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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 1
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BOSTON, MASSACHUSETTS 02114-2023

July 3, 2003

Mark Evans, Remedial Project Manager
U.S. Department of the Navy
Naval Facilities Engineering Command
Northern Division
10 Industrial Highway
Code 1823, Mail Stop 82
Lester, PA 19113-2090

Re: Responses to EPA's Comments on the Draft Volume II - Groundwater Monitoring Plan Operation and Maintenance Manual for Installation Restoration Sites at NSB–NLON

Dear Mr. Evans:

Thank you for the opportunity to review the draft Responses to EPA's Comments on the *Draft Volume II - Groundwater Monitoring Plan Operation and Maintenance Manual for Installation Restoration Sites at NSB–NLON*. The following comments are intended to amplify on the original comments where there is ongoing discussion. The present remarks also reflect discussions held during the teleconference of Tuesday, June 3, 2003. Detailed comments are included in Attachment A.

The original comment simply identified that the proposed changes to the primary monitoring criteria are, in many cases, significant, and warranted further discussion. The Navy's recent formal application to the CTDEP for approval of Navy's proposed alternate water quality standards; CTDEP review is pending.

The original comment raised two general questions regarding the potential impact of the revised primary monitoring criteria for the Area A Landfill on the monitoring program. These issues were discussed in the June 3 conference call, but left open-ended:

- It was noted that the changes in the primary monitoring criteria for inorganics for Area A Landfill groundwater render former exceedances for arsenic no longer a problem, while elements formerly below the monitoring criteria would be in exceedance of the new ones (*e.g.*, Cd and Cu). In the conference call, it was pointed out that this may lead to a repeat of the circumstances surrounding arsenic under the existing monitoring program. That is, there may well be sporadic, but persistent exceedances of the monitoring criteria for certain inorganics, particularly in the dredge spoil material, where it has been established that reducing conditions can mobilize metals. These exceedances may, at some point, call for another assessment like that done for arsenic, in which the role of the local geological, hydrological, and geochemical environment in controlling inorganics

concentrations is reviewed in order to allay concerns. It was suggested that the supplemental geochemical investigation conducted to address the arsenic issue might provide a starting point for any similar issues with regard to other metals.

- It was noted that some of the new primary monitoring criteria are below the nominal laboratory reporting limits (*e.g.*, for Be, Cd, Cu, and Pb at Area A Landfill). This raises questions concerning the appropriate course of action. EPA continues to believe that the analysis methods should be able to discriminate exceedances. Many highly sensitive analytical methods (*e.g.*, ICP-MS) are commercially available. In the present case, it is recommended that the monitoring plan be written explicitly to fall back on the detection limits available from standard methods (*i.e.*, ICP-AES) as the applicable criteria in the event that the method detection limits fall above the adopted primary monitoring criteria.

I look forward to working with you and the Connecticut Department of Environmental Protection to protect the environs of the Naval Submarine base. Please do not hesitate to contact me at (617) 918-1385 should you have any questions.

Sincerely,

Kymberlee Keckler, Remedial Project Manager
Federal Facilities Superfund Section

Attachments

cc: Mark Lewis, CTDEP, Hartford, CT
Dick Conant, NSBNL, Groton, CT
Jennifer Stump, Gannett Fleming, Harrisburg, PA

