September 16, 1998

Attn: Charlie Root
U.S. Environmental Protection Agency, Region III
841 Chestnut Street
Philadelphia, PA 19107-4431

Subject: Comments to draft ecological risk assessment work plan
Palmerton Zinc NPL Site Operable Unit #4

Dear Mr. Root:

BACKGROUND

The following memorandum has been prepared at the request of the PCCE Board in response to Task Schedule #27. PCCE Task Schedule #27 requests a review of the draft ecological risk assessment work plan, and submission of any comments to EPA. Because he was involved in all aspects of our review of the OU#3 Risk Assessment document, and to assure the most comprehensive and competent scientific review of the subject document, Environmental Toxicologist Dr. Dale Bruns, Ph.D. was also asked to briefly review the draft ecological risk assessment work plan. His comments have been incorporated into this review memorandum, but I retain complete responsibility for the final content.

General

From an ecological standpoint, the work plan appears fairly comprehensive and addresses crucial components of the stream ecosystem, the terrestrial environment, and wetlands, mostly in the floodplain of the stream drainage. The work plan has a multimedia approach, outlining a sampling plan that deals with pollutant concentrations in water, sediment, soil, groundwater, and terrestrial and aquatic biota. In this sense, the plan is broadly encompassing and in general it adequately covers the major exposure pathways of pollutants and identifies critical ecological endpoints at risk from past (and ongoing) environmental impacts of the Palmerton facilities.

The plan also attempts to include aspects of habitat assessment, pollutant and biota surveys, tissue analysis, toxicity testing, food chain accumulation modeling, and risk based clean-up targets, along with the risk assessment itself. In this sense, the work plan seems well-suited in its overall structure and in its various, individual components to address the necessary objectives of an ecological risk assessment. However, the plan is not always balanced in its documentation and approach to these different components and there are a number of details in some of the sections where some issues need to be better addressed.

The plan seems best served in regard to multimedia sampling and analysis for heavy metals in the water, soil, sediments, and biota (terrestrial and aquatic). Major pathways are identified and various sites throughout the area of concern are identified. However, it is difficult to even evaluate this component in any detail for several reasons. First, without a study area map (and even with the listing of sites and their relative positions) and without more detailed discussion of related studies on prevailing winds, air monitoring, etc., it is difficult to determine whether reference sites upstream of the facilities are sufficiently "clean" relative to the atmospheric deposition pathway.

There are abundant opportunities to characterize reference (or "background") aquatic and terrestrial communities because the same geologic formation "Blue Mountain" extends for hundreds of miles beyond the limits of detectable contamination. Streams like the Aquashicola Creek are common along the northwest-facing side of the Blue Mountain chain, with Cherry Creek located east of Wind Gap originating only a few miles from the source of the Aquashicola. This stream is within the same overall drainage (Delaware River), has the same edaphic (geologic) characteristics, similar land use characteristics, and has very similar geomorphology. Consequently, Cherry Creek seems like an appropriate reference stream for comparing water chemistry, physical parameters (sediment load and imbeddedness) as well as biological community structure and productivity.

It is difficult to assess in any detail the methods of collection, sample size, statistical analysis, and issues of QA/QC for any of the different media. In almost all cases throughout the document, these details are referenced in either a Standard Operating Protocol (SOP) or in QA Tables that were not included directly in the work plan. Presumably, if SOPs and a QA plan were developed as separate documents, then this would indicate that extra effort was dedicated to these issues. However, without seeing these supporting documents firsthand, it is impossible to evaluate them relative to their completeness and contribution to the quality of the work plan. For example, a list of the heavy metals to be analyzed for in the various media is not even provided and the reader does not even know if the water analyses will be for total, dissolved (most important from a toxicity assessment perspective), and/or particulate fractions of the metals.

There is no mention of the basic approach to statistical analysis of these data on a spatial basis. Presumably, there will be statistical testing to evaluate the significant differences in metal concentrations among the various sites, especially relative to a "reference" site with minimum impact from runoff and atmospheric pathways. Also, I would expect that metal concentrations would be analyzed (e.g., correlation) in regard to potential impacts on the distribution and abundance of aquatic and terrestrial biota. The one exception where this is discussed is for correlation analyses as part of assessing photosynthetic function described at the bottom of page 24; but even here the material is vague in regard to predicted/testable hypotheses for expected spatial patterns.

