Mina de Cobre Panamá

Environmental and social impact assessment
Report summary

September 2010

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Throughout this document:

- *we, us, our* and *Minera Panamá* refer to Minera Panamá S.A.
- the *project* and *Cobre Panamá* mean the Mina de Cobre Panamá mine.

This report is a summary of a larger environmental and social impact assessment (or ESIA) for the Cobre Panamá mining project. The project will mine and primarily process copper. Molybdenum, gold and silver will be produced as by-products. It will be a for-profit venture, designed to help Inmet achieve its growth objectives.

The project is located in Panamá, and within the richly biodiverse Mesoamerican Biological Corridor. This area is being adversely affected by unsustainable agricultural practices, mainly because of a lack of development and employment in the area.

Early and ongoing discussion with communities, NGOs and local governments has helped guide the design of our project plan. Our vision is that the project will (a) contribute to Panama's development and (b) be a regional economic engine that will help alleviate poverty in the project area, catalyzing the development of sustainable communities and improved environmental protection.

We also comply with international best practices for addressing environmental and social impacts in project development, including International Financial Corporation Performance Standards and the Equator Principles.

The ESIA explains to the Panamanian government how the project could affect the land and people in Panamá. It was developed in consultation with people living in communities near the project, and according to Panamanian environmental regulations and internationally accepted mining and environmental standards. It explains:

- how the project will mine and process copper, molybdenum, gold and silver
- the infrastructure we will build to support the mining operation
- what the land, plants, animals, community life and standards of living are like now, and how the project will interact with and change them, both positively and negatively
- how we can manage the project to increase the benefits it will bring, and reduce the harm it could cause
- the potential impact of the project *after* these measures (our residual impact).

You can get a copy of the ESIA by contacting us at +507 212 5101 or by e-mail at info@minerapanama.com. The table below tells you what's inside this summary, and where to find more detail in the EISA.

What's inside

About Minera Panamá

Minera Panamá S.A., is a Panamanian company established under the laws of the Republic of Panamá. We own the exploration and mining rights to the 13,000 hectare Petaquilla Concession, in the District of Donoso, Colón Province, in north-central Panamá.

We have been carrying out exploration on the concession since 1991 to confirm the amount of copper, molybdenum, gold and silver on the concession, and that it can be mined and processed profitably.

We are owned by Inmet Mining Corporation, an international mining company based in Toronto, Canada. Inmet has considerable experience in the responsible development and operation of mining projects in diverse areas of the world. It owns mining operations in Spain, Turkey and Finland, and it is a minority shareholder in Ok Tedi Mining Limited, owner of the Ok Tedi copper-gold mine in Papua New Guinea. Inmet also has closed mining properties in Canada and the United States.

We are governed by Inmet's policies, standards and values, and we benefit from Inmet's international experience.

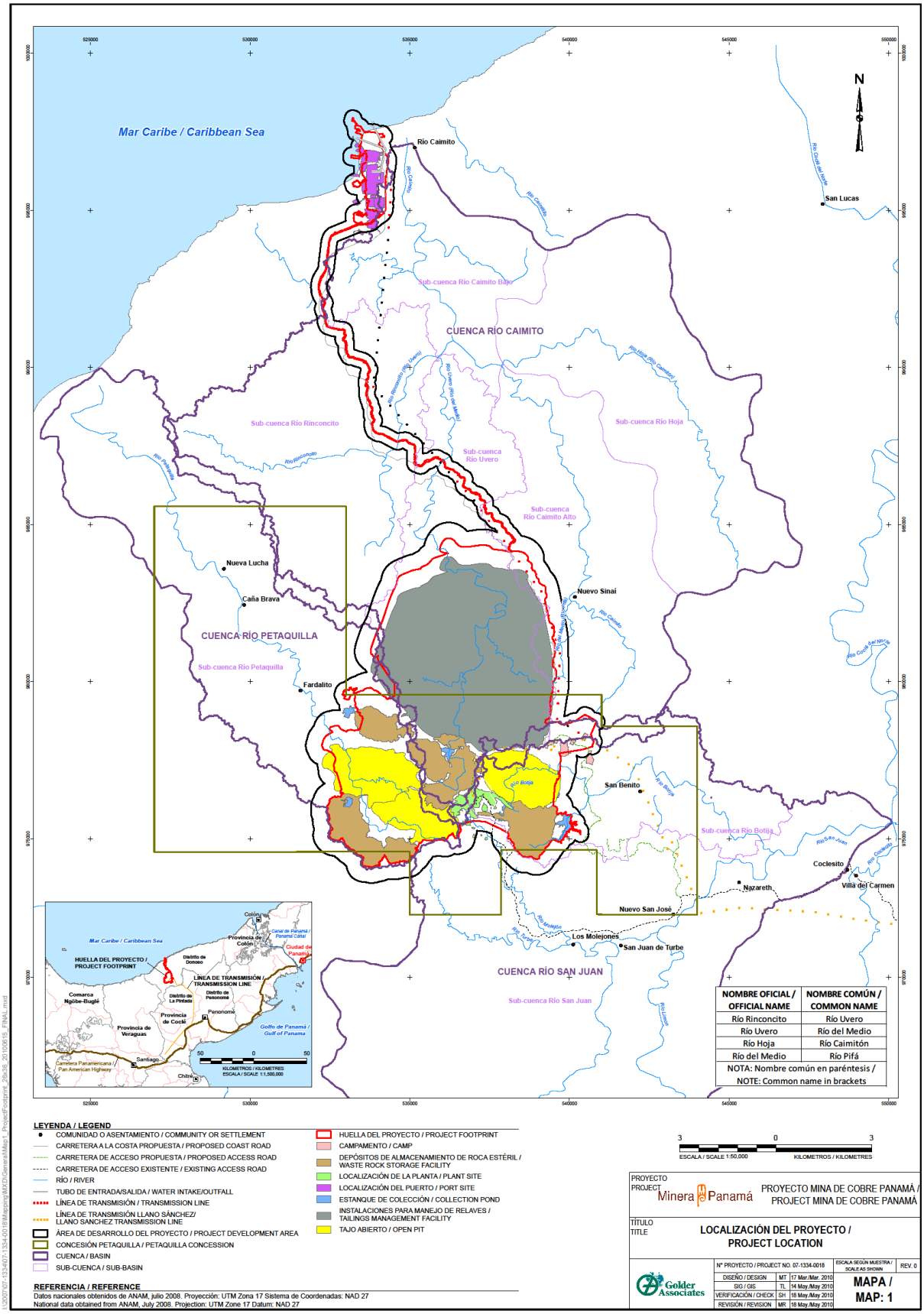
About the Mina de Cobre Panamá mine

The Mina de Cobre Panamá mine will be located about 120 kilometres west of Panamá City, 20 kilometres from the Caribbean Sea coast. Port facilities and a power plant will be constructed at Punta Rincón (Map 1).

In September 2010 we applied to the government of Panamá to begin the project. If approved, construction could begin in 2011. This project will provide employment and economic benefits to the people of Panamá for at least 30 years.

