# Appendix A

# Supporting Documentation

Environment Canada / Environnement Canada

Prairie & Northern Region
Environmental Protection Branch
Environment Canada
Twin Atria #2, Room 200
4999-98th Avenue
Edmonton, AB T6B 2X3

File number: 7834-3-37/E77-1

August 11 2005

Michael Tansey
Reclamation Manager
Kinross Gold Corporation, Lupin Operations
9816 Edmonton International Airport
Edmonton, Alberta
T5J 2T2

FAX: (204) 890-8814

Dear Mr. Tansey:

**Re: The Lupin Gold Mine Initial Monitoring EEM Study Design**

This letter is to advise you that I accept the Initial Monitoring EEM Study Design for the Lupin Gold mine. This acceptance is based on the Technical Advisory Panel's (TAP) review of "Lupin Gold Mine Environmental Effects Monitoring Study Design", received December 6, 2004, the final April 18 2005 TAP Mine meeting minutes, and the August 2 2005 electronic submission entitled 'Addendum Report: Changes to the Initial Environmental Effects Monitoring Study Design for the Lupin Mine'.

Please note that the TAP accepts the mercury results of the pre-decant sample from Pond #2 and will not require that samples be collected for fish tissue mercury analysis during this EEM biological monitoring study. Fish tissue samples will be archived for possible copper analysis however, as outlined in the addendum. Also note that the TAP had requested water samples be collected near the beginning and the end of the decant period (Item #13).

It is my understanding that the mine will remain in contact with the TAP during reconnaissance and field work, and that the TAP will be consulted on field decisions involving sentinel species, sample size, and other EEM endpoints.

If you have any questions please do not hesitate to contact the EEM Coordinator for your facility, (Email: paula.siwik@ec.gc.ca, Tel: 780-951-8824, Fax: 780-495-2758).

Sincerely,

Peter Blackall, P. Eng
Regional Director of Environmental Protection
MMER Authorization Officer

cc Paula Siwik, Environment Canada
Chuck Brumwell, Environment Canada
Ken Russell, Environment Canada

**MEETING MINUTES**

**MMER ENVIRONMENTAL EFFECTS MONITORING**
**STUDY DESIGN MEETING**
**Lupin Gold Mine**

**Monday April 18 2005**
**12:30 p.m. to 4:00 p.m.**

**Attendees:**

| | |
|---|---|
| Mike Tansey | Lupin Gold Mine |
| Rick Schryer | Golder Associates |
| Gary Ash | Golder Associates |
| Mark Dunnigan | Golder Associates |
| Chris Baron | Fisheries and Oceans Canada |
| Steve Harbicht | Environment Canada |
| Anne Wilson | Environment Canada |
| David Hohnstein | Nunavut Water Board |
| Paula Siwik | Environment Canada |

1. **Introductions**
2. **Adult fish survey**

Paula began by outlining the TAP's preferences. They included: 1- a 2 day reconnaissance to assess a) the presence of fish, b) the spawning condition and c) the presence of parasites in the ninespine stickleback population, 2- the use of juvenile arctic grayling and ninespine stickleback as sentinel species in lethal surveys, 3- a progression downstream in the Seep Creek system if species/populations higher in Seep Creek were not adequate, 4- July 15 as an acceptable start date, 5- other reference areas should be investigated due to the possible influence of wind blown tailings on the Norma system (recommended Fingers) and 6 – that copper concentrations be determined in the viscera or liver of the juvenile arctic grayling.

**a. Sentinel species selection and timing**

There was some discussion about past sampling techniques and the results of the ninespine stickleback survey at the Miramar CON site. The result was a decision to a) delay the adult fish survey until August (fish and benthic surveys done at the same time) and b) attempt to use sculpin as a sentinel species. Sample sizes were 20 adult males, 20 adult females and 20 immature fish per area for the sculpin and 40 immature fish per area for the arctic grayling. The TAP agreed that a non-lethal ninespine stickleback survey with a subsample sacrificed for ageing and to determine the presence of parasites be the backup plan.

