.

Response—The questions posed in this comment should be discussed at a Technical Meeting devoted to the geology of the Eastern Plume. The comment raises several important questions related to potential bedrock control of formation of Mere Brook and how this may affect contaminant transport. However, this comment does not recognize three important facts: (1) a thick layer of clay overlies bedrock south of Mere Brook as noted in the direct-push report (EA 1999). Clay thickness up to 40 ft has been measured in this area, which is likely to prevent VOC from impacting bedrock even if faults may be present (although no evidence of faults has been noted in boring logs or other site work); (2) ground-water flow in the shallow and deep intervals south of Mere Brook is to the northeast, which has prevented VOC migration south of current extent; and (3) data from the Remedial Investigation indicate an upward flow gradient from bedrock which would presumably prevent migration of dissolved phase VOC to bedrock. The Navy would appreciate the chance to review the personal communications cited in this comment. The Navy looks forward to discussing the results of the August 1999 sediment-vapor diffusion samplers at a future Technical Meeting in light of this comment. Note that the enhanced GIS visualization tools developed in 1999 may be used to address these issues in lieu of additional seismic surveys of the area.

3. All tables; can defer to 1998. Please indicate on all tables whether a given well is shallow or deep. Also, please indicate in the heading on every page of every table, the title of the table, reference to Sites 1 and 3 or the Eastern Plume, and the "page number of total page numbers" (i.e., Page 1 of 8). For ease of reference and consistency, please include both dates, and event numbers, in the title block of all tables.

   Response—In the 1998 Annual Report, tables include the well screen interval (i.e., shallow, deep). The Navy does not feel it is necessary to include the title of the table into the heading as tables currently reference Sites 1 and 3 or Eastern Plume in the title. The Navy also does not feel it is necessary to number the pages because the tables are in sequential order for the matrix being presented (i.e., Seep-1 through Seep-5). Table footers currently indicate which events are being referenced. Also, annual data tables currently include columns with dates and corresponding event numbers.

(a) Effectiveness of Plume Capture, can defer to 1998. The report documents the mass of VOCs removed by the extraction wells and treatment system, but lacks a measure of the effectiveness of mass removal. Such a measure is difficult to obtain since information on original quantities of contamination-released is not available. However, it may be possible to base an estimate of plume capture on the basis of water removed. Recommendations on this are included under Specific Comments in Section 4.6, Extraction System Refinement.

Response—Calculation of the mass of contaminant remaining in the Eastern Plume cannot be estimated accurately at this time. Such estimates would require numerous assumptions and would likely have a potential error of several orders of magnitude. Therefore, these calculations were not included in the 1998 Annual Report, although the 1998 Annual Report includes calculations of VOC removal rates and discusses mass removal trends noted since 1996.

(b) Long-Term Trends, can defer to 1998. Long-term trends are discussed in the document, but are difficult to follow without comparing many tables and graphs in Appendix A. Consequently, it is difficult to get a sense of the spatial changes that have occurred in contamination of the shallow and deep aquifers.

Recommendation: For the long-term trend analysis, please include a graphic based on Figure 3-1 that depicts only those wells that have experienced VOC contamination during Events 1 through 10. In the vicinity of each well, include a small logarithmic bar graph of same scale depicting total VOCs over time. Depict shallow and deep wells with different color bar graphs. This will show, among other things, on a single graphic, the transfer of contamination in the Eastern Plume from the shallow wells in the east to the deep wells in the west (e.g., the exchange between well MW-1104 and EW-4).

Response—Figures have been added to Appendix A to illustrate sample results more clearly. Trend graphs are also included. In addition, these features have been added to the ArcView GIS project to facilitate data interpretation.

(c) Deep Ground-Water Data, can defer to 1998. Deep ground-water flow has been greatly impacted by pumping in some areas since the 1991 E.C. Jordan study. Well MW-311 had a hydrostatic head of 31.98 on 20 December 1990, compared to 20.25 ft in early November of 1996. In future sampling events, please measure the true hydrostatic head for well MW-207A in order to correctly contour the deep ground-water piezometric surface.

Response—Monitoring wells which are artesian are gauged with a pressure gauge and the true hydrostatic head is determined.

(d) Data References; can defer to 1998. Many sections in the document do not indicate the specific tables that contain the data referred to. Please ensure that every section discussing data has specific table references.

Response—In the 1998 Annual Report, table references have been added.

(e) All Figures; can defer to 1998. For ease of reference and consistency, please include both dates, and event numbers when appropriate, in the title block of all figures.

