

**Fish Technical Working Group  
Pebble Project  
January 9, 2008**

Minutes taken by Charlotte MacCay/Bristol Environmental include edits from working group members.

**Present:**

Phil Brna/USFWS  
Jeff Estensen/ADNR/OHMP  
Phil North/EPA  
Doug Limpinsel/NOAA-NMFS  
Mark Fink/ADF&G  
Lowell Fair/ADF&G  
Tim Baker/ADF&G  
Serena Sweet/USACE  
Brian Lance/NOAA-NMFS  
Andrea Meyer/ADNR  
Dennis Deans/PLP  
Charlotte MacCay/Bristol  
Jim Buell/Buell & Assoc  
Randy Bailey/Bailey Environmental

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

**Administrative**

- The TWG members would particularly like to have access to protocol for study methods and specific fish study design details to make the meetings meaningful and enable TWG members to contribute constructive suggestions.
- The role of TWG meetings prior to having specific study protocols and data was considered very important and was therefore referred to the Steering Committee. Some members suggested that the TWG process should not go forward without being able to review the existing data and what has already been done.
- Agencies want the Pebble Partnership to provide additional information (study plans with detailed information and annual data reports) to make the process more beneficial to the agencies.
- Some TWG members clarified that their use of the term data did not refer to raw data, but to additional detailed information about the sampling efforts.
- TWG members want to review the analyses and summarization of the raw data. This review may or may not then lead to examination of or re-analyses of the raw data.
- Selection of a leader is being delayed until the Steering Committee has resolved the issue of having study design details, methods protocol, and data available prior to future meetings.
- The TWG would like the contracted fish consultants at the meetings.

- Charlotte is to canvas the group for the most pressing topics to discuss at the upcoming meetings which may include resolving if adult enumeration methodology such as aerial surveying is necessary.
- Rainbow trout telemetry was deferred for discussion at the next meeting when Rainbow trout experts could also attend.
- It was recommended that key staff from agencies attend the TWG meetings. Need to have staff familiar with resident species in the area to be on the TWG.

### **Information Requests**

- Detailed study design, including the time samples were taken, the sites sampled, flow, and the habitat type for the sampling sites, method protocol information, as well as summary data reports and raw data.
- A map of the study area is requested with an overlay of sampling sites
- Responses to past recommendations.
- ADF&G provided recommendations to Pebble Partners in May 2007 on the baseline fish studies. Final study plans were not completed until September 2007. A comparison of the ADF&G recommendations and final study plans shows that not many of the recommendations were incorporated into the fish baseline studies in 2007. Additionally, ADF&G was promised a response from the Pebble Partnership regarding the recommendations, which has not yet occurred.
- Percent of fish habitats sampled in the winter sampling program?
- A groundwater presentation of what's happening physically in this area.
- The groundwater sampling map
- Hydrographs
- A correlation of hydrographs and fish sampling stations
- Objectives for study plans that have measurable results
- What types of sampling gear are being used , where, why and in what combinations
- Comparison of snorkeling days and flow conditions
- Comparison of stream stage between snorkeling and electro-fishing methods for Upper Talarik resident species survey that includes a habitat/turbidity/flow comparison
- Timing and area of the juvenile anadromous fish surveys in the Upper Talarik and South Fork Kaktuli intermittent stretch.

### **Review of the Pebble Project Fish Study Plan**

#### Objectives

- The objectives in the study plans are more like goals than objectives
- TWG members suggested the following consideration in writing fish study objectives:
  - writing measurable objectives
  - stating objectives in a manner that can be reviewed to determine if they were accomplished or not
  - writing objectives that are scientifically defensible
  - stating the level of precision and accuracy the study will adhere to.
- TWG members suggested the following for inclusion in fish study objectives:
  - detect fish moving in and out of the project area.

