Aquatic Organisms Technical Working Group
Pebble Project
January 15, 2008
Minutes recorded by Charlotte MacCay

Present:

Jeff Estensen/ADNR-OHMP
Leslie Tose/USACE
Doug McBride/USFWS
Doug Limpinsel/NOAA-HCD
Phil North/EPA
Gretchen Hayslip/EPA (telephone)
Mark Fink/ADF&G
Andrea Meyer/ADNR
Andra Love/HDR
Jim Buell/Buell & Associates
Charlotte MacCay/Bristol

Public Observers:

Andrew DeValpine/Bristol Bay CSRA

As with all Technical Working Group (TWG) Meetings, the minutes reflect discussion of suggestions and concerns raised by individuals. Discussion does not reflect any decision making or consensus from the group (with the exception of electing a lead).

Administrative

- The TWG would like an educational presentation on aquatic organism sampling; this TWG does not have as many members with specific expertise as other TWGs.
- Agencies may wish to consider bringing in contracted expertise.
- Further discussion on Alaska Stream Condition Index (ASCI) versus Surber sampling methods will occur after the TWG has had time to review pertinent data and literature.
- A lead was not chosen for this TWG (to be discussed at the next meeting).

Data Requests

- General data on wind direction and speed to ascertain areas of potential dust deposition in relation to potential reference sites;
- Study area map with sample site locations marked on it;
- Data to compare ASCI and Alaska Department of Natural Resources (DNR) sampling methods by relationship per site;
- Gretchen Hayship to send U.S. Environmental Protection Agency (EPA) literature on ASCI;

- Provide a matrix of sampling types and frequency for all sites for all organisms; and
- Obtain a copy of Red Dog Mine's study program for macroinvertebrate and chlorophyll A, and diatom sampling. Keep in mind that, for comparison purposes, Red Dog Mine has a more mineralized system.
- Concerns with compositing samples – EPA to send some literature on this issue to Charlotte MacCay to distribute to the TWG.

Pebble Project Aquatic Organisms Study Plan Review

Objectives

- These are very general objectives, they don't provide a hypothesis for testing. Consider that baseline means understanding variability within sites and between sites. Some members were expecting that data would come with a hypothesis, methods description, and an analysis to answer the hypothesis. Potentially looking for mine effects and a control.
- There is an interest in reference sites.
- Study plans were not set up as a true experimental design, but to generate a comprehensive data set with general spatial representation.
- Studies were not set up to prove an hypothesis.
- Consider setting up studies to have specific and measureable objectives. Characterization is a broad term.
- A vast array of literature on potential mining effects on aquatic resources is available. The literature discusses which study methods have worked well.
- Some members feel that objectives should have a measurable target that allows a conclusion if the objective was met or not.
- With macroinvertebrates, it is more of a study of natural history, which organisms are present, and why, than quantitative science. This data is used to later determine how to try and set up studies to do the actual science of cause and effect.
- The baseline work is trying to approach objectives on two levels. The main objective is just to characterize the existing environment, but later much of the data may be used to support monitoring programs.
- Consider designing objectives to define variability of assemblages, periphyton and water quality parameters, measuring year to year, and site to site for variation to determine the power of detection that is possible for monitoring.

Study Team Background

- HDR, Inc., is an independent contractor conducting the field studies.
- HDR has 4-5 biologists with variable experience in invertebrates.
- Two team members have masters degrees, with a focus on macroinvertebrates in their thesis studies.

- An additional team member has a bachelors degree within which she did some work with macroinvertebrates.
- Additional help is hired in the form of interns from the University of Alaska, as needed for sorting organisms; HDR biologist conducts Quality Control checks on the sorting process.
- HDR has additional water and fish biology resources within the company.
- Most team members have had biometrics and statistical coursework associated with their degrees. One team member has a very strong statistical background.
- HDR subcontracts additional statistical expertise when needed.
- HDR has Special Aquatic Service/SPSS training in-house.
- Alaska Department of Fish and Game retains an in-house biometrics staff person to incorporate statistics into study design.

