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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
NATIONAL RISK MANAGEMENT RESEARCH LABORATORY
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OFFICE OF
RESEARCH AND DEVELOPMENT

MEMORANDUM

SUBJECT: Centredale Manor Restoration Project Superfund Site (07-R01-002)

FROM: Robert Ford, Ph.D., Environmental Scientist
Subsurface Remediation Branch

TO: Cornell Rosiu, Project Scientist
Anna Krasko, RPM
USEPA, Region 1, Office of Site Remediation and Restoration

Per your request for technical support, a review has been completed of 'Appendix A, Centredale Manor Restoration Project (CMRP) Superfund Site, Groundwater Investigations' to be included as part of the CMRP Superfund Site Feasibility Study report. As specified in your request, my review focused on evaluating whether conclusions derived from the field characterization effort to evaluate contaminant flux from site-derived groundwater into the Woonasquatucket River are supported by the collected data. As stated in Appendix A submitted for review, the study objectives were as follows:

Part I – 2005 Groundwater SPMD Investigation

1) Gain a better understanding of the potential migration of TCDD dissolved in the VOC-contaminated groundwater plume.
2) Determine if groundwater could be an ongoing source or migration pathway of TCDD from the site to the river.

Part II - 2006 Groundwater Investigation

3) Evaluate the groundwater flow regime in the source area.
4) Calculate an estimate of the potential flux of TCDD from the groundwater to the surface water of the Woonasquatucket River.

In general, the study goals under Part I were met. The data from analysis of samples collected from groundwater, sediment, and sediment SPMD deployments indicate the presence of a site-derived contaminant plume containing 2,3,7,8-TCDD discharging into the Woonasquatucket River. Relative to the support of site-specific risk management decisions, the data appear to be of use only in a qualitative sense with a high degree of uncertainty for the calculation of actual contaminant concentrations and/or fluxes into the Woonasquatucket River. The data and analysis presented under Part II

indicate greater uncertainty relative to addressing the stated goals. Specifically, there are two areas where existing data appear to be insufficient: 1) data to evaluate the annual variability in groundwater flux to the river, and 2) limited contaminant data to define the spatial extent of the contaminant plume at the point of discharge into the river. The calculated flux of 2,3,7,8-TCDD should be considered as an estimate with a high degree of uncertainty. Limitations of these data are described below along with suggestions for supplemental approaches to collect quantitative data with lower uncertainty..

Suggested Supplemental Approaches

There are two main concerns relative to the approach used to determine contaminant flux attributed to discharge of site-derived groundwater into the Woonasquatucket River. First, there appears to be limited supporting data to verify the reliability of applying the SPMD approach for determining concentrations and/or fluxes of 2,3,7,8-TCDD. Supporting analytical data needed to validate this approach would include assessment of the efficiency of partitioning of 2,3,7,8-TCDD onto the specific lipid material used as a contaminant sink within the SPMD marketed by Environmental Sampling Technologies, Inc. (www.est-labs.com) and assessment of the impact of deployment time on SPMD performance. Without documentation of method performance data, the results from the SPMD study for 2,3,7,8-TCDD should be considered uncalibrated. This aspect in combination with the observations of potential biofouling due to plant and/or microbial growth makes these data highly uncertain. Secondly, the limited number of SPMD deployments within the river as well as a lack of shallow groundwater sampling data in the vicinity of apparent plume discharge indicates that the spatial extent of plume discharge is not sufficiently mapped. Specifically, while the "length" of the cross section of plume discharge appears to be adequately defined based on results reported in the September 1999 USGS study (http://pubs.usgs.gov/of/2000/ofr00-276/), the "width (depth)" of plume discharge does not appear to be adequately characterized. The water depth along the eastern shore of the river is used to define "width" within the reviewed document with the inherent assumption that the plume discharge only occurs along the eastern river bank. It is feasible that the plume extends across the entire width of the river, i.e., extending to the opposite side of the river. Depending on the width of the river, this could significantly change the plume cross-sectional area used in contaminant flux calculations.

If quantitative data are needed for contaminant 2,3,7,8-TCDD concentration or flux in groundwater to support site-specific risk management decisions, then I recommend an alternative approach for sample collection. Specifically, the use of hand-deployed mini-piezometers (or pushpoint samplers) can be employed to provide greater sampling density with fewer analytical limitations that may be associated with SPMD deployments. This type of survey could be repeated during different seasons in order to better define the temporal variability in contaminant flux to the Woonasquatucket River. Application of this type of approach is documented in the following reports:

1) USEPA. Proceedings of the Ground-Water/Surface-Water Interactions Workshop. EPA 542/R-00/007, Office of Solid Waste and Emergency Response, Washington, DC, 2000. http://www.clu-in.org/s.focus/c/pub/i/600/

2) Conant Jr., B., J. A. Cherry, and R. W. Gillham. A PCE groundwater plume discharging to a river: influence of the streambed and near-river zone on contaminant distributions. Journal of Contaminant Hydrology 73: 249-279 (2004).

3) Zimmerman, M. J., Massey, A. J. and Campo, K. W. Pushpoint Sampling for Defining Spatial and Temporal Variations in Contaminant Concentrations in Sediment Pore Water near the Ground-Water/Surface-Water Interface. USGS Scientific Investigations Report 2005-5036, (2005). http://pubs.usgs.gov/sir/2005/5036/

If you have any questions concerning these comments, please do not hesitate to call me at your convenience (580-436-8872).

cc: Rich Steimle (5102G)
Rafael Gonzalez (5204G)
Richard Willey, Region 1
Stephen Mangion, Region 1