

1/22/03

**COMMENTS ON FIELD INVESTIGATION OF BEDROCK IN  
THE EXPLOSIVE ORDINANCE DISPOSAL RANGE,  
BRUNSWICK NAVAL AIR STATION  
DATED 22 JANUARY 2003 BY GANNETT FLEMING**

EA Engineering, Science and Technology has reviewed the U.S. Environmental Protection Agency (EPA) trip report entitled *The Field Investigation of Bedrock in the Explosive Ordinance Disposal Range Brunswick Naval Air Station* by EPA's consultant Gannett Fleming, Inc. dated 22 January 2003

EA is concerned by the continuing trend of Gannett Fleming, on behalf of EPA, presenting hypotheses and theories for the Naval Air Station (NAS) Brunswick project in documents that have not had the supporting data provided to the Brunswick Technical Evaluation Group (TEG) that would allow a third party professional peer review of the proposed theories and hypotheses. Without presenting supporting data, other groups cannot provide an independent review of the proposed theories and hypothesis. We believe this constitutes a significant problem, as this continuing practice has the potential to misinform the public through documents that have become part of the Administrative Record. Currently, there has been no review of Gannett Fleming's data by the Navy or its consultant. Instead, the Navy and EA have spent considerable effort refuting and disproving Gannett Fleming's hypothesis and theories. Despite the good-faith attempts by the Navy to focus these discussions so issues can be resolved, new theories continue to be put forth which have limited the ability of the TEG to evaluate current conditions, and to move the Long-Term Monitoring Program forward at this facility. We believe the unsupported hypothesis put forth by Gannett Fleming have delayed by several years the implementation of a natural attenuation remedy, and limiting or cessation of ground-water extraction. This delay in evaluating other effective remedies for ground water in the Eastern Plume may have resulted in the expenditure by the Navy of considerable time, resources, and money.

In an attempt to resolve this ongoing issue, EA recommends that the Navy submit EA's comment letter to the NAS Brunswick Administrative Record with a Navy cover letter so that the Navy's interests are represented and procedural concerns are documented.

EA's review comments of this document are presented below.

#### **GENERAL COMMENTS**

*Comment No. 1*—The Field Investigation Report completed for the explosive ordinance disposal (EOD) range draws a definitive link between the presence of surface linear features and underlying bedrock fracturing. Many statements in this document make this connection. The bedrock investigation at the EOD is based on the assumption that the hypothesized "linears" are in some way related to bedrock fracturing. A reader of this document could easily assume that this sort of relationship has been firmly established, when in actuality, no such relationship has been shown to exist by EPA's contractor, or by previous data. Because this report was completed at the request of EPA by their contractor, a member of the public could cite this report, as currently written, as proof that fracturing in bedrock has some connection to the hypothesized linear features. In the absence of any supporting data, we strongly object to that connection being drawn.

This comment has been raised several times before, and despite previous objections, a definitive link is again made by EPA's contractor in this document. This report, and others in the future, must clearly note that the theories being tested in this field program are entirely conjecture and may not actually exist. In addition, future documents should include supporting data and it should be presented so that the reader can verify the data, evaluate the theory(ies), and determine the validity of the hypothesis.

Similar to what EPA added to the *Draft Final Work Plan for Geophysical Investigation of Bedrock Fracture Zone at Site 11 and Areas Downgradient* (dated 8 November 2002), we recommend the following statement be included at the beginning of the report and in the cover letter so members of the public do not overemphasize theorized conditions that have been collected at this site.

*All existing chemical data at NAS Brunswick indicate the Eastern Plume is located only in the unconsolidated geologic units over bedrock, and that no bedrock impacts have occurred. However, EPA has hypothesized that contaminants may have contacted bedrock at some time in the past, and that some amount of contamination may have entered bedrock if certain bedrock conditions are present. This hypothesis is unlikely and it has not been tested scientifically, but EPA feels this scenario, while unlikely, could be conceptually possible. This investigation is being planned to collect data that can be used to quantitatively assess whether bedrock impacts are likely. The reader should realize the discussion of bedrock conditions included in this Work Plan are mostly hypothetical and that an unlikely set of conditions would be required for the contaminants of the Eastern Plume to have entered bedrock in the past. This investigation is designed to collect data that will assist site decision-makers when determining whether contaminants could have entered bedrock in the past, or whether the current understanding of the Eastern Plume is accurate.*