Sampling Method

- There is typically a lot of variability when studying macroinvertebrates between seasons and/or sites. For instance, studies at Red Dog Mine have shown immense variability.
- Consider assessing the variability for power; studies may only be producing gross numbers.
- Consider using the species with the least amount of variability as an indicator species.

State approach to determining project impacts requires evaluation based on the following considerations (listed by the most indicative to less indicative of site specific causes):

- Water quality changes.
- Chlorophyll A and periphyton changes.
- Aquatic invertebrate changes.
- Fish assemblage changes.
- Fish tissue analyses for changes in trace element concentrations.

Relative Abundance

- Number of organisms/unit area and percent composition.
- Too many organisms to count all of them, samples are subsampled.
- The macroinvertebrates distribution is too patchy to extrapolate numbers to make population estimates.
- Data is used to document the assemblage and community index and density/unit area.
- The end point is the assemblage, taxa may be used as indicators.
- Assemblages are characterized through taxa composition ratios and their density.
- The overview is conducted for a number of different years.

- Metrics:
  - Ephemeroptera, Plecoptera, and Trichoptera/Diptera or chironomids
  - % dominance
  - # of taxa
  - Total taxa richness (# of taxa in the sample)
- A functional feeding group analysis can be done at a later time to determine how the macroinvertabrates respond to different stimuli.
- Some taxa are more responsive to change, such as pH.
- To determine impacts, it is necessary to look at a combination of indicators; macroinvertebrates are not typically used as the only indicator being considered.
- Changes in macroinvertebrate assemblages are considered with other indicators and then a picture emerges.
- There is concern that looking at macroinvertebrates at one site instead of over habitat types will not address anything about the rest of the stream system.

Sampling Sites

- There are 10 sites
- Selection Criteria
  - The goal was to have an upstream and a downstream sampling site in each of the three rivers (North Fork Koktuli, South Fork Koktuli, and Upper Talarik).
  - SK100A (near confluence).
  - SK100B (U.S. Geological Survey data looked interesting at this site).
  - SK100D (closer to the potential mine site and before any major dilution from any major tributaries).
  - No upstream site on the SFK.
  - NK100C (upstream of NK1.190 tributary).
  - NK100A (near confluence).
  - NK119A (near a potential tailings storage alternative).
  - UT100D (upstream of Pebble West, with the discovery of Pebble East, the location may need to be reconsidered).
  - UT100C (upstream of UT119A) (The South Fork loses water to the Upper Talarik through the tributary UT119A).
  - UT100B (downstream of UT119A).
- Consider adding sites above and below Frying Pan Lake; SK100D could be considered the downstream site. Temperature changes are different between SK100D and F – look at seeps in that area.

- Sampling sites also need to address the potential road corridor with sites upstream and downstream of the road.
- Sampling along the road was conducted in 2004 and 2005 at 5 sites, but until the exact location of the road is known, it is difficult to establish upstream and downstream sites, therefore, the study has been stopped until a road centerline has been established.

Interest in Reference Sites

- There is interest by the agencies in having reference sites.
- PLP stated that reference sites are a monitoring issue, not a baseline issue; only baseline issues are being addressed at this time.

Discussion and Brainstorming about Potential Future Reference Sites:

- Reference sites would be helpful to look at effects from climate change, volcanic, activity, etc.
- Typically, reference sites are located upstream of a proposed impact area. At Pebble, the project is at the headwaters of the South Fork Koktuli, so there is no stream above the proposed impact area in this drainage.
- Upstream also may not be a good reference site in conjunction with a mine. Upstream may be outside of the mineralized zone. The mineralized zone can have significant impacts prior to any disturbance. Any reference site associated with a mineralized area needs to be considered with caveats.
- Big Wiggly Lake was brought up as a consideration for a reference site – it was noted by PLP that Big Wiggly Lake is a very different system from the stream sites.
- Reference sites provide data to help determine if changes to the assemblage are related to climate.
- Microhabitat is important to consider with reference sites.
- With macroinvertebrates you are watching for change across the assemblage.
- There are three watersheds in the study area; consider three reference sites one for each watershed.
- Reference site is an experimental control for temporal variability.
- If there is good water quality data and a consistent picture, and there's a change, then consider how, why, and what action to take.
- If the purpose is just to have a site not affected to mining – it could be anywhere.
- A reference site is a sort of pseudo-control. To use the term control can be misleading.
- Other mines have upstream sites, but they are not controls.
- Consider before-after control-impact (BACI) design.
- Differences occur with changes in hydrology; these are complex systems.
- Sites are not located near Frying Pan Lake because the mine design that was under consideration at the time the studies were initiated, would have filled in the lake.

