

## NAVY'S RESPONSES TO EPA'S COMMENTS ON THE SITE 16 DRAFT PHASE II RI QAPP

### GENERAL COMMENTS

#### Comment 1:

Conceptual Site Model (CSM): EPA acknowledges that data collection is ongoing at this site, and as such it is somewhat premature to solidify a particular CSM. Yet, it is certainly appropriate to begin the CSM development process based on what is currently known and not known about the release(s) identified in the greater site 16 area. It is also appropriate that the CSM will continue to evolve in the face of new information. EPA's review has identified a number of issues which bear on CSM development as well as, to a varying degree, on the Work Plan for the upcoming investigation. These issues include the nature, number, and locations of the potential source areas, ground water flow directions and gradients (horizontal/vertical) for all aquifers, observed patterns in the data with respect to COCs and degradation products, location and importance of significant fracture zones within the bedrock, etc. Perhaps most importantly, these issues point to the need to view site 16 from the larger perspective. For example, the data presented suggests that there are a number of reasons to further examine the underlying conceptual site model for Site 16 in the context of the adjacent areas to the northwest, west, and southwest, including the building 318 and 319 areas, and perhaps even the PR-58 NIKE/site 03/04 areas. Given the fact that recent drilling in the Building 41 area has failed to identify a definitive source for the substantial plume in that area, areas upgradient and up bedrock slope to Building 41 should now be given further consideration. It is possible that the Navy Sites 03, 04 as well as the former NIKE Site are possible contributing sources of the observed chlorinated compound (TCE) contamination in the Building 41 area as well as buildings E-319, 318 or the Creosote Dip Tank Area. In general, the range of potential conceptual scenarios which are insufficiently constrained by the data suggest that additional discussions concerning site conceptual model are needed. Most of the general comments below, therefore, speak to some aspect of the as-yet unclear CSM for the site, and offer opportunities to redirect or leverage resources so that the CSM may be clarified/improved efficaciously. Various conceptual site model issues are discussed further, below, as general and specific comments.

#### Response —

Comment noted.

The drilling and installation of 3 wells during February 2002 in Building 41 (demolished and the area paved during October 2002 by RIEDC) did indicate that the former vapor degreasing unit and Cosmolene dipping tank

areas do not appear to be a source for the chlorinated volatile organic compounds (CVOC) (mainly, trichloroethene [TCE]) plume detected in deep ground water. However, regarding the EPA statement that this work 'has failed to identify a definitive source for the substantial plume in that area,' should not be taken to mean that there is no source area at Building 41 (such as spills outside near the southeastern corner of that building which is where some of the highest total CVOC concentrations have been detected in deep ground water).

With regard for assessment of the need for and location of well clusters to address EPA's hypothesis for the connection of the deep CVOC in ground water beneath the PR-58 Nike Site / Site 03 to Site 16, the Navy added approximately 4,500 lineal ft. of seismic refraction geophysical profiling along Davisville Road, Marine Road, and Sanford Road to assess the configuration of the bedrock surface between Site 03 and Site 16. The related fieldwork was completed during August 2002. The preliminary results of that work were used to update the working draft of the Top of Bedrock figure (11 September 2002). This figure, along with a recommended location for additional monitoring well cluster (MW16-55D/R/R2) within an interpreted depression in the bedrock surface along the north side of Davisville Road, was presented during the 13 September 2002 BCT meeting. Concurrence with the well cluster location was received from EPA and RIDEM, and wells were constructed during late September-early October 2002.

**Comment 2:** Soil Sampling: Additional soil sampling is needed in order to clarify a number of unresolved aspects of the site characterization. These include the following:

**Comment 2a:** During the 2000 Phase I RI, soil samples were taken to support the HHRA/ERA activities at areas that were noted to be contaminated in previous site investigation studies in addition to those taken at new monitoring well screen locations (mostly at depth). New locations are being proposed for site characterization in response to EPA concerns that only one hypothetical source area was planned to be investigated by the Navy. Therefore, if other hypothetical source areas are being investigated, common sense suggests that both soils and groundwater should be investigated, (*Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA*, EPA/540/6-89/004, October 1988). According to table 2-1, new monitoring well locations: D, F, G, J, T, U, V, & W are located in areas that the Navy has not performed any screening level or RI quality soil-gas or soil sampling. While J, T, W, & V are not in suspected source areas, D, F, & possibly G are. Full suite surface soil and full suite soil sampling just above the water table (or shallow well screened interval) should be taken to enhance the HHRA for

this site. Soil sample results from the building 41 investigation should also be included in an updated HHRA.

**Response —** Locations for such samples will be evaluated during preparation of a Site 16 Phase II RI QAPP Addendum and will include review of the soil sampling headspace vapor FID screening results recorded on the Phase II RI boring logs.

**Comment 2b:** No confirmatory soil sampling is planned except at the location where petroleum odors were noted while drilling the MW16-07 cluster in June of 2000. Due to the confirmatory nature of this proposed sampling, EPA suggests that a minimum of three split-spoon samples is collected for each respective depth interval. In other words, shallow soil borings would be advanced to the proposed depths in three or more locations in the immediate vicinity of MW-16-07. This will provide a greater level of confidence that the soil samples obtained are representative of conditions at that location, as individual soil borings commonly fail to indentify known features and problems due to the small area sampled and the vagaries of subsurface distribution. Test pitting is another option which the Navy might use to evaluate the subsurface soils in this area. Visual examination and screening of soils exposed through test pits would insure that the most contaminated intervals are sampled.

**Response —** The Navy will collect soil samples from the 2 depth intervals from each of 3 soil borings to be located in the immediate vicinity of MW-16-07. These samples will be collected along with the soil samples to be included in a Site 16 Phase II RI QAPP Addendum.

