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LETTER REGARDING THE ENCLOSED PROPOSED ADDITIONAL SAMPLING AND ANALYSIS OF MERRICONEAG STREAM AND MERE BROOK NAS BRUNSWICK ME
8/3/2011
U S NAVY

DEPARTMENT OF THE NAVY
BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE, NORTHEAST
4911 SOUTH BROAD STREET
PHILADELPHIA, PA 19112-1303

BPMO NE/TB
Ser 11-113
August 3, 2011

Mr. Michael J. Daly
Remedial Project Manager
OSRR07-3
U.S. Environmental Protection Agency, Region I
5 Post Office Square, Suite 100
Boston, MA 02109-3912

Ms. Claudia Sait
Remedial Project Manager
Maine Department of Environmental Protection
Bureau of Remediation and Waste Management
17 State House Station
Augusta, ME 04333-0017

Dear Mr. Daly and Ms. Sait:

Enclosed, please find a copy of the Technical Memorandum "*Proposed Additional Sampling and Analysis of Merriconeag Stream and Mere Brook Brunswick Naval Air Station, Brunswick, Maine*". Additionally, responses to MEDEP and USEPA comments on the "*Draft Final Investigation Report, Mere Brook and Merriconeag Stream Groundwater-Surface Water Interface Investigation, February 2011*" are also attached for your consideration. Please provide your concurrence so we can start the second round of sampling during the week of September 5, 2011.

If you have any questions or comments, please contact the Navy's Remedial Project Manager, Todd Bober at (215) 897-4911.

Sincerely,

David Drozd
Director

Enclosures:
1. Proposed Additional Sampling and Analysis of Merriconeag Stream and Mere Brook Brunswick Naval Air Station, Brunswick, Maine
2. Responses to MEDEP Comments Letter dated March 30, 2011
3. Responses to USEPA Comments Letter dated April 21, 2011

Copy to:
MEDEP (C. Sait - two copies, C. Evans)
NASB (R. Leclerc, J. Gallant)
BRAC PMO NE (P. Burgio, D. Barclift)
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Copy to: (w/o encl)
BACSE (E. Benedikt, C. Warren)
RAB Brunswick Representative (S. Johnson)
RAB Harpswell Representative (D. Chipman)
RAB Topsham Representative (S. Libby)

TECHNICAL MEMORANDUM

Proposed Additional Sampling and Analysis of Merriconeag Stream and Mere Brook Brunswick Naval Air Station, Brunswick, Maine

PREPARED FOR: NAVFAC MIDLANT

PREPARED BY: CH2M HILL

COPIES:

DATE: July 14, 2011

Introduction

Additional sampling is being proposed to determine if seasonal variability has any impact on the results of the groundwater surface water interface (GSI) investigation that was completed in November 2010. The original GSI was completed to identify areas in and around the Merriconeag Stream and Mere Brook where impacted groundwater from the Eastern Plume was upwelling to surface water. The results showed that while volatile organic compounds (VOCs) were attenuating before reaching surface water, 1,4-dioxane was not and exhibited the potential to discharge into surface water. The 2010 study was performed following a significant rain event. Even though in-stream sampling (e.g., pore water) was delayed until near baseline stream conditions returned, there is some uncertainty with what potential influence the rainfall might have had on the 2010 findings. The sampling event will sample selected 2010 study locations that indicated potential upwelling conditions. This supplemental event will be completed during a relatively dry summer period when the trees are active to determine if the amount of upwelling and/or degradation varies seasonally. The purpose of this technical memorandum is to summarize the proposed sampling and analysis plan for this additional event.

Objectives

- Collect samples from at least one location for each of the upwelling areas identified for the GSI. Samples will include shallow groundwater, pore water, surface sediment and surface water and will be analyzed for VOCs and 1,4-dioxane.
- Collect additional vertical hydraulic pressure difference measurements at each pore water sample location to help characterize conditions of the GSI across the in-stream sampling areas.
- Collect monitored natural attenuation (MNA) parameters for all shallow groundwater and shallow pore water samples to help characterize the level of attenuation occurring at the site during the summer.

Study Design

Groundwater Surface Water Interface (GSI) Investigation Sampling

- Samples collected from shallow groundwater[1], sediment, porewater (matching depth intervals[2] as collected in 2010), and surface water sampling will focus on one or more locations that exhibited potential for contaminated groundwater discharge into surface water. A list of samples is located in the revised **Worksheet#18 - Sampling Locations and Methods/SOP Requirements Table** from the UFP-SAP and attached to this technical memo. The samples will be collected from one of the following four sample areas previously sampled in November 2010 (**Figure 1**):
  - Confluence of the Merriconeag Stream and the Mere Brook;
  - West of the confluence;
  - North of the confluence ; and
  - South of the confluence.
- The field methods used during the November 2010 GSI Investigation and detailed in the final UFP-SAP (CH2M HILL, 2010) will also be used for this investigation. Field methods outlined in the UFP-SAP (AGVIQ-CH2MHILL, 2010) will be used to collect samples for surface water, sediment and groundwater sampling and are not substantially changed from previous methods:
  - The vertical hydraulic pressure gradient will be measured in all pore water sample areas using a Capsuhelic® Differential Pressure Gage (Dwyer Instruments).
  - Pore water samples will again be collected using the "well-point" method2. Although well points from the November 2010 study were left in place a majority of them have become dislodged over the winter. These well points will be re-installed in locations and depths as close to the previous sampling intervals to the extent possible. Therefore, new pore water samples will be collected from these well points at the same depth and position as the November 2010 sampling event. Any outer screens that can be reused will be re-developed and all of the inner screens will be replaced before sampling.
  - Sediment will be collected from the same locations to the extent possible using identical coring techniques.
  - Surface water samples will be collected from the same locations to the extent possible using a tube and peristaltic pumping technique.
- All samples will be analyzed for VOCs and 1,4-dioxane; MNA will be collected from shallow pore water and shallow groundwater samples as conditions permit.

[1] Based on the 2011 results, additional deep groundwater samples will not be collected; significant variability is not anticipated in these wells.

[2] Based on the results of the 2010 study, no additional pore water samples will be collected using MEDEP PushPoint sampling method.