Response—Figures in the 1998 Annual Report note sampling monitoring and event numbers. These data are often present in footnotes or in the figure title.

(f) Atlas or GIS database; can defer to 1998. Considerable hydrogeologic work has been carried out at Naval Air Station Brunswick and entered into a dBase III database. Please consider establishing a GIS (ARCVIEW database constructing an atlas of all available well data including stratigraphy and screen interval). This would prove an immensely useful tool for augmenting situations presented in the event/annual reports, and for identifying further needs.

Response—An extensive GIS database has been established, and was issued in 1999.

(g) Report format; can defer to 1998. Strongly recommend issuing the draft report in a 3-ring binder so that tables and figures can be viewed with text. This would reduce "shuffling" back and forth. Incorporating as many figures into the text body of the report where they are discussed would make the report a lot easier to read. To save paper and costs, we suggest only issuing final report pages that changed from the draft with a list of effective pages for version control. Also, EPA has no requirement for single side reports.

Response—Subsequent reports have been issued in 3-ring binders. Where possible, future reports will incorporate figures into the text. The Navy anticipates the final report will be re-issued in its entirety and will re-issue revised pages only if practical.

4. Maximum Exposure Guidelines (MEGs). Many tables incorporate State MEGs and Federal Maximum Contaminant Levels (MCLs) for ease of comparison to current sample values. Some MEGs are incorrect; for example the State MEG for lead is 20 μg/L, while the tables don't indicate a MEG for lead. Also, Maine is revising the MEG tables, but this revision wouldn't affect 1997 data.

Response—The tables of the 1997 Annual Report have been revised to show the correct State MEG for antimony (no MEG), lead (MEG of 20 μg/L), and nickel (150 μg/L).

SPECIFIC COMMENTS

1. ***Section 2.2; can defer to 1998***—A general diagram of the stratigraphy to accompany the descriptive text would aid understanding. The geological profiles (E. C. Jordan 1991), in order from north to south, adapted to a single page with a reference map of profile lines would suffice.

   Response—The enhanced GIS will be used to generate site-specific cross sections in future Annual Reports, beginning in 1999.

2. ***Section 2.6 and Table 2-4***—Why were 5 analytes removed from the background ground-water sample list of 1996? In particular, in 1996, thallium exceeded the State MEG in all sampled wells, but was not included in the equivalent 1997 table. EPA has commented upon thallium in several recent Brunswick reports.

   Response—It has been the Navy's policy to only include those analytes detected in at least one of the samples, and contaminants of concern listed in the LTMP (ABB-ES 1994) on data tables. Five analytes referenced in the comment were not listed on Table 2-4 because they were not detected in the background ground-water samples.

3. ***Section 3.1***—Please include a brief mention of the pumping performed at MW-311 or reference Section 3.3.2.2, Table 3-12, and Figure 3-25.

   Response—The following text was added to the end of the 3rd paragraph in Section 3.1:

   Note that ground-water extraction was completed at MW-311 from July to November 1997 (see Section 3.3.2.2).

4. ***Section 3.1, Paragraph 4***—This paragraph and Table 3-2 disagree with Section 4.1, Paragraph 3 regarding the mass of VOCs removed by the extraction well network during 1997.

   Response—The mass removal numbers have been revised in Section 3.1, Table 3-2, and Section 4.1.

5. ***Section 3.2.1, Paragraph 1***—This paragraph indicates there are 16 EP series piezometers, with 4 added in June 1997. Figure 3-1 includes a piezometer, EP-15, which is not listed in Tables 2-2 and 2-3.

   Response—The 1998 Annual Report tables have been revised to include EP-15 and EP-16.

6. ***Section 3.2.2.1 and Section 3.2.2.2***—Section 3.2.1 Paragraph 1 states that well gauging was conducted bi-monthly in January, May, and September 1997 to identify seasonal trends in piezometric surface elevations. Please include in these two sections descriptions of the seasonal trends that were found in shallow and deep ground-water aquifers respectively, as a result of this work.

Response—The 1998 Annual Report contains discussion of seasonal variations in shallow and deep aquifers. No changes were made to the 1997 Annual Report.

7. ***Section 3.2.2.2, Paragraph 2***, can defer to 1998. Please include a brief discussion on 3-dimensional ground-water flow. Net flow direction is a function of both hydraulic conductivity and hydraulic gradient in three dimensions. Since the transition layer has been observed to have hydraulic gradients an order of magnitude lower than those of the semi-confined deep sand layer, and since the transition layer thickens as one approaches Mere Brook, the increased average difference in vertical hydrostatic head may not produce a meaningful change in vertical flow.

