EXECUTIVE SUMMARY

TECK-POGO MINE 5-YEAR ENVIRONMENTAL AUDIT

ES 1.0 INTRODUCTION

The Alaska Department of Natural Resources (DNR) and the Alaska Department of Conservation (DEC) require Teck-Pogo Inc. (Pogo) to have third-party audits conducted every five years in accordance with the issued Millsite Lease (ADL No. 416949) and the Solid Waste Disposal Permit (No. 0131-BA002). Pogo has selected Golder Associates Inc. (Golder) to complete the environmental audit (Audit). In compliance with the regulatory requirements Golder performed an environmental audit of the Pogo Mine, and the access road near Delta Junction, Alaska. Pogo permits were issued in December 2003, construction began in 2004 and Operations at Pogo started in 2006. The audit of the facilities was conducted from June 9th through June 12th, 2008 to characterise the compliance with the approved environmental permits. Interviews with various state agencies and a close out meeting were held at the DNR offices in Fairbanks on June 13, 2008. The audit team consisted of six Golder technical specialists in mining environmental and compliance issues, geochemistry, geotechnical engineering, hydrogeology and closure and reclamation. This is the first five-year audit that Pogo has undergone.

Pogo is an underground mine with a current annual gold production of 340,000 ounces of gold per year. The mine is expected to produce 400,000 ounces of gold per year over a 10-year mine life. Pogo is a joint venture with Sumitomo Metal Mining Co. Ltd. (51%) and Sumitomo Corporation of Japan (9%). Teck Cominco has a 40% interest in the mine and is the operator. The Pogo mine is located on state land in the upper Goodpaster River valley, about 38 miles northeast of Delta Junction and 85 miles east-southeast of Fairbanks, Alaska. Access to the mine is via the 50-mile Shaw Creek Road from the Richardson Highway.

The results of this Audit will assist in determining if the Environmental Management Systems of Pogo and the regulatory controls applicable to the Pogo mine provide reasonable assurance that environmental objectives are being met and that the systems and controls are functioning as intended.

This executive summary is a concise discussion of all environmental concerns and recommended mitigation measures related to the Pogo Mine and Milling Operation and the Shaw Creek access road.

ES 2.0 AUDIT PROCEDURES AND FIELD ACTIVITIES

The Audit was objective, systematic, and documented review of the conditions, operations, and practices related to environmental requirements and environmental management of the Pogo operations. The Audit results will be used by Pogo and the state of Alaska to assist in updating, renewing, or issuing authorization and permits, in updating policies, plans and procedures, and in determining compliance with permits and authorizations. The Audit covers the following tasks and scope of work related to completing those tasks:

- Task 1. Compliance with Federal, State, Local Permits and Authorization;
- Task 2. Compliance with Specialized Environmental Plans;
- Task 3. Reliability and Integrity of Information Relating to Environmental Reporting and Compliance;
- Task 4. Adequacy of State Oversight to Protect State Resources;
- Task 5. Condition of Chemical Containment Structures;
- Task 6. Laboratories and Sample Analysis Procedures;
- Task 7. Adherence with Pollution Prevention Strategy;
- Task 8. Adequacy of Closure and Post-Closure Financial Responsibility ;
- Task 9. Monitoring Programs.

The audit included the following activities in order to complete the scope of work:

- Preparation of audit protocols and agency kickoff conference call.
- Review of key project permits and environmental plans.
- Kick-off meeting with Pogo personnel.
- Inspection of mines and processing facilities, access road, hazardous material storage and handling, general waste management areas, environmental controls and waste containment, topsoil stock piles, r interceptor well system,

development rock piles, 'muck' piles in underground, data collection procedures and the environmental files.

- Review of environmental files for monitoring and reporting, environmental compliance, bonding and reclamation costs. This involved interaction with the Pogo personnel.

- Technical evaluation of key concerns that were identified in the request for proposal.

- Interviews with agency personnel.

- Review of agency records.

- Close-out meeting with the agencies and Pogo.

- Preparation of a draft audit report.

- Follow-up telephone conversations with Pogo and DNR personnel.

- Preparation of a final audit report.

ES 3.0 RESULTS OF THE AUDIT

The following nine tasks were completed for this audit and is a summary of the results:

ES 3.1 Task 1. Compliance with Federal, State, Local Permits and Authorization

Pogo is in general compliance with federal and state permits and authorizations. Golder conducted a thorough review of the existing project environmental management plans, key federal and state permits, relevant procedures and guidelines, and federal and state regulations. The review included compliance, expiration, and renewal requirements. Pogo maintains a filing system for all environmental studies and reports, permits and compliance information, and agency correspondences related to the project. The implementation of each document terms was checked during the field audit and found to be in compliance in general.

The main regulatory drivers for the project are:

- Plan of Operations Approval for the Pogo Mine Project (Issued 12/18/2003)(F20039500);
- Pogo Mine Project Final Decision to Issue Millsite Lease (Issued 12/18/2003)(ADL 416949);
- Pogo Project Road, Rights-of-way (Issued 12/18/ 2003)(ADL 416809, ADL 417066);
- Certificate of Approval to Operate a Dam for Pogo RTP Dam (NID ID# AK00304);
- Quality Assurance Project Plan (QAPP);
- Alaska Department of Environmental Conservation Waste Disposal Permit (0131-BA002 dated December 18, 2003)(includes the Solid Waste Monitoring Plan);
- National Pollutant Discharge Elimination System (NPDES) Water Discharge Permit (AK-005334-1);
- Spill, Prevention, Control, and Countermeasure (SPCC) Plan;
- Stormwater Pollution Prevention Plan (SWPPP);
- 404 Permit; and
- DEC Air Quality Control Minor Permit (AQ0406MSS03 dated December 13, 2006).