- A technical Memorandum will be produced once the results have been analyzed including an updated assessment of MNA that are similar to those presented in the original GSI investigation report.

Confluence Area

Pore water and piezometer samples will be collected from four of the 2010 locations near the confluence where contamination has been identified during previous investigations, including the 2005 pore water and 2007 peizometer sampling events. The proposed sampling locations are shown on **Figure 1** and described below:

- Water samples will be collected from PW-GSI-05 (shallow, intermediate and deep pore water) and the piezometer PZ-B3A (shallow groundwater) located on the west side of the confluence area. Elevated concentrations of VOCs and 1,4-dioxane were detected in the shallow groundwater and pore water.
- Water samples will be collected from PW-GSI-06 (shallow, intermediate and deep pore water) and the piezometer PZ-C3A (shallow groundwater) located on the east side of the confluence area. Elevated concentrations of VOCs and 1,4-dioxane were detected in the shallow groundwater and 1,4-dioxane was detected in the porewater samples.
- Samples will be collected from PW-GSI-07 (shallow, intermediate and deep pore water) and piezometer PZ-01A (shallow groundwater). Elevated concentrations of VOCs and 1,4-dioxane were detected in shallow groundwater and 1,4-dioxane in pore water.
- Samples will be collected from PW-GSI-08 (shallow, intermediate and deep pore water) and piezometer PZ-B4A (shallow groundwater). Elevated concentrations of VOCs and 1,4-dioxane were detected in shallow groundwater and chloroethane and 1,4-dioxane in pore water.
- Sediment and surface water samples will also be collected at PW-GSI-07 and -08.

West of the Confluence

The following samples, which are shown on **Figure 1** are proposed for this area:

- Even though the shallow groundwater sample collected from PZ-GSI-12 showed low levels of 1,4-dioxane in 2010, a new shallow groundwater sample will be collected here to evaluate potential seasonal variability.
- Samples will be collected from PW-GSI-12 (shallow and intermediate pore water) and PZ-GSI-12 (shallow groundwater).
- Sediment and surface water samples will also be collected from PW-GSI-12.

North of the Confluence

Samples will be collected from the area north of the confluence along the Merriconeag Stream at GSI-03. The proposed samples are shown on **Figure 1** and described below:

- Samples will be collected from PW-GSI-03 (shallow and intermediate pore water) and are proposed to be collected 800 feet north of the confluence located at a turn in the

Merriconeag stream north of the confluence. This is a likely place where deep aquifer contamination may be discharging into the stream.

- Samples will be collected from PW-GSI-04 (shallow and intermediate pore water) and PZ-GSI-04 (shallow groundwater) located 350 feet north of the confluence. Elevated concentrations of VOCs and 1,4-dioxane were detected in the shallow groundwater and chloroethane and 1,4-dioxane were detected in the pore water.
- Sediment and surface water samples will also be collected from PW-GSI-03 and PW-GSI-04.

3.2.4 South of the Confluence

Samples will be collected at the southern extent of the discharge area where the deep aquifer is contaminated with 1,4-dioxane. The proposed sampling locations are shown on **Figure 1** and described below:

- Samples will be collected from PW-GSI-14 (shallow and intermediate pore water) and PZ-GSI-14 (shallow groundwater).
- Sediment and surface water samples will also be collected at PW-GSI-14.

4.0 Data Evaluation

The analytical data obtained through additional sampling and analysis outlined in this technical memorandum will be evaluated in a manner consistent with the previous GSI investigation Report (AGVIQ-CH2M HILL, 2010). The same conceptual site model and data quality objectives (DQOs) will be used for the subsequent ecological and human health screening assessments as used for the 2010 study. The following describes the general approach that will be employed for the screening assessments.

Comparison to Screening Levels

The detected constituents in new samples collected (pore water[3], sediment, and surface water) will be evaluated and compared to the same medium-specific screening values used in the previous GSI report and identified in the UFP-SAP (AGVIQ-CH2M HILL, 2010). However, some constituents previously lacked screening values (e.g., ecological values for chloroethane in pore water, 1,4-dioxane in surface water and pore water, or acetone or chloroform in sediment). Therefore, additional effort will be put forth to identify any ecotoxicological information from the scientific literature which might be used to develop missing benchmarks, or to update potentially outdated screening values as necessary. If such benchmarks are identified, all detected constituents from the 2010 study not previously assessed will also evaluated along with 2011 results. All data collected will be evaluated to determine any potential seasonal and temporal trends and how those trends affect the site conceptual model.

[3] Pore water data will be used for ecological screening assessment only.

References

AGVIQ-CH2MHILL. 2010. Naval Air Station Brunswick, Mere Brook and Merriconeag Stream groundwater-surface water interface investigation sampling and analysis plan. November 2010.