How to contact us

contact:	Gina Roman Serra, Environmental Director
telephone:	office +507 212-5101
	direct +507 212-5115
	fax +507 212-5139 / 212-5140
email:	gina.roman@minerapanama.com
website:	http://www.minerapanama.com/
consultant:	Golder Associates Panamá, S.A. IRC-033-2008


Mar Caribe / Caribbean Sea
Río Caimito
San Lucas
CUENCA RÍO CAIMITO
Sub-cuenca Río Caimito Bajo
Sub-cuenca Río Rinconcito
Sub-cuenca Río Hoja
Sub-cuenca Río Uvero
Sub-cuenca Río Caimito Alto
Nueva Lucha
Caña Brava
CUENCA RÍO PETAQUILLA
Sub-cuenca Río Petaquilla
Fardalito
Nuevo Sinaí
San Benito
Sub-cuenca Río Botija
Coclesito
Nazareth
Villa del Carmen
Nuevo San José
Los Molejones
San Juan de Turbe
CUENCA RÍO SAN JUAN
Sub-cuenca Río San Juan
N
NOMBRE OFICIAL / OFFICIAL NAME
NOMBRE COMÚN / COMMON NAME
Río Rinconcito
Río Uvero
Río Hoja
Río del Medio
Río Caimitón
Río del Medio
Río Pifá
NOTA: Nombre común en paréntesis / NOTE: Common name in brackets
HUELLA DEL PROYECTO / PROJECT FOOTPRINT
LÍNEA DE TRANSMISIÓN / TRANSMISSION LINE
Comarca Ngöbe-Buglé
Provincia de Veraguas
Provincia de Coclé
Provincia de Colón
Penonomé
Santiago
Chitré
Colón
Golfo de Panamá / Gulf of Panama
Carretera Panamericana / Pan American Highway
KILOMETROS / KILOMETRES
ESCALA / SCALE 1:1,500,000
LEYENDA / LEGEND
COMUNIDAD O ASENTAMIENTO / COMMUNITY OR SETTLEMENT
CARRETERA A LA COSTA PROPUESTA / PROPOSED COAST ROAD
CARRETERA DE ACCESO PROPUESTA / PROPOSED ACCESS ROAD
CARRETERA DE ACCESO EXISTENTE / EXISTING ACCESS ROAD
RÍO / RIVER
TUBO DE ENTRADA/SALIDA / WATER INTAKE/OUTFALL
LÍNEA DE TRANSMISIÓN / TRANSMISSION LINE
LÍNEA DE TRANSMISIÓN LLANO SÁNCHEZ/ LLANO SANCHEZ TRANSMISSION LINE
ÁREA DE DESARROLLO DEL PROYECTO / PROJECT DEVELOPMENT AREA
CONCESIÓN PETAQUILLA / PETAQUILLA CONCESSION
CUENCA / BASIN
SUB-CUENCA / SUB-BASIN
HUELLA DEL PROYECTO / PROJECT FOOTPRINT
CAMPAMENTO / CAMP
DEPÓSITOS DE ALMACENAMIENTO DE ROCA ESTÉRIL / WASTE ROCK STORAGE FACILITY
LOCALIZACIÓN DE LA PLANTA / PLANT SITE
LOCALIZACIÓN DEL PUERTO / PORT SITE
ESTANQUE DE COLECCIÓN / COLLECTION POND
INSTALACIONES PARA MANEJO DE RELAVES / TAILINGS MANAGEMENT FACILITY
TAJO ABIERTO / OPEN PIT
REFERENCIA / REFERENCE
Datos nacionales obtenidos de ANAM, julio 2008. Proyección: UTM Zona 17 Sistema de Coordenadas: NAD 27
National data obtained from ANAM, July 2008. Projection: UTM Zone 17 Datum: NAD 27
ESCALA / SCALE 1:50,000
KILOMETROS / KILOMETRES
PROYECTO / PROJECT
Minera Panamá
PROYECTO MINA DE COBRE PANAMÁ / PROJECT MINA DE COBRE PANAMÁ
TÍTULO / TITLE
LOCALIZACIÓN DEL PROYECTO / PROJECT LOCATION
Golder Associates
Nº PROYECTO / PROJECT NO. 07-1334-0018
ESCALA SEGÚN MUESTRA / SCALE AS SHOWN
REV. 0
DISEÑO / DESIGN MT 17 Mar./Mar. 2010
SIG / GIS TL 14 May./May 2010
VERIFICACIÓN / CHECK SH 18 May./May 2010
REVISIÓN / REVISION MR 18 May./May 2010
MAPA / MAP: 1

About this report

We hired Golder Associates Ltd., an independent company that specializes in environmental, health and social issues, to carry out the field work and write the ESIA. The ESIA focuses on many issues, including those that local community members have said are of most concern and interest to them.

Golder's process

Golder's assessment focused in part on the environmental and social issues that local communities, government and civil society identified as being of most potential concern and value in a series of stakeholder consultations. Golder also focused on issues that internationally-recognized organizations like the International Financial Corporation (IFC) consider important. They used the following sources of information to complete their assessment and write this report:

- Baseline studies (carried out by Golder and other researchers) and relevant ESIAs. These help us understand the existing plant and animal life, and the area's social, cultural, economic and aesthetic values.
- Community surveys focusing most intensively on the communities closest to the project area.
- Public consultations. Open meetings with community members and their representatives.
- Reports and data from government agencies, including the Smithsonian Tropical Research Institute, the Panamá Canal Authority, the University of Panamá, and others. These help us understand what the scientific community and other stakeholders might be concerned about.
- Experience and professional judgment. The ESIA team included professionals from Panamá and other professionals with experience in mining projects in tropical areas.

Golder focused most of their research on the area around the concession, and on the ten communities closest to it: Villa del Carmen, Coclesito, Nazareth, Nuevo San José, San Juan de Turbe, Los Molejones, San Benito, Río Caimito, Nuevo Sinaí and Nueva Lucha. They also considered the effects of the project on other communities, including Penonomé, La Pintada, Miguel de la Borda and Coclé del Norte (Map 1).

Baseline studies

Golder spent more than 40,000 hours from June 2007 to April 2009 studying all aspects of the region across the different seasons.

They also reviewed:

- Scoping and baseline studies from the late 1990s
- Studies by other researchers that identified rare, threatened and endangered plant and animal species (*species of concern*) outside of the project area that could be affected by the project.
- Studies completed for ESIAs for the Petaquilla Gold Molejon Mine and for the Panamá Canal expansion.

They established socio-economic and community baselines using community surveys and fieldwork as primary sources.

Community surveys

Community surveys tell us how people in and near the project area live and work, and how the project will affect their lifestyles. Between April and August 2008, Golder surveyed 277 households in eight communities near the project.

Their research also included:

- sixty interviews with government agency officials, church ministers and pastors, community leaders and educators.
- forty-three focus group meetings, held in almost all communities in the study area.

The researchers gathered information across different demographics, including people of different ages, and both men and women. They looked at local activities (hunting, trapping and fishing), governance, employment, health, education and other important issues.

They also considered historical resources (evidence that people were using the area a long time ago), the visual quality of the land (what people see when they look at the land now), and the current health of the fish and plants local people eat.

To study economic impacts, they looked at businesses in the project area, prices charged in selected stores, traffic (how many vehicles, pedestrians and animals travel along the road between Penonomé and the proposed mine site), and the kind of services that are available now in the roadside communities between Penonomé and Los Molejones.

With the help of community members, Golder also developed ten “social” (land use) maps.

Public consultations

Consultations for the project included open meetings and forums with community members and their representatives, and small meetings with specific groups, like artisanal miners, non-governmental organizations, faith-based organizations and service providers.

We have engaged provincial authorities and the district government throughout the development of the project, and consulted with them during the ESIA process. Local representatives of *corregimientos* (the smallest administrative unit) and *junta* (community boards) were also involved in many of the ESIA and project development meetings.

Major conclusions

The ESIA concludes that the project is technically, economically, environmentally and socially viable. It will comply with Panamanian regulations, and meet international standards, such as the IFC's Performance Standards on Social and Environmental Sustainability.

Any project of this size, however, will have both positive and negative effects on local communities, the economy and the environment people live in and rely on for sustenance. It's also important to realize that, while much of the area is remote and mainly primary forest, in-migration is increasing and, with it, deforestation, as people with few economic opportunities move into the area and clear the land.