The TAP had expressed the desire to have water quality data collected near the beginning of decant. Originally, this would not have been an issue with the proposed temporal separation of the fish and benthic surveys. Anne inquired as to whether Pond 2 was well mixed and David replied that it was, that Pond 2 was relatively shallow, and that the siphons draw off the top 3 m. The facility agreed to sample water quality in the proposed biological

reference and exposure areas soon after commencing decant to address the TAP's concern.

**b. Copper and mercury**

Paula explained that the TAP agreed mercury need not be sampled in fish tissue provided the mercury concentration in the effluent sample to be collected from Pond #2 pre decant was ‹ 0.1 µg/l. If the effluent sample has a mercury concentration > 0.1 µg/l, it was suggested that non-lethal tissue sampling be considered (guidance to be available soon).

The group did not reach resolution on the issue of copper analysis. Sufficient tissue for 12 copper samples per area will be collected and archived during the adult fish survey. The preferred tissue is arctic grayling liver. If grayling are not found in the study areas, liver or viscera from other sentinel species should be collected. Further discussion on this topic will take place.

**c. Reference area**

The rationale for locating a new reference area was outlined. There is a road to Fingers Lake and the creek can be accessed by boat. Reconnaissance will be done to determine if sufficient numbers of the appropriate species reside in that system. Paula advised the mine that the absence of fish in an area where they should be present is considered an effect in the metal mining EEM program. Therefore the reference area must be sampled even if insufficient numbers of fish are caught in the exposure area.

**3. Benthic Invertebrate Survey**

Paula outlined the TAP's suggestions. They included: 1- using Seep Creek as the exposure area, 2- to sample during decant even if it means compromising a bit on timing, 3- focus on depositional habitat, 4- collect sediment samples for metals analysis in addition to TOC and PSA, 5- use cores instead of an Eckman to collect sediment samples, 6 – include both the 243 and 500 µm fraction in the Interpretative Report and 5 – increase the number of benthic subsamples from 3 to 5.

**a. Sieve size and sub samples**

It was agreed that the number of subsamples would be increased from 3 to 5 per station. There was some discussion about the 500 vs. the 243 µm fraction. Paula explained that future program decisions would likely be made at the 500 µm level and analysis should be done on that fraction. It was decided that the data for both the 500 and 243 µm fraction would be included in the Interpretative Report but that analysis would be done on the 500 µm fraction.

**b. Sampling areas**

As the TAP recommended sampling depositional areas, it was suggested that the small unnamed lakes along Seep Creek might be the most suitable sampling areas. The TAP agreed that they should be looked at. In terms of reference areas, the decision was to explore the area downstream of Concession Lake to see if the habitat and flow were similar. Other options, including some small lakes in the Fingers system, were discussed as back up.

**c. Sediment sampling**

Sediment will be collected using a core sampler at each benthic invertebrate station and analyzed for PSA, TOC and metals. As outlined in the review comments, the TAP recommended collecting the upper 4 cm for analysis.

**4. Effluent and Water Quality**

Paula reminded everyone to ensure that labs use the appropriate detection limits when analyzing effluent and water quality samples, and that water sampling must be done in both the fish and benthic exposure and reference areas. The comments were noted. Mike asked about suitable sampling stations for the routine effluent and water quality sampling. Paula stated that the exposure station should be close to the point of discharge but far enough downstream to allow for some dilution. David suggested the station at the narrows be the exposure station and the one at Concession Creek act as a reference station.