Attachments

SAP Worksheet #18—Sampling Locations and Methods/SOP Requirements Table

Sampling Location	Sample ID	Sample Type	Depth Interval (bgs)	Analyses
Northern Extent of Discharge Zone				
GSI-03	BN-PW-GSI-03-02	Pore Water	2"-8"	VOCs, 1,4-Dioxane, and MNA parameters
	BN-PW-GSI-03-08	Pore Water	8"-14"	VOCs and 1,4-Dioxane
	BN-PZ-GSI-03-10	Shallow Groundwater	4.2'-9.2'	VOCs, 1,4-Dioxane, and MNA parameters
	BN-SW-GSI-03-00	Surface Water[3]	0-6"	VOCs and 1,4-Dioxane
	BN-SD-GSI-03-00	Sediment[4]	0-6"	VOCs and 1,4-Dioxane, TOC, grain size, and moisture content
GSI-04	BN-PW-GSI-04-02	Pore Water	2"-8"	VOCs, 1,4-Dioxane, and MNA parameters
	BN-PW-GSI-04-08	Pore Water	8"-14"	VOCs and 1,4-Dioxane
	BN-PZ-GSI-04-10	Shallow Groundwater	3.6'-8.6'	VOCs, 1,4-Dioxane, and MNA parameters
SW-17	BN-SW-17-00	Surface Water	0-6"	VOCs and 1,4-Dioxane
Confluence Area				
GSI-05	BN-PW-GSI-05-02	Pore Water	2"-8"	VOCs, 1,4-Dioxane, and MNA parameters
	BN-PW-GSI-05-08	Pore Water	8"-14"	VOCs and 1,4-Dioxane
	BN-PW-GSI-05-14	Pore Water	14"-26"	VOCs and 1,4-Dioxane
PZ-MB-B3-A	PZB3A-111810	Shallow Groundwater	7'-12'	VOCs, 1,4-Dioxane, and MNA parameters
GSI-06	BN-PW-GSI-06-02	Pore Water	2"-8"	VOCs, 1,4-Dioxane, and MNA parameters
	BN-PW-GSI-06-08	Pore Water	8"-14"	VOCs and 1,4-Dioxane
	BN-PW-GSI-06-14	Pore Water	14"-26"	VOCs and 1,4-Dioxane
PZ-MB-C3-A	PZC3A-111910	Shallow Groundwater	7'-12'	VOCs, 1,4-Dioxane, and MNA parameters
GSI-07	BN-PW-GSI-07-02	Pore Water	2"-8"	VOCs, 1,4-Dioxane, and MNA parameters
	BN-PW-GSI-07-08	Pore Water	8"-14"	VOCs and 1,4-Dioxane
	BN-PW-GSI-07-14	Pore Water	14"-26"	VOCs and 1,4-Dioxane
PZ-MB-01-A	PZ01A-111810	Shallow Groundwater	7'-12'	VOCs, 1,4-Dioxane, and MNA parameters
	BN-SW-GSI-07-00	Surface Water	0-6"	VOCs and 1,4-Dioxane
	BN-SD-GSI-07-00	Sediment	0-6"	VOCs and 1,4-Dioxane, TOC, grain size, and moisture content
GSI-08	BN-PW-GSI-08-02	Pore Water	2"-8"	VOCs, 1,4-Dioxane, and MNA parameters
	BN-PW-GSI-08-08	Pore Water	8"-14"	VOCs and 1,4-Dioxane
	BN-PW-GSI-08-14	Pore Water	14"-26"	VOCs and 1,4-Dioxane
PZ-MB-B4-A	PZB4A-111910	Shallow Groundwater	7'-12'	VOCs, 1,4-Dioxane, and MNA parameters
	BN-SW-GSI-08-00	Surface Water	0-6"	VOCs and 1,4-Dioxane
	BN-SD-GSI-08-00	Sediment	0-6"	VOCs and 1,4-Dioxane, TOC, grain size, and moisture content
Western Seep Area				
GSI-12	BN-PW-GSI-12-02	Pore Water	2"-8"	VOCs, 1,4-Dioxane, and MNA parameters
	BN-PW-GSI-12-08	Pore Water	8"-14"	VOCs and 1,4-Dioxane

SAP Worksheet #18—Sampling Locations and Methods/SOP Requirements Table

Sampling Location	Sample ID	Sample Type	Depth Interval (bgs)	Analyses
	BN-PZ-GSI-12-10	Shallow Groundwater	6.7'-11.7'	VOCs, 1,4-Dioxane, and MNA parameters
	BN-SW-GSI-12-00	Surface Water	0-6"	VOCs and 1,4-Dioxane
	BN-SD-GSI-12-00	Sediment	0-6"	VOCs and 1,4-Dioxane, TOC, grain size, and moisture content
SW-18	BN-SW-17-00	Surface Water	0-6"	VOCs and 1,4-Dioxane
Southern Extent of Discharge Zone				
GSI-14	BN-PW-GSI-14-02	Pore Water	2"-8"	VOCs, 1,4-Dioxane, and MNA parameters
	BN-PW-GSI-14-08	Pore Water	8"-14"	VOCs and 1,4-Dioxane
	BN-PZ-GSI-14-10	Shallow Groundwater	4.8'-9.8'	VOCs, 1,4-Dioxane, and MNA parameters
	BN-SW-GSI-14-00	Surface Water	0-6"	VOCs and 1,4-Dioxane
	BN-SD-GSI-14-00	Sediment	0-6"	VOCs and 1,4-Dioxane, TOC, grain size, and moisture content

