PolyMet NorthMet Proposed Copper-Nickel Mine Project
Outline for Methylmercury Analysis

I. Hydrology
   A. Model wetlands cone of depression at mine site using MODFLOW or calibration of analog model for drawdown within impact zones.
   B. Model wetlands drawdown at tailings site based on capture of seepage (use reasonable range of prediction of efficacy of engineered systems)
   C. Model wetland rewetting based on seasonal cycles and mine site filling of pits on closure
   D. Model pathways of seepage from mine site sources of sulfate and mercury to wetlands through groundwater during operations and closure (use reasonable range of prediction of efficacy of engineered systems)
   E. Model pathways of tailings seepage to wetlands through groundwater during operations and closure (use reasonable range of prediction of efficacy of engineered systems)
   F. Model water yield per acre of wetlands at mine site and tailings site

II. Chemical Inputs
   A. Model project local mercury deposition at mine site and tailings site
   B. Model (aggregate) project local sulfur deposition as a result of dust, spills and emissions at mine site and tailings site, calculate as sulfate load
   C. Model mercury loading to wetlands from seepage of each mine site source and from tailings (use reasonable range of prediction of efficacy of engineered systems and provide total and net loading of tailings site sulfate based on reasonable no action scenario).
   D. Model sulfate loading to wetlands from seepage of each mine site source and from tailings (use reasonable range of prediction of efficacy of engineered systems)
   E. Model sulfate loading to wetlands from transportation corridor spills (use reasonable range of prediction of efficacy of spill controls)

III. Baseline Wetlands Data
   A. Sample (or obtain from previously undisclosed sampling) wetland waters for mercury, sulfate and methylmercury. Method could focus on immediate drainage to creeks, at least 10 samples on each creek, 3-4 samples over the months spring to fall
   B. Apply exceptional data sets from the Marcell Experimental Forest in Minnesota (http://www.nrs.fs.fed.us/ef/marcell/) to characterize baseline wetlands for mercury, methylmercury and sulfate levels

IV. Bioaccumulation
   A. Consolidate existing data on mercury concentrations in biota (fish and insects), including state and tribal data, both near the project site and in the St. Louis River
   B. Strategic sampling to fill data gaps, particularly for Partridge and Embarrass River watersheds

V. Analysis [consider use of Knightes VELMA and WASP models coupled with BASS bioaccumulation modeling as well as Marcell results]
   A. Predict total sulfate loading to mine site and tailings site wetlands (disaggregate based on wetland characteristics) under reasonable range of chemical inputs, pathways and deposition

B. Predict total mercury loading to mine site and tailings site wetlands under reasonable range of chemical inputs, pathways and deposition
C. Predict wetlands drying and rewetting in mine site and tailings site wetlands
D. Combine impacts of A-C to estimate percentage increase methylmercury export from wetlands consistent with Marcell experimental wetlands data
E. Calibrate methylmercury export from wetlands to proximate streams in nanograms/acre/year based on water yield per acre and the Marcell analog wetland(s).
F. Estimate bioaccumulation in fish and various mechanisms of downstream methylmercury transport