**5. Additional Items**

a) Paula will be the EEM contact during the field surveys and will supply the consultants and facility with contact information
b) Paula will make arrangements with Mike for a visit to the site during field work.
c) Some of the TAP comments were discussed and an addendum will be submitted. The highlights of that conversation include: 1- lake seiche effects were not included in the model, 2- an estimate of the plume at 250 m will be done in the field, 3- any tissue metal data will continue to be reported in dry weight but the moisture content of the sample will also be presented and 4 – the consultants will verify the volume of sediment required for analysis.
***d)*** Lupin is considering their options and may decide to submit a letter requesting Recognized Close Mine status. ***ACTION ITEM: Paula will review recent decisions regarding the timing of this request and provide that information to Mike.***

**Golder Associates Ltd.**

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Telephone (780) 483-3499
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2 August 2005

05-1373-019

**Environment Canada**
Environmental Protection Branch
Prairie and Northern Region
Room 200, 4999 – 98 Avenue
Edmonton, AB T6B 2X3

**ATTN: Paula Siwik**
**Regional Environmental Effects Monitoring Coordinator**

**RE: ADDENDUM REPORT: CHANGES TO THE INITIAL ENVIRONMENTAL EFFECTS MONITORING STUDY DESIGN FOR THE LUPIN MINE**

Dear Ms. Siwik,

A meeting was held between the technical advisory panel (TAP), Kinross Gold Corporation (Kinross) and Golder Associates Ltd. (Golder) on 18 April 2005 at Environment Canada's offices in Edmonton, Alberta. The purpose of this meeting was to discuss and finalize the proposed Biological Environmental Effects Monitoring (EEM) study design for the Lupin Mine. Based on these discussions and review comments to the study design report (Golder 2004), the following changes were agreed upon with regards the final design to the fish survey, benthic invertebrate survey, and water quality and sediment quality sampling programs (minutes to the meeting and review comments to the study design report are attached).

## 18 APRIL 2005 TAP MEETING

### *Fish Survey*

Changes to the fish survey include the following:

- Juvenile Arctic grayling and slimy sculpin are confirmed as the target sentinel species (lethal sampling program for both species). Ninespine stickleback will be a contingent target species (non-lethal sampling program, with a subsample sacrificed for aging and to determine the presence of parasites).

- For juvenile Arctic grayling, lethal sampling will be completed on 40 individuals in each of the reference and exposure areas. Sample sizes for slimy sculpin include 20 adult males, 20 adult females and 20 juveniles in each of the reference and exposure areas.

- The field sampling session is scheduled for late August and early September 2005, and includes a 2-day reconnaissance in each of the reference and exposure areas to assess presence of fish, spawning condition, and the presence of parasites in the ninespine stickleback populations. The Lupin Mine anticipates their effluent discharge period to be 15 July through 6 September 2005.

- Tissue samples for mercury may not need to be collected. This program will depend on the concentration of mercury an effluent sample to be collected in advance of the field sampling session. If the effluent sample has a mercury concentration greater than 0.1 µg/L, a tissue sampling program will be carried out.

    - The effluent sample will be collected at the traditional sample point (Pond No. 2 of the TCA, Survey Network Point 925-10) after ice out but before discharge begins. The sample will be analyzed for mercury and for the full suite of deleterious substances as outlined in the Metal Mining Effluent Regulations (2002), Schedule 4. The results of the sample analyses are to be reviewed by the TAP before commencing discharge.

    - The Metal Mining Guidance Document specifies the collection of 50 g of muscle tissue from one fish species. A minimum of eight samples, preferably from one sex and one age class, are required from each of the reference and exposure areas (Environment Canada 2002).

    - During the meeting, it was suggested that non-lethal tissue sampling be considered for the mercury monitoring program (guidance documents pending). Also, it was agreed upon that juvenile Arctic grayling will be a target sentinel species for the population health sampling program (lethal sample design, $n$=40 from each of the reference and exposure areas).