**Comment 2c:** Since the SVOC analysis won't address the question of Cosmolene contamination, the Navy should also include Method 9070 A&B analysis for the groundwater and (where appropriate) soil sampling in the shallow screened interval at locations down gradient of the building 41 tanks and the MW16-07 location. Locations: MW16-07, MW16-01, MW16-08, MW16-15, MW16-21, MW16-22, MW16-23, K, I, MW16-02, L, N, O, P, Q, R, MW16-03, S, X, MW16-24, MW16-16, MW16-25, MW16-04, MW16-29, and MW15-05 are suggested. EPA may change these recommendations based on discussions with the BCT.

**Response —** As established previously during preparation of the Work Plan Addendum for soil borings and soil sampling in Building 41, the laboratory can not provide Method 9070A which requires extraction with freon that EPA does not want laboratories to use anymore.

The Navy agrees with analysis of soil samples that exhibit a petroleum odor, however, for the Phase I RI monitoring wells, only soil from

MW16-07 has exhibited a petroleum odor. Therefore, the Navy does not recommend collection of soil from the other Phase I RI monitoring wells (borings). For soil collected from Phase II RI wells/borings that exhibit a petroleum odor, the Navy plans to submit one such sample per interval (S, I, and D) per boring/well for Method 9070A analysis. This will be added in a Site 16 Phase II RI QAPP Addendum based on review of the soil sampling headspace vapor FID screening results recorded on the Phase II RI boring logs.

**Comment 2d:** In order to support the FS for the TCE plume remediation, and help understand the partitioning of contaminants from the soils into the groundwater, soil samples should be taken at the well screen interval and analyzed for TAL metals, TCL-VOCs, grain size, and total organic carbon (it is noted that the soils at the MW16-14D screened interval are 5 times more contaminated than the similar soils at location 15, but the groundwater contamination is 1 ppm higher at location 15 than it is at location 14).

**Response —** Comment noted. However, based on review of the boring logs, the soil sample from MW16-14D is more sand while the sample from MW16-15D is more gravelly; i.e., less fine material to retain CVOC during sample collection. Additionally, the soil sample from MW16-14D was located 1–3 ft above the ground-water sample depth interval of 60.5 ft bgs; i.e., the two sample depth intervals are not the same. Therefore, the partitioning concern raised in this comment should not be directly drawn from the available data.

Additional soil sampling to support elements of the FS is beyond current tasking and will be addressed as part of the FS or the development of the Site 16 Phase II RI QAPP Addendum.

**Comment 3:** Please confirm continuous split spoon sampling for geologic lithology at locations not yet logged and the use of an FID for headspace analysis on samples collected from each split spoon.

**Response —** Yes, continuous split-barrel sampling of soil with FID screening of soil sample headspace vapors is planned for each deep ('D') well of a well cluster.

**Comment 4:** Ground Water Flow System: It is understood that the Navy's IR program usually evaluates each IR site separately, however, the complexity of this plume(s) seems to transcend the somewhat arbitrary boundaries which have been thus far established. A critical issue, therefore, which needs be resolved concerns the nature and temporal variation of the ground water flow system over the area including site 16 as well as the adjoining Navy

sites 01/02/03/04, PR-58 NIKE site, and the adjacent down-gradient, cross gradient, and upgradient areas. The direction and magnitude of the head field gradients, in three dimensions, needs to be better understood under "average" conditions as well as over a representative range of variable aquifer conditions. It should be acknowledged by all parties that the complexity of the aquifer system, which includes several distinct hydrostratigraphic layers in the overburden, as well as a variably weathered and fractured bedrock substrate, argues for a more robust ground water head measuring program (i.e., water-levels), over a larger area than is currently the focus of the site 16 RI. In order to gain a better understanding of these first-order issues, EPA recommends quarterly water-level monitoring for all wells at the Site 16 site and adjacent properties, including Navy sites 01/02/03/04, PR-58 NIKE site, and the adjacent down-gradient, cross gradient, and upgradient areas. As a starting point, the general area depicted on Figures 4-B and 5, and 6 of the Basewide Ground Water Inorganics Study Report (6 September, 1996) should be evaluated. A synoptic quarterly water-level measurement program, including all available wells and piezometers in this area, should be initiated at the earliest possible date, but a rigorous evaluation of the spatial adequacy of the current well network should also be undertaken. Additional wells may be needed in selected areas. In particular, if the piezometers used to prepare the contours presented in the Basewide study no longer exist, re-installation should be considered.

**Response —** Comment noted. The Navy appreciates and agrees with the water level measurement suggestion.

**Comment 5:** Fracture Pathway Assessment: With respect to the ground water flow system at site 16 and the adjacent areas, it should be acknowledged by all parties that bedrock ground water flow, particularly fracture-controlled flow in bedrock, appears to be a significant factor. Additional focus should therefore be directed toward identifying significant bedrock fracture pathways. Although seismic techniques have been used with some success at these sites, 2-dimensional electrical resistivity profiling, surface VLF surveys, 'tracer' testing (with active and/or passive tracers such as dyes, stable isotopes, or major element geochemistry), pump testing, or other techniques may also prove to be useful tools.

**Response —** Comment noted. Additional characterization (beyond that presented as part of the response to Comment 1) related to potential down-gradient migration of CVOC from the NIKE PR-58 Site is beyond current tasking and may be addressed during the development of the Site 16 Phase II RI QAPP Addendum in consultation with the USACE FUDS Program.

**Comment 6:** Well Location Finalization: EPA strongly recommended that the Navy present seismic data and other supporting information prior to finalizing the well locations tabulated on table 2-1 for BCT review and concurrence. For example it is not clear that many of the proposed locations shown on Figure 2-4 are the most appropriate. For example, it is not clear that wells J-D, T-D, W-D, and V-D/R, which are currently located hundreds of feet from the nearest control points, will be sufficient to establishing the plume boundaries in these directions (the stated purpose). The seismic data to be collected in the general vicinity of these proposed locations may offer addition insight and may offer additional or better locations for wells directed to this objective. Many other recommendations for relocating specific wells are offered below as general or specific comments. However, it will be beneficial to review these suggestions, as well as the Navy's currently proposed locations in the context of the seismic data once it is available.