The best way to address these issues is to introduce sustainable economic development to the area. Any development project coming into the area must incorporate regional land use planning with the development of sustainable communities and ecological protection – and these are fundamental to our plans.

Early and ongoing dialogue with communities and other stakeholders has helped guide the design and development of the socio-economic baseline study. We began intensive stakeholder engagement in 2007 and will continue it throughout the mine's life. Government and civil society at all levels have been active participants in the development of the ESIA. Consultations have been inclusive, culturally appropriate, responsive to the language preferences of affected people and communities, and sensitive to the requirements of disadvantaged or vulnerable groups.

Ongoing dialogue and oversight – during construction, operations and closure/post-closure – will ensure we meet these expectations at every stage.

Major concerns

Most local concerns are related to:

- employment
- community health and safety
- the potential need for resettlement
- environmental damage to water, air and to the abundant life in the area.

National and international issues of concern include effects on the tropical rainforest, biodiversity and the Mesoamerican Biological Corridor. There are also concerns about the project's impact on indigenous peoples, and the effects of in-migration on a sensitive ecosystem.

Socio-economic impacts

Economic stimulation and employment – The project will provide strong stimulation to the economy because it will need goods and services and will provide training and employment. Revenues for Panamá will be generated by royalties and taxes, and businesses in Panamá will benefit from an increase in customers.

Education, infrastructure and employment – Infrastructure and government services will be improved in this under-developed area, which will improve access to education and healthcare and the quality of local infrastructure, including improving the quality of local drinking water. The project will also provide jobs, although the national labour pool may not have enough skilled people at first to support the needs of both

the Mina de Cobre Panamá and Panamá Canal projects, which will be happening at the same time during early stages of project construction.

In-migration, public health and safety, and resettlement – The communities may see an increase in alcohol and substance abuse and sexually transmitted diseases as more people move into the project area. Higher traffic could raise noise levels and affect public safety. People coming into the region because of the project (in-migration) will likely put a strain on local infrastructure and services, which will need to be strengthened. A limited number of households directly affected by the project will have to be resettled, and some of the local indigenous communities will be affected by this resettlement.

To help reduce the likelihood and impact of these effects, we will work with local communities, governments and civil society to develop and implement community development programs. We will also develop in-migration management, resettlement and indigenous peoples action plans.

Environmental impacts

Water – The Minera Panamá project will change local stream flows. It may reduce flooding in communities. It could also change stream channels and floodplains, and reduce how much water is available to some communities downstream from the mine facilities. Although the project will comply with all applicable water quality standards, there may be higher levels of metals and other contaminants (including suspended solids) in local watercourses and estuaries.

Deforestation – About 5,900 hectares of land will be cleared over a period of several years, which could affect threatened, endangered or endemic species of plants and animals in the region. There could be ongoing deforestation as more people come into the area (in-migration).

Animals – There will be noise close to the facilities which may scare away some animals near the project's boundaries and along the proposed road from the mine to the port.

Air quality – Air emissions from the power plant and mine vehicles and dust from traffic could affect nearby communities. The project will also produce greenhouse gases.

We will offset these environmental effects by:

- clearing the project footprint over a period of several years and re-vegetating as we go
- reforesting other areas near the site to offset our impact and help preserve other areas of rich biodiversity
- creating new conservation areas and supporting existing ones
- strengthening community benefits and sustainability
- using methods that reduce the potential for soil to enter streams
- treating water, if necessary, to ensure it meets required standards
- using pollution control devices to reduce air quality concerns, including
    - proper controls on all equipment and filters on the power station to reduce air pollution
    - settling ponds to control suspended solids going into rivers
- ensuring a minimum flow is maintained in the rivers, to protect water quality and provide enough water for local communities and for fish.

Managing the project

Our environmental action plan describes how we will manage all aspects of the project. We will use international best practices, focusing on developing the capabilities, support mechanisms and plans necessary to administer environmental and social management programs.

The action plan, and the programs and activities it contains, are living commitments that will be reviewed every year and updated (as necessary) during construction, operations and closure/post-closure. A review mechanism will continuously improve the environmental, social, health and safety performance of the project.

About the Mina de Cobre Panamá mine

The Mina de Cobre Panamá mine will primarily mine and process copper. Molybdenum, gold and silver will be produced as by-products. These metals are contained in minerals in the rock beneath the concession.

Rock containing metals that can be extracted for profit is called *ore*. We plan to build three open pits to remove the ore, and a plant next to the open pits to extract the minerals from the ore to make copper and molybdenum concentrates. We will transport the concentrates by pipeline to Punta Rincon (near Rio Caimito), and then filter and ship it to other countries for final processing.

Project components

The project includes four main components (Map 1):

- a *mine and plant site* where we will mine ore and process it into concentrates
- a *port site* at Punta Rincón where we will filter the concentrates and load and unload ships
- a coal-fired *power plant* at Punta Rincón to generate electricity for the project
- *supporting infrastructure,* including roads, pipelines, transmission lines, camps for accommodation, and gaseous, liquid and solid waste management

In total, approximately 5,900 hectares of land will be affected by the project.

To limit the areas disturbed at any one time, we will clear areas only when needed and rehabilitate them as soon as we don't need them anymore. We expect that our impact on the land will be greatest between years 15 and 20 of operations.

For safety, there will be a buffer zone around all project areas. It will extend 500 metres around the pits, waste rock and tailings management facility, and 250 metres around all other facilities. The public will not be allowed in these buffer zones or other project areas.

When our mining is complete, we will remove the buildings and facilities we've constructed at the mine and port sites. Most of the land will be reclaimed or returned to a condition similar to what existed before the mine, including plant and animal life. We expect the power plant to continue to generate electricity for Panamanians for some time after the mine is closed.

Mine and plant site

- three open pit mines (Botija, Colina and Valle Grande) will be developed over the life of the project
- facilities for crushing, conveying and stockpiling ore, including:
  - two gyratory crushers (and a third crusher and conveyor to increase throughput later in the mine life)
  - belt conveyors
  - a pad to stockpile crushed ore.

- a concentrator that has:
  - a grinding plant with six mills to turn the rock into fine particles
  - a flotation plant with large tanks for separating the copper-bearing minerals from the rock, to produce copper concentrate. The copper concentrate will include small amounts of gold and silver, which will be recovered in offshore facilities during the smelting and refining processes
  - an additional flotation circuit to separate molybdenum and produce a separate concentrate
  - a concentrate thickener that will prepare the copper concentrate to be transported to the port site by pipeline, and storage tanks for surge capacity.
- a tailings management facility which, for the first 22 years of mining, will store the crushed rock and water mixture left after the metal has been extracted
- facilities for storing waste rock (material with no economic value, separated from the ore before we remove it from the open pit)
- a stockpile of low-grade ore
- a fresh water reservoir
- a process water reservoir
- other facilities, including:
  - shops for maintaining trucks and other mobile equipment
  - offices
  - a sewage treatment plant
  - fuel storage and fuelling
  - facilities for preparing and storing explosives used to blast the rock
  - a non-hazardous waste incinerator
  - secure landfills for conventional non-hazardous waste
  - structures to divert water and prevent soil from entering streams and rivers
  - camp facilities for employees and contractors during construction and operations
  - a medical clinic for the mine
  - offices and meetings rooms for the mine
  - security facilities
  - roads that provide access to the camps, pits, waste rock storage facility, tailings management facility and ancillary facilities.