    - If a mercury tissue sampling program is required, Golder recommends that muscle tissues from the juvenile Arctic grayling collected for the population health program be concurrently used for the mercury tissue monitoring program. Utilizing juvenile Arctic grayling for both the population health and tissue monitoring programs will reduce potential impacts (e.g., stress due to handling and sampling of adults for tissue, and incidental mortalities if tissues are sampled non-lethally from this species) on adult Arctic grayling populations. Historically, numbers of adult Arctic grayling in the Seep Creek spawning run have been low, while juveniles were more abundant. RL&L and DFO (1991) captured 0 adult and 76 juvenile Arctic grayling during studies examining fish resources and utilization in Seep Creek. In 1983 and 1984, RCPL and RL&L (1985) encountered 33 adult and 302 juvenile Arctic grayling with the use of a box trap situated near the mouth of Seep Creek. Furthermore, RCPL and RL&L (1985) only encountered juvenile Arctic grayling in their catch from unnamed lake. The size of the adult Arctic grayling encountered in the above catches ranged between 261 and 419 mm fork length (ages ranged from 5 to 13 yr).

- It is confirmed that sufficient liver tissue from Arctic grayling will be collected for 12 samples of copper analyses in each of the reference and exposure areas. The samples will be properly stored (-20°C) at the analytical laboratory (Alberta Research Council,

Vegreville, Alberta) for a period of up to three years, until directed otherwise by the TAP. If Arctic grayling are not found in sufficient numbers, tissues from another fish species will be collected, depending on direction from the TAP.

  - Analytical laboratories require a minimum of 2 g (wet weight) of tissue to conduct one ICP-MS analysis and between 5 to 10 g (wet weight) for moisture content. Golder intends to collect these samples from the juvenile Arctic grayling utilized for the population health monitoring program.

- Fingers Lake and its tributaries will be used as the primary fish survey reference area.

- The fish survey reference area will be sampled even in the event that sufficient fish are not captured in the exposure area.

### *Benthic Invertebrate Survey*

Changes to the benthic invertebrate survey include the following:

- Sampling will focus on depositional habitats. In the exposure area, two to three stations in each of the two small ponds situated at the downstream end of Seep Creek will be established. If the ponds are not large enough for required spacing between stations (see below), then unnamed lake (the waterbody into which Seep Creek empties) will be sampled.

- According to Environment Canada (2002), sample stations (dimensions of at least 10 × 10 m) should be more than 20 m apart in lakes and separated by three times the bankfull width of similar habitats in streams. During the 18 April 2005 meeting, it was decided that the stations will be established at least 30 m offshore and separated by approximately 100 m. In the larger of the two ponds on Seep Creek, and provided there is enough distance, three stations could be established: one near the inlet, one in the middle, and one near the outlet.

- The wide, depositional portion of Concession Creek and downstream embayments of Concession Lake will be the preferred reference areas for the collection of benthic invertebrate samples. Small lakes or waterbodies in the Fingers Lake watershed will be considered as a contingent reference area.

- Invertebrate samples will first be collected in the exposure area, and the following habitat features will be documented: water depth, substrate characteristics, water velocity (if any), distance from shore, etc. Sampling stations in the reference area with similar habitat features as those of the exposure stations will be selected.

- It is confirmed that the sampling design will include sampling of five stations to be established in each of the reference and exposure areas. Five replicate Ekman dredge samples will be collected per station and pooled.

- In the field, the Ekman dredge samples will be sieved over a 243 µm mesh. In the laboratory, the samples will be sorted and reported for numbers (i.e., densities) collected on a 500 µm sieve and a 243 µm sieve. Data analyses and reporting will be conducted on

total numbers (i.e., 500 µm data). The 243 µm data will be provided in an appendix to the report.

### *Water Quality*

For the fish survey and the benthic invertebrate survey, one water quality sample will be collected from each of the reference and exposure areas. Total number of samples will depend on the number of reference areas utilized in the study design. Presently, the reference area for the fish survey is Fingers Lake and the reference area for the benthic invertebrate survey is Concession Creek and portions of Concession Lake near its outlet. Methodological detection limits will adhere to those required by the Metal Mining Effluent Regulations (2002) and the associated guidance document (Environment Canada 2002). The water samples will be analyzed for the following:

- Deleterious substances as listed in Schedule 4 of the Metal Mining Effluent Regulations (2002).
- Nutrients (total phosphorus, ammonia, nitrate, total Kjeldahl nitrogen, total organic carbon, dissolved organic carbon).
- Physical characteristics (pH, conductivity, alkalinity, and total hardness).
- Other total and dissolved metals (including aluminium, cadmium, iron, manganese, mercury, molybdenum, selenium, uranium), and major ions (chloride, calcium, magnesium, potassium, sodium, sulphate).
- In the field, measurements of pH, conductivity temperature, and dissolved oxygen also will be recorded at each study area and sediment sampling station.