ES 3.1.1 Potable Water Supply

Pogo's certificate to operate the two existing potable water treatment systems has expired in January 2008. Pogo is actively working with the DEC to renew this permit.

ES 3.1.2 Dry Stack Tailings Facility

The dry stack tailings facility was evaluated from a geotechnical engineering and geochemical perspective. Pogo has developed an Operations, Maintenance and Surveillance (OMS) Manual for the dry stack tailings facility. The dry stack tailings facility is not regulated as a dam under AS 46.17. However, the Alaska Sam Safety and Construction Unit provided technical support to the Department

of Natural Resources Division of Mining, Land & Water Appraisal Unit and technical review for the design of the Pogo dry stack tailings.

Pogo has a Solid Waste Monitoring Plan that is similar to what is described in the Operations, Maintenance and Surveillance (OMS) Manual. Pogo is complying with both of these documents regarding the tailings dry stack disposal facility except for the following discrepancies:

- Annual reviews of the OMS Manual
- Construction of the dry stack tailings shell is with non-mineralized development rock instead of compacted tailing because of inconsistency in the milled tailings. Pogo plans to use compacted tailings for the shell when the mineralized development rock volume diminishes. There has been no formal approval from the DNR for this change.
- Decrease in the thickness of dry stack tailings being placed and compacted over the mineralized development rock that is being encapsulated.
- Not all physical parameters of tailings material are being performed.
- The annual Facility Safety Inspections (FSI) has not been performed.

From a geochemical perspective, the tailings and development encapsulating the tailings did not have visible signs of sulfide oxidation and/or acid generation during the audit. An acid-base balance was developed for a number of layering scenarios using available acid base accounting (ABA) data for the composite samples of tailings and development rock. An average acid-base composition was calculated for both tailings and development rock and then used to determine how the overall acid-base balance changes as a function of the relative thickness of the tailings layer vs. the underlying rock layer. These balances were calculated in 10% increments, i.e., from a 90%-10% tailings/development rock mixture to a 10%-90% tailings/rock mixture.

Sulfur and arsenic content is one criteria used to determine whether the development rock is classified as mineralized or non-mineralized. A sulfur threshold content of 0.5% was used to distinguish between potentially acid generating and non acid generating mixtures of tailings and development rock. Results to date demonstrate that no tailings/rock mixture exceeds the 0.5% sulfur. Based on the sulfur content of the composite samples, the development rock placed on the drystack has consisted of non-mineralized material which, in turn, suggests that the thickness of an overlying tailings layer is

not important from an acid generation perspective. The other criterion for identifying mineralized development rock (Arsenic > 600 mg/L) exceeded the threshold value in several composite development rock samples. However, the tailings themselves over the period of record have contained an average arsenic concentration of approximately 1,490 mg/L. Therefore, although the tailings may limit arsenic mobility from mineralized development rock by acting as an infiltration barrier, the tailings themselves constitute a potential arsenic source as well.

Deviations from the layering design specified in the OMS Manual are acceptable from an acid generation perspective. The design function of the tailings layers to prevent sulfide oxidation and acid generation appears to be of limited importance given the overall non-mineralized nature of the development rock placed on the drystack.

ES 3.1.3 Shaw Creek All-Season Access Road

The construction and maintenance of the Shaw Creek All-Season Access Road (access road) is permitted under permits (ADL 416809 and ADL 417066). The road is 49.5 miles long and has five single lane bridges. All major river crossing were examined during the audit. Pogo uses best management practices (BMPs) to minimize sediment from entering the waterbodies. Road maintenance and routine repairs to maintain road integrity is conducted by Pogo's maintenance department. They are currently developing a road maintenance program that will address culverts, brush berms, and other road repairs.

The permit states that Pogo must have operational plans for shipping and spill containment that must be approved by the state. Pogo's Emergency Response Plan does not detail response and remediation measures for spills of every hazardous material that is transported to site for use at the mine. Site-specific response plans directly related to the access road should be developed for all transporters.

ES 3.1.4 Spill Prevention Control And Countermeasure (SPCC) Plan

There were five issues identified from review of the current spill prevention control and countermeasure (SPCC) plan, the monthly inspection documents, and an inspection of the aboveground tanks (ASTs). These issues were:

- Lack of secondary containment for some 55-gallon drums that contained oil or oily water.

- Not all double-walled or double-bottom tanks have the necessary overfill prevention measures such as an overfill alarm nor an automatic shut-off valve or flow restrictor and an overfill alarm. Pogo is in the process of installing overfill protection on these tanks. They estimate the work to be completed by August 31, 2009.

- One AST had damage to the lined tertiary containment.

- Some of the double-walled or double-bottom ASTs' interstices (secondary containment) are not being monitored for water and fuel as part of the monthly inspections.

- Not all ASTs are being regularly tested for proper operation.

ES 3.1.5 Toxic Release Inventory (TRI) Program

Pogo has developed a tracking system for TRI chemicals that it uses, develops, or exposes through the mining and milling process. These chemicals are tracked and monitored to determine if the quantities released to the environment (placed in the drystack tailing pile, discharged in water effluent [in compliance with permit conditions], or emitted in incinerator emissions meet the reporting threshold. Samples are taken at strategic points and analyzed for concentrations. The accumulated volumes of TRI chemicals are calculated and compared to the reporting threshold. Pogo submitted annual reports for 2006 and 2007. Review of the Pogo TRI Reporting program demonstrated that it is in compliance with the regulations.