- understand where fish go throughout their life cycle to understand the scope of impact for determination of adequate study area.
- determining where fish overwinter, and what are the characteristic winter habitat types.
- utilization of habitat, this information is important to the agencies.
- Need to ensure there is enough information to assess potential project effects for each species, and how to avoid, minimize and mitigate those effects, for all life stages of all species.
- characterizing fish habitat in the study area

#### Study Area

- Pebble Project fish studies were set up on drainage concept for the three drainages at the sites; the North Fork Koktuli Drainage, the South Fork Koktuli Drainage and the Upper Talarik Drainage for as far as the company had access. There are property access issues in the lower portion of the Upper Talarik which lies in APC lands. APC is under contract to operate three hydrology stations on the portion of the LTC that runs through their lands.
- The study area addresses the potential road and transmission corridor and port site.
- Present study boundaries were based on previous guidance from the agencies that when you reach a point downstream that your project is resulting in a very small change of stream flow that there is no purpose in sampling any further downstream. After a certain threshold small changes of flow become “noise” in the system and it becomes challenging to detect changes from natural variation.
- The study area should consider if there is to be an equal level of study intensity inside and outside of the current mine study area, or if sampling could be done further apart as you moved out of the mine study area.
- There are a suite of regulations from endangered species to NEPA to Title 41 that all have different concerns and therefore different extent of study area. NEPA encompasses more than the CWA or Title 41. The extent of a study area differs by regulation and by parameter.
- Studies must consider proving there is no impact, not be seen as assuming.
- Consider having the Koktuli River study area extend further downstream into the Mulchatna and Nushagak Rivers, and for the Upper Talarik River study to extend down to its confluence with Lake Iliamna. This concept would look at the entire Nushagak River drainage as a whole watershed and/or an ecosystem, likewise for the whole Upper Talarik Drainage. This would allow the agencies to put mine impacts in context of larger watershed conditions.
- The Nushagak River affects Bristol Bay.
- The agencies often define a drainage based on the scale of a project.
- PLP is basing the definition of a drainage on consideration of the extent of potential impacts. A definition for establishing boundaries was offered that stated “downstream until you get to a waterbody where a change in flow won’t have significant effect – based on flow for fish). The studies should go downstream until you can show there is no effect. Some members feel this definition can only be applied to flow and not to other parameters.
- Consideration of the adequacy of the extent of the study area, included discussion that tagging has shown that Rainbow trout are in the Upper Talarik and cross the lake [Iliamna] to tributaries on the other side of the lake. There is interest in determining what life stages of fish move up and down this full drainage. Fish known to be present include grayling, rainbow trout, salmon, and Dolly Varden.
  - Radio-tagging in the Kenai River has demonstrated some surprisingly extensive distances travelled by fish in that system.

## Relative Abundance Studies

- The term relative abundance as used in the Pebble Project studies needs to be better defined.
- PLP stated that relative abundance was meant to address catch/unit effort across species and life stages to create an index of abundance.
- PLP consultants stated that you do not need to have measurable population data for baseline, but it is important for evaluating impacts. Some agency members stated disagreement with this assertion.
- Population estimates are planned for some species within the project footprint.
- Population estimates are more useful than relative abundance.
- A decrease in population could show impact, but not necessarily from the proposed mine.
- There are many outside influences that affect the population.
- Some agencies suggested assessing fry/smolt production so that freshwater production can be separated from marine production.
- PLP's study objective is to get some relative order of magnitude so know which habitats are important to preserve. PLP's permitting experience has been that a full population estimate is not usually required for permitting or for developing mitigation proposals.
- Another project chose not to do population studies outside of relative abundance, possibly in contrast to advice given by the permitting agencies, it only stalled the process when they later had to go out and gather additional population study data.
- That project had different impacts, they were destroying spawning areas in the streams.
- Population estimation is important to know the number of fish using the system to determine the stream capacity and if that capacity is changing. Accuracy and precision are important to know if the change is real.
- Consider if tower fish counts have 10% reliability (theoretical) and sometime later there is a 30% drop in returning adults for a few years, but you are also measuring water quality, periphyton and they show no change – the population estimate would not lead to any conclusion about project impacts.