### *Sediment Quality*

For the benthic invertebrate survey, one sediment sample will be collected from each of the replicate sampling stations ($n$=10). Sediment samples will be collected with the use of a core sampler and not an Ekman dredge. Samples will consist of the top 4 cm of materials. Each sediment sample will be analyzed for the following:

- Particle size.
- Total organic carbon.
- ICP-MS metals scan (36 elements, total concentration).

## TAP REVIEW COMMENTS ON THE EEM STUDY DESIGN

On 4 April 2005, the TAP provided review comments to the proposed Lupin Mine EEM Study Design (Golder 2004). Some of these comments were addressed during the meeting held on 18 April 2004. Item numbers refer to the list of review comments.

**Items 1, 2, and 3.** Golder is aware of the Metal Mining Guidance Document (Environment Canada 2002) and other materials posted on Environment Canada's EEM website at http://www.ec.gc.ca/eem/English/Whatsnew.cfm. Such documents have been repeatedly cited, after interpreting the contents as best as possible, in the Lupin Mine EEM study design document (Golder 2004) as well as the present addendum report.

An application for a Scientific Research Licence was submitted to the Nunavut Research Institute on 15 June 2005. An application for a Licence to Fish for Scientific Purposes was submitted (22 June 2005) to Fisheries and Oceans Canada, Iqaluit.

**Item 4**. The plume delineation model did not consider lake seiche effects. Seiche effects were considered as having a negligible influence on the dispersion of the effluent plume.

**Item 5**. An estimate of the effluent concentration at 250 m from each final discharge point will be conducted in the field. This will be accomplished by using conductivity measurements as a tracer for the effluent plume.

**Item 6.** As recommended during the 18 April 2005 TAP meeting, the exposure water quality monitoring point will be the routine Nunavut Water Board sampling station (SNP 925-24) situated at the narrows between Inner and Outer Sun bays.

**Item 7**. Golder and RL&L Environmental Services Ltd. report fish tissue concentrations on a dry-weight basis to reduce data variability due to differences in moisture content in fish tissue (i.e., moisture generally accounts for 75 to 85% of tissue weight). Thus, the dry weight copper concentrations reported in Golder (2004) are approximately five times higher than the wet weight values reported in the Lac de Gras area and in Back Bay of Great Slave Lake (Martin 2001; Jackson et al. 1996). Golder will continue to report tissue concentrations on a dry-weight basis, with moisture data also being recorded.

**Item 8**. The selection of target sentinel fish species, and the order of preference in situations where there are not two adult fish species, was discussed during the 18 April 2005 TAP meeting (see Fish Survey above). Further information on the study design sampling options for the fish survey is provided under Item 12 below.

**Item 9**. It is confirmed that both the exposure and reference areas must be sampled for fish and that up to 7 days of sampling effort will be expended, if needed, in each of the two study areas.

**Item 10**. The topic of a reconnaissance survey in Seep Creek was discussed during the 18 April 2005 TAP meeting (see Fish Survey above). It was agreed that a 2-day reconnaissance in each of the reference and exposure areas will be carried out to assess presence of fish, spawning condition, and the presence of parasites in the ninespine stickleback populations.

**Item 11**. The latitude and longitude (degrees / minutes / seconds) along with a written description sufficient to identify the location of the benthic and fish sampling areas will be provided in the interpretive report.