ES 3.1.6 Best Management Practices (BMP)

Pogo has developed a BMP Plan according to the Environmental Protection Agency (EPA) Guidance Manual for Developing Best Management Practices (EPA 833-B-93004, October 1993). This plan has been approved by the EPA and Alaska Department of Environmental Conservation (DEC). The BMP Plan includes a statement of BMP policy, structure and procedures of the BMP committee, description of potential pollutants, a risk assessment, standard operating procedures (SOPs) to achieve described BMPs and procedures for reporting BMP's incidents. The plan is annually reviewed by Pogo's BMP committee.

ES 3.1.7 Air Quality Control Minor Permit

Pogo is permitted under the Air Quality Control Rules within the purview of DEC's Air Permits Program. The Program's Compliance Assurance Group has oversight for all reports. Pogo operates under an Air Quality Control Minor Permit (No. AQ0406MSS03) issued by the DEC dated December 13, 2006. Pogo is not classified as a Prevention of Significant Deterioration (PSD) project because the applicable emissions for each pollutant (NO_x, CO, PM-10, VOC and SO_2) are less than 250 tonnes per year. Pogo is subject to fuel limits to protect both the ambient air quality standards and increments during operation. The project includes diesel-fired generators, diesel-, propane-, and used oil-fired heaters, ore-concentrate handling equipment such as crushers, screen, and conveyors, and other miscellaneous equipment. The project has an emission unit inventory that includes fugitive emission sources, non-road engines, and mobile sources. Parts of the above ground portions of the mine are subject to NSPS requirements of Subpart LL for metallic mineral processing plants. The underground portions of the project are exempt from the provision of Subpart LL, under 40 C.F.R. 60.380(a). Golder reviewed the permit requirements and compared them to operating practices.

Pogo is subject to fuel limits to protect both the ambient air quality standards and increments during operation. The fuel burning equipment has restrictions on fuel consumption, fuel sulfur content (not to exceed 0.5 % by weight), hours of operation; and has specific record keeping, testing and reporting requirements. Pogo has developed a monitoring system that allows monthly tracking of fuel and 12 month rolling totals for each required emission unit. Pogo shows compliance with the state sulfur standard for distillate fuel burning equipment by keeping records of the fuel grade and the amounts. Pogo completed the permit general requirements, an operational emission unit inventory and visible emission testing.

During the life of the permit, Pogo is required to send the DEC an operating report by August 1 for the period January 1 to June 30 of the current year and by February 1 for the period July 1 to December 31 of the previous year. As required by the permit, the reports are certified by a Pogo responsible official, Teck Cominco Alaska's Director of Corporate. The semi-annual facility operating reports for the second half of 2006, first half of 2007, and the second half of 2008 were reviewed to confirm that Pogo complies with this permit requirement.

Pogo has had two deviations from this permit since mine start-up. Both times Pogo notified the DEC. The first deviation was in October 2006 due to a fire that destroyed the main electrical control room

and switchgear. Electrical service from the GVEA grid was interrupted and operations at the mine were halted. Generators which were expected to be used as standby power during rare and relatively short duration outages were needed to provide continuous emergency power to the mine site for underground ventilation, heat, lights and potable water and waste water treatment. Systems were repaired and the mine was switched back to grid power in December 2006. As a result of the extended outage, the 12-month rolling total fuel limit of the permit was exceeded. Pogo notified that DEC at the time of the problem and in each semiannual report and reason for the exceedances. The second deviation was related to a generator maintenance check.

The DEC conducted an evaluation of Pogo from the period January 1, 2005 through March 1, 2007 and identified eight compliance issues. Pogo completed corrective action to respond to each of these issues and sent a letter to the DEC dated July 30, 2007 explaining their corrective actions. Golder verified that Pogo implemented these changes.

Pogo uses the emission strategy to track the NOx emissions for fuel burning equipment by monitoring fuel and using emission unit specific emission factor to track NOx emissions. Pogo is required to track NOx emissions for the fuel-burning equipment by tracking fuel consumption and using a source-specific emission factor to track NOx emissions.

The DEC expanded the standard condition for Reasonable Precautions to Prevent Fugitive Dust and added specific fugitive dust requirements to include a baghouse requirement. Pogo is required to monitor the pressure drop once a day to determine if the baghouses are operating properly. Records were reviewed during the audit and verified that Pogo is in compliance with this requirement.

Pogo submits payment to the DEC for their annual emissions based on the facility's assessable emissions of 444 tons per year as stated in the permit.

ES 3.1.8 National Pollutant Discharge Elimination System (NPDES) Water Discharge Permit (AK-005334-1)

Surface water and effluent monitoring programs were evaluated according to the requirements described in the NPDES Permit (AK-005334-1). Surface water and effluent monitoring programs are in compliance with the NPDES and waste disposal permit requirements. The Off-River-Treatment Works is functioning as permitted.

ES 3.1.9 Storm Water Management

The Pogo Mine controls and manages storm water under an EPA Multi-Sector General Permit for Industrial Activities (for Alaska-Permit #ADR05). In accordance with the permit requirements, the Pogo Mine prepared a Storm Water Pollution Prevention Plan (SWPPP) and filed a Notification of Intent (NOI) on October 25, 2005. Golder conducted a review of the Pogo Storm Water Management program and visual inspection of the storm water controls and systems. Golder determined that all of the storm water systems are effectively controlling storm water runoff and in accordance with the plan. Pogo is in compliance with this EPA permit.