**Response —** A working draft of the new Top of Bedrock Contour Map (updated 10 July 2002 with the results of the Phase II RI seismic refraction survey results) was e-mailed to EPA and RIDEM on 10 July 2002 and proposed relocation of some wells was discussed during an 11 July 2002 conference call between representatives of the Navy, EPA, RIDEM, and EA. The preliminary results of the additional seismic refraction fieldwork stated in the response to Comment 1 were used to update the working draft of the Top of Bedrock figure (11 September 2002). This figure, along with a recommended location for additional monitoring well cluster (MW16-55D/R/R2) within an interpreted depression in the bedrock surface along the north side of Davisville Road, was presented during the 13 September 2002 BCT meeting.

**Comment 7:** Since the QAPP appears to be related primarily to further understanding of the groundwater hydrogeology as well as filling datagaps about nature and extent in groundwater and soil, the DQOs would be somewhat different than those for risk assessment. For instance, risk-based detection limits would in many cases be lower than detection limits needed to map a plume. Since generation of new data (e.g. vinyl chloride in shallow groundwater) might result in the need to update the human health risk assessment, it is important to include DQOs describing how the data will be used for risk assessment. This may most appropriately be included in an appendix to the QAPP to be produced later (as will perhaps be done for recreational sediment risk).

**Response —** With regard to the EPA statement 'risk-based detection limits would in many cases be lower than detection limits needed to map a plume,' these detection levels were selected for ground-water samples so the resulting analytical data could be added to a Phase II HHRA, besides assessing the

extent of the CVOC plume. The use of these data in the Phase II HHRA would be described in an addendum to the Site 16 Phase II RI QAPP.

**Comment 8:**

Several observations, comments, and recommendations are provided in this review. These findings are enclosed in the following general and specific comments. In summary, we believe there are at least three major potential contributing source areas to the Site 16 groundwater contamination, primarily the observed high levels of trichloroethylene (TCE) noted the several deep and bedrock monitoring wells east of Building 41. Past review and discussions have focused on the Site 16 central area (creosote dip tanks, fire training area, etc.), a potential source to the southwest, initially thought by the Navy to be Building 41; and another potential source to the south of Building 41 (Building 318 and/or Building E-319). Subsequent evaluation of data, specifically the recent groundwater quality monitoring at Site 03, has reinforced concerns that another possible major potential source area may exist at one or more of the sites to the west of the Site 16 area. These include the former Nike PR-58 site, and the Navy 03 and 04 sites.

The recommendations provided in this technical review are intended to resolve these concerns in the most cost-effective manner. While the potential western source area could be evaluated at a later date, it makes more sense to reallocate resources currently being directed at Site 16 under the present work plan to address this issue. Evaluation of available data from the western sites in addition to Site 16 suggests that after completion of the proposed Phase II program as presented in this Quality Assurance Project Plan (QAPP) there is likely to be an unresolved issue as to where the CVOC originated from. It may very well be that the observed contamination is due to contributions from all three general areas or possibly primarily from only one area. If the distribution of CVOC contaminants cannot be satisfactorily explained under the proposed Phase II Remedial Investigation, there may be a necessity to mobilize again for a Phase III or a supplemental investigation to address the potential contribution from the sites to the west. This will certainly be more costly than addressing that concern within the context of this Phase II investigation.

Understanding the contributions of contaminants to observed site contamination has significant ramifications for any remedial strategy. For example, if there is a contributing source at the western site area that is not considered in any remedial activity it may result in a failed remedy. That is, if natural attenuation is proposed and implemented, and there is a significant mass of CVOC contamination that is yet to reach the Site 16 area, the Natural Attenuation Remedy may fail to achieve remedial goals. On the other hand, if what is observed in the Site 16 area is not from the

western site area, or represents the tail end of releases from that area, appropriate decisions could be made with more certainty.

**Response —**

Comment noted. Potential impacts to the Site 16 CVOC plume from Building E-319 and the Stage 1 area are being addressed under the Phase II RI. The proposed relocation of some wells was discussed during an 11 July 2002 conference call between representatives of the Navy, EPA, RIDEM, and EA. As stated in response to Comment 5, additional characterization (beyond that presented as part of the response to Comment 1) related to potential down-gradient migration of CVOC from the NIKE PR-58 Site is beyond current tasking and may be addressed during the development of the Site 16 Phase II RI QAPP Addendum in consultation with the USACE FUDS Program.

**Comment 9:**

EPA's review of information available on Navy Sites 3 and 4 and the Army Nike PR-58 site, review of the Site 16 Phase I data, and the supplemental investigation conducted at Building 41, give strong indications that those location(s) are contributing to the observed contamination on Site 16. Specifically, at least part of the large fraction of the observed TCE detected in the deep and bedrock wells extending from the east of Building 41 to the northeast, may have originated from those western locations. The work plan does not consider potential contribution to the Site 16 area from those locations. In order to fully develop the Site 16 conceptual model and evaluate the origin, fate and transport of contaminants, those areas must be included in the evaluation of Site 16. The rationale for this interpretation is as follows. Review of the Site 3 Interim Sampling Event 01 results in several observations that are not explained by simple migration of CVOCs from the Nike PR-58 Site with diminishment in concentrations as they cross the Navy Site 03 area. The first issue is that at the concentrations of CVOCs observed at MW03-14, on the Nike site, the down gradient concentrations in groundwater should be higher than what is observed. That is, the concentrations found in MW03-03, MW03-10, etc. appear to be relatively low, without associated indicators to account for the lower concentrations, i.e. high levels of degradation products, etc.