Port site (Punta Rincón**)**

- a facility for dewatering and filtering copper concentrate
- a building for storing copper concentrate

- a port with facilities for loading ships with concentrate and for unloading fuel and operating supplies (including coal for the power plant)
- facilities for receiving equipment and supplies during construction and operations
- camp facilities during construction and operations
- ancillary facilities, including sewage treatment and domestic waste management
- a reservoir for fresh and process water, created by damming a small river close to the plant site
- security facilities.

Power plant (Punta Rincón)

- two 150-megawatt coal-fired units for generating electricity (and a third unit added later if needed)
- facilities for handling and storing coal
- an exhaust stack for combustion gas
- facilities for removing ash particles and sulphur dioxide from the flue gas
- facilities for storing ash
- systems for seawater intake and discharge (for cooling and for removing sulphur dioxide from the flue gas)
- camp facilities for employees and contractors during construction and operation.

Supporting infrastructure

- a new private road (the coast road) that will connect the mine and plant site with Punta Rincón
- improvements to the existing Coclesito access road between Penonomé and the plant and mine site, including new bypasses of the Molejon Gold property Coclesito, La Pintada and a marshalling centre at Penonomé
- three pipelines (concentrate, fuel, and filtrate that may be mixed with fly ash slurry) buried beneath the coast road
- fibre optic cable between the mine and plant and port sites, buried under the coast road within the right-of-way
- overland power transmission lines (230 kilovolts) between the port site and the plant site, and between the mine and plant site and the interconnection substation at Llano Sanchez (where our power lines will connect to the Panamanian electrical grid)
- water management facilities, including dams for water reservoirs, stream diversions, systems for monitoring and treating sewage and effluent (if necessary) and drinking water treatment systems
- facilities and systems to monitor and manage interactions with the environment, in compliance with our project commitments and regulatory requirements.

Access

Initially, we will bring equipment, materials and supplies to the mine and plant site using the existing Pan-American Highway from Panamá City and the secondary road from Penonomé, La Pintada and Coclesito (Coclesito Road). We will use the existing port facilities in Panamá City or Colón to receive equipment and supplies, upgrading and realigning parts of the Coclesito Road as necessary.

We will build the coast road to connect the port at Punta Rincón with the mine and plant site. The coast road will be approximately 30 kilometres long and used only by vehicles travelling between the mine and plant site and port site.

Until the coast road has been built, employees will travel to the mine and plant site by bus along Coclesito Road, and to the port and power plant by boat.

We expect to find enough crushed stone for the project in the quarries we will build in the Botija Pit, in the tailings management facility footprint at the mine and plant site, at the ash storage area at the power plant site and at other locations along the coast road route. We will import other construction materials and transport these to the site as needed.

The staging area for deliveries for the power plant by barge may be at the Port of Colón and Cristobal. The staging area for the delivery of equipment and materials for the transmission line will likely be near Llano Sanchez and the switchyard at Punta Rincón.

Cargo shipped in containers that we receive through Colón will be moved to project containers at the Colón marshalling yard. Cargo we receive through Puerto de Balboa will be moved to the Penonomé staging area.

Project phases

There are four project phases:

1. planning
2. construction
3. operations
4. closure/post-closure

Construction, operations and closure/post-closure are the three formal phases for the purposes of the EISA. The dates in the descriptions below are approximate, and our best estimate as of the day this document was published.

1. Planning

Detailed planning has been underway since 2007, when Minera Panamá re-initiated field work on the copper sulphide deposits in the project area.

The planning phase involves:

Inmet assuming operational responsibility for Minera Panamá	completed April 1, 2008
Inmet consolidating 100 percent ownership of Minera Panamá	completed December, 2008
Collecting on-site technical, environmental and social data	completed April 2010
Creating preliminary design and cost estimates	completed March 31, 2010
Preliminary logistics planning	completed March 31, 2010 (as part of detailed engineering)
Detailed design and logistics planning	to be completed by May 2013
Preparing for construction	to be completed by September 2011, after the ESIA is approved and permits received
Preparing and submitting the ESIA	submitted September 2010
Receiving government approvals and initial construction permits	expected by September 2011
Making improvements to the Coclesito Road	began June 2010 with necessary permits
Detailed engineering	to be completed by May 2013

At the end of this phase, we will have finalized planning, design and cost estimates for all project facilities, and procured construction materials.

2. Construction

The construction phase involves:

Site capture	September 2011 to August 2012 (11 months)
Construction	August 2012 to December 2015 (40 months)
Commissioning the concentrator	October 2015 to January 2016 (3 months)

At the end of this phase, we will have completed the construction of all facilities needed for the safe and efficient operation of the mine, ore processing facilities and all supporting infrastructure.

Construction will involve the following steps:

- Site capture – the initial field work and temporary infrastructure required to prepare each site for construction
- Civil work – major earth excavation
- Main facilities – power plant and distribution systems, plant, port facilities
- Supporting facilities – tailings management facilities, cyclone sand systems, water reclamation
- Infrastructure – building maintenance facilities, office
- Pre-commissioning – testing our process systems with air and/or water, without feeding actual ore to the plant
- Commissioning – testing our process plant facilities with ore.

Accommodations

During this phase, our camp facilities will house up to 3,500 people at the mine and plant site, up to 1,100 people at the port site, and up to 1,800 people at the power plant site. Each camp will include a kitchen, dining hall, water and sewage treatment, drinking water and communications facilities, including phone, fax and internet.

3. Operations

The operations phase includes commissioning all remaining facilities, and operating the mine, plant, port and supporting facilities.

This phase includes:

Active mining of ore	2016 to 2044 years (28 years)
- mining the Botija Pit	late 2015 until late 2034
- mining the Colina Pit	late 2017 to the end of 2042
- mining the Valle Grande Pit	2019 to 2042
- processing low-grade ore stockpiles	2043 to end of 2045
Processing ore and transporting concentrate to the port	completed by end of 2045 (with current ore reserves; we will likely be able to extend the mine's life through further exploration)
Production (average)	
- copper/gold concentrate	1,150,000 tonnes per year containing an average of 255,000 tonnes of copper
- molybdenum concentrate	7,300 tonnes per year
Concentrator throughput	
- first ten years	150,000 tonnes per day
- after 10 years (increases to compensate for lower ore grades and to keep concentrate production constant)	225,000 tonnes per day

Our main operations at the mine and plant site will take place at three open pits (Botija, Colina and Valle Grande), at our waste rock storage facility and saprolite storage areas, and at our ore processing and tailings management facility.

The ore we extract from the pits will be crushed, milled and separated from waste minerals to form a concentrate in flotation cells at the plant site, then transported to the port site by pipeline. Copper concentrate will be filtered at the port site, and the wastewater from the filtering process will be pumped by pipeline back to the tailings management facility or an empty pit.

The concentrate will be stored in covered facilities and then loaded by closed conveyors onto bulk freighters at the main berth at Punta Rincón, and then shipped to customers for further processing.

Tanks of diesel fuel will be delivered to Punta Rincón by barge, and the fuel will be transported to the mine and plant site by pipeline. Other reagents and supplies will arrive by barge and be unloaded to a

storage area at the port or directly onto vehicles that will transport them along the coast road to the mine and plant site.

The marine facilities at Punta Rincón will include two berths: a main (Panamax) berth and a smaller berth for barges and coastal vessels.

Waste rock

We'll remove vegetation and saprolite (weathered rock) and other waste rock progressively, as we need to access areas for mining. Waste rock and low grade ore will be stored in the Botija South waste rock storage facility, the Botija West waste rock storage facility, the Colina North waste rock storage facility and the Southwest waste rock storage facility. Saprolite will be stored in the Botija North Saprolite storage area.