**Item 12**. The flow chart provided on page 54 of the Study Design Report (Golder 2004, Figure 4-2) was developed for purposes of discussion only. Golder acknowledges the order of preference

for the selection of suitable fish species as outlined in the Metal Mining Guidance Document (Environment Canada 2002). As such, please consider the following as a revised flow chart:

As discussed during the 18 April 2005 TAP meeting, and specified on page 4-15 in the Metal Mining Guidance Document (2002), the recommended method for carrying out the fish survey is to monitor adults (sexually mature fish) of two species of relatively sedentary finfish that have been exposed to effluent over a long period. In environments that do not support adequate numbers of fish to meet the recommended sample sizes (section 4.3.2.2.3 of the guidance document) or there are not two suitable fish species for monitoring, the following options, in order of preference, may be considered:

- one sexually mature fish species and one sexually immature fish species;
- two sexually immature fish species;
- one sexually mature fish species; or
- one sexually immature fish species.

During the 18 April 2004 meeting, it was decided that lethal sampling programs will be conducted on populations of juvenile Arctic grayling and slimy sculpin. Ninespine stickleback will be used as a back-up species (non-lethal sampling program, with a lethal subsample to assess age and incidence of parasitism). Also, while the field sampling session is in progress, the field crew will be in contact with Paula Siwik (regional EEM coordinator for the Lupin Mine) to discuss and finalize options should adequate numbers of Arctic grayling and slimy sculpin not be obtained.

**Item 13**. As requested, water quality samples will be collected near the end of the field sampling session.

**Item 14**. During the reconnaissance program, ninespine sticklebacks will be sampled and incidence of parasitism (usually *Ligula instestinalis*) will be recorded (as discussed during the 18 April 2005 TAP meeting). Field crews will evaluate and familiarize themselves with identification features of parasitized and non-parasitized specimens.

Should ninespine stickleback be used as a target sentinel species (non-lethal sampling program), parasitized specimens will be removed from the pool of specimens used for collection of fish measurements, where possible. If it is not possible to confirm the identification of parasitized specimens during data collection processes in the field, data will be closely reviewed in the office. Data collected from specimens suspected of being parasitized will be analyzed separately from specimens that were deemed not infested with parasites. A larger number of ninespine stickleback may need to be collected to accommodate such data analyses. For specimens known to be parasitized, total body weight will be recorded, the parasites will be removed, and the carcass will be reweighed.

**Item 15**. Requirements outlined in the updated guidance document for non-lethal sampling will be used during the Lupin Mine EEM program, if sufficient numbers of Arctic grayling or slimy sculpin cannot be obtained (i.e., if the alternate target fish species, ninespine stickleback, is used).

**Item 17**. Golder's technical procedures documents are not available for dissemination (proprietary information). These technical procedures are used by field crews as guidance documents only. The Metal Mining Guidance Document (Environment Canada 2002) will have

precedence over Golder's technical procedures. If required by the TAP, Golder can supply a copy of the technical procedures for review on a confidential basis, with return of the copy after completion of the review.

**Item 18**. As discussed during the 18 April TAP meeting, benthic macroinvertebrates will be collected from Seep Creek (exposure area).

**Item 19**. During the 18 April 2005 TAP meeting, it was recommended that five replicate subsamples be collected at each station. Environment Canada, Environmental Protection Branch has directed several monitoring assessment at the Lupin Mine (Mudroch et al. 1988; Porter et al. 1991; RL& L 1996b). Four field sampling sessions were carried out (August 1985, September 1985, August 1990, and August 1991). In each of the field sampling sessions, 10 replicate Ekman dredge samples were collected from several stations establish in Inner and Outer Sun bays of Contwoyto Lake. These samples were not pooled. The magnitude of variation among replicate samples was monitored as the replicate samples were processed in the laboratory; results indicated that between three and eight replicates are required for acceptable data variation (i.e., standard error of 20% of the mean for total numbers; Elliott 1977). Thus, the collection of five pooled replicate samples per station appears to be appropriate for the EEM program.