ATTACHMENT A

Page	Comment
2. p. 2-10, §2.2.3.3	The original comment noted that, given what is now known about transport processes in the neighborhood of the Area A Landfill, the balance of monitoring wells in the long-term monitoring program should be reviewed. In particular, Navy recommends: • *Eliminate dredged-material wells 2WMW38DS, 2WMW39DS, 2WMW41DS, 2WMW45DS, and 2WMW47DS.* These wells have been shown to monitor a local environment in the dredged material that shows no discernible impact of the landfill. Furthermore, these wells are redundant, in that there are five additional dredged-material wells that Navy proposes to leave in the LTM program. The five wells proposed for elimination can be dropped without loss of useful data for monitoring the effectiveness of the site remediation. • *Add monitoring well 2LOW1D for four rounds of sampling in order to address the concern for lack of well coverage in the alluvium.* This well location appears to be well chosen to monitor for potential impacts of the landfill on groundwater in the conductive alluvium. It is toward the downgradient (northern) end of the landfill. According to the response, the recommended well has the deepest screen among downgradient wells within the landfill footprint. The rationale for choosing a deep screen should be provided. Is this simply to assure that the well is screened within the alluvium? If the alluvium is sufficiently thick here, and if there is an existing well screened in the uppermost portion of the alluvium, that may be a worthwhile sampling target, because one might expect landfill influences to be detected first in the shallowest "fast" material. Are there available estimates of the vertical hydraulic gradient in the vicinity of 2LOW1D? Ideally, EPA would like some assurance that the well does not sample groundwater discharging upward from underlying bedrock. • *Retain 3MW37S (alluvium), 3MW12D (bedrock), and 3MSP01 (seep) for coverage of the downgradient domain.* These locations provide adequate coverage to monitor for downgradient impacts of the landfill. No additional wells are indicated in the downgradient area at this time.

7. p. 2-44, §2.3.4.4 The original comment questioned the *logic* behind the statement that "... the DRMO site is not causing the leaching of metals." The comment did not challenge the overall conclusion that DRMO has a minimal impact on inorganics in groundwater. The response suggests that similar logic was presented in the Year 3 Annual Groundwater Monitoring Report, and therefore that it stands as presented. However, if an error was overlooked in the annual report, it should not be repeated here. The lack of a correlation between ORP and As and Ba concentrations does not by itself exonerate the DRMO as a potential source.

15. Appendix G The original comments offered an assessment of Navy's efforts to accommodate earlier EPA comments on the approach to estimating dilution in the estuary. In general, the assessment was positive - Navy addressed systematically each of the concerns raised by EPA. The comments focused on two areas where minor changes in the approach could be made, or where further rationale for the approach chosen could be given. These areas were discussed on the conference call of 6/3, and Navy agreed to take appropriate steps:

- The original comments asked for further support for the choice to use 10% of the tidal flux in calculating the dilution. Navy's draft response states that Maryland uses this figure, and asserts that it is "conservative." As noted in the teleconference, the 10% figure appears to be rather arbitrary in the absence of further support. It is entirely possible that Maryland confronted the observation that groundwater discharge can be highly localized in a surface water body, and, lacking any other basis for accounting for local concentrations to which receptors might be exposed, simply adopted an order-of-magnitude adjustment. The original comment was intended only to ask that the rationale for this factor of 10 be stated clearly (*e.g.*, is it based on model calculations, empiricism, or merely an arbitrary attempt to build in a "factor of safety" that appeared sufficiently conservative based on "expert judgment"?). In any case, it was agreed in the conference call that the appropriateness of the 10% factor would be discussed among EPA, CTDEP, and TetraTech personnel, and that TetraTech would research the basis of Maryland's adoption of the 10% factor. Further comments on Appendix G are presented in Attachment B.

- The second area discussed in the conference call is how the determination of monitoring criteria accounts for contaminant concentrations already present in the river/estuary. Please see further comment under Specific Comment 16, Appendix G.

- A third issue that was raised in the original comments, but that was *not* discussed in the teleconference, is represented by the second bullet on page 10 of the Responses to Comments. EPA's earlier review raised the question of whether surface-water monitoring would be required. Navy's response states that the process as it currently stands is appropriate - *i.e.*, surface-water sampling is triggered by increasing trends in groundwater COPCs and comparison to secondary monitoring criteria, but is not necessary until such an occurrence.

16. Appendix G

The original comment noted that the approach adopted by Navy to account for ambient contamination in the river/estuary is well motivated and carefully executed. However, it entails some assumptions that are not conservative. In particular:

- The analysis considers COPC detections in surface water only local to each site. This approach is well conceived in principle, but seems difficult to apply when working with limited data. That is, the concern is certainly with the ambient river concentrations in the area of discharge of site groundwater (*i.e.*, groundwater emanating from DRMO or GCL). However, there are insufficient data to characterize the spatial variation of COPCs in the river. In the absence of defensible average concentrations of each COPC in the river offshore of each site, it would seem that a "conservative" approach would be to adopt the highest concentration observed *anywhere* in the river. In application, this approach will make no difference at all for the DRMO and GCL calculations, because TCE and chromium are the only COPCs detected in the river, and the maximum detections of both happen to be in the vicinity of the DRMO, where these contaminants are of concern. However, because the document outlines a general protocol, and may be viewed by others as a precedent, it should be noted that a different distribution of ambient COPCs in surface water could result in a calculation that is not the most conservative possible. Because variability in the river flow and tidal mixing can cause variations in concentrations at a particular point in the river, and because of the significant uncertainty in the analytical results (*e.g.*, for chromium, what is the influence of particulates?), the most conservative approach would be to use the maximum observed COPC concentrations from all surface water samples.

- A second assumption that is well motivated in principle, but difficult to apply when surface-water data are sparse, is that "deep" samples are associated with the tidal exchange, while surface samples are associated with the river flow. That is likely to be the case, and could be verified through larger numbers of samples, examination of salinity and temperature, *etc.* However, for the limited number of surface-water samples available in the present case, it is difficult to demonstrate that the TCE is found only in the river (6SW1S) and the chromium only in the tidal water (6SW1B). Indeed, the only other detection of chromium is in a deep sample (8SW1S), suggesting that chromium is present in the deeper, tidal water, at least in some locations and/or at some times. In the absence of more complete characterization, a more conservative approach would be to assign the maximum observed COPC concentrations found anywhere in the surface water to *both* the river and the tidal wedge. As noted in the original review comments, this makes only a very small difference in the present application, because the ambient surface water is relatively clean. For example, the monitoring criterion calculated for TCE in DRMO groundwater, assuming the observed TCE is associated only with the river flow, is 43.5 mg/L. If one were to assign the same TCE concentration to the tidal flow, as well, the calculated DRMO groundwater criterion drops to 42.7 mg/L. Again, these adjustments are insignificant in the present context. However, to the extent that the document sets a precedent, and may provide a protocol that will be applied at other sites, the assumptions deserve careful scrutiny.

In the teleconference of 6/3, Navy acknowledged that the assumptions made in their calculations are not conservative. It was agreed that any recalculation of the monitoring criteria using the more conservative approach discussed above would be postponed pending the forthcoming discussion of the 10% mixing assumption. If the 10% parameter is adjusted following that discussion, the assumptions behind the river and tidal-wedge concentrations will also be reconsidered.

ATTACHMENT B

EPA Analysis of groundwater discharge to Thames River estuary (Appendix G)

1. Since the Thames River estuary is stratified at this location, the tidal flushing analysis could be inaccurate because it assumes complete mixing.

2. Instream concentrations are compared to chronic aquatic life criteria and human health criteria. What about acute aquatic life criteria? Could acute toxicity be a concern here? Typically, acute mixing zone would be smaller than the chronic mixing zone (see MD regs, below, and TSD [see note*]), and analysis would be conducted for conditions over a shorter time frame (typically one hour).

3. The methodology should account for previously discharged pollutant concentrations being returned on the subsequent tide and contributing to ambient pollutant concentrations (background buildup). Since some of the COCs bioaccumulate, this could be problematic in the nearshore areas. It may be prudent to take some samples taken near the surface water/groundwater interface (*i.e.*, nearshore samples).

4. In general, the assumption of complete mixing may be inaccurate. It is very possible that, because this is a groundwater discharge, concentrations will be higher near the benthic interface in the nearshore/discharge areas.

5. EPA briefly disussed mixing zone policy with Lee Dunbar of CT DEP. There is no firm state mixing zone policy, along the lines of the one in Maryland referenced by Appendix G, which makes geometrical recommendations for sizing mixing zones. Connecticut allows "zones of influence" on a case by case basis. If the Maryland regulations are going to be applied, then the methodology used may need some correction. The Maryland regulationss cited [26.08.02.05(C) and (D)] do not call for the use of 0.10 of the <u>tidal prism volume</u>. Rather, for a chronic mixing zone in estuarine areas, the maximum <u>cross-sectional area</u> of the mixing zone may not exceed 10 percent of the cross-sectional area of the receiving water body; and, for acute mixing zones the cross-sectional area may not exceed 5 percent of the water body cross sectional area (see highlighted regs).