Tailings

years 1 to 20	Tailings containing silicates and iron sulphide will be stored in a tailings management facility
years 20 to 22	Rougher (coarser) tailings will be deposited in the tailings management facility, to form a cover Cleaner (finer) tailings will be deposited under water in the mined-out Botija pit
years 23 to 28	All tailings will be deposited under water in the mined-out Botija pit
years 29 to 30	All tailings will be deposited under water in the mined-out Colina pit

Power

The coal-fired power plant at Punta Rincón will be the main source of electricity for the project.

Two-150 megawatt coal-fired power plant units will operate continuously 24 hours a day, 365 days a year, except for scheduled maintenance shutdown periods. Electricity will be fed through a substation into the transmission line between the port site and the mine and plant site ,and connected to the Panamanian electrical grid at Llano Sanchez.

The power plant will be cooled using seawater, which will be discharged back to the sea through diffusers to improve mixing and cooling of the discharge stream.

Power plant exhaust gas will be filtered to remove particulates and scrubbed with seawater to remove sulphur dioxide.

Bottom ash will be stored in an on-site facility. We are considering three options for managing fly ash:

(1) mixing it with water to form a slurry, and pumping it with the concentrate filtrate to the tailings management facility and/or mined-out pits

(2) depositing it with the bottom ash in the ash storage area at the power plant

(3) selling it for use as an additive in cement production.

Accommodations

During the operations phase, we will house 1,200 people at the mine and plant site and 120 people at the power plant site. People working at the port site will live at the mine and plant site and travel back and forth by bus.

4. Closure and post-closure

At the end of the project, we must rehabilitate the property so the land is returned to its current use as forest land. We plan for this phase throughout the life of the project.

The closure/post-closure phase has two periods. Closure is when we stop extracting and processing ore and reclaim and rehabilitate all areas affected by the project. During post-closure, we monitor, inspect, and maintain the property to make sure our environmental, safety and post-mining land use objectives are being met.

Whenever possible, we will rehabilitate disturbed areas during the operations phase, so that few areas will need to be rehabilitated once mining and processing have stopped. That means that during the mine's life, we will decommission, demolish and remove buildings and other infrastructure as we no longer need them, re-vegetate the recovered land, and, when we can, re-establish water courses in their original watersheds.

At closure:

- the Colina, Botija and Valle Grande open pits will fill up with water naturally over time. Water covering tailings in the Botija pit will prevent acid from forming. Once the open pits are full of water, they will overflow and discharge naturally into their watersheds. We will treat the overflow, if necessary, to make sure the water meets limits for emissions and environmental standards for receiving water
- the power station will become a part of the Panamanian power grid and continue to generate electricity for Panamanians. When the power plant is no longer needed, it will be demolished and the buildings and other infrastructure will be removed
- we expect the port facilities associated with the power plant (including the wharves), and the road from the port to the plant site, will continue to operate to support the power station.

During post-closure, we will monitor and treat effluent as needed to meet regulatory and corporate commitments and to ensure the safety and environmental integrity of the site. We expect the post-closure period to begin in 2048 and to continue for as long as is necessary to ensure the site is secure and not affecting the surrounding environment.

Options we considered

We looked at many possible options for the project, to find viable solutions that would have the least overall impact. This included looking at other options for the proposed components of the project, as well as considering alternatives to the project as a whole.

Alternatives to the project

Inmet had two alternatives to the project:

a. develop or acquire other copper deposits, or

b. do not proceed with a new copper development project.

To meet its strategy for growth as a mining company, the expectations of its shareholders and customer demand for copper and molybdenum concentrate, Inmet's only alternative to Cobre Panama would be (a), to develop or acquire another copper deposit.

If it had chosen this option, the copper deposit would probably not have been in the Republic of Panamá. And, because of the size and relative quality of the Cobre Panama copper deposit, it is virtually certain that the deposit would still be developed by another mining company.

Inmet does not have any significant exploration options that are as advanced as the Mina de Cobre Panamá copper deposit. It therefore rejected both alternatives, and decided to submit an environmental and social impact assessment to the Autoridad Nacional del Ambiente (National Authority of the Environment) for approval.

Options within the project

We reviewed many options within the project plan, to find those that would have the most acceptable environmental, social, technical and economic impacts.

A team of environmental, social, technical and economics professionals ranked the options, then normalized, summed and averaged them to provide an overall rating for each alternative considered. They gave equal weighting to the four categories (environmental, social, technical and economic), and analysed the sensitivity of the ranking to each.

In most cases, we selected the option with the best overall rating. In some instances, for example when an alternative was not technically or economically feasible, or had a very high environmental or socio-economic impact, we selected the next best rated alternative.

Project costs

We will use debt financing for about 50 percent of the project's capital cost.

The table below lists total project cost estimates in US dollars during the construction phase.

Construction phase	Total capital to establish the project (potential direct capital investment in Panama, excluding the power plant)	$4.3 billion
	Total indirect and induced investment in Panama	$0.5 billion
	Total projected capital during construction	$4.8 billion

Our impact

This section discusses the impact the project will have in three areas:

- social environment: people, economy and health
- physical environment: land, water and air
- biological environment: plants, animals and fish.

We used six steps to assess the potential impact of each project activity and phase on each of these three areas. We:

1. identified all interactions the project could have with the surrounding environment and communities
2. reviewed issues and concerns related to each interaction
3. classified the potential effects as positive or negative
4. identified measures to enhance positive impacts and reduce negative impacts
5. evaluated the potential impact *after* these measures (the residual impact)
6. considered the cumulative impact (the effect of our project, combined with effects from current and past project, or projects that are likely in the future).

Social environment

(people, economy and health)

Any project of this size will have both positive and negative effects on local communities, the economy and the environment people live in and rely on for sustenance.

Managing our socio-economic impact involves first understanding the positive and negative effects of the project from the perspective of people who expect to benefit directly (through employment, or new or increased business) and of those who may only benefit indirectly. For this second group, assistance with agriculture, education, health services, clean water, electricity and housing may be their highest priorities.

Early and ongoing dialogue with communities and other stakeholders helped guide the design and development of the socio-economic baseline study.

Communities affected by the project

Panamá had an estimated total population of 3,322,576 in 2010, which corresponds to a population density of about 44 inhabitants per square kilometre.. About two-thirds of the population is concentrated in urban areas. The country has a life expectancy at birth of 75 years, and population growth is declining because birth rates are decreasing.

Golder's study covered the 20 communities that are most likely to experience the greatest impact from the project. The total population of these communities at the time of Panamá's last census (2000) was over 17,000. It is estimated to exceed 22,000 in 2008. The majority of these people live in Penonome and La Pintada. The sixteen closest communities to the project have an estimated population of 2,000 people. Another five communities may be affected to some extent by our transmission line routing.

Most of the project is in the District of Donoso, one of the poorest rural districts in the Province of Colón and in Panama as a whole. The project is also within the District of La Pintada in Coclé Province. Most of the people who live and work in these communities are *campesinos* — they speak Spanish and are generally fully integrated into Panamanian society. There are also two communities of indigenous Ngöbe-Bügle people. The Government of Panamá and the international community recognize the Ngöbe-Bügle as a distinct indigenous group.

- *Eight communities closest to the project* (*nearby communities*): Villa del Carmen, Coclesito, Nazareth, Nuevo San José, San Juan de Turbe, Los Molejones, San Benito and Río Caimito. These are all within 9 km of the project. The project could have both positive and negative effects on the natural resources (land, water, forest, fauna and mineral resources) that families in these communities rely on for their livelihoods, and on their quality of life. The eight communities vary in size, availability of infrastructure and services, and socio-economic conditions.
- *Two indigenous communities*: Nuevo Sinaí (1.1 km away) and Nueva Lucha (5.3 km away). The Ngöbe, who live mainly in these two communities, have a distinctive livelihood and community structure, and depend heavily on natural resources that could be affected by the project.
- *Six rural communities along the current project access road (roadside communities*): Llano Grande, San Antonio, Sabaneta, Cascajal, Ranchería and Molejón. We expect these communities will be affected by the vehicles travelling along the road west of La Pintada during construction and

operations. The road is also used by many others, including children, who commute between communities. Schools, health centres and other services and infrastructure are also near the road.