There are many environmental disturbance and pollutant factors that may interact and affect the ecological resources at risk from the facilities. Habitat disturbance from sedimentation, bank erosion, channel instability, and flash flooding from a sparsely vegetated watershed will have adverse affects on stream biota. Likewise, the interaction of pH, alkalinity, metal solubility, and potential pollutant interactions (e.g., synergistic vs. additive vs. antagonistic) will also affect toxicity impacts on the biota. The work plan does not even acknowledge the complexity of these potential factors and their interactions, nor does it attempt to simplify the analyses by making some basic assumptions to facilitate the assessment. Even a factor analysis or a step-wise regression analysis would allow at least a first attempt to sort out some of these factors as part of the context for the later risk assessment. I do not recall reading that the work plan even assumed that pollutant impacts were additive, the standard default approach for toxicity studies. In general, the plan was comprehensive in its coverage and various components but it seems almost naive in its failure to integrate the various components and the degrees of ecological complexity as identified here.

Finally, the risk assessment itself, while seemingly implicit in all the other sections, appears almost like an after-thought at the end of this work plan. No discussion of the ecological risk assessment literature in a wider sense is provided and even the basic EPA document (EPA 1997) is cited almost in passing. The second paragraph in Section 3.6 (page 41) lists the various aspects of the risk assessment and many of these are covered reasonably well in previous sections of this document. However, evaluation of "exposure pathways" (and pollutant and impact interactions as identified above), "testable hypotheses," "measurement endpoints and associated study design," and uncertainties to determine and "characterize the risk" are all merely listed without sufficient discussion, specificity, and integration with the relevant published literature or even "gray-literature" of government documents. Also, a review of the extensive literature from earlier ecological research conducted at Palmerton should also be recognized and incorporated in the risk assessment work plan.

Specific

1. Page 3, Instream Habitat Evaluation (and p. 19, Wetland Habitat Evaluation): I recommend a quantitative rather than a qualitative approach to habitat variables in order to conduct statistical analyses of habitat (sedimentation, bank erosion, etc.) vs. high metal concentrations and potentially depressed populations of biota. It might be useful to make field measurements of some of Rosgen's (Applied River Geomorphology) stream channel and flood plain parameters (e.g. entrenchment ratio, etc.) as part of the habitat assessment.

2. Page 4, and page 20, on Water Quality: Alkalinity and hardness may be needed (along with Hydrolab pH measurements) in order to determine the relative toxicity of metals to biota. Water quality standards and ecological risk assessments may require these data in their methodology.

3. Page 6, on sample size for Surber samples: I recommend processing all five replicates. Typically, you can be assured that lotic invertebrate data will be high in variability and if you have some sites with n=3 vs. n=5, then you will have limitations in the options and rigors of conducting statistical analysis, especially if you are working with ANOVA.

4. Page 9, p. 15, pp. 22-23 on Toxicity Testing: The approach to toxicity testing is fairly conventional with use of standard test species at the level of individuals. Other alternative approaches (population, community, ecosystem toxicity testing) are available in the literature but are more complex and expensive. The standard approach is probably OK here given the biological field surveys of populations and communities at the stream sites and the ability to analyze for functional feeding groups and biodiversity measures from these descriptive data sets. Most of the toxicity testing (stream water, sediments, soils, groundwater, wetland sediments, etc.,) involves either 100% water or 100% soil or 100% sediments (without any dilutions) vs. a control or reference. This approach may be limiting in the longer run. For example, if all replicated treatments at some sites have organisms that either all die or all survive, then it will be very difficult to interpolate intermediate effects at intermediate concentrations (exposures), since these data are expected to be nonlinear, the typical situation for toxicity curve-fitting.

5. Various sections: In a few places, reference is made to "qualitative" assessment or to "protocols" that will be developed (or perhaps available somewhere). These statements and methods are too vague and non-specific to be evaluated. In order to sort out the whole range of complex factors, it would be best to quantify these parameters rather than make general assignments to a "checklist" category from a qualitative basis.

6. On the sections on vascular plants: It might be good to conduct heavy metal analyses of mosses and lichens also since these are known to accumulate heavy metals from atmospheric sources. This could be useful in assessing the atmospheric pathway and its significance relative to the reference site intended for use in statistical comparisons with sites where there are more direct and immediate pollutant exposure pathways. Also, the observed phenomenon of metals enriched partially decomposed organic material needs to be studied in detail.