Notes:
bgs - below ground surface

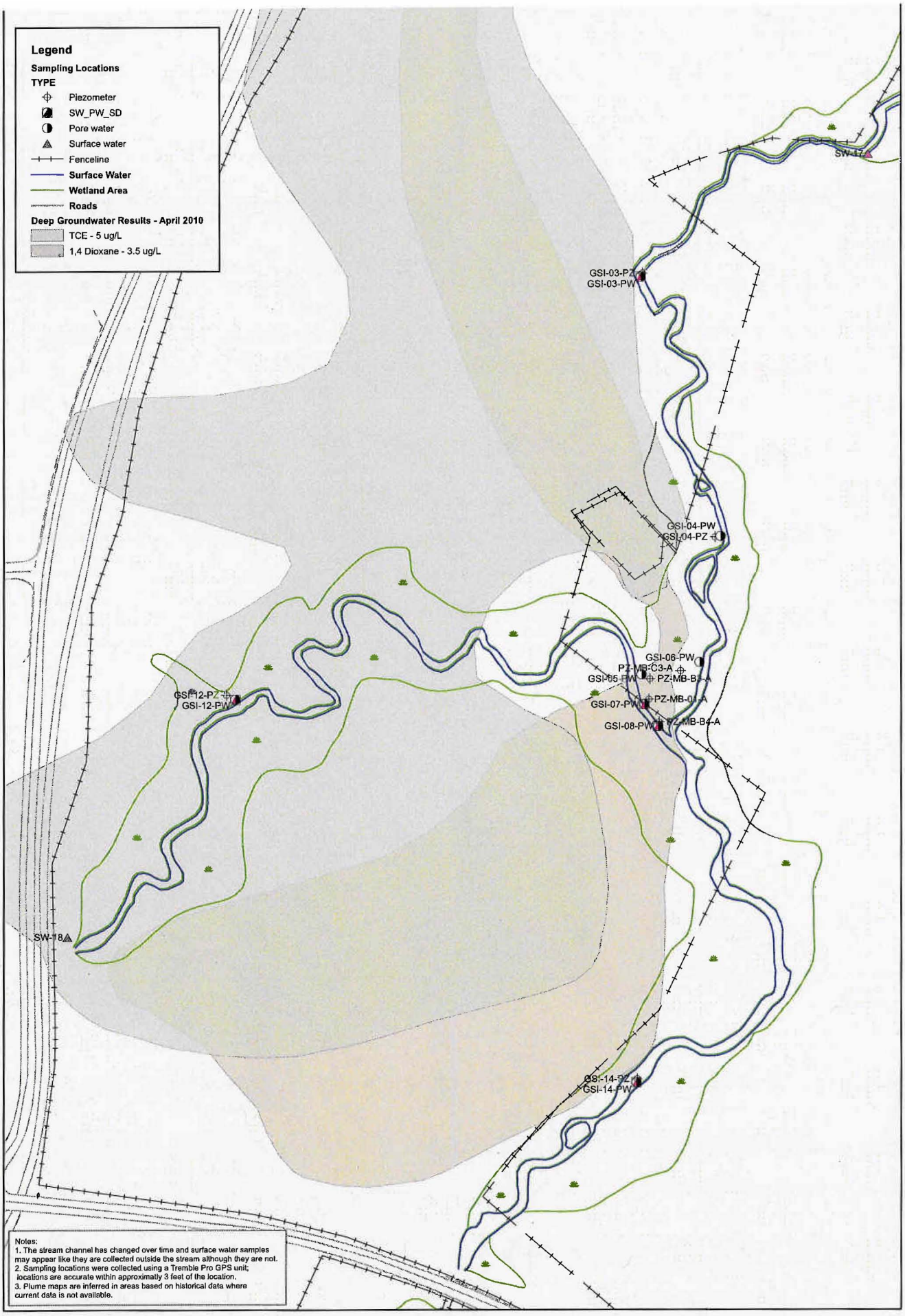
VOCs - Volatile organic compounds

TOC – Total organic carbon

MNA parameters including the following analyses: dissolved iron and manganese, nitrate, sulfate, methane, ethane, ethane, and total organic carbon.

QA/QC sampling will be performed at locations determined in the field based on site conditions. The frequency of QA/QC sampling is defined in Worksheet #20.

1 – Pore water sampling will be performed following SOP-08. Hydraulic gradient measurements will be taken at these locations following SOP-10.
2 – Shallow groundwater sampling will be performed following SOP-07. Water levels and total depths will be measured from these sample locations following SOP-07.
3 – Surface water sampling will be performed following SOP-11.
4 – Sediment sampling will be performed following SOP-12.



AGVIQ CH2M HILL

0 50 100 200 300 400 Feet

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Figure 1

Supplemental GSI Sampling
Groundwater-Surface Water Interface Investigation
Naval Air Station Brunswick
Brunswick, Maine

Responses to USEPA Comments (Comment Letter Dated April 21, 2011)
Mere Brook & Merriconeag Stream, Groundwater-Surface Water Interface Investigation Report
Naval Air Station, Brunswick, Maine

Comment Number	Section and Page Number	Comment	Response
1	General Comment	EPA generally concurs with the summary and conclusions presented in Section 5 of the report. It appears from the numerous collected data sets that Eastern Plume chlorinated VOC ground water contamination discharging into the Mere Brook & Merriconeag surface water environment is being reduced by natural attenuation processes within the hyporheic zone of these stream systems. 1,4-dioxane, on the other hand, does not appear to be undergoing similar robust concentration reductions due to its chemical properties that make it more resistant to biodegradation processes. Nonetheless, dilution and dispersion processes appear to be reducing concentrations as it interacts with the hyporheic zone until it ultimately reaches the surface water column.	We agree with this comment.
2	General Comment	A qualitative risk evaluation was completed as part of the study. For the surface water media, sample concentrations were non-detect for chlorinated VOCs and 1,4-dioxane concentrations were non-detect with the exception of an estimated concentration of 0.92 ppb at sampling station GSI-15 and 0.51 ppb at sampling station GSI-3. Carcinogenic risks associated with Eastern Plume chlorinated VOCs and 1,4-dioxane for the surface water media would be below EPA levels for acceptable human risk. It is stated several times throughout the report that risks to aquatic biota cannot be evaluated due to a lack of ecological screening values for 1,4-dioxane. While there are currently no federal or state ambient water quality criteria available for 1,4-dioxane, Region I did consult EPA's ECOTOX database as well as the Canadian Water Quality Guidelines for Protection of Aquatic Life (CWQG-PAL). Numerous toxicity tests based on several different test endpoints and effects measurements for a variety of aquatic organisms all suggest that low ppb levels of 1,4-dioxane detected in pore water and surface water would not result in any acute or chronic risks to benthic or water column species within Mere Brook or Merriconeag Stream. Attached with this comment letter are the results from an EPA ECOTOX query as well as a 1,4-dioxane aquatic toxicity assessment completed by the Canadian Council of Ministers of the Environment (CCME). While an acute or chronic CWQG-PAL was not developed because minimum CCME data requirements were not met, the Ontario Ministry of the Environment (OMOE) has developed an interim guideline of 58 mg/l (58,000 ppb). It should be noted that this interim guideline is significantly higher than the maximum 1,4- dioxane concentration detected within the Eastern Plume ground water contaminant plume.	We agree with the comment. The toxicity data provided will be considered along with other relevant information from the scientific literature, when updating this report and for incorporation into the risk evaluation of future investigation reports.
3	General Comment	EPA reviewed MEDEP's letter dated 30 March 2011 transmitting its comments on the GW-SW Interface Investigation Report. EPA concurs with MEDEP that due to the significant rainfall that occurred both before and during the field sampling effort, the results are potentially not representative of the varying seasonal recharge and discharge conditions that likely exist within the shallow ground water and Mere Brook-Merriconeag Stream environments. EPA support's MEDEP's recommendation to conduct another round of shallow groundwater, pore water, and surface water sampling during a seasonally dry period at a subset of GW-SW interface study monitoring locations. EPA suggests that a conference call be conveyed in the near future to discuss and come to a consensus on which GW-SW study sampling locations should be targeted for further sampling. Completing this additional sampling will provide additional confidence that Eastern Plume ground water contaminants interacting with and discharging to the Mere Brook and Merriconeag Stream environment do not pose potential unacceptable risk to human health and the environment.	The data collected during this sampling event has shown some significant results but collecting results from other seasons including low-water periods would add to the conclusiveness of the data. The Navy is in the process of developing the second round of sampling planned to be conducted during a low-water and warmer periods of the year (early September 2011).