## Winter Sampling

- Concerns and Limitations
  - Winter sampling is well acknowledged as being difficult to conduct due to weather and ice conditions that limit study design and field work
  - There are safety concerns related to temperatures, darkness, and ice conditions
  - Fewer hours of daylight limit visibility and sampling efforts
  - The presence of snow and ice limit visibility
  - Instrumentation and some fish trapping methodologies, such as weirs, are not practical in ice conditions
  - Snorkeling is unsafe under ice
  - Cutting through ice to conduct studies may affect fish behavior by muddying the water, or scaring the fish
  - Sampling sites are often limited by access and ice conditions, making it difficult to establish random sampling sites
  - There is no guarantee that the habitats being sampled are representative
  - To extrapolate data out to the larger drainage you need random data

- Sampling Sites:
  - Sites are picked by safety and access, not habitat type
  - Some sites can be repetitively sampled over the years
  - In 2004 there were 40 sites
  - Ice conditions in 2005 limited sampling to 12 – 13 sites
  - 2007 many more sites were accessible
  - Total of 75 sites over the years
- The study cannot address areas where you can't look. A winter flow study may be more successful than directly studying the fish.
  - The most pivotal time is based on flow, it's not necessarily the coldest time
  - The limiting factor is low flow in late March or early April so that is the optimal time to sample
- Sampling options include:
  - Sampling in January – difficulties in consistent sampling
  - November when there are more habitat types accessible
  - Late spring when there are more habitat types accessible
- Additional comments raised during discussion on winter sampling
  - Consider if there is sufficient data to determine if overwintering fish distribution can be defined or if stratified sampling is necessary
  - Not certain if fish are or are not in the same place in November as they are in April. They may stage somewhere right before freezing
  - Some adults stay in upwelling areas during the winter, some go downstream
  - Consider radio-tagging Grayling
  - PLP Studies have not yet correlated fish with flow and habitat. Some statistics have been done to look at overall geographical distribution
  - A map could be created of distribution by species, but it is based on highly variable sampling
  - Consider combining data from young of year and newly emerged fry with areal spawning data
  - Pre-smolt Sockeye appear to be in beaver ponds, a few in lakes for rearing. Not many in North Fork Koktuli, but generally out of the project area. Some present in the South Fork Koktuli springs
  - Can combine actual spawning locations from aerial survey and combine with flow modeling to assess issue of eggs and fry
  - Consider what is more important – sampling a wider variety of habitats during a less than optimal time frame or go sampling at a more optimal time?
  - Is sampling possible as the waters start to open up in late March and early April? Look at some sites right after break-up and see if they match observations during late March. Describe sampling difficulties in the program
  - Some areas aquifers may bleed out
  - Open water areas stay in the same place, however some are more sensitive to cold than others and may freeze up some years
  - Ranking of habitat types also of importance
- Sampling Methods
  - Flow and habitat parameters are recorded for all stations
  - Minnow Traps

- Minnow traps don't always work consistently
- Minnow traps are the lowest common denominator amongst gear types. Report catch/unit effort for minnow traps and use other methods to see what the traps are not catching.
- Targets mostly salmonid species
- Used for presence/absence of some species
- Minnow traps are not being used in riffles
- Trap avoidance can occur with minnow traps
- Combining gear types can be very effective
- With good trap success can collect relative abundance data
- Video cameras attached to traps can establish if trap avoidance is occurring.
- Pit tagging from traps has been done for some other projects. It is too difficult with ice flows. If used might provide output population estimate.
- The minnow trap yield was poor so other methods were added over time
- Consider night methods for winter sampling
- Electrofishing
  - Catches more fish than minnow traps
  - Less size selective than minnow trapping
  - Provides qualitative data
  - Provides association of catch per unit effort per habitat type
  - The method of shocking, marking, returning and re-shocking to determine if the fish present are the same fish as the previous sampling effort or different fish was considered, but there was no confidence in the method. Analogous to looking for a needle in a haystack. Also, the fish probably come out at night, while for safety reasons sampling is only conducted during daylight hours.
  - If gear types have different levels of success within different habitats then it's difficult to compare data across habitat types
  - Weirs are not practical in spring with high flows and ice
- Snorkeling
  - One objective is to determine where to focus protection and enhancement (such as potentially augmenting flows), considerations include:
  - Determining where the fish are overwintering, where the fish are staging before freeze-up
  - Confirming where there are springs, gaining reaches, and/or open water that support fish
  - HDR is using multiple lanes (not multiple passes of the same lane)
  - Snorkeling has been conducted in open water areas only for safety reasons
  - Study areas have varied in length
  - By sampling for fish in areas where they are expected to occur based on hydrology, rather than using a stratified or random sample design, there is potential to introduce bias into the study.
  - Sampling could also be refined by reviewing the data
  - Snorkeling is the largest data set – calibrating may give relative abundance estimates
- Gravel Pumping
  - Sampling could be refined by including gravel pumping