   Response—The 1998 Annual Report no longer contains a discussion of averaged difference in hydrostatic head and instead provide generalized discussion of vertical flow, most notably as it relates to extraction system performance. The 1997 Annual Report was not changed.

8. ***Section 3.2.2.3, Paragraph 1***—This section compares water elevation data for Sites 1 and 3, collected over 1995-1996 with data from 1997, yet only tables for the 1997 data are included. We recommend adding the graph of water levels that's been shared with the RAB as a concise and complete way to display the falling water level trend, and thus success of the remedy, at Sites 1 and 3.

   Response—The 1998 Annual Report includes graphs displaying water levels at Sites 1 and 3 throughout the monitoring program (Monitoring Events 1 through 13). No changes were made to the 1997 Annual Report.

9. ***Section 3.2.2.3, Paragraph 2*** infers that about 0.9 ft of the waste material remains saturated while Section 4.2.2, Bullet 3 infers that 0.8 ft of waste material remains saturated.

   Response—Section 3.2.2.3 is correct, and Section 4.2.2 has been revised to indicate 0.9 ft of waste material remained saturated.

10. ***Section 3.2.2.3, Paragraph 3***; can be deferred to 1998. The true cone of depression for any extraction well cannot be contoured without having multiple data points within it. Consequently, it cannot be stated that extraction wells EW-4/EW-5 impact the shallow ground-water potentiometric surface more than EW-2/EW-3 do. Without data points inside the true cones of depression, the apparent cones of depression visible for EW-4 and EW-5 in Figures 3-2 through 3-7 are contouring software artifacts.

    To state that the deep potentiometric surface maps show more limited changes in ground-water flow patterns due to ground-water extraction would imply that the extraction well network may be ineffective in capturing the deep plume. Since the deep-ground-water well network is robust near the extraction wells, the relative impacts of the extraction wells on the deep potentiometric surface can be determined to a greater degree. However, more data points would be required to accurately delineate the full extent of the cones of depression/ zones of diversion. Note that the cone of depression surrounding MW-311 in Figure 3-13

is artificially circular, despite the known variability of hydraulic conductivity at this site. A method for estimating the effectiveness of the extraction system in capturing the plume is proposed in Specific Comment No. 51.

Response—The 1998 Annual Report includes detail maps showing contour lines that cannot be displayed due to map scale in the vicinity of the appropriate extraction wells. We agree that accurate determination of cones of depression around extraction wells cannot be made without additional data points, as noted in the 1998 Annual Report.

11. ***Section 3.3.1, Paragraph 2*** misleadingly implies that water quality indicator parameter stabilization is achieved when turbidity measurements, by themselves, were reduced to below 10 NTU. Perhaps the thought conveyed was "...parameters were deemed stable when turbidity reached...?"

    Response—The sentence has been revised as follows:

    Stabilization of water quality parameters was achieved when three consecutive measurements were within 10 percent agreement of the previous measurement, ~~or~~ and when the turbidity measurements were reduced to below 10 nephelometric turbidity units (NTU).

12. ***Section 3.3.2.1, Paragraph 6 (Page 3-7, Paragraph 4)***; can defer to 1998. This section refers to Figure 3-20 for total VOC and vinyl chloride concentrations over time in the Sites 1 and 3 wells which had VOC concentrations above State MEGs or Federal MCLs during 1995 through 1997 (Monitoring Events 1 through 10). Including wells EW-6 and EW-7 in Figure 3-20 and in the discussion would completely describe trends in this area and be consistent with Table 3-11.

    Response—The 1998 Annual Report includes trend graphs for all monitoring points. The 1997 Annual Report has not been changed.

13. ***Section 3.3.2***—Recommend introducing Appendix A as a vehicle for long-term trend analysis in this paragraph. It could also be stated that the tables, not Appendix A, are the "official" data tables for the report and will include data qualifiers, MEG/MCLs, exceedances in bold, etc.

    Response—The graphs included in Appendix A are introduced in the first section of the report. The data tables will continue to include qualifier information.

14. ***Section 3.3.2.1***, can defer to 1998. This section attempts the difficult task of describing in words the trends of Figure 3-20, causing fertile ground for differing interpretations and stylistics comments. These graphs are great analytical tools and improve the report. We strongly recommend that future reports put this figure directly in this section so the reader sees them right there with the text. A distinction should be made between VOC levels/trends of shallow and deep ground water as was done in the subsequent Section 3.3.2.2 on the

Eastern Plume and in wells inside and outside of the slurry wall. VOC levels in MW-216A, EW-6, and EW-7 should also be displayed and analyzed. General comments and discussion should then be possible and stay clear of interpretive and stylistic comments.