Responses to MEDEP Comments (Comment Letter Dated March 30, 2011)
Mere Brook & Merriconeag Stream, Groundwater-Surface Water Interface Investigation Report
Naval Air Station, Brunswick, Maine

Comment Number	Section and Page Number	Comment	Response
1	General Comment	While the data may represent the groundwater/pore water, stream and sediment concentrations of Eastern Plume Contaminants of Concern (COCs) at the time period of the sample event, it may not be representative of different seasonal (recharge/discharge) conditions. However for this sampling event 1,4 dioxane is the only plume constituent that persisted from the shallow groundwater to the surface water. Significant degradation and/or attenuation of the chlorinated Volatile Organic Compounds (VOCs) appears to be occurring in the upper 2 feet of sediment, based on relatively frequent detections in shallow groundwater and few in the 2-6 inch interval. This is similar to data reported elsewhere, highlighting the importance of the very shallow sediment/porewater chemistry for breakdown of VOCs. The relative importance of dilution on shallow groundwater and porewater data collected is unclear based on the single round of data. Precipitation records for Bath, Maine indicate that 2.14 inches of rain fell the week before the event and 1.77 inches (2.04 inches for Brunswick according to the report) fell during the investigation. Readings from the staff gauges and zip-ties on the porewater stick-ups indicate how dynamic the system is in response to rain events, based on rapid changes at some locations and slower responses in others. The data from Long-Term Monitoring (LTM) porewater locations indicated that at the confluence concentrations of VOCs in shallow groundwater	The data collected during this sampling event has shown some significant results but collecting results from other seasons including low-water periods would add to the conclusiveness of the data. The Navy is in the process of developing the second round of sampling planned to be conducted during a low-water and warmer periods of the year. According to data from Weather Underground (weather gauge MC0774) only 0.36" of rain fell from Nov 7-16, with the majority of that falling on Wed, Nov 10th (0.35"), a full week prior to the study event rainfall of Wed, Nov 17th. This information will be added to Section 2.1.2.
2	General Comment	The evaluation of the different pore water sample methods indicates that they are roughly comparable for the targeted zone of interest. The relatively short screen and technique of targeting sandier zones may contribute to the wider range of detections seen in the MEDEP method samples.	The commenter makes a good point. While the concentrations are within the same order of magnitude, the difference could be explained by different degrees of apparatus filtering (i.e., lack of sand pack on PushPoint), but also possibly due to the positioning of the narrower screen of the PushPoint (~2 inches; 4 inches smaller than the Well Point screen) in a more contaminated subsurface zone. The last aspect will be added to the discussion in Section 4.1.2 of the report. See also response to Comment 20c and 22b.
3	General Comment	These data support inclusion of 1,4 dioxane into the LTM porewater and surface water sample analyte list as this investigation has shown that it is the contaminant most likely to persist in the surface water.	Four pore water samples and 5 surface water samples are currently included in the long-term monitoring (LTM) plan. The pore water samples are currently analyzed for 1,4-dioxane. The Navy will evaluate analyzing surface water samples for 1,4-dioxane as part of the LTM.
4	General Comment	Most of the figures in the report appear to have a PDF format conversion error that substitutes random symbols for the north arrow and sample locations. Please revise the figures for the final report with the correct symbology.	The figures will be revised.
5	Section 1.3.1, 2005 Mere Brook and Merriconeag Stream Pore Water Investigation, Paragraph 3	"VOCs and 1,4 Dioxane were detected in pore water samples collected…" a.) Please list the VOCs detected in the pore water samples during the 2005 porewater event. b.) The data from this investigation should be compared to earlier pore water results to gain a broader prospective of natural attenuation as this round was just a single point in time and may not reflect other seasonal or recharge/discharge conditions within the shallow groundwater and stream. c.) para 2: Please note that the 2005 sample effort extended north to the confluence area.	a.) A list of detected results for VOCs and 1,4-dioxane will be added to the paragraph including highest detections. b.) A qualitative comparison will be added to the results section; a more in depth analysis is not able to be completed because the locations and depths are not collected from the same locations. c.) A sentence will be added noting that the investigation extended north of the confluence.
6	Section 1.3.2, 2007 Mere Brook and Merriconeag Stream Investigation, last paragraph	"Results of the pore water sampling program confirmed that constituents of the Eastern Plume were migrating into the Mere Brook and Merriconeag Stream area." See comment 5 above.	A list of detected results for VOCs and 1,4-dioxane were added to the paragraph including highest detections.
7	Section 1.3.3, Supplemental Remedial Investigation, August 2008-January 2010	TCE, TCA and 1,4 dioxane were found in 13 of 83 pore water samples during the 2008 pore water sampling event. (Please keep in mind that was another high water event.) This must also be discussed in this section and included in the CSM.	A list of detected results for VOCs and 1,4-dioxane will be added to the paragraph including highest detections.
8	Section 1.3.4, Long-Term Monitoring, Paragraph 1	Please revise the text to clarify that the HiPOx system was not installed and operational until 2010.	The revision will be made as requested.
9	Figure 1-1	This figure is based on a 2007 version and should be updated to show the plume in the confluence of the stream. Please use more updated and accurate depiction of the Eastern Plume based on the Long Term Monitoring and recent investigations	The plume has been updated showing the LTM April 2010 data, the most up to date data available.
10	Figure 1-2	Please add the source(s) of this data.	The source of the data for creating the plume maps is the LTM data from April 2010. A reference has been added to the map; please see figure 3 of the UFP SAP for actual data.
11	Section 2.1.2, Rainfall	This section should also include the precipitation for the week prior to the sampling event. (Precipitation records for Bath, Maine indicate that 2.14 inches of rain fell the week before the event.)	See response to Comment 1.
12	Section 2.2, Table 2-2, Table 2-5 & Project Sampling and Analysis Plan (SAP) Pages 57-58	The SAP indicated dissolved oxygen readings would be collected for surface water and porewater sample locations, but these readings were not collected, please note in the deviations section.	The lack of DO for pore and surface water is due to the instrument used for water quality measures during collection of these samples (Myron L Ultrameter). This meter does not have a DO sensor and was dedicated to pore water sampling. While the meter used for groundwater (YSI) sampling did measure DO, these sample efforts rarely coincided and thus DO could not be measured at the time of all pore water pulls. This deviation will be noted in Section 2.9.