ES 3.1.10 Waste Disposal Permit (WDP) (0131-BA002)

Pogo's Waste Disposal Permit states that the *permittee must provide and maintain secondary containment for all process piping and chemical mix tanks containing hazardous or toxic materials. Secondary containment is considered to be 110% of the largest tank within one containment, or the total volume of manifolded tanks.* The CIP storage tank located outside of the paste plant and the overhead process delivery lines from the mill to the paste plant do not provide adequate secondary containment. The WDP requires Pogo to have an annual meeting with the Department and held in conjunction with ADNR in which the annual report will be presented to the agencies and the public. Pogo has fulfilled this requirement in 2006 and 2007.

ES 3.2 Task 2. Compliance with Specialized Environmental Plans

Golder reviewed Pogo's internal environmental plans and determined that Pogo is in compliance with those plans. Golder interviewed Pogo operations personnel on the mining and process operations, permit and regulatory requirements, chemical containment structures and storage procedures, monitoring and environmental controls and procedures, data collection, reclamation and closure procedures, and environmental reporting. The audit team systematically addressed the adequacy of the environmental plans, whether the plans are being followed, and documented the performance of the environmental programs during the field audit. A tour of the mine facilities revealed that the site-specific environmental systems are in place and being followed.

ES 3.3 Task 3. The Reliability and Integrity of Information Relating to Environmental Reporting and Compliance

Direct field observations were completed to determine the reliability of reported information and to verify additional information provided through interviews with key mine personnel. Site observations focused on the environmental controls, reclamation activities, and monitoring systems.

Mine operations and facilities that were inspected included the following:

- Milling and beneficiation facilities;
- Processing and surface maintenance operations;
- Paste backfill plant;
- Non-mineralized rock stockpile;
- Mineralized rock storage area;
- Temporary rock storage areas;
- Drystack tailings facility;
- Recycle tailings pond (RTP) and dam;
- Fuel and materials storage facilities;
- Water supply wells;
- Sewage treatment plant (STP);
- Water treatment plant (WTP);
- Off-river treatment works (ORTW);
- Two potable water treatment plants;
- Seepage collection wells;
- Underground workings;

- Shaw Creek Hillside all-season road
- Monitoring facilities, and
- File system.

The reliability and integrity of information for reporting and compliance is adequate. The staff is well organized, knowledgeable, and well-trained on environmental management for mines.

ES 3.4 Task 4. The Adequacy of State Oversight to Protect State Resources

In order to determine the adequacy of state oversight to protect state resources Golder interviewed staff from the following agencies:

- DNR, Fairbanks (Division of Mining, Land and Water Management; Office of Habitat Management and Permitting);
- DEC (Division of Water; Division of Environmental Health), Fairbanks;
- DNR (Dam Safety), Anchorage;
- COE, Anchorage;
- U.S. Fish and Wildlife Service; and
- Alaska Department of Fish and Game.

Golder reviewed inspections reports from the DNR. The reports include one for years 2002, 2003, and 2004 and two for years 2005, 2006, and 2007. The most recent inspection and report was for May 2008. The reports summarize their inspection tour, any finding/observations and photographs. The inspections have included staff from the DNR and other agencies. Inspections included construction activities, the general mine site and access road. The regulatory agencies for this project appear knowledgeable and have sufficient understanding of mining practices, environmental mitigation measures and the state and federal regulations.

ES 3.5 Task 5. Condition of Chemical Containment Structures

Pogo's Waste Disposal Permit states that *the permittee must provide and maintain secondary containment for all process piping and chemical mix tanks containing hazardous or toxic materials. Secondary containment is considered to be 110% of the largest tank within one containment, or the total volume of manifolded tanks.* The CIP storage tank located outside of the paste plant and the

overhead process delivery lines from the mill to the paste plant do not have adequate secondary containment.

Detoxified cyanide solution and material from the cyanide destruct circuit is delivered from the mill to the storage tank via the overhead pipeline. The detoxified solution still can contain up to 20 mg/L WAD cyanide. Pogo's rationale for not having secondary containment for the delivery pipeline and the storage tank is that they are Bevill Amendment exempt. Golder does not agree with this and considers the detoxified solution and materials to still be a process solution that is "stored" in a tank and is not "disposed of" as a solid waste material at that point in the circuit. Golder recommends secondary containment of the delivery pipeline and the storage tank.

Golder reviewed an as-built drawing that confirmed adequate secondary containment for the cyanide leach tanks in the CIP circuit.

ES 3.6 Task 6. Laboratories and Sample Analysis Procedures

ES 3.6.1 On-Site Laboratory

The analytical program associated with the development rock management involves determination of arsenic (As), sulfur (S) and iron (Fe) content of sludge (cuttings) samples generated by blasthole drilling, or muck samples if sludge is not available. The analysis is conducted by wavelength dispersive x-ray fluorescence (XRF), which is an appropriate tool for this purpose. Pogo has a sample custody and management program

The XRF analysis takes place in a laboratory facility used for routine assaying of ore, tailings and development rock. The cleanliness of the laboratory is adequate for this purpose. The XRF machine is periodically decontaminated.

The XRF is operated by personnel who have been trained on the job. No training manual or formal program is available, but hands-on training is provided under the supervision of an experienced personnel. Pogo has developed and use standard operating procedures for XRF startup and detailed maintenance checks Pellets resulting from the XRF analysis are collected and disposed of a in the dry stack. The amount of pellet material is recorded. Personnel from the Environmental Department are present during disposal. Laboratory personnel perform minor repairs on the XRF, but qualified consultant technicians repair the serious breakdowns.