Response—In the 1998 Annual Report, figures were added into text where possible, although this was not done if figure detail would be compromised. The position of figures at the end of the section will be maintained, otherwise figures referenced in later sections of the text would be difficult to locate. We feel it is more efficient to place all tables and figures at the end of each chapter. The 1998 Annual Report tables distinguish wells as being inside or outside the slurry wall. The ArcView GIS allows users to customize trend graph displays for data analysis. No changes were made to the 1997 Annual Report.

15. ***Section 3.3.2.1, Paragraph 6 (Page 3-7, Paragraph 4)***—Discussing VOC trends observed in EW-6/7 would aid in understanding conditions in the landfill.

    Response—Pumping was ceased in extraction wells EW-6 and EW-7 in 1997, and sampling was limited to one monitoring well within the landfill. We believe discussion of VOC movements outside the landfill is most significant. No changes were made to the 1997 Annual Report.

16. ***Section 3.3.2.1, Paragraph 6, Bullet 6, Dash 1***—Citing the long-term trend of chromium concentrations around the MCL for MW-217B would be most accurate. This should also be expected for a well in the landfill. The overall level appears steady in the Appendix A chart (Page 59 of 139).

    Response—The following sentence has been added to the first dash of the sixth bullet of the sixth paragraph of Section 3.3.2.1 in the 1997 Annual Report:

    Chromium concentrations have shown an increasing trend from Monitoring Events 2 through 4 and have shown an overall stable trend from Monitoring Event 4 through Monitoring Event 10.

17. ***Section 3.3.2.1, Paragraph 6, Bullet 6, Dash 2***—EW-6 and EW-7 arsenic exceedances should be mentioned in the text. This should also be expected for wells within the landfill footprint.

    Response—Dash 2 has been revised as follows:

    At Sites 1 and 3, arsenic exceeded the corresponding Federal MCL in ~~1~~ 3 wells (MW-218 during Monitoring Events 8 through 10, EW-6 during Monitoring Event 9, and EW-7 during Monitoring Events 8 and 9). ~~during Monitoring Event 8 through 10, and was reported above the Federal MCL of 50 • g/L during all sampling events.~~

By including wells EW-6 and EW-7 in the discussion, the fifth dash has been revised to include EW-7, which changed the number of wells to 7 and, therefore, the following sentence was also added to the 6th bullet in this section:

...Monitoring Events 8 through 10, and in EW-6 during Monitoring Events 9 and 10.

The following sentence has been added as the 7th dash:

Thallium was reported at concentrations in exceedance of the State MEG in 2 wells (EW-6 and EW-7) during Monitoring Event 9.

18. ***Section 3.3.2.1, Paragraph 6, Bullet 6, Dash 3***—The aluminum MCL (200) is much lower than the listed MEG (1,430); but aluminum exceedances are attributed to site background at Brunswick. EPA recommends a statement to the effect that numerous well aluminum MCL exceedances are due to site background.

Response—An additional dashed sentence was added to this section as shown below:

— *Aluminum was also reported above the corresponding MCL in several wells. However, exceedances are attributed to site background conditions.*

19. ***Section 3.3.2.1, Paragraph 6, Bullets 5 and 6***—These bullets don't relate to Figure 3-20 and should be a new paragraph and refer the reader to Table 3-8 and Appendix A graphs.

Response—Reference to the appropriate figure, table, and Appendix A have been added, as requested.

20. ***Section 3.3.2.2, Paragraph 2***—Recommend referring to Table 3-9 as the location of data discussed in the bullets of this paragraph.

Response—A reference to Table 3-9 has been added.

21. ***Section 3.3.2.2, Paragraph 2, Bullet 2***—Recommend citing the concentrations observed in ground-water samples relative to those observed in method blanks to justify eliminating any constituents of concern as likely laboratory contaminants.

Response—The data quality review section of the monitoring event reports provides this discussion, therefore, no change was made.

22. ***Section 3.3.2.2, Paragraph 4 (Page 3-10, Paragraph 1)***—Can defer to 1998. Same observation as Comment No. 24 below. We strongly recommend inserting Figure 3-21 into this section to minimize the words required to describe the long-term trend results.

Response—A reference to Table 3-9 has been added to Section 3.3.2.2, Paragraph 4.