Second, the groundwater contours presented for the Site 03 groundwater suggests that groundwater from the Nike PR-58 site appears to migrate to the southeast of the Navy Site 03 rather than significantly impacting Site 03. However, in that down gradient direction, there is even less CVOC contamination observed, i.e. EA-111, MW03-11R, and EA-110. The contours also suggest that what is observed on the Navy Site 03 area may have at least partly originated in the vicinity of the former Navy Site 04 area. An extension of the groundwater flow direction (as presented in the Site 03 Interim Sampling Event 01) results in groundwater migrating from

the Nike PR-58 Site and Navy Site 04 directly toward the eastern portion of Building 41.

Review of the Site 03 and Nike PR-58 groundwater elevations also indicates that there are significant vertical hydraulic gradients in the downward direction, primarily over portions of the Navy Site 03 area. This suggests that contaminants released at Site 03 (possibly Site 04) and the Nike PR-58 site are migrating deeper into the aquifer as they migrate to the east, southeast. Figure 3B ("Interpretive Ground-Water Surface Contours Rock Wells November 2001") from that report was re-evaluated during this review. From the groundwater elevations presented on that figure, it appears that the groundwater contours may not have been optimally constructed. The groundwater contours were re-interpolated for this review and are shown on the attached Figure A. While the re-interpreted contours are similar for the north portion of the Site 03 area (above Parade Avenue) there appears to be a significant departure in the locations of the contours on the south side of the Site 03 area. In particular, there are inflection points for the bedrock well contours that point toward MW03-08.

This potentially has substantial significance. First, this pattern is often a signature of a subsurface drainage control. It may be observed in an agricultural drainage system where drains are installed to lower the groundwater table. The groundwater flows to the drain in a manner similar to base flow recharge of a surface stream. In bedrock, this pattern is often observed where there is a preferential pathway in the rock. Typically, this may be manifested in bedrock by a zone where the rock is made more permeable due to faulting and/or fracturing. Groundwater (and contaminants) is likely to flow preferentially into this more highly permeable zone. This apparent bedrock control may account for the relatively sharp downward vertical gradients (and revised bedrock groundwater contours) observed at the Navy Site 03 area.

Although the contours constructed are probably subject to some variability from season to season and year to year, an extension of the axis of the inflection points of those contours indicates groundwater in the bedrock is migrating toward the eastern side of Building 41. It should be noted that only one bedrock monitoring well is present between MW03-08 (near the Nike PR-58 and Site 03 boundary) and MW16-14 and MW16-15 (at Building 41) along this interpreted axis. That well, MW110R, however, actually appears to be monitoring groundwater that flows toward the inferred bedrock fracture zone, as represented by the centerline from a southwest direction, not from the Nike PR-58 site or the Navy 03 and 04 sites. Additionally, due to the noted downward vertical gradients on the Navy Site 03 this well may be installed at too shallow a depth to intercept

contaminated groundwater migrating downward and along this interpreted bedrock fracture zone.

Bedrock well EA-111R also appears to monitor groundwater from a similar direction. The groundwater being monitored by that well does not appear to be representative of groundwater emanating from the former Nike PR-58 site or Navy Sites 03/04. MW03-03R and MW02-03R may be in position to intercept contaminated groundwater from Sites 03 and 04 to some extents, but, also do not appear to be situated to monitor groundwater migrating along the interpreted, fractured bedrock preferential zone since they appear to be located on a groundwater divide.

Review of the attached Figure A also suggests that a potential source area for contaminants entering the more permeable bedrock zone is the vicinity of the former Site 04 area where mounding may be occurring, possibly due to more permeable backfill of the former trench. Construction of groundwater flow lines using the re-interpolated contours results in the flow lines passing through the location of the former Site 04 location along Battalion Boulevard. It is noted again that there are no bedrock wells located within the center of the interpreted bedrock preferential groundwater flow zone. Previous monitoring wells, MW03-06D, MW03-07D, and MW03-10D were all located above the bedrock. Nonetheless, those wells, in particular MW03-06D, had significant levels of CVOC contaminants. It is very probable that higher concentrations exist near those locations, deeper in the bedrock.

There are several additional indicators for the western areas noted to be contributing to Site 16 CVOC contamination. A review of the CVOC compounds detected in the deep and bedrock wells near Building 41 showed the presence of 1,1,2-TCA (trichloroethane), 1,2-DCA (dichloroethane), and 1,1-DCA, albeit at very low concentrations. These compounds were not identified to be present in the vicinity of the central area of Site 16, including the limited number of shallow groundwater monitoring wells.

Table 4-14 of the Site 16 Phase I Report (Volume I) shows that these compounds were detected at 0.3 to 1.0  $\mu\text{g/L}$  in the following wells: MW16-09D, -10D, -11D, -13D, -14D, -16D, -21D, -25D, and -02D and -02R. The detection limit for MW-16-15R was too high to allow evaluation of these low levels. These compounds are degradation products of 1,1,2,2-TCA, a compound detected at high concentrations at the western sites. The distribution of these compounds correlates with the elevated TCE levels in the deep and rock wells.

It should also be noted that a primary degradation product of 1,1,2,2-TCA is TCE. Some research has shown that under neutral and base catalyzed hydrolysis (Haag and Miller 1988) the sole product is TCE. Also, abiotic conversion of 1,1,2,2-TCA to TCE has been reported by others (EPA 540/S-99/001 SEP 99). Review of several of the groundwater sampling field forms indicates that groundwater in bedrock in many of the wells is neutral or alkaline (pH 7 to 9). Therefore, the observed TCE may also represent abiotic degradation of 1,1,2,2 TCA that has migrated from the up gradient western sites.