The method reporting limits for As, S and Fe are well below the decision criteria of interest for development rock segregation. The XRF results are higher than those for the quarterly composite samples indicating that the development rock management to date has been conservative and the amount of mineralized development rock likely was overestimated. Although on a quarterly basis results from XRF and quarterly samples may differ, due to the conservative bias of the XRF, the XRF analytical results can be used for decision making regarding development rock segregation.

The XRF was originally calibrated in 2002 in collaboration with the University of Alaska Fairbanks. As part of ongoing QA/QC, a standard with a known As, Fe and S content is included in every analytical batch and any observed drift is automatically corrected for automatically twice a day. Analysis of replicate samples was performed until approximately 6 months ago, when it was discontinued due to the consistent "good agreement" between original and duplicate samples.

Physical and electronic records of the analytical results are kept in the laboratory and results are sent to the Geology Department for use in development rock management decision-making.

ES 3.6.2 Contracted Water Quality Laboratories

Water quality sample analysis procedures (i.e. analytical method) are performed at laboratories certified to conduct the methods presented in the QAPP .

ES 3.7 Task 7. Adherence with Pollution Prevention Strategy

In accordance with State regulation (AS 46.06.021) in order to prevent and minimize present and future pollution, when making management decisions that affect waste generation, Pogo has considered the following order of priority options:

a. Waste source reduction;

b. Recycling of waste;

c. Waste treatment; and

d. Waste disposal.

Pogo has adhered to this pollution strategy in both strategic project design at the project inception and on-going programs that Pogo's environmental group has initiated. Pogo opted to develop two ore recovery processes instead of using whole ore cyanidation in order to reduce potential impacts to the environment. Although this dual process has reduced the gold recoveries by 1% to 2%, it was selected in order to minimize the amount of cyanide used in the recovery of the gold. After milling, gold is recovered by gravity methods; floating the remaining gold and sulfide minerals using froth flotation; and recovering the gold from the flotation concentrate using cyanide leaching. Cyanide is recovered after leaching using counter-current decantation (CCD) for reuse in the process circuit. Subsequently the remaining cyanide residual is destroyed using the INCO SO_2 process. These methods have been selected to isolate the cyanide process from any contact with the environment, to allow the cyanide to be destroyed, and to isolate any residual material underground in the cemented backfill.

The flotation process recovers the gold not collected in the gravity circuit into a gold sulfide concentrate. This concentrate is leached in a conventional cyanidation circuit to extract the gold from the concentrate. The cyanide leaching circuit is designed to prevent any contact between slurry that contains cyanide and the external environment. Following cyanidation, the cyanide is destroyed, and the slurry is mixed with cement to create a paste material which is placed underground as cemented paste backfill to fill void spaces created during mining.

The tailings from the flotation circuit which comprise approximately 90% of the total tailings produced are filtered prior to placement in a surface drystack tailings facility. Half of the flotation tailings are combined with the cyanidation tailings and used as paste backfill in the mine.

Pogo recycles most of the process water from the process circuit. Pogo's environmental department has developed and implemented many recycling programs.

ES 3.8 Task 8. Closure and Post-Closure Financial Responsibility

Golder reviewed the Pogo Reclamation & Closure Plan Update, October 2003. The Plan and the site conditions indicated that the Plan was comprehensive and described in detail the steps that would be taken to close and reclaim the site. Salient features of this review are present below.

- Two Reclamation and Closure Cost Estimates were produced for the Pogo Mine, one in October 2003 and a second in December 2004. Reclamation and Closure Costs presented to the State for 2006 and 2007 were based on the Direct Construction Costs in the December 2004 Cost Estimate, without escalation for inflation.

- The 2003 and 2004 Reclamation and Closure Cost Estimates are detailed. All of the major facilities and many of the incidental items are listed and provided with reclamation costs. The general approach and assumptions used in the calculation of the reclamation and closure costs appear reasonable and extensive.

- A sampling of Building Demolition showed reasonable agreement with published values for building demolition. However, these costs were difficult to evaluate due to the nature of the information presented in the cost estimates.

- The cost of Adit and Raise Plugs compared favorably with cost estimates prepared for other mines.

- Alaska Pamphlet No. 600, September 1, 2007, was utilized to back-calculate selected labor categories to December 2003; and these values were determined to be approximately 8.8 percent higher than the values used in the December 2003 cost estimate.

- Equipment and Operating Costs were evaluated by comparing costs used in the December 2003 Cost Estimate with values from the 2008 Equipment Watch, Bluebook Rental Rates for selected pieces of equipment. Costs were adjusted for Alaska; and it was deduced that equipment costs used in the December 2003 Cost Estimate were approximately 73.5 percent low.

- An evaluation of equipment production rates produced mixed results with production values for some pieces of equipment being considered appropriate and others being relatively high.

- The evaluation of the Post-Closure Water Treatment, Monitoring, and Site Maintenance compared the 2004 estimated water treatment costs with the costs that are currently being experienced by Pogo. Water treatment costs in the 2004 Cost Estimate were considered to be adequate. However, subjectively, the allowance for site monitoring seems low.

- The determination of appropriate Contractor Indirect Cost Factors consisted of the evaluation of published values and conventions. Suggested values for the following indirect cost factors are:

    - Mobilization and Demobilization: 5 to 8 percent of the direct costs.

    - Contractor Overhead and Profit: 15 percent of direct costs plus mobilization and demobilization.

    - Performance and Payment Bonds: 1.5 percent each applied to the sum of the Direct Costs, Mobilization and Demobilization, and Contractor Overhead and Profit.

    - Liability Insurance: 3 percent of the sum of the Direct Costs, Mobilization and Demobilization, and Contractor Overhead and Profit.