**Comment No. 2**—The evidence for surface linear features has never been submitted in written form for Navy review and, therefore, we cannot offer an opinion as to whether some connection between surface linear features and bedrock fractures is likely. Similarly, the geological review at the EOD range provides additional data, but has not proven any meaningful relationship exists between the top of bedrock and surface linear features. We would again request EPA's contractor provide the GIS overages which show the linear features, and provide a description of how they generated so the Navy can review these data. Without this, any discussion of a connection between "clay linears" and "lineaments" in bedrock and hydrogeology cannot be evaluated by the Navy. The concept of "clay linears" was first proposed in 1998 by Gannett Fleming. To date, the Navy has not seen any data to support this concept despite 4-or more years of requests for the data.

**Comment No. 3**—The Field Investigation Report does not provide a significant discussion of the hydrogeologic conditions that may relate to any observed fracturing noted at the EOD. The presence of fractures or foliation in bedrock has never been disputed by the Navy, and is documented by the existing bedrock monitoring wells at NAS Brunswick. However, EPA's contractor has hypothesized that significant quantities of ground water can be transported along these fractures, and may have the potential to move offsite (over 2 mi) to the south. We find this conjecture to be unfounded by what we know about the hydraulic properties of bedrock at the site. This trip report does not provide any evidence to support the bold assertion that undiscovered fractures can conduct the Eastern Plume from Site 11 to offsite receptors.

We would like to re-focus this effort, and future bedrock investigations, on the water-bearing nature of the bedrock, and how to best locate a bedrock monitoring well at Site 11. We were under the assumption that this field effort would collect useful data to address these issues. To provide additional data that could help interpret the geophysical data scheduled to be collected at Site 11, we would recommend the EOD bedrock fractures be evaluated for water-bearing potential over a greater scale (i.e., meters or hundreds of meters) as this sort of data would shed light on whether ground-water movement is possible in bedrock over long distances. Currently, there are no data to support the conjecture that large-scale water-bearing fractures are present that could conduct water from Site 11 (the only potential entry point for overburden contaminants to bedrock) to offsite receptors. No additional data are provided in this report that would contradict the currently accepted conceptual model that the Eastern Plume is contained in overburden, and that no significant volatile organic compound concentrations have been detected in bedrock monitoring wells.

#### **SPECIFIC COMMENTS**

**Section 1.0, Background**—We recommend the text be revised to note the hypothetical nature of the linear features, and to clearly note this hypothesis remains untested. Please see General Comment No. 1 for the text we believe is needed to alert citizens or others who may read this document that all existing chemical data from NAS Brunswick show the bedrock at the site is not impacted, and is not a significant migration pathway for contaminants.

**Section 2.0, Regional Bedrock**—The document does not provide any references to note where these facts originate. Statements should be referenced so the reader can clearly note whether statements in this section are based on previously published literature, or are based on data collected during this work.

**Section 3.0, Key Findings**—The text references that 80 bedrock features have been observed. However, there is no discussion of where these data points were collected, or any description of what geographic area they may represent. The reader is left to guess that all measurements are from the EOD area, but their actual locations within the EOD (or at other locations in the area) are not known. A map showing the location of each point and the relevant features observed is necessary for the reader to interpret the significance of any observations made regarding bedrock. Without knowing where these data points were collected, a reader cannot interpret the accuracy of the statements provided in the document, nor provide any meaningful assessment of the information noted in Sections 3, 4, or 5 of this document.

**Section 3.3, Site 11 Bedrock Peak**—The document states that *...considerable evidence now suggest the bedrock peak at Site 11 is in fact a north-northeast oriented ridge with a steeper western face. Such a feature may or may not include a pegmatite sill*. The reader is left wondering what that evidence is, and where it may be found. If this statement is meant to suggest that surficial bedrock features observed at the EOD range can be directly related to subsurface features at Site 11, we must point out that this sort of conjecture is entirely hypothetical, and has not been discussed with the Brunswick TEG.

**Section 3.4, Pegmatite/Meta-Volcanic near CL-1**—The actual presence of the feature referred to as "CL-1" has never been acknowledged by the Brunswick TEG, other than by EPA's consultant. No peer-reviewed reports or documents which contain a meaningful description of

this feature (or other "linear features") have been provided to the Brunswick TEG for comment. Therefore, the proposed relationship between the Pegmatite/meta-volcanic rock unit and this feature appears to have no scientific basis. We, therefore, cannot comment upon whether the "CL-1" feature exists, nor whether any rock units may be related to this hypothesized feature.