The methodology in Appendix G effectively uses a mixing zone of 50 percent of the cross sectional area of the estuary, but then uses 10 percent of the tidal volume in that mixing zone for dilution. It's likely that for chronic criteria, the dilution factors generated may be similar. However, for acute criteria (typically on a one hour time scale) the tidal dilution is not a factor. Typically, you would analyze for the hour around low slack tide, in a mixing zone of five percent of cross-sectional area, or five water depths, *etc.*--whatever is most stringent. Compliance with acute criteria was not specifically investigated and should be.

*Note: blue highlighted language in Maryland regulationss is taken from EPA's Technical Support Document (TSD) for Water Quality Based Toxics Control [EPA/505/2-90-001] that provides EPA guidance on mixing zones, *etc.* All of these recommendations are typically for outfall pipes, rather than groundwater discharges. However, best professional judgement can be applied to treat these like very low velocity point sources, for the purposes of establishing mixing zones at least. For example, recommendations based on discharge length scales would not be applicable, whereas the recommendations of five times the local water depth at the discharge point would be reasonable when establishing a mixing zone (assuming this meets other applicable requirements, *i.e.* 5 percent of cross sectional area, *etc.*).

7. Lee Dunbar of CT DEP indicated that as a general rule for discharges to large rivers and estuaries, the State would not allow a dilution factor of greater than 100:1. I recommend that you discuss this with Lee Dunbar (860.424.3731).

8. As far as EPA guidance is concerned, I recommend the TSD referenced above, (although the Maryland regulations referenced follow the TSD fairly closely). It may be useful to reanalyze using the equations provided in Appendix G. However, instead of using 0.1 of the tidal prism volume for one half of the estuary, calculate the appropriate volume for a smaller mixing zone (sized at 10 percent of CSA or other appropriate size for chronic, 5 percent CSA or other appropriate size for acute). Given the size of this waterbody, it is highly possible that CT's 100:1 maximum dilution rule will apply here.

From Maryland State Regulations:

.05 Surface Water Mixing Zones.

A. General.

(1) Effluents may be mixed with surface waters in the mixing zone.

(2) Effluents may not be treated in the mixing zone.

(3) Lethality to passing organisms may not occur in any mixing zone.

(4) Surface waters outside the mixing zones shall meet the water quality criteria for that particular body of water.

(5) Mixing zones may be designated by the Department provided that the following requirements are met outside the mixing zones:

(a) There shall be no interference with biological communities or populations of indigenous species to a degree which is damaging to the aquatic life or ecosystem;

(b) There shall be no diminishing of other legitimate beneficial uses;

(c) Mixing zones may not form barriers to the migratory routes of aquatic life;

(d) Mixing zones shall be designated and located to protect surface waters and shallow water shoreline areas;

(e) The general water quality criteria set out in Regulation .03B(1)-----(3) of this chapter apply within the mixing zones.

(6) Complete mixing within the mixing zone shall be assumed for toxic substance discharges to streams, rivers, and estuaries unless site-specific information indicates that another mixing pattern is more appropriate.

(7) Stream flows other than the design flow values set forth in § B-----E of this regulation may be used, at the Department's discretion, on a case-by-case basis for mixing zones associated with noncontinuous discharges.

(8) Toxic pollutants shall be treated as conservative substances when calculating instream waste concentrations. The assumption of conservatism may be waived based on pollutant-specific and site-specific information.

(9) Unless a later time is stipulated by the Department, the discharger shall submit to the Department, at the time of permit application, the mixing zone technique preferred for each of its discharges, and actual mixing zone calculations together with supporting documentation.

(10) A mixing zone may not cause a significant human health risk, considering likely pathways of human exposure.

(11) Except when the applicant can demonstrate to the satisfaction of the Department that adverse aquatic life or human health effect does not occur, overlapping mixing zones are not permitted. Demonstration may include chemical monitoring, ambient toxicity testing, or examination of benthic communities or fish tissue.