Another indicator of a potential migration pathway from the western sites to Site 16 is the results of the seismic investigations. Appendix I, Figures 1 and 2 of the Site 16 Phase I investigation show a potential fracture zone immediately to the west of Building 41. Line No. 3 had a seismic velocity of 12,600 feet per second. This velocity generally indicates a more weathered and/or fractured rock. This velocity is low compared to other seismic lines across the site except in the central area of Site 16. The velocity of this line is especially noteworthy when compared to the velocities recorded for rock to the north of this line. Across Davisville Road, there was initially a slight increase to 13,500 feet per second, and then to 15,000 to 15,800 feet per second further north for lines immediately west of the Site 16 central area. This relatively low seismic velocity zone (Line No. 3 and the southernmost portion of Line No. 10 (13,500 feet per second) cross the interpreted fractured bedrock zone oriented from the western sites to Building 41.

The seismic results from the geophysical investigation in the central area of Site 16 also tend to support this interpretation. Appendix B gives seismic velocities along five lines. In the north central portion of this area at the intersection of lines SL-2 and SL-4 there was a very low velocity zone of approximately 8,000 feet per second. However, at the northwest corner near Westcott and Davisville Roads, there was a segment (line SL-2) with seismic velocities of 12,000 feet per second. This segment is in proximity to Line No. 3 of the other geophysical investigation and Building 41. Since these velocities are also lower than much of the surrounding bedrock, the seismic surveys, therefore, can be interpreted to indicate a more fractured zone in the vicinity of Building 41.

It should also be noted that the interpreted fracture zone did not receive characterization during the Membrane Interface Probe (MIP) investigation. There was only one MIP location along Davisville Road, west of the high CVOC contamination noted in the deep and bedrock. That location was MIP16-06 which, although no response was noted, was terminated at 28.5 feet. The MIP locations to the east of that location, along the inferred bedrock fracture zone, had elevated ECD responses

(i.e., northeast and east of Building 41). Those depths ranged from 40 to 60 feet below the ground surface.

Review of several cross sections for the "Characterization of CVOC Contamination Former PR-58 Nike Site" indicates that there are potentially significant fractures sets beneath both the Navy Site 03 area and the Nike PR-58 area. In particular, the VLF survey results (shown on Figure 9) are presented as showing fracture zones beneath the former Nike PR-58 site that are oriented northeast to southwest, similar to the inferred fracture zone orientation in the immediate vicinity of the Site 16 central area. It should be noted that no VLF survey traverses appear to have been performed in the vicinity of the Navy Site 03. Also, there are indications of fracture sets (Figures 5, 6 and 8) that appear to show matching fracture sets along a northwest to southeast strike dipping to the southwest (as referenced to MW03-14R). These may be inferred from monitoring wells EA-113R, EA-104R and MW03-03R. This suggests a northwest to southeast striking fracture zone perpendicular to the noted VLF fracture zone. This strike direction aligns with the bedrock contours noted previously.

In view of these observations and interpretations evaluation of this potential and likely contributing pathway should be included in the Phase II Remedial Investigation for Site 16. As mentioned there is a scarcity of data between the western sites and Site 16, in particular bedrock monitoring wells. There is also a lack of bedrock structural characterization, including lack of geophysical survey or other field mapping/logging data for the intervening area.

The concern is that after conduct of the Site 16 Phase II Remedial Investigation as presented in the QAPP there is a strong likelihood of still having unresolved issues. These are similar to the Site 16 Phase I investigation where it was interpreted by the Navy that the TCE observed in the deep overburden and bedrock was attributable to a release from the solvent recovery still in Building 41. As commented on previously, there are indications that the TCE in the deep overburden and bedrock detected may be from past releases within the Site 16 central area (fire training, creosote dip tanks, etc.). It may also be from spills outside the loading docks or railroad spurs, or possibly the buildings to the south of Building 41 where TCE was reported to have been stored/used/recycled for a longer period of time than at Building 41. However, the potential contribution of contamination from the western sites should be considered in this Phase II Investigation.

In order to address this data gap, two monitoring well clusters are recommended along Davisville road at the western portion of Site 16.

Also, two seismic traverses are proposed in this area also. This can be accomplished with reallocation of planned Phase II resources as described in the Specific Comments below.

**Response —**

Comment noted. Please refer to response to Comment 8 above and to the notes of the 13 June 2002 BCT meeting (with regard to the Site 03/PR-58 Nike Site issues).

**Comment 10:**

While considerable effort is being expended for the Phase II investigation at Site 16, two data gaps still exist for the central area of Site 16. The first is that the southeast quadrant of the central area is not adequately investigated, as previously discussed. In particular, a monitoring well cluster is needed in the vicinity of the MIP16-24 groundwater probe sample where 5,300 µg/L was detected. A concern raised previously is that either contaminants released at the former fire training area have migrated down dip over low permeability silt and/or clay layers (if not with groundwater) until encountering a break in that layer. At that location they may have migrated vertically to deeper locations resulting in the observed contamination in the deep and bedrock wells. A review of soil boring logs indicates high photoionization detector (PID) readings at MW16-02 at the middle to deeper intervals of the soil profile. Contaminants noted at MW16-05 and MW16-29 in the sand and gravel layer may also be following this pattern.

An additional data gap is the groundwater table elevations to the east of Building 41. Under the proposed plan there continues to be an absence of shallow (water table) groundwater wells to the east of Building 41, north of the former railroad spurs, and south of Davisville Road. At least one additional shallow groundwater well is needed in this area, most likely in the vicinity of MW16-21. This can be accomplished with reallocation of planned Phase II monitoring well as described in the Specific Comments below.

**Response —**

The Navy does not see the benefit of installing a well cluster at the MIP16-24 location which is between existing wells MW16-02D (2.1 mg/L) and MW16-29D (2.8 mg/L) to confirm that there is also ppm concentration of CVOC between them. Prior to further consideration of this location, the Navy believes that the proposed well cluster locations L, M, N, O, P, and Q be installed and the field findings (geology and soil sample vapor headspace screening) assessed related to the need for a well cluster at the MIP16-24 location.