**Section 3.5.1, Cape Elizabeth Schistosity**—This section includes the statement that *... west-facing slopes of the Cape Elizabeth rock are sufficiently steep and high enough to rise above the Presumpscot clay and may make good hydraulic contact with overburden formations. This observation applies both to the Site 11 bedrock peak, and to the (west-faction) east wall of the north-northeast bedrock trough, especially between EW-5A and MW-305.* However, there are no data provided in this report to support this statement, nor in any other document that has been made available to the Navy for review. Without supporting data which can be peer reviewed by the Brunswick TEG, this statement should not be presented and must be considered to be entirely hypothetical. Unless supporting data are provided, this statement should be clearly identified as conjecture, or removed from this report. We strongly object to statements such as this that lack any supporting scientific data, and which make conclusions on little or no evidence. As with similar statements made in this report, a reader could easily assume this statement is fact, in direct contradiction to all existing data. Because this statement is originating from EPA's consultant, the document must clearly delineate proven statements from hypothesis.

**Section 3.5.4, All Bedrock Features**—The report notes 80 bedrock observations were included in this analysis. However, no data are provide in the report to illustrate where these measurements were recorded, nor what the actual measurements are. At a minimum, a figure is needed to show where these measurements were collected, and a table must be provided so these data could be checked or reproduced in the future. Without additional information, the reader cannot evaluate the accuracy of the rose diagrams provided in Figures 5A to 5D, nor interpret their meaning with any certainty.

**Section 3.6, Fracture Correlation of Lineaments**—This section includes the statement *... Consequently, 7 of 9 lineaments near Site 11 can be considered fracture-correlated (Figures 5 and 6). In addition, a small set of EOD fractures does correlate to N50E, suggesting a possible physical reality for the two NE oriented lineaments...* As with other unsupported statements noted above, this statement appears to be made without any supporting data. Simply stating that a lineament near Site 11 can be considered to be fracture correlated does not provide sufficient evidence. The referenced figures do not add any support to this statement. We would suggest that based on the data presented in this report and other reports, such as the Remedial Investigation and subsequent geologic investigations at NAS Brunswick, there is no evidence to support the presence of lineaments near Site 11 which may be continuous, nor that fractures at EOD support their existence in any way.

**Section 3.7, Bedrock Hydraulic Conductivity**—This section includes the statement *... it is likely that many bedrock areas will register greater vertical than horizontal hydraulic conductivity.* What data are offered to support this statement? This appears to be an opinion based on field observations that lacks any hydrogeologic support. The report does not document descriptions of any fractures that could be used to support this statement. We believe that the issue of bedrock conductivity is a critical issue to be discussed and resolved before the bedrock monitoring well at Site 11 is installed to test the hypothetical ideas presented by EPA's consultant. However, this

statement cannot be considered as credible unless some sort of data are provided in support. This statement should be clearly identified as conjecture, or removed from this document.

*Section 4.0, Ramifications for the Geophysical Investigation*—We agree with Bullets 1 and 2. Bullets 3, 4, and 5 do not appear to be supported by information contained in this report. We would like to point out that Bullet 5 mentions investigating the possibility of fracture zones near EW-5 and MW-305. No previous mention of this area has been made to the Brunswick TEG, and we are not clear as to how the bedrock study at the EOD range relates to the area near EW-5. The study of bedrock at the EOD was completed to assess and gather more data on bedrock to help interpret the geophysical investigation planned for Site 11. The inclusion of new areas for review appears to be unsupported.

*Section 5.0, Further Field Work*—We believe that further field work would be warranted, but that the goals, objectives, and methods should be discussed with the Brunswick TEG first, and that other interested parties be included in field efforts. Clearly, the data collected from this initial bedrock review are limited and highly subjective and, therefore, can be interpreted in many ways. The recommendations for future field work must focus on two issues:

1. How can the EOD bedrock exposures help the TEG plan and evaluate the planned geophysical investigation?
2. What can we learn about water-bearing fractures, and the likely hydrogeologic conditions that exist in bedrock?

Insofar as the recommendations in this section support these goals, we agree that additional data collected would be useful. However, insufficient data have been presented by EPA's contractor to make the case that hypothesized linear features are a viable hypothesis, or are worthy of the expenditure of additional resources.