23. ***Section 3.3.2.2, Paragraph 5, Bullet 1 (Page 3-10, Paragraph 2, Bullet 1)***—It's likely the organic contamination originally observed at MW-1104 moved down into the deep sand layer to EW-4 and EW-5 due to vertically downward hydraulic gradients. The 100 μg/L line at the north end of the Eastern Plume in Figures 3-17 through 3-19 reflects this due to the high contamination shown at MW-306. The Appendix A graph of volatiles for MW-306 peaked during Event 4, approximately 6 months after MW-1104 peaked. This follows the findings of the 1991 E. C. Jordan study which predicted ground-water seepage velocities of about 1,235 ft/year in the vicinity of MW-1104. At this rate, to travel the 600 ft between the wells would require 5.8 months. Documenting this observation would aid the reader's understanding of the plume.

    Response—The Navy agrees with the observation noted above. The GIS visualization tools which have been completed will provide useful discussion point in future reports to link VOC migration pathways and site lithology. No changes were made in the 1997 Annual Report.

24. ***Section 3.3.2.2, Paragraph 6 (Page 3-11, First Partial Paragraph)***—Can defer to 1998. The observation that high concentrations of VOCs relate to depressions in the top-of-clay contour surface is well worth emphasizing. Including a simplified professional graphic depicting this (i.e., not all top-of-clay contours need be depicted) would improve visualization of the plume.

    Response—Please see response to EPA General Comment No. 1 related to GIS visualization. This topic would best be addressed in a technical meeting.

25. ***Section 3.3.2.2, Paragraph 7 (Page 3-12, Paragraph 2)***—Can defer to 1998. Adding Figures 3-22 to 3-24 would improve this section considerably.

    Response—Additional graphics were added to the 1998 Annual Report. No change was made to the 1997 Annual Report.

26. ***Section 3.3.2.2, Paragraph 11 (Page 3-12, MW-311 Extraction, Paragraph 2)***—Indicates that extraction well EW-2A was scheduled to be installed during 1998; this doesn't agree with Section 3.3.2.4, Paragraph 2, Bullet 2, which states that the well "has been installed." Also referring to Table 3-12 and Figure 3-25 would help the reader.

    Response—Additional text has been added to Section 3.3.2.4, as follows:

    Therefore, an extraction well (EW-2A) is scheduled to be installed adjacent to MW-311...

27. ***Section 3.3.2.3, Paragraph 1***—Lead also exceeded the State MEG (20 μg/L) and the Federal MCL (15 μg/L) in MW-810. MCL/MEG exceedances in wells MW-810, 211B, and MW-NASB-020 challenge their validity as background wells. Table 3-10, among others, also does not list the State MEG for lead and should be cited in this paragraph.

Response—See response to MEDEP Comment Nos. 4 and 44b on the 1997 Annual Report. The discussion of background wells has been removed from the text of the 1998 Annual Report. MEG values have been corrected.

28. ***Section 3.3.2.6, Paragraph 1***—Should probably reference Table 3-11 instead of Table 3-13.

    Response—The correct table reference has been added to this section.

29. ***Section 4.1, Paragraph 1***—Recommend referring to Table 3-1 for GWETS pumping details. This information could be easily put into a chart and included in the section to better convey these data.

    Response—A reference has been added to Table 3-1 in Section 4.1, Paragraph 1.

30. ***Section 4.1, Paragraph 2***—Can defer to 1998. A discussion of influent and effluent concentrations of the treatment system should be either here or in Section 3.1 and the other section referred to. The reason why detectable concentrations of VOCs are in the plant effluent should be stated. We anticipate a summary of the reason why GWETS redesign work was initiated will be in the 1998 report.

    Response—The plant effluent is piped to the Brunswick Sewer District and, therefore, effluent concentrations are not discussed in the annual reports. Details on refinements to the GWETS are addressed in separate reports and will not be included in the 1998 Annual Report. Actual plant modifications would be summarized in future annual reports.

31. ***Section 4.1, Paragraph 3***—States that the total VOC mass removed in 1997 by the extraction/treatment system was 137 kg, of which 87 kg was removed from the Eastern Plume. However, Table 3-2 and Section 3.1, Paragraph 4 indicate that the same figures are 51.4 kg and 51.0 kg, respectively. (EPA's rough estimate is 286 lb or about 130 kg of VOC removed by the GWETS in 1997. Interesting that this is a little more than half a drum, or about 25 gal of VOC.)

    Response—The text of the 1997 Annual Report in Sections 3.1 and 4.1 has been revised to correspond with data previously reported on Table 3-2 (i.e., 84.75 kg total VOC removed in 1997).