**Item 20.** This item was discussed during the 18 April 2005 TAP meeting (see Benthic Invertebrate Survey Section earlier in this document).

**Item 21**. Data analyses for the benthic invertebrate data will follow that of the Metal Mining Guidance Document (Environment Canada 2002).

**Item 22**. For the benthic invertebrate survey, the *in situ* variables identified in the Metal Mining Guidance Document (Environment Canada 2002) will be collected at each sampling station:

- Habitat description (e.g., stream order, drainage area).
- Physical-chemical measurements (e.g., water temperature, dissolved oxygen, pH, conductivity).
- Morphometric measurements (e.g., bankfull width, wetted width, depth, slope).
- Flow characteristics (e.g., velocity, stream hydrograph).
- Substratum characteristics (e.g., embeddedness, substratum composition).
- Sediment chemistry (e.g., fine particle size, total organic carbon, ICP-MS metals scan).
- Riparian zone characteristics (e.g., riparian vegetation, % canopy cover).

**Item 23**. It is confirmed that the top 4 cm of sediments will be collected for analysis.

**Item 24**. According to Enviro-Test Laboratories, Edmonton, the following sediment sample volumes / sizes are required:

- TOC = 2 g (wet), absolute minimum, subsampled from total metals container.
- Particle size = 50 g (wet), absolute minimum, submitted in a 125 mL jar or plastic bag.
- Total metals = 5 g (wet) absolute minimum, plastic bag is the preferred container (although a 125 mL jar would suffice).

**Item 25**. It is confirmed that water quality monitoring will be conducted at both the fish and benthic macroinvertebrate survey areas during the field surveys (see Water Quality above). Water quality constituents will include those required for effluent characterization, water temperature, dissolved oxygen, pH, and deleterious substances (Metal Mining Effluent Regulations 2002).

**Item 26**. Conductivity will be used as the water column tracer in the benthic invertebrate survey.

**Item 27**. It is confirmed that that the fish survey will be conducted during effluent discharge. During the 18 April 2005 TAP meeting (see Fish Survey above), it was recommended that the field sampling session be conducted during late August and early September 2005. The Lupin Mine anticipates the effluent discharge period to be 15 July through 6 September 2005. To date, the field sampling session is scheduled for 24 through 6 September 2005.

**Item 28**. It was confirmed during the 18 April 2005 TAP meeting that the timing of the fish survey will be late August through early September 2005 (see Item 27 and Fish Survey sections above).

**Item 29**. The first sentence under Table 3-1 should have read, "Between 1994 and 2004, total annual discharge from the mine varied between 0 and 3 102 895 $m^3$ (Table 3-1)."

**Item 30**. The last sentence on p. 68 should have ended with, "...they spawn in summer."

## ADDITIONAL ITEMS

- Paula Siwik will be the EEM contact during the field surveys and will supply the consultants and the Lupin Mine with contact information.
- Paula will make arrangements with Mike Tansey for a visit / audit to the site during field work.

## CLOSURE

Kinross will require written approval of the proposed changes to the Lupin Mine EEM study design prior to commencing with the field program. Therefore, questions from the TAP arising from items discussed in the present letter report will need to be addressed in a timely manner. (i.e., on or before 8 August 2005).

If you have any questions or concerns, please feel free to contact myself (780.930.8657) or Gary Ash (780.930.8666).

Sincerely,

**GOLDER ASSOCIATES LTD.**

Mark Dunnigan, M.Sc., P.Biol.
Aquatic Biologist

Cc: Mike Tansey, Kinross Gold Corporation, Edmonton, Alberta.
Peter Blackhall, Environment Canada, Edmonton, Alberta.

MD/GA/
encl.