Responses to MEDEP Comments (Comment Letter Dated March 30, 2011)
Mere Brook & Merriconeag Stream, Groundwater-Surface Water Interface Investigation Report
Naval Air Station, Brunswick, Maine

Comment Number	Section and Page Number	Comment	Response
13	Section 2.3.2, Hydraulic Pressure Measurements	"Figure 2-2 depicts the in-field set up of the gage and pushpoint prove..." This should read "pushpoint probe", please revise the text.	The revision will be made as requested.
14	Section 2.3.3, Sampling, Paragraph1 & Section 2.9, Deviations	Based on MEDEP's field notes the decision to sample was a combination of stabilizing stream levels, predicted additional rainfall, and field team schedules. Measurements at the zip-ties placed at porewater locations indicated significant water level decreases at some locations, but the staff gauges actually increased in some cases on the days samples were collected. Please note the mix of factors that formed the field decision, the data indicate the watershed was still responding to the rain event.	It was the field team's recollection that the staff gauges had raised in some cases, but only in relation to previous low water periods of the year. The conditions in the sampled areas of the stream had returned to near pre-rain event conditions in most cases. Regardless, more details regarding the observations, factors & discussions considered before the pore water sampling was started is provided in the opening/first paragraph of Section 2.3, including specific staff gauges and well points that were monitored for SW levels (measurements shown in Table 2-3). Therefore, the first sentence of Section 2.3.3 will be deleted so that all discussion regarding the decision to start sampling is discussed in one, up-front section of the pore water investigation section of the report. Additionally, the following sentence will be added to the end of section: "However, based on these observations and measurements, the watershed was still responding to the rain event of November 17."
15	Section 2.4.2, Temporary Piezometer, Installation	"The total depth of the monitoring wells was 12 feet bgs or when the ..." This sentence seems out of context unless the Navy means "piezometers" rather than "monitoring wells". Please check and revise as necessary.	The sentence will be changed to: "The total depth of the piezometers was 12 feet bgs or when the..."
16	Section 2.9, Deviations from the UFP-SAP	a.) Bullet 1: "Piezometers GSI-05, GSI-06, GSI-07, GSI-08, and GSI-10 were not installed. Instead ..." This change was agreed to prior to CH2M Hill going into the field (response to comment 29 (undated; received via email 11-15-10)) and therefore should not be called a field change. However, it could be noted that once the existing piezometers were determined to be in good condition that there was no need for new piezometers to be installed or something similar. b.) Regarding surface water sampling, in the response to comments (RTCs) (undated; received via email 11-15-10) RTC 22 stated, in part: "There is no recollection of discussing the use of a chamber to help with this process. Though, given the flow the risk of dilution is acknowledged. Therefore, the sample will be collected even closer than the stated 4 inches in the SOP (more like 2 inches from sediment surface). Additionally, the sample tubing can be attached to a pole such that the opening of the tubing will be 2 inches from the bottom of the pole when the pole gently rests on the sediment surface." MEDEP did not observe surface water being collected as agreed upon but by a person reaching into the stream with tubing and estimating the distance from the stream bottom. When questioned about the collection method MEDEP was told that the pole was only to be used as a secondary measure if it couldn't be done by hand. This change was made over the objection by MEDEP and the deviation needs to be included in this section.	a) Comment noted and bullet 1 will be edited accordingly. b) The deviation in surface water sample procedure will be added to this section. The positioning of the sample tube opening within 2 inches of the stream bottom was accomplished at all sample locations by the person holding the tubing for sampling. Essentially, the sampler's arm was used in lieu of a pole when it was determined that the water was shallow and clear enough to visually determine. In all cases, surface water samples were collected from a depth even closer than 2 inches from the bottom as the ultimate goal was to collect the sample as close to the sediment surface as possible without disturbing the sediment itself.
17	Table 2-5	The depth to surface water at GSI-07 appears to be mislabeled. Please revise as needed.	Agreed. This depth data is a type and will be revised from 39.91 feet to 3.91 feet. However, in further review of this table and water level measures, the depth is currently presented incorrectly and Table 2-5 will require further revision. Specifically, the information and data presented under the columns "Depth to Surface Water (feet)" "Depth to Pore Water (feet)" are misplaced. These water levels provided for "Pre", "Mid" and "Post" sampling time points should instead be presented for "Shallow", "Intermediate" and "Deep" well points, respectively throughout the table. Therefore, these edits will be made for the final version.