    - Contract Administration: 4 to 5 percent of the total of Direct Costs and the Contractor Indirect Costs.

    - Engineering Design and Construction: 4 to 6 percent of the total of Direct Costs and the Contractor Indirect Costs.

    - Contingency: 8 percent of the total of the Direct Costs and the Contractor Indirect Costs.

- The 2003 and 2004 Cost Estimates do not include holding costs; nor do the Reclamation and Closure Costs presented in the 2006 and 2007 Annual Report. It was not established that this is a regulatory requirement.

- Revised Direct Costs for Reclamation and Closure were produced by adjusting the Labor, Material, and Equipment Costs in the December 2004 Cost Estimates. Increases in these cost categories were made by combining the ENR CCI with the differences that were determined from the analysis of the cost estimates. Using this methodology, the Direct Costs of a 2007 Revised Reclamation and Closure Cost were determined to be $27,138,766, which is approximately 28.8 percent higher than the Direct Costs for Reclamation and Closure presented in the 2006 and 2007 Annual Reports.

- Application of the factors for the Indirect Costs produced a Revised Reclamation and Closure Cost ranging from $39,723,867 to $41,915,528, which is 43.9 to 51.9 percent higher than the costs presented in the 2006 and 2007 Annual Reports.

ES 3.9 Task 9. Monitoring Program

Pogo has developed a site specific monitoring program that includes engineering and environmental programs. Golder reviewed monitoring data related to these programs over the term of these permits and determining if there are any gaps or significant trends in the data.

ES 3.9.1 Geotechnical

Based on a review of the design documents, as-built report, OMS Manual (which includes the emergency action plan), 2007 periodic safety inspection (PSI), and a visual inspection of the facility, the RTP Dam and the dry stack tailings area appears to be in general compliance with the related permits.

ES 3.9.2 Geochemical

Monitoring of the geochemistry of the tailings solids and flotation tailings interstitial water and, the development rock is conducted in accordance with the sampling and analytical specifications.

ES 3.9.3 Groundwater

Pogo has developed a groundwater monitoring programs in accordance with the requirements described in the Waste Disposal Permit (0131-BA002) and the Quality Assurance Protection Plan (QAPP) (Tech-Pogo April 14, 2006). Golder reviewed the environmental management and monitoring plans, the monitoring data and associated quarterly and annual monitoring reports and the QAPP. Groundwater monitoring wells were observed at all but one location (due to its relatively remote location). Well locations include downgradient of the ore body, downgradient of the RTP, down gradient of surface solid waste facility and monitoring between the Off-River Treatment Works Pond #2 and the Goodpaster River.

The monitoring results for the quarterly and annual reports for the years 2006 and 2007 and first quarter 2008 were reviewed.

The well purge and sampling techniques described for each well were reviewed. All groundwater wells except one are purged and the water sample obtained from the well using dedicated PVC tubing

with a check valve located at the bottom of the tubing. The tubing is dedicated to avoid potential cross contamination and the water is withdrawn by moving the tube up and down. This purge and sample technique was identified as a consistent method with all the wells except one where an air-lift method is used to purge and sample groundwater. The air-lift technique has the potential to affect the water quality result for some parameters and potentially could affect the aquifer by introducing air into the sample and the formation.

Well head protection at two wells is inadequate to eliminate the risk of surface water (i.e. snow melt) and potential debris from entering the well.

ES 3.9.4 Water Balance

Pogo developed a fluid management plan according to the requirements in the Waste Disposal Permit (0131-BA002) and the QAPP. Golder reviewed the QAPP Fluid Management Plan, Water Balance data sheets and associated quarterly and annual monitoring reports. The fluid meter station at the RTP was observed. Fluid management appears to be consistent with the Fluid Management Plan. Fluid transfers through the project are tracked using flow meters at appropriate points and the results are documented in the quarterly and annual monitoring reports. The water balance calculations demonstrate that the RTP has significant excess capacity allowing the operator flexibility in managing the project fluids and minimizing discharges to the Off-River Treatment Works (ORTW). Discharges to the ORTW appear to be infrequent and of relatively low annual volume.

The only parameter or volume within the water balance equation that is not documented or calculated based on metered volumes is the "Run-off "parameter. This parameter apparently is an assumed value that is used to balance the water budget, and is not based on any specific measurement on a monthly basis. The "Run-off" parameter includes various components that cannot be metered such as groundwater flux in and out of the RTP, direct precipitation into the pond, evaporation, and storm water run-off, and the cumulative effect of the fluid meter range of accuracy that may be under or over report volumes or rates of flow.

The QAPP states that all fluid meters require accuracy checks on an annual basis. Some of the meters have not been calibrated since startup. The components of the run-off parameter would be difficult to determine with certainty without significant monitoring of groundwater levels, and other hydrology studies, and a detailed weather tracking and measurement system. These additional hydrology studies

may not be applicable considering the RTP appears to be operating with excess capacity without consistent discharges to the ORTW.

ES 3.9.5 Surface Water and Effluent

Pogo has developed surface water and effluent monitoring programs in accordance with and are compliant with the NPDES Permit (AK-005334-1) and the Waste Disposal Permit (0131-BA002). The Off-River-Treatment Works (ORTW) is functioning as permitted. There were some minor permit deviations due to changing natural conditions (pH, turbidity, flow) and were not related to discharge from Water Treatment Plant.

Chronic toxicity tests (Whole Effluent Toxicity (WET) testing) of a sampling location downstream of the water treatment plant and upstream from the flow entering the ORTW are conducted annually. The tests are conducted to characterize and measure the absolute chronic toxicity of that location and to measure compliance with WET triggers. The results were under the toxicity trigger specified in the NPDES Permit.