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**MEETING MINUTES**

**MMER ENVIRONMENTAL EFFECTS MONITORING**
**STUDY DESIGN MEETING**
**Lupin Gold Mine**

**Monday April 18 2005**
**12:30 p.m. to 4:00 p.m.**

**Attendees:**

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1. **Introductions**
2. **Adult fish survey**

Paula began by outlining the TAP's preferences. They included: 1- a 2 day reconnaissance to assess a) the presence of fish, b) the spawning condition and c) the presence of parasites in the ninespine stickleback population, 2- the use of juvenile arctic grayling and ninespine stickleback as sentinel species in lethal surveys, 3- a progression downstream in the Seep Creek system if species/populations higher in Seep Creek were not adequate, 4- July 15 as an acceptable start date, 5- other reference areas should be investigated due to the possible influence of wind blown tailings on the Norma system (recommended Fingers) and 6 – that copper concentrations be determined in the viscera or liver of the juvenile arctic grayling.

**a. Sentinel species selection and timing**

There was some discussion about past sampling techniques and the results of the ninespine stickleback survey at the Miramar CON site. The result was a decision to a) delay the adult fish survey until August (fish and benthic surveys done at the same time) and b) attempt to use sculpin as a sentinel species. Sample sizes were 20 adult males, 20 adult females and 20 immature fish per area for the sculpin and 40 immature fish per area for the arctic grayling. The TAP agreed that a non-lethal ninespine stickleback survey with a subsample sacrificed for ageing and to determine the presence of parasites be the backup plan.

The TAP had expressed the desire to have water quality data collected near the beginning of decant. Originally, this would not have been an issue with the proposed temporal separation of the fish and benthic surveys. Anne inquired as to whether Pond 2 was well mixed and David replied that it was, that Pond 2 was relatively shallow, and that the siphons draw off the top 3 m. The facility agreed to sample water quality in the proposed biological

reference and exposure areas soon after commencing decant to address the TAP's concern.

**b. Copper and mercury**

Paula explained that the TAP agreed mercury need not be sampled in fish tissue provided the mercury concentration in the effluent sample to be collected from Pond #2 pre decant was < 0.1 µg/l. If the effluent sample has a mercury concentration > 0.1 µg/l, it was suggested that non-lethal tissue sampling be considered (guidance to be available soon).

The group did not reach resolution on the issue of copper analysis. Sufficient tissue for 12 copper samples per area will be collected and archived during the adult fish survey. The preferred tissue is arctic grayling liver. If grayling are not found in the study areas, liver or viscera from other sentinel species should be collected. Further discussion on this topic will take place.

**c. Reference area**

The rationale for locating a new reference area was outlined. There is a road to Fingers Lake and the creek can be accessed by boat. Reconnaissance will be done to determine if sufficient numbers of the appropriate species reside in that system. Paula advised the mine that the absence of fish in an area where they should be present is considered an effect in the metal mining EEM program. Therefore the reference area must be sampled even if insufficient numbers of fish are caught in the exposure area.

**3. Benthic Invertebrate Survey**

Paula outlined the TAP's suggestions. They included: 1- using Seep Creek as the exposure area, 2- to sample during decant even if it means compromising a bit on timing, 3- focus on depositional habitat, 4- collect sediment samples for metals analysis in addition to TOC and PSA, 5- use cores instead of an Eckman to collect sediment samples, 6 – include both the 243 and 500 µm fraction in the Interpretative Report and 5 – increase the number of benthic subsamples from 3 to 5.

**a. Sieve size and sub samples**

It was agreed that the number of subsamples would be increased from 3 to 5 per station. There was some discussion about the 500 vs. the 243 µm fraction. Paula explained that future program decisions would likely be made at the 500 µm level and analysis should be done on that fraction. It was decided that the data for both the 500 and 243 µm fraction would be included in the Interpretative Report but that analysis would be done on the 500 µm fraction.

**b. Sampling areas**

As the TAP recommended sampling depositional areas, it was suggested that the small unnamed lakes along Seep Creek might be the most suitable sampling areas. The TAP agreed that they should be looked at. In terms of reference areas, the decision was to explore the area downstream of Concession Lake to see if the habitat and flow were similar. Other options, including some small lakes in the Fingers system, were discussed as back up.