- No gravel pumping is conducted for eggs or fry – already know where spawning occurs
  - The Pebble Project winter snorkeling study targeted juvenile and adult fish and habitat usage, not eggs and fry. The study was looking for habitat association. Incubation was not the focus of the study. The study was determining what sites were important for overwintering.
  - Concern was raised that egg and fry studies could be important as a reduction in flow could result in egg or fry mortality
  - The Pebble Project hydrology team is focusing on springs and areas of inflow, as will the Fish Habitat Instream Studies. There are some intra-gravel thermistors also.
- Smolt Studies
  - Smolt studies are sometimes used to augment habitat characterization – there are some smolt studies being conducted within the project footprint
  - A way to measure juvenile production from a system
  - Requires a large population to be effective
  - Smolt studies are done at initial break-up to mark the fish
  - Smolt counters can be installed at a point of convergence
  - Will help get data for determining abundance
  - It can be difficult to get a smolt weir to hold in these streams
  - Incline plane traps can be used to capture, mark, and get population estimates
  - Incline plane traps are not practical because at break-up there is overbank flow everywhere, the trap cannot be effectively indexed
  - Some projects put tags in the smolt in the fall, capture the smolt in traps or by electrofishing; traps are put out in the spring

### **Salmon Escapement**

Escapement – defined as the number of adult fish returning to the survey area as a population estimate (except in 2004 where sampling was not conducted at the beginning of the year)

#### Objectives

- Determine relative abundance and identify the spawning and incubation sites/

#### Methods

- Aerial surveys are also used for a relative population estimate
  - Consider aerial surveys as more of an index than a population estimate, or they can be viewed as a population estimate with large error bars – better population estimators are weirs, videos, and counting towers or sonars. Weirs do not stay put in these waters
  - Up to 50% variability with some aerial surveys
  - Aerial surveys have less sample power
  - ADF&G stated that aerial surveys are not adequate and should not be used for abundance estimates. ADF&G currently uses their abundance estimates for fishery management, not for project related baseline or NEPA process data.
  - ADF&G recommends that some other method be used to enumerate salmon escapement in the Talarik and Koktuli drainages. The preferred methods are weirs, counting towers, and sonar. The preferred methods will provide better quality data and are less costly than aerial surveys.
  - Bad weather also leads to lost survey days with aerial surveys