Pogo conducts surface water quality sampling at four Goodpaster River monitoring stations to monitor changes that may occur as a result of activities associated with the discharges from the ORTW and assure that the state water quality standards are met. Samples are taken six times a year: two times in winter (in late February to mid-March and in December) and summer (in June and August), and one time in late spring (in May) and late fall (in September).

In order to assess long term trends in the Goodpaster River, fish tissue monitoring is conducted to monitor metals concentration in fish tissues at two stations, one upstream and the other downstream from the project facilities.

Pogo has developed a QAPP according to the EPA Requirements for Quality Assurance Project Plans (EPA/QA/R-5) and the EPA Guidance for Quality Assurance Project Plans (EPA/QA/G-5). The QAPP was approved by both the EPA and DEC. The plan was reviewed to verify compliance with monitoring requirements, action limits and data verification and validation.

Surface water and effluent sampling is conducted according to the schedule and at the station locations described in the NPDES Permit, the Solid Waste Monitoring Plan and the QAPP. Effluent

and surface water samples are analyzed for the parameters and in conformance with the EPA methods described in the Solid Waste Monitoring Plan and the QAPP.

Pogo submits quarter and annual reports to the DNR Division of Mining, Land and Water, DEC and the EPA summarizing the inspection and environmental monitoring results to fulfill the requirements of the DEC Waste Disposal Permit (0131-BA002) and the EPA NPDES Permit (AK005334-1).

ES 3.9.6 Biological Visual Survey

Pogo performs biological visual survey to monitor wildlife interaction with the surface waste disposal facilities in order to evaluate impacts that operations may have on wildlife. No mortalities have been observed on the Pogo mine site.

ES 3.9.7 Cyanide Concentrations CIP-Paste

Pogo's DEC permit requires that the carbon-in-pulp (CIP) tailings undergo cyanide destruction after the gold is recovered from the ore in the CIP tanks and before they are sent to the paste plant for use as backfill material. After cyanide is destroyed, the CIP tailings are stored in the CIP stock tank prior to being sent for mixing with cement and used for backfill in the mine. Samples are taken prior to mixing to confirm cyanide destruction. The permit requires that at least 90% of the samples contain less than 10 mg/L of WAD cyanide and none of the samples contain more than 20 mg/L of WAD cyanide. Pogo is in compliance with the DEC permit by monitoring and controlling the WAD cyanide concentrations of the CIP tailings prior to paste backfill use.

ES 3.9.8 Development Rock Segregation and Tracking

Pogo has a development rock segregation and tracking program to segregate the rock at the approved concentrations. The development rock segregation program is described in detail in the QAPP. Development rock segregation is conducted based on arsenic and sulfur content to ensure that mineralized development rock is disposed of in a manner that prevents potential environmental impacts. Golder evaluated the effectiveness and compliance of Teck-Pogo's waste rock operational characterization and handling. The program generally is conducted in accordance with the sampling, analytical and QA/QC specifications presented in the QAPP. The following was noted during the site visit:

1. Contrary to the description of the development rock segregation and tracking procedures, no signage or picketing was observed in the underground muck bays

2. During surface area placement, overlap between piles may occur, potentially resulting in overlap between non-mineralized and mineralized material. Also, not all surface piles contained flags. However, when in doubt the dozer operator will consider the material to be mineralized and handle it as such.

3. There is no control on the final disposition of development rock on the drystack. The general placement area is supposed to receive the red material, with the green material reporting to the shell or used for drain construction. Although the potential for misplacement is very minor due to the obvious differences in destination, incorrect placement cannot be ruled out.

ES 4.0 CONCLUSIONS AND RECOMMENDATIONS

ES 4.1 Dry Stack Tailings Facility

- The OMS Manual should be updated to include changes in site personnel, tables, figures, operations, and surveillance. The revised manual should be issued to the Alaska Department of Natural Resources Division of Miing, Land and Water Appraisal Unit.

- Continued placement of compacted non-mineralized development rock should be performed according to the rockfill toe berm specified in the OMS Manual.

- Physical parameter tests such as grain size distribution, Atterberg limits, standard proctor, and moisture-retention are important for the tailings placed in the general placement area. These tests are useful to confirm design values, for future FSRs. The triaxial testing schedule should resume after mill produces more consistent results.

- Pogo and the DNR should reconcile the difference in the design and operational changes and document the decision in their files.

- Annual and 3-year geotechnical inspections should be performed.

- QA/QC samples of the dry stack geochemistry should be collected at the frequency identified in the QAPP.

- In future Monitoring Reports, the reporting for both results to “total inorganic carbon”, with units of “%C” and “%CO2”, respectively. Alternatively, one of the two analyses can be eliminated.

ES 4.2 Recycle Tailings Pond (RTP) Dam

- Erosion along the spillway flume where the diversion ditch outlet discharges into the flume should be repaired during routine maintenance operations.

- HDPE pipe within the spillway and flume should be removed during routine maintenance operations in order to maintain flow capacity.

- Pogo should perform the additional work identified in the 2007 PSI including repairing or replacing the pressure transducer located on the upstream pumps and installation of a fixed gauge to manually monitor the water elevation.

ES 4.3 Development Rock Segregation

- Underground use of signage and picketing needs to be conducted in accordance with the development rock segregation protocols to reduce the potential for incorrect classification and disposal/use.

- Overlap between piles of non-mineralized and mineralized development rock should be avoided in surface placement.

- The reference to lead analysis for the development rock is in error in the QAPP and should be corrected in future versions.