B. Mixing Zones for Conventional Pollutants. The following requirements apply to the calculation of the regulatory mixing zones for conventional pollutants as identified in the Federal Act:

(1) Except for thermal mixing zones established in accordance with COMAR 26.08.03.03-----.05 and toxic substance mixing zones established
in accordance with § C-----E of this regulation, any mixing zone may not exceed the following maximum limits:

(a) In freshwater streams and rivers, a mixing zone width may not exceed 1/3 of the width of the surface water body;

(b) In lakes, the combined area of all mixing zones may not exceed 10 percent of the lake surface area; and

(c) In estuarine areas, the maximum cross-sectional area of the mixing zone may not exceed 10 percent of the cross-sectional area of the
receiving water body; and

(2) The flows used shall be:

(a) For freshwater streams and rivers, the design stream flow; and

(b) For estuaries and the open ocean, determined from:

(i) Specific data, when available, for the mean water level and average tidal velocity and, where appropriate, the design stream flow,

(ii) Specific data on waste dispersion or dilution, when available for a specific discharge, or

(iii) Dispersion or dilution studies required at the Department's discretion.

C. Application of Toxic Substance Acute Criteria for the Protection of Aquatic Life.

(1) In intermittent streams, the acute criterion shall be applied at the end of the discharge pipe.

(2) In other water bodies, achievement of the acute criterion to protect aquatic life shall be provided:

(a) Within a very short distance from the outfall using:

(i) A high velocity discharge with an initial velocity of 3 meters per second or more, and

(ii) A mixing zone limited to 50 times the discharge length scale in any direction, where the discharge length scale is defined as the
square root of the cross-sectional area of any discharge outlet;

(b) Without a high velocity discharge, within a short distance from the outfall using the most restrictive of the following conditions:

(i) Meeting the acute toxicity criterion within 10 percent of the distance from the edge of the outfall structure in any direction to the
edge of the mixing zone used for application of toxic substance chronic criteria,

(ii) Meeting the acute toxicity criterion within a distance of 50 times the discharge length scale in any direction, when the discharge
length is defined as the square root of the cross-sectional area of any discharge outlet, or

(iii) Meeting the acute toxicity criterion within a distance of five times the local water depth in any horizontal direction from the
discharge outlet, where appropriate; or

(c) By demonstration or calculation that a drifting organism may not be exposed to a 1-hour average concentration exceeding the acute
aquatic life criterion.

(3) For the application of the acute criteria, any mixing zone may not exceed the following maximum limits:

(a) In freshwater streams and rivers, a width equal to 1/3 the width of the surface water body;

(b) In lakes, for all discharges combined, 5 percent of the lake surface area; and

(c) In estuarine areas, a cross-sectional area equal to 5 percent of the cross-sectional area of the receiving water body.

(4) The flows used shall be:

(a) For freshwater streams and rivers, the design stream flow; and

(b) For estuaries and the open ocean, determined from:

(i) Specific data, when available, for the mean low water and minimum daily average 1-hour tidal velocity and, when appropriate, the
design stream flow,

(ii) Specific data on waste dispersion or dilution, when available for a specific discharge, or

(iii) Dispersion or dilution studies required at the Department's discretion.

D. Application of Toxic Substance Chronic Criteria for the Protection of Aquatic Life.

(1) Any mixing zone may not exceed the following:

(a) In freshwater streams and rivers, a mixing zone width may not exceed 1/3 of the width of the surface water body;

(b) In lakes, the combined area of all mixing zones may not exceed 10 percent of the lake surface area; and

(c) In estuarine areas, the maximum cross-sectional area of the mixing zone may not exceed 10 percent of the cross-sectional area of the receiving water body.

(2) The flows used shall be:

(a) For freshwater streams and rivers, the 30Q5 value; and

(b) For estuaries and the open ocean, determined from:

(i) Specific data, when available, for the mean water level and average tidal velocity and, when appropriate, the 30Q5 stream flow,

(ii) Specific data on waste dispersion or dilution, when available for a specific discharge, or

(iii) Dispersion or dilution studies required at the Department's discretion.

E. Application of Toxic Substance Criteria for the Protection of Human Health. The flow used to determine impacts to human health shall be the mean annual flow value.