Additionally, the Navy does not see the benefit of installing a shallow well at the MW16-21 location. Because there is no apparent confining layer above the intermediate ('I') depth zone well (26.5 to 36.5 ft bgs with the

water table approximately 8 ft bgs) planned at this location, the water level measured for this well should be representative of the shallow zone. Additionally, two similar intermediate depth wells are planned for this general area (MW16-22I and MW16-24I).

**Comment 11:** The proposed additional monitoring wells may not adequately address a potential source area to the south of Building 41. Although there are limitations to the MIP data, review of the Phase I information suggests that there is a zone or "corridor" of elevated MIP ECD responses that trends from northeast to southwest at the northeast corner of Building 41. The axis of this "corridor" if extended to the south suggests a potential release area in the vicinity of the western half of Building 318 and the eastern half of Building E-319. However, there were no MIP locations south of Elm Street. In order to adequately address this data gap, the area to the north of the west half of Building 318 should have additional coverage. This may be accomplished by relocating the proposed monitoring well cluster G and the proposed monitoring well cluster H as discussed in the Specific Comments below.

**Response —** A working draft of the new Top of Bedrock Contour Map (updated 10 July 2002 with the results of the Phase II RI seismic refraction survey results) was e-mailed to EPA and RIDEM on 10 July 2002. Proposed relocation of some wells (including coverage to address Buildings 318 and E-319 as potential source areas) was discussed during an 11 July 2002 conference call between representatives of the Navy, EPA, RIDEM, and EA.

## SPECIFIC COMMENTS

**Comment 12:** **Section 20, second paragraph;** Please also reference Section 2.1 along with Section 7, as Section 2.1 includes the DQOs for Phase II RI in the bulleted text.

**Response —** Section 2.1 will be referenced along with Section 7.

**Comment 13:** **Page 2-7, 5<sup>th</sup> bullet;** Slug tests should be completed on all new wells.

**Response —** Only the screened Phase II RI wells will be slug tested. The 25 ft of open borehole for wells completed in the bedrock will not be slug tested because the results would provide a meaningless averaged value for the entire length of the open rock hole portion of such wells.

**Comment 14:** **Pages 2-14 and 2-15;** It is not clear that the Navy's CSM adequately addresses the potential for fracture-controlled flow in the bedrock. In

addition, additional information concerning ground water flow patterns is generally needed. Please see general comments 4, 5, 9, above.

**Response —** Please refer to the responses to General Comments 4, 5, and 9, above.

**Comment 15:** **Page 5-2, last paragraph;** It is not clear that MW-16-11D is actually down-gradient of the former Building 81 septic tanks. Additional work is needed with respect to ground water flow. Please see general comments 4, 5, 9, above.

**Response —** It is assumed that building referenced in this comment is Building 41. There will be a more detailed water level contour map available after installation of the planned Phase II RI monitoring wells.

**Comment 16:** **Page 5-4 through 5-6;** The Navy acknowledges that the northern boundaries of the plume are not established between MW-16-05D and MW-16-04D. As this uncharacterized area is very close to Allen Harbor, the investigation should consider additional assessment of the GW/SW interface in this area, such as, vapor diffusion samplers or piezometers along with sediment sampling.

**Response —** Comment noted. The requested effort is beyond current tasking and may be addressed during the development of the Site 16 Phase II RI QAPP Addendum. Based on the Phase I RI, the contamination detected in the deep ground water is CVOC. During the Phase I RI, shallow ground water (MW16-04S and MW16-05S near the harbor shoreline) and two seeps were sampled and analyzed for VOC. The maximum total CVOC reported in the samples was 1.4 µg/L which does not support the presence on upwelling of the deep CVOC plume at the shoreline.

**Comment 17:** **Page 8-2;** It is assumed that fluid conductivity logs will also be collected. EPA also recommends collecting natural gamma logs.

**Response —** Both types of logs will be included.

**Comment 18:** **Table 2-1, Boring/Well D-S;** The location of this proposed boring/well is not shown on Figure 2-4. Does this mean that although it is described here it will not be installed?

**Response —** Well location 'D' was inadvertently deleted from Figure 2-4 during a final revision process. It was included on a corrected and enlarged copy of Figure 2-4 that was submitted to the BCT on 31 May 2002.

**Comment 19:** **Table 2-1, Boring/Well E-S;** This well, and the associated I and D components of the well cluster should be moved southwest to near the northwest corner of Building 318 to provide better coverage of any release from that area and to provide better resolution of the shallow groundwater table. Alternatively, Boring/Well H-S and associated components may be relocated to that position.

**Response —** Based on the new Top of Bedrock Contour Map (updated 10 July 2002 with the results of the Phase II RI seismic refraction survey results), well cluster location D was re-located on 10 July 2002 to an interpreted depression in the bedrock surface that appears to be in the general area requested.

**Comment 20:** **Table 2-1, Boring/Well G-S;** This well along with other wells of this proposed cluster should be moved to the south-southwest of MW16-17 S/I/D/R. The orientation of the MIP responses in soil suggest that a possible CVOC release may have originated in the vicinity of western portion of Building 318 or Building E-319. This new location provides better coverage of any possible release from the Building 318 and/or Building E-319 location. It is noted that there are not any MIP locations in the vicinity to the south of MW16-17, and the area of the proposed Boring/Well G is outside the area of the MIP detection.

**Response —** Based on the new Top of Bedrock Contour Map (updated 10 July 2002 with the results of the Phase II RI seismic refraction survey results), the S and I resources portion of well cluster location G was re-located on 10 July 2002 as a "D" well to a new location 'Y' in an interpreted depression in the bedrock surface between Buildings 318 and E-319 to assess potential historical CVOC release(s) from Building E-319. The Navy agrees to move the location G-D/R wells approximately 300 ft south southwest.

**Comment 21:** **Table 2-1, Boring/Well M-S;** The location of this well is not shown on Figure 2-4. Does this mean that although it is described here it will not be installed?