32. ***Section 4.2.1, Paragraph 2***—Can defer to 1998 for direct-push data. Please briefly mention the impact of the clay trough on deep ground-water flow in this paragraph. The semi-confining nature of the transition layer results in a proportion of the flow moving preferentially along the deepest segment of the trough.

    Response—This topic should be discussed at a Technical Meeting. No changes were made to the 1997 Annual Report.

33. ***Section 4.2.2, Bullet 2***—As mentioned earlier, please use the same value for the amount of saturated waste, in this section and in Section 3.2.2.3, Paragraph 2.

Response—These values have been changed to be consistent at 0.9 ft.

34. ***Section 4.2.3, Paragraph 1***—Can defer to 1998. This section in next year's report should be rewritten in light of Comment No. 21 on Section 3.2.2.3, Paragraph 3, regarding the relative impact of extraction wells on potentiometric surface maps.

Response—This comment is unclear. Comment No. 21 does not refer to potentiometric surface maps. The 1998 Annual Report notes that additional data points are necessary to fully define cones of depression surrounding extraction wells.

35. ***Section 4.3.2, Paragraph 1***—Can defer to 1998. Similar to Comment No. 25, summarizing trends in words is difficult. We recommend including charts 3-22 through 3-24 in this section to reduce differing interpretations from the same data. Also, some information here seems to be redundant to Section 3.3.2.2.

Response—In order to minimize stylistic differences in describing trends, the 1998 Annual Report includes additional graphs and with less text describing trends, except where trend identification is necessary to understanding changing conditions at these sites.

36. ***Section 4.3.2, Paragraph 1, Bullet 8***—We agree that 1997 data for these wells are either steady or inconclusive. However, a case for steady to declining levels since 1995 could be made.

Response—This observation has been noted; no changes have been made in the 1997 Annual Report.

37. ***Section 4.3.2, Paragraph 2***—The comparison of Figure 3-25 with the graph for MW-311 in Appendix A shows that during the extraction pilot testing, total VOC for the well dropped initially by about 30 percent (or approximately 5000 μg/L from commonly reported non-pumping values), and then held fairly steady at this level.

Response—We agree with this observation. Text has been added to last paragraph of Section 4.3.2 as shown below:

> *..., a significant decrease occurred in July, followed by a relatively stable trend from August through November. Concentrations of total VOC declined from 15,000 to 7,500 • g/L, and TCE declined from 11,000 to 6,000 • g/L.*

38. ***Section 4.4.3, Paragraph 1, Bullet 4***—This section indicates that no discernible trends were observed in target analyte concentrations in seep samples during 1997. However, the distinct arsenic trend observed at SEEP-5 should be commented upon.

Response—The following text has been added to the fourth bullet of Section 4.4.3:

However, arsenic concentrations in SEEP-5 were noted to have increased from Monitoring Event 8 to Monitoring Event 10 from 12.8 • g/L to 1,590 • g/L.

39. ***Section 4.6, Sampling Frequency, Bullet 2***—Water budgets in Maine demonstrate that July, August, and September generally have lower water levels than October. Should a lower sampling frequency be implemented, February/August or March/September would be preferred combinations over April/October.

    Response—A sampling frequency of April and September was agreed upon at the 10 February 1999 Technical Meeting. No changes were made to the Final 1997 Annual Report.

40. ***Section 4.5***—We strongly concur with the corrective actions set for 1998 and are encouraged that an inspection/maintenance program for the landfill cap is part of the revised LTMP.

    Response—No response required.

41. ***Section 4.6, Extraction System Refinement, Bullets 1 and 2***—Please be more specific about how further lithologic borings would enhance these data. The extraction wells appear to have been located well with regard to the top-of-clay surface, with the possible exception of EW-3, which appears to be screened somewhat above the top-of-clay surface. Consequently, it is not clear what is to be gained from further lithologic characterization, given the extensive penetrometer study done by E.C. Jordan (1991).

    If further lithologic study is performed, we recommend a cone penetrometer approach due to its efficiency, and since the locale is conducive to such work. This approach can rapidly generate much of the other additional characterization that has been suggested.

    We concur that any new extraction wells should be screened in the deep sand layer only, provided it has been verified by piezometric sampling of shallow ground water around the extraction wells that no contamination has been drawn into the shallow system. EW-4 and EW-5 are the most likely candidates for this potential problem.

    Response—The Navy will consider these suggestions during future re-assessments of the extraction well network.