- Pebble Project aerial survey relative precision improved through use of helicopters instead of planes, which by being slower allow for better viewing. The area also has very little stream overhang to interfere with visual estimates and the water is very clear allowing for a fairly good idea of how many spawners are coming in.
- If observer efficiency were known and there was paired data, it's maybe possible to get relative abundance data
- Some previous studies have observer efficiency
- Nushagak Main stem uses sonar to measure escapement. Many changes in outside influence have been reflected in Nushagak sonar data that help the fishery managers to understand outside factors.
- Towers
  - Towers count hourly vs aerial surveys counting daily
  - Towers may be less expensive than aerial surveys and yield a better population estimate. Compare budgets with the data received to see if it's more cost effective. There are written operational plans available if you decide to go with a tower. Towers require 3 people to man them at a cost of \$35,000/month.
  - Towers would help to refine the existing aerial survey data for use throughout the survey life and help to determine observer efficiency
  - Smolt input or output numbers may provide some insight freshwater versus marine production
- Adult spawners do not drive escapement
- Radio tags are another method to consider
  - Tagging could improve the precision of the aerial surveys
- So many things affect escapement, water quality or some other physical parameter would be a stronger means of determining if any fish population effects were project related
- Smolt output data can help to segregate marine impacts from freshwater impacts. ADF&G has some useful information on smolt
- Fishery survey reports should include a discussion of rationale for the selection of methods
- When monitoring programs are initiated along with project start-up smolt out-migration and adult monitoring may be added then, it would be better to have some pre-operational background data to go with the monitoring data.

### **Fish Abundance in Upper Talarik**

- Looking at resident species in this study
- Variables for this study are habitat, turbidity and flow
- Calibrating snorkel data across age groups and species by conducting snorkel counts followed by an abundance estimate based on electrofishing
- Electrofishing for this study is done with multiple passes in a closed system
- Passes were conducted until a declining trend was established
- Consider repeating efforts to catch any possible timing effects on juveniles
- The UT fish studies were done under generally comparable flow conditions
- Consider validating habitat types in snorkeling surveys
- New blocking gear has been added to the program

### **Distribution of Juvenile Anadromous Fish**

- Concern that the extent of range of juveniles includes the upper reaches of the stream system.
- This study is meant to supplement earlier data recorded in 1991-1993.
- Looking at tributaries to South Fork Kottuli and the South Fork intermittent flow reach to observe what is going on there. Also observe area of the transportation corridor study area where it comes close to the Upper Talarik.
- Using electro-fishing and snorkeling for presence/absence.
- Timing should be considered.

### **QA/QC**

- To ensure accurate identification of juveniles, questionable fish are compared to voucher species.
- This stream system has not had many ambiguous fish as have been seen in some other systems in the state like the Chuitna River.
- Never encountered a need to separate out adults in this study.
- Consider how to make sure juveniles are not lost when releasing adults.

### **Other**

- In the ephemeral reaches of the stream, the hydrology team has taken picture of piles of dead fish that were left behind when the water naturally retreated. We know this occurs, but do not have any numbers for how many dead fish are in these natural fish kills.
- Consider looking at different habitat types for calibration

### **General Comments**

- There are 4 years of data collected to date and one more year planned. Consider how changes to the program will affect the usability of data already collected. Determine how many years of data are sufficient.
- It is important for study design assumptions to be reviewed and discussed well before each field season.
- Data will be evaluated related to possible impacts of reduced flow and potential mitigation for potential increased flow.
- Major concerns that need review are time and area for fish studies. Less so for study methodology.
- Information needed to apply for permits include hydrology, water quality and fish distribution
- Flow data and water chemistry data are collected from the same sites that are used in the fish studies, but not necessarily at the same time. These data are collected by separate teams. Upwelling information is also being collected by the hydrology team.
- Potential indirect effects include potential flow reduction. Impacts need to be quantifiable and include habitat effect for mitigation.
- The program is improved if you can minimize the number of assumptions.

### **Mitigation Considerations**

- Mitigation by federal definition means to avoid, minimize, rectify, compensate
- Being precise when looking for mitigation solutions will help ensure the applicant and agencies maintain the same perspective. If the agencies decide they do not have confidence in the method they will be more conservative and use the higher end of the data range.

- Rationale for being precise is to minimize disagreement and conflict and come closer in range.
- It is known that waters that underlie the project footprint will need to be mitigated.
- The estimate of value/amount of mitigation will be higher if based only on habitat characterization and habitat loss without adequate associated abundance data. In that scenario mitigation will be based on an assumption of 100% use.
- Mitigation methods may have to be based on habitat units if population estimates can't be quantified.