- XRF and monitoring results for development rock from the drystack should be compared on a quarterly basis for quality control by including XRF analysis of the quarterly composites of development rock.

ES 4.4 Laboratories and Sample Analysis Procedures

The current XRF analysis does not meet the QA/QC requirements as set forth in the QAPP. Analysis of the standard should be continued, while analysis of a duplicate sample should be re-introduced. Duplicate results should be evaluated using the RPD approach.

ES 4.5 Surface Water and Effluent Monitoring

Pogo should develop and include procedures for trend analysis and interpretation in its QAPP to evaluate changes in water quality parameters over time. Procedures should include purpose of the statistical analysis, procedures to evaluate the overall pattern of change in a parameter over time, and statistical methods to be used.

ES 4.6 SPCC Plan

- Pogo should provide secondary containment for all 55-gal. drums that contain oil or oily water.

- Pogo should provide overfill prevention measures for all double-walled or double-bottom tanks without tertiary containment to comply with EPA Memorandum OSWER 9360.8-38.

- Pogo should repair and maintain tertiary containment liner for all ASTs to provide the necessary overfill prevention measures to comply with EPA Memorandum OSWER 9360.8-38.

- Pogo should monitor the interstices of double-wall and double-bottom tanks to verify that no water or oil is present, and verify that primary tanks have not been compromised.

- Pogo should implement specific methods to verify the operation of the liquid level sensing gauges and include this check as part of the periodic inspections.

- Pogo should update the SPCC Plan to include the changes/upgrades noted above as well as all methods for handling and controlling water in open secondary containment that may have oil sheen.

ES 4.7 Groundwater

One groundwater well is air-lift purged and sampled. This technique allows air to contact the water sample. Alternative purging and sampling methods should be considered to eliminate the air to water contact. Future monitoring reports should include a statistical evaluation for significant water quality parameters changes or trends.

ES 4.8 Fluid Management

The "Run-off" parameter in the water balance equation includes various components that cannot be metered such as groundwater flux in and out of the RTP, direct precipitation into the pond, evaporation, and storm water run-off, and the cumulative effect of the fluid meter range of accuracy that may be under or over report volumes or rates of flow. The components of the run-off parameter are difficult to determine with certainty. Fluid meters should be calibrated on annual bases as specified in the fluid management plan. The factors that contribute to the "run-off" component used

to balance the water budget should be more clearly identified in the monitoring reports, and the magnitude of each should be approximated, if possible, so any error range in the water balance can be estimated.

ES 4.9 Secondary Containment

Secondary containment for all process tanks and pipelines is required for the Solid Waste Disposal Permit. Pogo has appropriate secondary containments for all process facilities except the CIP tailings storage tank and associated pipelines to the paste plant. Pogo should construct engineered secondary containments and maintain these for this part of the process circuit.

ES 4.10 Closure and Post-closure Financial Responsibility

Alaska Pamphlet No. 600, September 1, 2007, was utilized to back-calculate selected labor categories to December 2003; and these values were determined to be approximately 8.8 percent higher than the values used in the December 2003 cost estimate.

Equipment and Operating Costs were evaluated by comparing costs used in the December 2003 Cost Estimate with values from the 2008 Equipment Watch, Bluebook Rental Rates for selected pieces of equipment. Costs were adjusted for Alaska; and it was deduced that equipment costs used in the December 2003 Cost Estimate were approximately 73.5 percent low.

An evaluation of equipment production rates produced mixed results with production values for some pieces of equipment being considered appropriate and others being relatively high.

The evaluation of the Post-Closure Water Treatment, Monitoring, and Site Maintenance compared the 2004 estimated water treatment costs with the costs that are currently being experienced by Pogo. Water treatment costs in the 2004 Cost Estimate were considered to be adequate. However, subjectively, the allowance for site monitoring seems low.

The determination of appropriate Contractor Indirect Cost Factors consisted of the evaluation of published values and conventions. Suggested values for the following indirect cost factors are:

- Mobilization and Demobilization: 5 to 8 percent of the direct costs.

- Contractor Overhead and Profit: 15 percent of direct costs plus mobilization and demobilization.

- Performance and Payment Bonds: 1.5 percent each applied to the sum of the Direct Costs, Mobilization and Demobilization, and Contractor Overhead and Profit.

- Liability Insurance: 3 percent of the sum of the Direct Costs, Mobilization and Demobilization, and Contractor Overhead and Profit.

- Contract Administration: 4 to 5 percent of the total of Direct Costs and the Contractor Indirect Costs.

- Engineering Design and Construction: 4 to 6 percent of the total of Direct Costs and the Contractor Indirect Costs.

- Contingency: 8 percent of the total of the Direct Costs and the Contractor Indirect Costs.

The 2003 and 2004 Cost Estimates do not include holding costs; nor do the Reclamation and Closure Costs presented in the 2006 and 2007 Annual Report. It was not established that this is a regulatory requirement.

Revised Direct Costs for Reclamation and Closure were produced by adjusting the Labor, Material, and Equipment Costs in the December 2004 Cost Estimates. Increases in these cost categories were made by combining the ENR CCI with the differences that were determined from the analysis of the cost estimates. Using this methodology, the Direct Costs of a 2007 Revised Reclamation and Closure Cost were determined to be $27,138,766, which is approximately 28.8 percent higher than the Direct Costs for Reclamation and Closure presented in the 2006 and 2007 Annual Reports.

Application of the factors for the Indirect Costs produced a Revised Reclamation and Closure Cost ranging from $39,723,867 to $41,915,528, which is 43.9 to 51.9 percent higher than the costs presented in the 2006 and 2007 Annual Reports.