- One reference site in each drainage may not provide enough points for variability determinations.
- Wind effects and potential dust distribution need to be taken into consideration if reference sites are established.
- Consider bracketing the area with reference sites to pick up seasonal changes.
- If sites are out of the study area, then less is known about the associated hydrologic effects.
- Transportation corridor study area sample sites could also be used to reflect seasonal changes. These would cover a spectrum of stream types.
- Mineralization may or may not be important in this system – the waters are not obviously affected by mineralization; however, there are some naturally elevated parameters.
- Without reference sites to indicate non-project related causative factors, there will be a tendency to blame any changes in the system on the project.
- The TWG needs to consider the above points further to determine what characteristics are important in a reference site before any are instituted.

Macroinvertebrate Sampling Method

- Once at the site, sampling takes about 2 ½ hours per site.
- ASCI Method
  - Habitat based: riffles, woody debris, emergent vegetation, sand, and other.
  - 20 subsamples are taken that are representative of the proportional distribution of habitat types within a stretch.
  - All 20 subsamples are mixed together to make a composite sample for that site.
  - Samples are collected with D-frame nets.
  - Provides habitat information – but not within-site variability data.
- 2004 modified ASCI in Frying Pan Lake and Big Wiggly Lake
- DNR Method
  - Samples only riffles, no sampling of other habitat types
  - 5 samples at each riffle site, each sample processed separately to get within-site variability
  - Uses Surber nets
  - Provides variability data, but not much habitat data
- In 2005, sample sites were decreased in number from 10 to five in order to accommodate a request from the agencies to use both methods for comparative purposes. The agencies have not agreed upon which method to employ, and sampling was not conducted in 2006. In 2007, sampling was conducted using both methods at the same time, at five sites plus five additional sites; some near the newly discovered East Zone. For 2008, 10 sites are

being considered, with hopes that methodology can be agreed upon between the DNR and EPA.

- Sampling is conducted once in June. In 2004, it was conducted in both June and August to determine which time period produced the most taxa-rich event. June was chosen as the most taxa-rich event.

There is a difference of preference in macroinvertebrate sampling methods amongst agencies. Various points about the pros and cons of the two methods are discussed below:

- At the mine study site HDR noted a greater taxa richness using the Surber net method than the ASCI method. Along the transportation corridor study area, the opposite occurs; there is greater variability using the ASCI method than the DNR Surber net method. There is less high growth and/or woody debris along the mine site streams than the transportation corridor study area, which could contribute to the difference in method results.
- If there was a change in water levels, the invertebrate taxa that colonize the sides of the stream channel may change and this could be documented using the ASCI method.
- Variability is considered a red herring by some. ASCI can often detect an impact when water quality does not. The Surber method will only characterize riffles, if there is a percent change in riffle habitat in a reach, the Surber method won't pick that up. With ASCI, multiple habitats are used to characterize a reach as a unit.
- Pogo Mine and Donlin Exploration Project used multiple years of ASCI for baseline.
- Mining studies in Canada use methods similar to ASCI.
- The two methods give different results based on the sampling design.
- ASCI calls for random subsampling to 300 organisms for identification. Each of the surbers were fully counted and identified, with the exception of a few samples that were so large that subsampling was employed. Samples were identified to genus, or to lowest practicable taxonomic level.
- If it's not known which taxa came from which habitats (e.g., ASCI method); habitat changes can't be measured.
- Habitat types are defined by a questionnaire for habitat assessment found in ASCI.
- It's problematic to hook habitat change and variability together,
- There are no regulatory requirements regarding aquatic monitoring in the National Pollutant Discharge Elimination System program to offer any guidance. DNR does not have any monitoring requirements either, but they have the authority to include aquatic monitoring and methodology as requirements, as special conditions in the wetlands permit.
- Red Dog Mine uses the DNR method. Red Dog Mine has a lot of variability in the macroinvertebrates. They can tie their periphyton results to water quality results.
- EPT measurements are helpful; Rapid Bioassessment is useful because it is rapid.
- EPT is based on out-of-state conditions. There are a lot of waters in Alaska that are listed as high quality water, which also have high Diptera counts. Many pristine streams in