- *One community near the port and power plant:* Rio Caimito is close to the proposed port and power plant site and will experience some impact from these facilities.
- *Two urban centres* (*urban communities*)*:* Penonomé, the capital of Coclé Province (46 km away) and La Pintada (32 km away). As the largest urban centres in the region, these communities are likely to benefit from the project, especially economically.
- *Two communities along the Caribbean coast* (*coastal communities*)*:* Miguel de la Borda (47 km away) and Coclé del Norte (21 km away). It is unlikely that these communities will experience any negative environmental impact from the project. We will work with them as much as possible to provide employment and economic benefits.

Project impact

Local stakeholders are most interested in the impact the project will have in the following areas:

- employment
- education and training
- community development
- environmental harm or benefit
- economics
- natural resource and land use
- community health, safety and security
- community and regional infrastructure and services
- land acquisition and resettlement
- indigenous peoples.

Although much of the area is remote and heavily forested, in-migration is increasing and, with it, deforestation, as people with few economic opportunities move into the area and clear the land.

The best way to address these issues is to introduce sustainable economic development to the area. Any development project coming into this area has to incorporate regional land use planning with the development of sustainable communities and ecological protection. These are fundamental to our plans.

Community development

Our vision is that the project will be a positive force for sustainable economic development and ecological conservation in the immediate area of the project, in the Colón and Coclé Provinces generally, and throughout the entire country.

To make this happen, we are carefully planning and developing the project in consultation with local residents and are developing a Community Development Foundation that will be governed by community representatives and representatives of several Panamanian and international development organizations.

The Foundation's primary objective will be to invest in development opportunities in local communities. The project will provide a project-based income stream to the Foundation. We are considering several funding options, including the provision of a small carried equity stake in the Project.

The Foundation will be governed by a charter and bylaws, and overseen by a board of directors made up of community representatives and representatives of both international and Panamanian development organizations. Government representatives may be invited to participate as observers and external advisors to the process. The local communities will be the foundation's direct beneficiaries.

We expect that the Foundation will work to understand the social and environmental development priorities of the community, and will invest in these priorities, leveraging its own money, and money from government and other development bodies.

Broadly speaking, we expect the Foundation may become involved in the following:

- capacity building
- working with governments to improve infrastructure
- helping facilitate establishment of sustainable local businesses
- improving access to clean water, education and healthcare services
- literacy improvement programs
- improving access to educational and cultural opportunities
- conflict resolution and human rights
- micro-credit and micro-finance programs
- support for women's issues, indigenous peoples, children and the elderly
- assistance for ecological and environmental monitoring, to conserve the biodiversity in the area, and to support our vision for sustainability.

The details of the Foundation will be developed over the coming months in consultation with all project stakeholders.

Once the Foundation is established and operating, it will take on and be responsible for the community development programs that are already underway. We will fund the Foundation directly until the mine is operational, after which it will rely on the project-based income stream.

Our vision is that the Foundation, with a steady income stream from the project during operations, will be able to catalyze sustainable economic and community development over the mine's estimated 30-year life, and, if managed responsibly, for many years after the mine is closed.

Economics

Panamá's economy is growing for many reasons: the Panamá Canal expansion project, the new Colón Free Trade Zone, the Panama City Metro project, infrastructure improvements, an increase in tourism, and a real estate boom. Mining opportunities in Panamá are also generating interest from the national and international mining community.

The project will have positive effects during the construction and operations phases because it will increase national, regional and local revenues, and local and regional wages. We also expect local communities to become more self-sufficient, especially during the operations phase, and will use

community development strategies, fair hiring practices and other commitments to maximize these effects.

The project could also have negative effects, like inflation, inequity in the distribution of income and in-migration. These can be reduced to some extent with appropriate regional land use planning, community development strategies, hiring policies, steps to control project-induced in-migration, and other measures (for example, to control in-migration, we will use remote hiring and training centers and exclusion zones along the coast road). We discuss these actions in more detail in our social development action plan, which you can read about on page 56.

Employment, working conditions and training

People in the communities around the project area are underemployed, and the two local indigenous communities are among the poorest populations in Panamá. Some households engage in artisanal and small-scale mining, using traditional methods like panning or sluicing. Hydraulic mining is also used locally, which damages water courses.

The project will increase employment locally, regionally and nationally during construction and operations, as detailed in the table below:

	total direct employees	**total direct, indirect and induced jobs**
During construction	3,000 per year (on average)	10,000 per year
Total life of mine	2,000 per year	6,000 per year

We will also offer scholarships, apprenticeships and training programs for workers, and provide worker accommodation and health services. We will increase the participation of local people affected by the project by supporting local businesses and helping build a deeper understanding of the project and business practices.

At closure, many of the positive economic effects from the project will be reduced or eliminated. The sustainable communities and livelihoods developed during the life of the mine, however, should persist, and will be supported by the foundation which will continue to provide funds after the mine closes for community development and ecological protection priorities using money from investments made during the mine life.

Natural resources and land use

Most families near the project area either have legal title to their land or have rights of possession, and rely on subsistence agriculture or fishing. The most isolated communities rely on local forests for firewood and building materials, and hunt for most of their food. Fishing is most common in the communities at the coast.

There will be some loss of access to local travel routes in the project development area. We will build safe trails and special accessways where needed, and affected people will also be relocated and/or compensated as necessary. Please see page 56 for more details.

There is little agriculture close to or inside the project development area, so we expect only a moderate loss of agricultural land or restriction of access during construction. Loss of land or access to land will be minor during operations. Agricultural extension services and relocation and/or compensation will mitigate any effects.

We expect the project to have a moderate effect on fishing and hunting during construction and a minor effect during operations once we introduce community development strategies to address the loss of livelihoods or sources of sustenance. We will restrict access to the project development area, and workers and contractors will not be allowed to hunt or fish.

The project will remove approximately 5,900 hectares of forest. While some of this area will be reclaimed to forest when the project is closed, the new forest will need several generations to fully mature. Please see page 44 for more details.

We expect effects to water quality and availability to be minimal. Please see page 38 for more details.

Health, safety and quality of life

Common health problems in or near the project area include respiratory and gastrointestinal diseases, skin problems and malnutrition. The traditional diet is very low in protein and many people use natural medicines because prescribed medicines are expensive and hard to get.

In the urban centres, growing health and social problems include sexually transmitted diseases, alcoholism and prostitution. In more isolated rural areas, diseases transmitted by insects, such as malaria, dengue and leishmaniasis, may be increasing.

In-migration and the injection of more cash into the local economy could increase violence, theft and alcohol or drug abuse. We will try to mitigate these negative effects by housing staff in camps, establishing a code of conduct for all staff and contractors, training workers in community relations, establishing a fair and transparent program for the resolution of concerns and complaints, and continuing our stakeholder engagement program.

In-migration can also accelerate the deterioration or loss of natural resources and put a strain on local infrastructure. We will recruit local workers at a hiring centre in Penonomé, implement a hiring policy to give preference to local and regional workers, and discourage newcomers from moving into the project development area. Despite these efforts, we expect the negative effects of in-migration to be moderate during both construction and operations.