42. ***Section 4.6, Extraction System Refinement, Bullet 3***—Can defer to 1998. In addition to the supplied recommendations, use of modeling to calculate a water budget for the area of the Eastern Plume could estimate extraction system plume removal efficiency by calculating the percent of the water leaving the system versus that captured by the extraction wells. Augmenting this information with an estimate of the plume mass remaining, as currently characterized, and the time frame required to capture this mass might be more precisely estimated than the current 13- to 77-year duration.

Deep ground-water flow has been greatly impacted in some areas since the 1991 E.C. Jordan study. Well MW-311 had a hydrostatic head of 31.98 on 20 December 1990, compared to 20.25 ft in early November of 1996. Scenarios could be developed to indicate the net effect of pumping on piezometric surfaces and the resulting changes in ground-water flow in this area. This could be especially useful as new data indicate the plume may be discharging to Mere Brook.

Response—This issue should be discussed during a Technical Meeting. It is anticipated that further discussion of these topics will be necessary using the GIS visualization tools and additional data before more definitive conclusions can be made. No changes have been made to the 1997 Annual Report.

43. ***Section 4.6, Additional Data Collection, Bullet 1***—Can defer to 1998. Future collection of nitrate and sulfate data in addition to oxygen, manganese, iron, and arsenic for all wells and Sites 1 and 3 would provide data to develop radial diagrams for interpretation of the redox zonation that occurs beneath and downgradient of landfills. The same method on Eastern Plume wells could illustrate temporal and spatial trends for individual parent ethane compounds. Specifics of this visualization method are contained in Carey et al. (1998). It is worth noting that at Sites 1 and 3, SEEP-5 has shown significant increases in arsenic (Monitoring Event 11, approximately 6,500 μg/L), suggesting that the ferrogenic zone of the landfill's plume lies in the vicinity of this seep.

Response—These comments will be considered in future refinements of the monitoring program at Sites 1 and 3. The Navy agrees that increased arsenic at SEEP-5 is likely in response to changing redox conditions caused by closure of the Sites 1 and 3 landfill, or may be the result of reduced seep flow (due to the landfill slurry wall) which may be causing increased sediment entrainment during sampling. No changes were made to the 1997 Annual Report.

44. ***Figure 3-1***—Can defer to 1998.

(a) The leachate sediment-stations LT-1 through LT-5 are the same locations as SEEP-1 through SEEP-5.

Response—The 1998 Annual Report will show only the SEEP and LT locations which were sampled during the reporting period. No changes were made to the 1997 Annual Report.

(b) Please add well MW-211B to the figure.

Response—Monitoring well MW-211B is already shown on Figure 3-1 in the Draft 1997 Annual Report.

(c) Six stream gauging points are listed in Table 3-4 as GP-1 through GP-6. Table 3-19 lists 3 gas probe points also as GP-4, GP-5, and GP-6. Apparently, to avoid confusion, Figure 3-1 identifies the gas probe points as G-4, G-5, and G-6. Labels for the gas-probe points would be better if consistent throughout the text, tables, and data records.

Response—Table 3-19 has been revised to be consistent with Figure 3-1 (i.e., gas probe points labeled as G, stream gauges labeled as GP).

45. ***Figure 3-1***—Can defer to 1998. Adding a figure layer for fences and the Navy property line would add more information and speak to access considerations for exposure.

    Response—The base boundary has been added to the site map in the 1998 Annual Report. Existing base surveys do not show all fences currently in place. Therefore, adding a fence layer would require a significant effort with little actual benefit and, therefore, no changes have been made in the 1997 Annual Report.

46. Figure 3-2 seems to have missed the slurry wall layer for Sites 1 and 3.

    Response—The location of the slurry wall has been added to the 1998 Annual Report figures. No changes have been made in the 1997 Annual Report.

47. ***Figure 3-3***—This figure does not appear to be contoured correctly in the vicinity of GP-6 and MW-313. Please correct this figure.

    Response—This figure has been corrected in the 1998 Annual Report.

48. ***Figures 3-2 through 3-13***—Can defer to 1998. The contouring suggests that potentiometric values were available for the extraction wells; the values should be included as appropriate.

    Response—Potentiometric values have been added to extraction wells in the 1998 Annual Report.

49. ***Figures 3-8 through 3-13***—Well MW-308 does not appear to have been utilized in contouring the deep aquifer in Figures 3-8, 3-9, and 3-12, while it appears to have been utilized in Figures 3-10, 3-11, and 3-13. Please check and verify figures if required.