7. Modeling sections: There are many assumptions in this section and most of the values for bio-uptake, etc., are from the literature. It might be good to provide more discussion on the justification of these approaches and values based on regulatory requirements and best available data and best professional judgement. Specific EPA guidelines should be cited to provide a stronger justification of these assumptions and data. Without this, industry or other interest groups may questions the validity of the approach and key issues could be ignored in the pathways and exposure assessment components.

8. Terrestrial predator, page 25-26: Most of the cited data is for the fox. Why not just make the assessment for fox instead of coyote. I would expect foxes to be more typical and abundant, have a smaller home range, and represent a more realistic picture of what is potentially going on in the food web of this area.

9. Page 47 and throughout the text: Generally the document is weak in documentation. There is almost no mention of the ecological risk assessment literature and the ecological modeling literature as published in various peer-reviewed journals (e.g., by SETAC) or reference text authored by various national experts. For example, no mention or discussion is given to such reference like: Ecological Risk Estimation (Bartell et al. 1992, Lewis Publishers), Ecological Risk Assessment, (Suter 1993, Lewis Publishers), and Performing Ecological Risk Assessments (Calabrese and Baldwin 1993, Lewis Publishers).

Questions

1. Within the last several years a substantial volume of material which appears to be either IRM or cinder-pile has been used as fill at the base of Blue Mountain Ski Area, upstream of Little Gap Road, along and upgradient of the Aquashicola Creek. To determine the extent of ecological impacts and risks, as well as the aquatic community parameters for relatively uncontaminated sections of the Aquashicola Creek, aquatic sampling should extend along the Aquashicola Creek a sufficient distance upstream of Blue Mountain Ski Area. The list of 10 aquatic sample locations (page 3 of 47) indicates that sampling will occur within Aquashicola Creek upstream of Blue Mountain Ski Area (location 8 and possibly location 7), but the narrative description of Aquatic Sampling Locations (section 3.1.1) is not consistent with the list in that it specifically excludes the Aquashicola Creek upstream from the confluence with the Buckwha. Why?

2. The extent of terrestrial impacts, especially the impact upon vegetation community structure and productivity, clearly extends south-west from Palmerton for several miles beyond the Pennsylvania Turnpike tunnel. Consequently, it can be assumed that the Lizard Creek has also been affected by historic and on-going contamination. Why is the Lizard Creek also not included in the draft ecological risk assessment work plan?

3. Similarly, I have observed over the years many instances where there was a very visible change in the character of epilithic growth (periphyton) from the confluence of the Aquashicola with the Lehigh River, downstream beyond the Route 873 bridge. The ecological risk assessment work plan does not indicate any analysis of the Lehigh River, however, it was disclosed during the Wednesday, September 16, 1998 PETF meeting that sampling in the Lehigh River was conducted. What is the extent of ecological risk assessment sampling and analysis conducted on the Lehigh River? What were the geographic and analytical parameters examined in the Lehigh River?

4. One hypothesis regarding the observed aberrant epilithic growth is excessive nutrient loading. Two sources seem likely, an industrial point source discharge, and/or runoff of material placed on Blue Mountain as part of the revegetation effort. Even if an industrial source is identified, water chemistry analysis should be conducted to quantify the level of nutrient loading resulting from "treated" sections of Blue Mountain. Ammonium, Nitrate-Nitrogen, Phosphate and Potassium are all appropriate parameters that should be included in the surface water quality analysis. Specifically which water chemistry parameters will be evaluated?

5. Why was the finfish survey excluded from sample locations 4, 7 and 9? Also, what methodology will be used to distinguish between native adult and recently released hatchery raised trout when conducting residue analysis? This could be an important factor when investigating food chain impacts upon large carnivores.

6. There are several NPDES permitted discharges from industrial facilities along the Aquashicola Creek which require monitoring and reporting of monthly averages for total suspended solids, oil and grease, cadmium, lead, pH, and zinc. Will the results of these "permitted" discharges be included in the calculation of cumulative ecological risk from the facility? Will the water quality (chemical) analysis conducted during the ecological risk assessment be capable of evaluating whether the reported monthly averages are consistent with total maximum daily loads (TMDL's)?

Thank you for the opportunity to review and comment on the draft ecological risk assessment work plan. If you have any questions and or comments, please contact me directly at (610)791-2700.

Sincerely,

McTish, Kunkel & Associates

Robert H. Hosking Jr.
Environmental Services Manager

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