**Response —** Well location 'M' was inadvertently deleted from Figure 2-4 during a final revision process. It was included on a corrected and enlarged copy of Figure 2-4 that was submitted to the BCT on 31 May 2002.

**Comment 22:** **Table 2-1, Boring/Well MW16-13I;** This well should be moved to a location along Davisville Road approximately between MW16-01 and MW16-11. The resources allocated to this well should be redirected to complete a well cluster (I/D/R) at that location due to a possible bedrock

fracture zone aligned between the western sites (PR-58, Site 03, Site 04) area and the area just east of Building 41. See General Comment above.

**Response —** It appears from information provided by EPA, that the referenced hypothetical possible bedrock fracture zone trends to an area just west (not east) of Building 41, and therefore, would not cross through the area of the proposed well cluster. Additionally, based on recent notification by RIEDC, the EPA-proposed well cluster area is planned to be a detention pond in the near future; and therefore, not accessible for well installation. Also, refer to the response to Comment 1 regarding the addition of well cluster MW16-55D/R/R2.

**Comment 23:** **Table 2-1, Boring/Well MW16-14I;** This well should be moved to a location along Davisville Road approximately between the intersection of Sanford Road and the boundary of Site 16 depicted on Figure 2-4. The resources allocated to this well should be redirected to complete a well cluster (I/D/R) at that location due to a possible bedrock fracture zone aligned between the western sites (PR-58, Site 03, Site 04) area and the area just east of Building 41. See General Comment above.

**Response —** The Navy believes that the planned location of MW16-14I is important to the understanding and assessment of a potential CVOC source area somewhere in the vicinity of the northeast end of Building 41.

Assessment of the need for and location of well clusters (beyond that presented as part of the response to Comment 1) to address EPA's hypothesis for the connection of the deep CVOC in ground water beneath the PR-58 Nike Site/Site 03 will be considered separately from, and as a potential addition to, the Navy's planned monitoring well installation program presented in the Draft Site 16 Phase II RI QAPP.

**Comment 24:** **Table 2-1, Boring/Well W-D;** The resources used to complete this well should be applied to one of the two additional monitoring well clusters that should be completed along the western border of Site 16 described in Specific Comments No. 5 and 6. Data collected and provided in the Phase I Site 16 Remedial Investigation does not support the proposed location of Boring/Well W-D being an area that is likely to yield significant additional data, at least compared to the installation of the two monitoring well clusters along Davisville Road.

**Response —** Based on the new Top of Bedrock Contour Map (updated 10 July 2002 with the results of the Phase II RI seismic refraction survey results), well cluster location W-D/R was re-located on 10 July 2002 to an interpreted deep depression in the bedrock surface.

The Navy needs the planned W-D/R location to assess the northeast extent of deep CVOC plume in ground water to determine the extent of easements that will be needed in the future to address RIDEM's requirement that the Navy have control of the extent of contamination.

Assessment of the need for and location of well clusters (beyond that presented as part of the response to Comment 1) to address EPA's hypothesis for the connection of the deep CVOC in ground water beneath the PR-58 Nike Site / Site 03 will be considered separately from, and as a potential addition to, the Navy's planned monitoring well installation program presented in the Draft Site 16 Phase II RI QAPP.

**Comment 25:** **Table 2-1, Boring/Well V-D& V-R;** The resources used to complete these wells should be applied to one of the two additional monitoring well clusters that should be completed along the western border of Site 16 described in Specific Comments No. 5 and 6. Data collected and provided in the Phase I Site 16 Remedial Investigation does not support the proposed location of Boring/Well V-D being an area that is likely to yield significant additional data, at least compared to the installation of the two monitoring well clusters along Davisville Road.

**Response —** The Navy believes that the planned V-D/R location to assess the northeast extent of deep CVOC plume from MW16-05D (approximately 2.3 mg/L total CVOC) in ground water and to determine the extent of easements that will be needed in the future to address RIDEM's requirement that the Navy have control of the extent of contamination.

Assessment of the need for and location of well clusters (beyond that presented as part of the response to Comment 1) to address EPA's hypothesis for the connection of the deep CVOC in ground water beneath the PR-58 Nike Site / Site 03 will be considered separately from, and as a potential addition to, the Navy's planned monitoring well installation program presented in the Draft Site 16 Phase II RI QAPP.

**Comment 26:** **Table 2-1, Boring/Well U-D & U-R;** The location of this well is not shown on Figure 2-4. However, there is a distinct need for an additional monitoring well cluster (I/D) at the location of MIP16-24 where 5,300 µg/L of TCE was detected in a groundwater probe sample. The resources used to construct the proposed U-D well should be applied to installing a well at the MIP16-24 location. Data collected and provided in the Phase I Site 16 Remedial Investigation does not support the proposed location of Boring/Well U-D being an area that is likely to yield significant additional data, at least compared to the installation of a well at the MIP16-24 groundwater probe location.

**Response —**

Well location 'U-D' was inadvertently deleted from Figure 2-4 during a final revision process. It was included on a corrected and enlarged copy of Figure 2-4 that was submitted to the BCT on 31 May 2002. A U-R location was not planned or included in the Draft QAPP.

The Navy needs the planned U-D location to assess the east extent of deep CVOC plume in ground water to determine the extent of easements that will be needed in the future to address RIDEM's requirement that the Navy have control of the extent of contamination. Additionally, the Navy does not see the benefit of installing a well cluster at the MIP16-24 location which is between existing wells MW16-02D (2.1 mg/L) and MW16-29D (2.8 mg/L) to confirm that there is also ppm concentration of CVOC between them. Prior to further consideration of this location, the Navy believes that the proposed well cluster locations L, M, N, O, P, and Q be installed and the field findings (geology and soil sample vapor headspace screening) assessed related to the need for a well cluster at the MIP16-24 location.