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Comment Number	Section and Page Number	Comment	Response
18	Section 3.1.2, Pore Water, Paragraph1	"The only action levels applicable to pore water are the direct exposure screening values [2] for surface water." While for this study it is appropriate to compare shallow pore water to surface water criteria for eco-toxicity, pore water results are typically compared to groundwater and as stated in the SAP (Worksheet 11) pore water is being used to determine nature and extent therefore it must be compared to groundwater criteria to meet that objective. Please revise the above statement and paragraph to reflect the stated use of data per the SAP.	Risk-based criteria (e.g., MEGs, MCLs) are sometimes used in the nature and extent evaluations to delineate contamination in exposure media such as groundwater and soil. However, it was determined through the SAP (DQO process) that pore water was not an exposure medium for human receptors. Therefore, the MEGs and MCLs are not applicable to pore water. Furthermore, Worksheet #11 states the following in the following sections: • Federal and State Water Quality Standard - "results from groundwater (shallow and deep) will be compared against appropriate MEGs and MCLs." • Human Health Risk – "Pore water data characterize the chemical concentrations near the groundwater-surface water interface; therefore, the data will be used for the nature and extent purposes only and will not be screened against the human health screening levels" Nature and extent evaluations are most often performed to identify what is detected, where it was detected and at what concentrations it was detected. Nature and extent is not used for screening or to identify risks, which is the purpose of the risk assessments. Therefore, the approach taken for this investigation/report was to evaluate the nature and extent of site-specific contamination across the transport pathway (groundwater --> pore water --> sediment --> surface water). Therefore, additional screening of the pore water data will not be performed.
19	Section 3.1.3.1, Ecological Screening Values	It would be clearer if the second paragraph in Section 3.1.2 was moved into this section and the reference to pore water removed. (See comment 18 above.)	The second paragraph in Section 3.1.2 will be repeated in section 3.1.2.1 (see response to Comment 18). However, it will be noted that the screening values used for pore water and surface water are the same.
20	Section 4.12, Pore Water	a.) "None of the concentrations of these constituents exceed ecological screening values..." For the purpose of nature and extent the MEGs and MCLS must be compared also. (See comment 18 above.) b.) para 2: Please consider adding a sub-heading to this paragraph so the comparison of results between well points and push points collection is not lost in the report. c.) para 2: The text indicates that the higher 1,4 dioxane detected using the MEDEP Push-Point method might be due to increased presence of fines or colloids. Is there data from other sites where this is the case? 1,4 dioxane has a very low Koc value and should not significantly sorb to particulates. Unfortunately there are no field turbidity or Total Dissolved Solids (TDS) data for the MEDEP method locations, to use for comparison. For the four LTM porewater locations turbidity has not exceeded 25 NTU over the last three rounds, suggesting turbidity is not a factor. Other reasons for the different detections may be the spatial heterogeneity in the porewater discharge or the shorter screened zone of the Push-Point.	a.) See response to Comment 18 b.) A subheading will be added called "Comparison to Pore Water Sampling Methods". c.) There is no other data available from the site verifying the potential for sorption of 1,4-dioxane onto particulates. No turbidity measurement were collected during sampling of the porewater samples. The estimated decrease in turbidity is based on the differences between the PushPoint and Well Point pore water collection methods (i.e., less filtering via PushPoint). The differences in PushPoint vs. Well Point concentrations will primarily be discussed as indicated in the response to Comment 2 (relatively restricted screen zone), as well as potential spatial heterogeneity, and/or dilution (response to Comment 22b).
21	Section 4.2, DQO 2 – Potential Risks	Due to the short duration and limited nature of the investigation and evaluation of data, any discussion of ecological or human health risks from Eastern Plume must be revised to discuss the limitations of this investigation to determine long term risks.	Samples have been collected semiannually since the mid 1990s via the LTM program. This program has shown that this is a general decreasing trend in the concentrations of chemicals of interest. The data used in the human health and ecological risk evaluations were typically collected from the areas of past elevated contamination, rather than the areas where potential chemical exposures by human and ecological receptors most likely take place. Therefore, the data used in this investigation are believed to conservatively represent future concentrations at the site. A new "uncertainty" section will be added as Section 4.2.3. The uncertainties associated with the limitations of assessing potential risks will be included in the report. Specific uncertainty topics that will be discussed include the following: • Use of conservative screening values • Constituents without screening values • Data limitations (short duration, point-in-time nature of investigation, rainfall event influence). • Use of maximum detected (HH) and/or point-by-point (Eco) concentrations in the evaluations.

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22	Section 4.2.1, Ecological Risk Evaluation	a.) "Therefore, no unacceptable risks are expected for aquatic based on the presence and potential exposure to these constituents." This statement should be removed or heavily qualified as this was only a one time sampling event which may or may not have been affected by the heavy rains. (If retained please check the sentence for a missing word after aquatic.) (Also see comment 21 above.) b.) "Based on the volatile nature of these constituents, aquatic receptor exposures are expected to be minimal after discharge at the GSI." The ecological exposures for 1,4 dioxane will not be reduced significantly by volatilization, although dilution is certainly an important factor. Please modify the text.	a.) This statement was made in reference to those constituents that were detected and had screening values. As these screening values are conservative in nature and they were applied on a sample-by-sample basis, this statement is considered appropriate. The potential impact the rainfall may or may not have had on the occurrence of COCs will be noted in the "Uncertainties" section being added (see response to Comment 21). The statement will be qualified to state that "at the concentrations constituents detected during this investigation" that have screening values, unacceptable risks are not expected for populations of aquatic biota (or similar, qualifying that these data represent the most recent "snapshot in time") b.) This statement will be revised clarify that significant volatilization is not expected as much as dilution.
23	Section 4.2.2, Human Health Risk Evaluation, Paragraph1	a.) "In particular, four constituents (1,1-DCE, TCE, PCE and VC) were detected at concentrations exceeding all of the three drinking water screening levels…" It is unclear why only the compounds that exceed all three groundwater criteria (MEGs, MCL and RSL) included for discussion. The discussion of potential risk in this section must include all VOCs that exceeded any of the criteria, including 1,4 dioxane, 1,1 DCA, and cis-1,2-DCE. b.) "Among these four constituents, the maximum detected concentrations of three constituents (TCE, …) also exceed their IA GWSLs." Please consider the following language: ~~Among these four constituents, the maximum detected concentrations of~~ Three constituents (TCE, …) also exceed their IA GWSLs. c.) para 1: "Because of the results of screening comparison and short duration and infrequent nature of potential human exposure to sediment, the concentrations in sediment are not expected to pose unacceptable risks to potential human receptors evaluated in this screening evaluation." See comment 21 above.	a.) The discussion in this section focused on the chemicals exceeding either Maine State MEG or Federal MCLs, because the Groundwater Remediation Goals were established based on these two standards in the 1998 ROD and the 2010 ESD (for VC and 1,4-Dioxane). As suggested, the chemicals that were detected at concentrations exceeding any of the three drinking water screening levels will be mentioned in the section. b.) The sentence will be revised as suggested. c.) See response to Comment 21.
24	Section 4.3.1, Temporal Comparison	a.) para 1: "The data from the previous sampling events show an overall decreasing trend for both 1,4-dioxane and TCE, especially in the confluence area." The piezometers were initially installed in early 2007 (March), and data is available for VOCs and 1,4 dioxane from mid-2007 and from 2009. While MEDEP concurs that based on the data from the 2 or 3 sample events concentrations have declined from 2007 at most of the locations in the confluence, additional data would be needed to establish clear trends. Please revise the text to note these data and the limitations of only 2-3 rounds of data. b.) para 2 – "Although the two wells…" Please revise the text to reflect that all the monitoring wells had 1,4 dioxane detections.	a.) The statement will be modified to qualify the comparison: "Although limited to a small group of sampling locations and over only 2 or 3 sampling events the available data from the previous events show an overall decreasing trend..." Additional data from previous sampling events will be added. b.) The sentence will be revised to say "Although the two deep aquifer wells..."
25	Section 4.3.2, Constituents of Concern	The pore water and piezometer sampling has shown that chlorinated solvents have been degraded throughout the study area in shallow sediments." Please briefly discuss the limitations of the study including the heavy rainfall and limited sampling. (See comment 5 & 24.a above.) Also please consider replacing "degraded" with "attenuated" as attenuation includes multiple processes.	This sentence was added to the section: "During the investigation there was heavy rainfall that fell prior to collection of pore water samples in the area of the stream which may have some effect on results from the pore water. Although the investigation did take place during a rain fall event evidence of breakdown products of chlorinated solvents and the presence of 1,4 dioxane at the most shallow depth is evidence that the VOCs are more likely degrading than being removed from the sediments due to dilution or flushing Attenuated will be replaced by degraded where applicable.
26	Section 4.3.2.1, Chlorinated Solvents, Paragraph2	"By the time the water migrates to the GSI, the contaminants are fully attenuating." See comments 5 & 24.a above regarding limitations.	The sentence will be revised as follows: "By the time the water migrates to the GSI, the contaminants are in advanced stages of degradation.
27	Section 4.3.2.2, Chloroethane	It appears the text should state that chloroethane is produced by the breakdown of 1,2-DCA and 1,1-DCA and not chloroethane, as stated, please revise.	The text will be revised to state: "chloroethane… is also known to be generated with the breakdown of vinyl chloride in a reducing environment."
28	Section 4.3.2.4, Table 4-8 & Table 4-9	A comparison of the Monitored Natural Attenuation (MNA) parameter data from this study to those from the "Monitored Natural Attenuation Assessment of the Eastern Plume" (Oct 2006) illustrate the variation in conditions suitable for degradation across the plume. The scores for wells in that study had a maximum of 13, much less than the aggregate score for this study, and only six wells were over a score of ten. If individual location scores were compiled please add them to Tables 4-8 and 4-9, so comparisons can be made to the older study.	Individual scores will be added in Tables 4-10 and 4-11 although any direct comparison with the older study will be difficult as there were not many overlapping wells in the two studies. The individual results appear to support that adequate evidence for anaerobic biodegradation is occurring instead of strong evidence. When looking at all the evidence together focusing on the contaminated areas and evaluating each category before adding the scores together there is enough overall evidence for rating the monitored natural attenuation as strong for the site.