Alaska have been listed as impaired, strictly because of the high EPT counts. Diptera is a vast assemblage in itself that has not been very well explored by the science community.

- The sampling time involved in the two methods is similar; ASCI may take a little more time to sample. However, processing of the Surber samples takes longer because there are five of them.
- HDR selected ASCI Subsamples using a Caton sub-sampler, which is a grid tray. Material is spread out over the grid, and then squares of material are randomly removed from the grid; if more material is needed, it is selected from subsequent random squares within the grid.
- HDR identified organisms to genus. Genus level identification picks up a lot of changes by habitat; there would be some additional information if organisms were identified to species, but there is not much more information related to the effort involved.
- A repeatable methodology needs to be chosen.

Chlorophyll A sampling

- Sampled diatom assemblages in 2004, DNR felt chlorophyll A was more sensitive, so in 2005 the study switched from diatom sampling to Chlorophyll A sampling.
- Performed at the same time as the macroinvertebrate sampling. DNR prefers that all aquatic sampling is conducted during the same sampling event.
- The most optimal sample date would be during the summer solstice.
- Method
  - Choose 10 rocks at various points, spatially distributed throughout a 100-meter reach. Place a five cm square on the rock. Clean the rest of the rock (outside of the square) thoroughly with a toothbrush. With a new toothbrush, scrub the contents within the square into a 0.45 micron filtering device. Add magnesium carbonate as a preservative. Put the sample filter into a Ziploc® bag with dessicant. Freeze and send to DNR for processing. This process has also been used by EPA at other sites.
  - At the Chuitna Coal Project, they clean off the rock with a razor blade – toothbrush. Use of a toothbrush is preferable, as it can remove the material within the pits in the rock.
  - There were no periphyton studies at Pogo Mine.
  - DNR is making the toothbrush method standard state-wide for large projects.

Zooplankton

- 2006 horizontal tows in five lakes, one sampling event /year.
- 2007 looked for freshwater mussels in a variety of lakes in the mine study area – none were located.
- Big Wiggly Lake has a lot of zooplankton. There are also a few rearing river–type Sockeye in the lake. Lots of bug life would be conducive to rearing Sockeye

- Frying Pan Lake is not being sampled, as it currently lies in the proposed footprint of the project.
- Zooplankton identification is at a high level taxa only.
- There is a set tow distance and tow speed. Density per unit catch can be determined.

Lake Iliamna Study

- This study was initiated in 2005 at agency request.
- Interest was in part because of the transportation corridor alternative at Pile Bay.
- The Lake has already been characterized by other studies, so this study is not intended to characterize the lake itself.
- Purpose of the Pebble Project Lake Study was to set up discreet baseline sites for water quality, sediments, mussels and zooplankton. Sites are located at:
  - Pile Bay
  - Knutson Bay
  - Roadhouse Bay
  - N.E. Bay near Iliamna Village
  - Confluence of Upper Talarik Creek with Lake Ilimana
  - An additional 4 sites were sampled just for mussels (trace elements), sediment, and water quality.
- In 2005, samples were collected monthly from May to October for water quality and zooplankton sites; samples were collected twice for mussels in June and September.
- Field data included
  - Sechi disc measurements at every meter of depth
  - YSI multi-parameter meter readings at every meter from surface to substrate (or 20 meters)
  - WQ samples collected using a Niskin sampler
  - Sediments collected via Ekman dredge or grab sampling.
- In 2006 sampling was only done at the mussel sites
- In 2007 sampling was conducted at the original five sites monthly from May to October.
- Mussel sampling was discontinued after two years to minimize stress on the mussel population.