Traffic in or near local communities will increase during construction and then taper off, but will continue to be high during operations. We expect the number of traffic accidents to increase, along with dust and noise levels. A traffic management plan will include awareness campaigns, speed limits, signage, driver training, road improvements and timing for moving vehicles. We expect the residual effects from traffic to be moderate during construction, and minor during operations. Please see page 34 for more details.

We expect the project's impact on air quality for nearby communities to be minor during operations. We will install scrubbers in our power plant stacks and water the roads as necessary to control dust. Please see page 33 for more details.

Noise from project vehicles, blasting, the processing plant, the power generation plant and the port could disturb local communities. We expect noise from the mine and the port to have only a minor impact on nearby communities because they are far enough away from the project development area. Noise levels at roadside communities may increase because of project traffic. We will restrict driving to daylight hours and use truck convoys (when possible) to help keep additional noise to a minimum.

Waterbodies formed as a result of the project could increase insect-borne disease, and in-migration could also introduce or spread disease in the region. We expect the effects of insect-borne diseases to be moderate, but there are some variables that could affect our impact (including government health

interventions, diseases that have not been well-studied, and the health of newcomers to the area). We will work with government agencies to support community health programs targeted to diseases carried by insects (for example, vaccination campaigns). We will also work with government health service providers to carry out programs to study and mitigate insect-borne diseases.

Community and regional infrastructure and services

The urban centres of Penonomé and La Pintada are the most developed communities in the area. The other communities have largely inadequate services and infrastructure. Most families use gravity-fed aqueducts connected to springs or streams and water purification systems that are often poorly maintained. The two indigenous communities draw their water directly from rivers and streams. Policing and other emergency services are lacking. Many schools have only one teacher and generally provide only basic education.

Because the project will result in a population increase, there will be added stress on the existing public services and other infrastructure. We will talk with government agencies about ways to improve or add community and regional infrastructure and services, which could include support for new facilities and programs for schools and health centres. This infrastructure is important to local communities and is vital for the success of our project.

Minera Panamá and the Community Development Foundation will work with every level of government to mitigate any negative social impacts from the project. Where possible, we will encourage:

- strengthening government capacity for planning, budgeting and resourcing
- supporting initiatives that involve the public in managing and monitoring changing social dynamics
- addressing key potential impacts through improvements in housing, water and sanitation, health, and communication.

We will provide health services to all of our workers and their families, comprehensive worker health and safety programs and training, and support for other programs and improvements the community identifies as high priorities.

We expect the project to have a range of effects on community and regional infrastructure and services, from positive (because of project and government support for improvements), to negative (related to in-migration). It should have a moderate and mainly positive effect on health services, educational services and road improvements during both construction and operations.

Resettlement

We explored a number of designs to avoid displacement and, where unavoidable, to minimize the scope as much as possible. The project will, however, result in the displacement of a small number of households. We do not expect any physical displacement of people associated with the transmission line – it will mostly affect rights-of-way.

All resettlements will follow international standards. Our framework resettlement action plan includes relevant background information and sets out the principles, procedures, organizational arrangements, provisions for monitoring and evaluation, framework for participation, and mechanisms for addressing grievances related to land acquisition and resettlement. Please see page 56 for more details.

Indigenous people

The two main indigenous communities (Nueva Lucha and Nuevo Sinaí) and their satellite settlements will be affected by the project because they are near the project area, and because they depend on natural resources for their livelihood (for example, artisanal and small-scale mining, and hunting and gathering).

Discussions with these communities are ongoing. Once the ESIA is approved, we will prepare an indigenous peoples development plan in consultation with these communities that will include measures to avoid, reduce or compensate them for potential adverse effects. The plan will follow International Finance Corporation Performance Standards.

Cultural resources

As part of the ESIA, archaeologists looked for evidence of historical populations in the project area. They identified areas likely to have historical resources by studying maps and using helicopters to survey the area, then focused their field investigations on these high potential areas. They completed five field programs and surveyed about 600 hectares, or 10 percent of the project area. They visited all high potential areas on foot, completing visual assessments and excavating and evaluating small amounts of soil.

Their field programs identified 148 historically or culturally important sites in the vicinity of the project: 114 new cultural resource sites and 34 sites that had been previously recorded. The most common type of artifact found was ceramic fragments, likely from the Late Ceramic Period Cortezo Red-Buff Ware pottery group (dated between AD 1300 to 1520), and the Conte pottery group (dated between AD 750 to 900).

The distribution of cultural resource sites indicates a geographically extensive and dispersed settlement pattern, similar to what exists in the area now. The low density of recovered artifacts and the small size of the sites suggest that the prehistoric population density was low. This likely corresponds to a small population that moved their settlement centre within the same broad territory from generation to generation.

Cultural heritage

We will avoid archaeological resources on the project site where possible. Where it is unavoidable, we will reduce our impact by excavating these sites to gather more information and increase Panamá's knowledge of its history and culture.

Visual aesthetics

Removing vegetation and constructing buildings (including the power plant stack, the wharf, the tailings management facility and waste rock storage facilities) could disrupt the visual landscape. Both the mine and port sites have limited visibility, however, so changes to the visual aesthetics of the area will affect very few people and communities.

Human health and ecological risk assessment

To evaluate the project area's current environmental quality, identify existing health risks to people, plants and animals, and evaluate the potential impact of the project, Golder carried out a human health and ecological risk assessment.

The current levels of several metals in local streams and rivers are much higher than what is recommended for aquatic life and soil invertebrates in the project area. For example, concentrations of arsenic, cadmium, chromium and copper in water and, in some cases, sediment, already exceed

guidelines for the protection of aquatic life, because they naturally occur in amounts higher than normal, and erode into the water.

Golder's human health risk analyses concluded that the risk to people from all project-related contaminants except arsenic are either negligible, or low and likely to be negligible. Risks associated with arsenic are uncertain, but are likely low to moderate because the project-related changes in water quality, combined with existing concentrations of arsenic, could have an impact on the level of arsenic in fish tissue.

Golder's ecological risk analyses concluded that the risk to species in the food chain for all project-related contaminants except aluminum and copper are either negligible, or low and likely to be negligible. The study indicated possible changes in concentrations of aluminum and copper in the water, but the likelihood of adverse effects is highly uncertain because conservative assumptions were used in the models. Monitoring during construction and operations will help reduce this uncertainty.

A fauna food chain model indicated that project-related risks are negligible to low. The study did not identify any project-related risks considered to be moderate or high.

Baseline and predicted impact case exposure estimates were similar for all contaminants except copper and selenium. The model used predicts a relatively small increment in copper concentrations associated with the project (2 to 5 times). This indicates that there is risk, although uncertain, of adverse effects from copper released by the project. However, current baseline concentrations of copper in the soil the study area are higher than environmental guidelines, so it is possible that the plants and soil organisms in that area are not highly sensitive to copper. Predicted selenium concentrations range from 1 to 3 times the baseline case, indicating a low and likely negligible risk to soil invertebrates and plants.

Physical environment

(the land, water and air)

Golder assessed the current conditions and features of the physical environment — the land, water and air — and our expected impact on them, organizing their study into the following categories:

- geology (the composition, structure and origin of rocks)
- geomorphology (surface features of the earth and their relation to its underlying geological structure and climate)
- topography (the shape of the earth's surface and the landforms such as mountains or valleys)
- geochemistry (the chemical interaction of the rocks and minerals with the natural environment)
- soils
- air quality and climate
- noise and vibrations
- surface water
- water and sediment quality (to determine if the water is good for fish, and for people to drink)
- groundwater (the water in the soil and rocks, which seeps down from the surface over decades or more)
- oceanography (the study of the oceans, such as ocean currents and waves)
- natural and industrial hazards (for example, earthquakes).