**Comment 27:**

**Table 2-1, Boring/Well T-D;** The resources for this boring/well should be applied to constructing a monitoring well cluster at the MIP16-24 location. See Specific Comment above.

**Response —**

Based on the new Top of Bedrock Contour Map (updated 10 July 2002 with the results of the Phase II RI seismic refraction survey results), well cluster location T-D was re-located on 10 July 2002 to an interpreted deep depression in the bedrock surface.

The Navy needs the planned T-D location to assess the east extent of deep CVOC plume in ground water to determine the extent of easements that will be needed in the future to address RIDEM's requirement that the Navy have control of the extent of contamination. Additionally, the Navy does not see the benefit of installing a well cluster at the MIP16-24 location which is between existing wells MW16-02D (2.1 mg/L) and MW16-29D (2.8 mg/L) to confirm that there is also ppm concentration of CVOC between them. Prior to further consideration of this location, the Navy believes that the proposed well cluster locations L, M, N, O, P, and Q be installed and the field findings (geology and soil sample vapor headspace screening) assessed related to the need for a well cluster at the MIP16-24 location.

**Comment 28:**

**Table 2-1, Boring/Well J-D;** The resources for this boring/well should be applied to construction a shallow monitoring well in the area to the east of Building 41, probably at the MW16-21 location. There continues to be a data gap in terms of the shallow groundwater table elevations in this area.

**Response —** The Navy needs the planned J-D location to assess the east extent of deep CVOC plume in ground water to determine the extent of easements that will be needed in the future to address RIDEM's requirement that the Navy have control of the extent of contamination. Additionally, the Navy does not see the benefit of installing a shallow well at the MW16-21 location. Because there is no apparent confining layer above the intermediate ('I') depth zone well (26.5 to 36.5 ft bgs with the water table approximately 8 ft bgs) planned at this location, the water level measured for this well should be representative of the shallow zone. Additionally, two similar intermediate depth wells are planned for this general area (MW16-22I and MW16-24I).

**Comment 29:** **Figure 2-3;** It is difficult to identify the proposed seismic line traverses on this figure. However, it appears that there is significant seismic refraction work planned for the eastern and northeastern portions of the site. It is not clear from the Phase I Remedial Investigation that this is the most beneficial use of those resources. A portion of those resources (seismic line lengths) should be reallocated to performing two seismic line traverses perpendicular to Davisville Road at and beyond the western boundary of Site 16. The purpose of this reallocation would be to evaluate what appears as a fracture zone extending from the PR-58, 03, and 04 sites into the Site 16 area. One seismic traverse line should extend along Sanford Road to the building west of Building 41. A second seismic traverse line should be completed extending from the southeast side of Building 224 south along Marine Road, crossing Davisville Road and running along the road to the west of the building west of Building 41. See General Comment above. In addition, additional seismic coverage is needed along the eastern, southern and western sides of Building E-319. General comments related to these suggestions were provided to the Navy in a March 25th e-mail.

**Response —** Comment noted. Additional characterization (beyond that presented as part of the response to Comment 1) related to potential down-gradient migration of CVOC from the NIKE PR-58 Site is beyond current tasking and may be addressed during the development of the Site 16 Phase II RI QAPP Addendum in consultation with the USACE FUDS Program.

**Comment 30:** **Figure 2-4;** Proposed Boring/Well locations for D-S, M-S, D-I, I-I, M-I, and U-D do not appear to be depicted on this figure. Although these locations are described in Table 2-1 it is not clear which prevails, Table 2-1 or Figure 2-4.

**Response —** As stated previously, these well locations were inadvertently deleted from Figure 2-4 during a final revision process. They were included on a

corrected and enlarged copy of Figure 2-4 that was submitted to the BCT on 31 May 2002.

### Summary of Recommended Relocation of Selected Proposed Wells

<i>Recommended Well(s)</i>	<i>Relocated Proposed Wells</i>
#1 Between MW16-01 and MW16-11 (I/D/R)	MW16-13I, V-D, V-R
#2 Between Sanford Road and Site 16 boundary (I/D/R)	MW16-14I, W-D, W-R
#3 At MIP16-24 Groundwater Probe Location (I/D)	U-D, T-D
#4 East of Building 41 at MW16-21 Location (S)	J-D

**Response —** Please refer to the responses to Comments 22, 23, 26, 27, and 28.

**Comment 31:** **Table 7-1;** According to the footnote, the Project Action Limits equal the lowest levels among MCLs, RIDEM GA, and Region 9 PRGs. For review purposes it would be useful to identify (by footnote?) which of the three criteria is used for each analyte.

**Response —** The table will be annotated as suggested.

**Comment 32:** **Table 7-1;** Many of the achievable quantitation limits are higher than the PALs. Therefore, it will be impossible to determine if the concentration exceeds the PAL (and its associated MCL, RIDEM, or Region 9 value). The QAPP should address how nondetects will be treated for nature and extent determination, as well as risk assessment (e.g. concentration of nondetect = 1/2 detection limit versus concentration of nondetect = zero). This would normally be done in a DQO section and would vary depending on the purpose of the analysis (nature and extent, conceptual site model, risk assessment).

**Response —** Due diligence was pursued to achieve the lowest detection limits from available standard methods. However, for some analytes these detection limits are still higher than the related PAL, particularly when the PAL is based on a U.S. EPA Region 9 PRG value. Additional effort has been made to achieve lower detection limits specifically for the analytes identified by the Phase I HHRA as COPC, e.g., Method 6260B SIM for

related VOC. The use of these data in the Phase II HHRA would be presented in a related addendum to the Site 16 Phase II RI QAPP.

**Comment 33:** **Table 12-2, last 2 methods in the table;** There needs to be a brief description as to what the modifications are for these methods. A footnote to the table that describes the modification will be sufficient, or if there is enough room in the last column (Modified for Project Work) it can be included there

**Response —** A footnote will be added to the table.