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Comment Number	Section and Page Number	Comment	Response
29	Section 4.4, DQOs 1C and 4..., bullet 1	"However, the analyses of natural attenuation shows that the observed chlorinated solvents are degrading completely prior to reaching the GSI of Mere Brook and Merriconeag Stream, with 1,4-dioxane persisting all the way through the transport pathway." While this may have been happening during at this point in time, additional sampling rounds would be necessary to determine if this is the case under all recharge/discharge conditions. Also see comment 1 above.	Comment noted. Language will be added to acknowledge that the investigation was only one point in time and not showing long-term trends.
30	Table 4-1	a.) Please add the well number (360) to BN-GW-MW-EP. b.) Please check the table for erroneous "U" designations for (e.g., BN-PZ-GSI-04, PZ3A-111810 and others). c.) Please add a foot note of the "E" designation. d.) It is difficult to determine why certain color designations were used over others. Please consider removing the color coding and just bold detections and highlight those values which exceeded any of the criteria. If the Navy wants to retain the color coding it might simplify it if the exceedance of the MEGS or the MCLs used one color. e.) Also please consider creating a separate table for the vapor intrusion data to simplify the table. f.) It is unclear why some of the compounds are shown as exceeding the RSL yet are non detect. Please correct. If the detection limit exceeded the screening criteria it should be noted. g.) Notes: Please reference the updated VI screening criteria used.	a.) This portion of the sample ID was inadvertently truncated in the table. The table will be revised to show the entire sample ID. b.) The table will be revised to remove erroneous "U" designations such as those for tetrachlorothene and trichloroethene for PZ3A-111810. c.) A footnote describing that the E qualifier means the chemical was detected above the calibration range will be added. d.) The UFP SAP defined all the screening levels in Table 4-1 as project action limits. A tiered approach was taken to screen the groundwater data for the purpose of showing the chemicals that exceeded the project action limits defined in the UFP SAP. Using one color to screen chemicals against the MEGs and MCLs would not be correct since the screening levels are not the same for most of the chemicals detected in groundwater. A footnote will be added to describe the tiered screening approach. e.) The groundwater screening level for protection of indoor air is one of the project action limits for groundwater, as defined in the UFP SAP and is therefore considered to be appropriate to screen against chemicals detected in groundwater in the same table as the other groundwater screening levels. Therefore, no change will be made. f.) Non-detect chemicals for which the detection limit exceeded screening levels were color coded to show the appropriate exceedence. A footnote will be added to explain that non-detect chemicals with detection limits exceeding screening criteria are shaded accordingly.
31	Table 4.2	See comment 30.c above.	A footnote describing that the E qualifier means the chemical was detected above the calibration range will be added.
32	Table 4.3	For consistency please use bolding for detection and highlighting for exceedances.	As stated in the footnote of the table, detected concentrations are shaded. This is consistent with the other tables presented in Section 4 as well.
33	Table 4.4	a.) Please revise GSI-12 to west rather than east of the confluence. b.) Please note the purpose of highlighting; revise if necessary.	a.) The table will be revised to indicate GSI-12 is located west of the confluence. b.) As stated in the footnote of the table, detected concentrations are shaded.
34	Table 4.7	Please check title for spelling errors.	The PDF of the table will be re-generated so that the entire title appears on the table.