UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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May 3, 2001

James Shafer, 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 Comments dated March 15, 2001 on the Draft Final Remedial Investigation for Old Fire Fighting Training Area at the Naval Station Newport, in Newport, RI

Dear Mr. Shafer:

EPA reviewed the *Response to Additional Comments dated March 15, 2001* on the *Draft Final Remedial Investigation for the Old Fire Fighting Training Area, dated February 20, 2001* for technical sufficiency, applicable regulations, EPA guidance, and generally accepted practice. The Navy responses are dated April 11, 2001. Two outstanding issues remain.

Attachment A - Evaluation of Response to Comment

No. 28 The original comment discussed that it was inappropriate to use background data sets where the frequency of detection does not exceed zero percent detections in statistical comparisons between site data and background. The Navy has agreed that they will revise tables Q-18 and Q-19 to state that background test results are considered not applicable (NA) for chemicals with zero detects in background and for which background tests did not indicate that the site values exceed background.

The Navy has expressed a desire to retain results based on the upper ranks test which in some cases demonstrate that site values exceed background even when there are all non-detected in the background data set. The rationale provided for retaining these results appears valid, and EPA agrees that retaining results where, based on the upper ranks test, site values are shown to exceed background are valid even if the background data set has a detection frequency of zero percent.

Attachment B - Evaluation of Response to Comment

No. 1 The Navy indicates that they are unaware of any evidence of site-related activities or contaminants altering the natural form of arsenic. In order to evaluate whether site related PAHs could promote the mobility of arsenic, a review of site data to evaluate indications of reducing conditions would need to be performed. Oxyhydroxides of iron, manganese, and

aluminum are common components of soils, usually as surface coatings formed during weathering of minerals. These surface coatings are well-known for their ability to scavenge other metals, including arsenic, lead, chromium, copper, and others. In an anerobic environment, these coatings dissolve and arsenic is liberated. Under reducing conditions, As(III) species are favored thermodynamically and are consequently mobilized, as As(III) species sorb less readily than As(V) species. References to investigations of this behavior are found in numerous review articles (*e g*, Cullen and Reimer, 1989; Smith *et al.*,1998; Bhumbla and Keefer, 1994).

It is likely that the presence of PAHs is consistent with a reducing environment. PAHs sorb strongly to soil organic matter, and the *in situ* microbial degradation of both the naturally-occurring soil organics as well as any other anthropogenic organic compounds (VOCs, SVOCs, fuel constituents, *etc.*) would certainly promote a low-ORP environment. There is evidence that degradation of PAHs occurs under reducing conditions (*e g.*, Johnson and Ghosh, 1998). If the OFFTA soils have sufficient organic matter, or if the PAHs were deposited with other organic contaminants, microbial degradation will consume the oxygen, the local environment will become reducing, and an anaerobic microbial population will dominate. This situation would, in turn, promote the dissolution of the ferric oxyhydroxide surfaces described in the preceding paragraph, thus enhancing the mobilization of arsenic.

If the Navy is interested in evaluating whether there reducing conditions that could promote the mobility of arsenic (either as part of the RI or the FS) the following questions could be pursued:

- Are there indications of a reducing environment? Are there groundwater samples at the locations of interest with low ORP, sulfate, and/or nitrate, and high iron and manganese? Is there methane? Do the soils have high TOC or low pH?

- Are there data for other metals in the soils? A correlation between iron, manganese, aluminum, and arsenic may support their presence as sorbed or co-precipitated surface coatings on the native mineral grains.

I look forward to working with you and the Rhode Island Department of Environmental Management toward the cleanup of the Old Fire Fighting Training Area. 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

cc: Paul Kulpa, RIDEM, Providence, RI
Melissa Griffin, NETC, Newport, RI
Jennifer Stump, Gannet Fleming, Harrisburg, PA
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REFERENCES

Bhumbla, D. K. and Keefer, R. F., 1994, *Arsenic mobilization and bioavailability in soils.* Arsenic in the Environment, Part I. Ed. J.O. Nriagu. John Wiley & Sons.

Cullen, W. R., and Reimer, K. J., 1989, *Arsenic speciation in the environment.* Chem. Rev. 89:713-764.

Johnson, K. and Ghosh, S., 1998, *Feasibility of anaerobic degradation of PAHs in dredged river sediments.* Water Science and Technology 38(7):41-48.

Smith, E., Naidu, R., and Alston, A. M., 1998, *Arsenic in the soil environment: a Review. Advances in Agronomy*, Vol. 64, Ed. D. L. Sparks. Academic Press.