    Response—Monitoring well MW-308 is a bedrock well and should not be included in contouring the deep aquifer. Figures 3-10, 3-11, and 3-13 will be revised to exclude these data in future annual reports. No changes were made to the 1997 Annual Report.

50. ***Figure 3-14***—MW-313 appears to be labeled with water elevation data rather than VOC data.

    Response—This has been corrected in the 1997 Annual Report figures.

51. ***Figures 3-14 through 3-19***—Figures 3-17 through 3-19 were contoured using information from well MW-106, which is a shallow well. Please check and verify figures if required.

    Response—Figures 3-17 and 3-18 have been revised to remove MW-106. Figure 3-19 did not include MW-106, therefore, no changes were made.

52. ***Table 2-1***—Can defer to 1998. A number of chemical tests are performed beyond those listed in Table 2-1. For instance, ground-water samples from Sites 1 and 3 are tested for 9 additional inorganic analytes beyond Table 2-1; surface water samples related to Sites 1 and 3 are tested for 11 additional analytes beyond Table 2-1. It may be worthwhile to review the test suites, to see if unnecessary testing could be reduced.

    Response—The actual analytical methods have been presented in the 1998 Annual Report. No changes were made to the 1997 Annual Report.

53. ***Table 2-4***—This table is a duplicate of Table 3-10.

    Response—Table 3-10 has been removed from Chapter 3 and subsequent tables have been renumbered in the 1997 Annual Report.

54. ***Tables 3-1 and 3-2***—The gallons extracted, as calculated from Table 3-1, do not match the figures indicated in Table 3-2. Please investigate this and correct as appropriate. EPA's rough estimate was about 137 kg of VOCs extracted in 1997.

    Response—Table 3-2 has been revised in the 1997 Annual Report. See response to specific Comment No. 4.

55. ***Table 3-9***—Please include in this table the concentrations of all eight VOC referenced in Section 3.3.2.2, Paragraph 2, Bullet 1; or alter the text.

    Response—The 8 VOCs referenced in the first bullet of the second paragraph of Section 3.3.2.2 are correct. Tables include only those analytes detected in at least one of the samples, and the constituents of concern listed in the LTMP (ABB-ES 1994) on the data table; therefore, it was considered unnecessary to include excess information on the data tables.

56. ***Table 3-18***—It is not clear from the Summary of Notes Table (or Standard Notes Table) what is meant by the superscript (a) on the leachate station analytes.

    Response—The following note has been added to the Summary of Notes Table for seep sediment as the superscript (a):

    (a) Reanalysis conducted on sample due to low surrogate recovery.

57. ***Summary of Notes Table***—Can defer to 1998. Referencing the Standard Notes Table on every page of appropriate multi-page tables would be more clear to the reader.

    Response—This note has been added in subsequent reports, as necessary.

58. ***Appendix A includes data for the first event of 1998, Monitoring Event 11***—We recommend adding a footnote that Event 11 data are beyond the original scope of this document but that they were available at the time of publication and were provided as a courtesy for enhanced interpretation.

Response—These graphs have been revised and no longer include Monitoring Event 11 data.

We understand that the tables and graphs of Appendix A were a successful additional effort to aid understanding of the data and are not intended to be "official" tables with complete data qualifiers. However, the following inaccuracies were noted:

a. Tables and graphics are included for wells listed as MW-216, MW-216A, and MW-216B. The data listed for MW-216 appears to be from MW-216A.

   Response—These redundant data points have been removed from Appendix A in the 1997 Annual Report.

b. The Monitoring Event 9 analytical values for MW-229B and MW-229A appear to have been switched in Appendix A. They appear to be listed correctly in Table 3-9.

   Response—These corrections have been made in the 1997 Annual Report.

c. Can defer to 1998. We recommend adding a header on each page (or a cell by the well name) for if the well(s) belong to Sites 1 and 3 or the Eastern Plume and labeling the well tables and graphic as either deep or shallow. This would greatly aid the reader.

   Response—This information has not been changed in the 1997 Annual Report, although tables in the 1998 Annual Report have been revised to note the requested shallow or deep designation.

d. Can defer to 1998. We recommend adding columns for MEGs and MCLs in the tables.

   Response—This comment is unclear. MEG and MCL are present on graphs in Appendix A.

e. Can defer to 1998. Some seep-station sediment data are listed under the titles SEEP-1/Sediment through SEEP-5/Sediment, while other sediment data for the same stations are listed under the titles LT-1 through LT-5.

   Response—These corrections have been made to the 1998 Annual Report. No changes were made to the 1997 Annual Report.