Geology, geomorphology and topography

Current state

Panamá is bordered by the Caribbean Sea to the north, the Pacific Ocean to the south, Costa Rica to the west and Colombia to the east (see Figure 1). The landscape is dominated by the Cordillera Central mountain range, which runs east to west across the country.

Earthquakes, volcanic activity and other geomorphic processes, like weathering and wind and water erosion, shaped the landforms of the country. Volcanic rocks were deposited in the mid-Tertiary period (about 35 million years ago), and other kinds of rocks, known as the Petaquilla batholiths, were placed there during the same period.

The mine and plant site is in an area with steep, rolling hills and valleys, with elevations rising up to 400 metres. The land is less steep towards the coast, where elevations drop to sea level.

Possible effects

During the construction and operations phases, the following activities will change landforms, slope gradients and topography:

- earthworks (excavating soil)
- linear construction (laying pipelines, roads and transmission lines)
- building dams and reservoirs
- stockpiling saprolite and waste rock
- building the plant site and supporting facilities
- mining and filling the tailings management facility.

Our activities will create or change slopes in some areas, and level them in others. This will change geomorphic processes like erosion because slope angles, drainage patterns (how water flows into rivers or streams) and the rate that water enters the soil will all be different. It will also affect other things, like the type and quantity of sediment entering local rivers and streams.

At and after closure a larger area will be covered by water. There will be more gentle slopes and less steep and hilly terrain. Stream beds will be re-established. Most of the slopes created along our mine pit walls will be under water.

Soils

Current state

Golder studied the types of soils in the project area, how well they support trees and plants, how vulnerable they are to water and wind erosion, and whether we're likely to be able to reclaim the soil. Their baseline soil and terrain studies looked at soil layers and colour, how wet it is, and what is found in the soil now.

Soil samples from 143 inspection sites showed seven types of soils. Soils in most of the project area are very weathered and oxidized. The soil layer covers a layer of rock and ranges in thickness from less than a few metres to over 30 metres. The soils are tropical, and generally low in both nitrogen and phosphorous (the nutrients needed to grow plants and sustain animals). This is partly because of the climate - high rainfall increases weathering and leaches minerals from the soil. However, the warm soil temperatures and high moisture conditions help organic matter, like leaves, to degrade rapidly, putting nutrients back into the soil.

These soils are classified as marginal to good for agriculture, and from low to moderately suitable for reclaiming the mine site. The potential that surface soils in the project area will be eroded by wind or water ranges from low to very high, depending on how steep the slopes are.

Possible effects

During the project we will remove soil, and we may also disturb soil, reduce soil productivity and increase erosion. Accidental spills and leaks of petroleum products may contaminate soils.

We will manage soil erosion during construction and operations with erosion and sediment control measures, and use best management practices to mitigate soil damage and reduce the likelihood of accidental spills and leaks. We will reduce the impact of any spills or leaks that do occur by responding promptly and cleaning up any contaminated soil.

We also have a plan for restoring soils when we close the mine. We will restore productivity to the soil by loosening it, adding organic material and nutrients and re-vegetating promptly. This will also prevent the soil from becoming compacted, and reduce erosion. By post-closure, about 2,700 hectares will be reclaimed. The rest of the site will be covered in water.

Air quality and climate

Current state

Golder collected data on air temperature, precipitation (rain), wind direction, and dust (particulate matter) at air quality and climate monitoring stations set up at two locations: the Colina camp near the proposed mine site and the community of Río Caimito, near the proposed power plant and port site.

The two stations collected data on wind speed and direction, temperature, humidity, barometric pressure, solar radiation, precipitation and evaporation. Golder left instruments at these sites for a full year so that information about precipitation and temperature could be collected during all seasons.

The mine site receives about 4,500 millimetres of rain per year, while the coast receives about 5,000 millimetres in an average year. February and March usually have the least amount of rain, while November and December typically have the highest amounts.

Temperatures and relative humidity in the project area are high and do not vary much during the year. The temperature typically ranges from 20 to 32 degrees Celsius and relative humidity is generally around 80 percent. For most of the year, the winds in Panamá are usually from the north-northeast. In the autumn they shift to the southwest. Average wind speeds ranged from about 5 kilometres per hour at the Colina camp to about 10 kilometres per hour at the Río Caimito location.

Although the project area has high humidity and rainfall, evaporation during the day can increase the potential that dust will become airborne. The monitoring stations showed that concentrations of dust in the air were generally below applicable criteria, with a few instances of higher measurements that may have been caused by local development (at both locations), road traffic (at Colina), land clearing (at both locations) and natural airborne marine salts (at Río Caimito).

Possible effects

The project has the potential to affect air quality in all phases, which can affect nearby residents, agricultural crops and natural flora. Dust, exhaust from vehicles and emissions from the power plant can all affect air quality. Winds will also erode exposed surfaces if they are not re-vegetated or kept moist.

Emissions from the project are expected to increase national greenhouse gas emissions by eight percent from current levels.

We will keep the level of dust to required standards during all phases of the project by applying water (to control dust on the roads), treating the surfaces of parts of the road network, enforcing speed limits and covering loads. We will re-vegetate some exposed areas, where feasible. We will keep the tailings management facility wet to limit wind erosion and transport concentrate to the port through a pipeline.

Vehicles will be kept in good repair and will have exhaust control systems. The processing plant and power generation plant will use filters and scrubbers to remove particles and sulphur dioxide from the emissions.

Based on air quality modelling, emissions at the communities closest to our activities will be within required guidelines during operation, except for dust levels in Río Caimito and sulphur dioxide levels in San Benito, which will exceed 24-hour World Health Organization guidelines during some project phases. The elevated sulphur dioxide levels predicted at San Benito are likely from emissions from our vehicles. Dust levels at Rio Caimito, however, are currently above the guidelines. We will monitor dust and sulphur dioxide at these sites during our operations to ensure that the levels are acceptable.

Golder’s human health and ecological risk assessment found that the predicted future air quality poses a negligible to low risk to humans and animals. We will monitor actual air quality to make sure the assumptions used in the model are valid and that actual air quality remains within required limits and does not pose a risk to human health.

Noise

Current state

Golder studied noise by focusing on measuring background noise levels in communities close to the proposed project sites.

Golder monitored baseline noise levels over a 24-hour period at six communities: Nuevo Sinaí, Río Caimito, San Benito, Los Molejones, Nazareth and Cascajal. Current noise levels in the project area were typical of rural areas in Panamá, and were mostly from roads, nature and outdoor public activity.

The only industrial noises were from exploration drilling, helicopters, and construction of the Petaquilla Gold Molejón project, two kilometres south of our project (an existing operational mine).

Possible effects

Traffic on the access roads, clearing the forest, digging, blasting, hauling waste rock and processing ore will all increase local noise levels. The power generation plant and port activities will also add to noise levels.

Golder carried out both noise and vibration modelling, using assumptions listed in the noise section of the impact assessment.

- Noise modelling showed that noise levels will be higher than the required guidelines in some of the nearest communities, mainly because these communities already have naturally high ambient noise levels. Noise from our helicopters will add to the problem, but only for short periods of time (high magnitude, but short duration). We will design flight paths to avoid communities whenever possible.
- Vibration modelling showed that vibration from blasting will be low, even in San Benito, the community closest to the mine site. According to this model, mitigation of vibration is not necessary or recommended.

We are designing the project to ensure that people living near it will not be affected by excess noise. All vehicles will have silencers, helicopter flight paths will avoid communities, and waste rock facilities, ore stockpiles and buildings will act as barriers to noise generated by the mine and the processing plant.

Surface water

Current state

The proposed mine site is in the upper catchment area of three rivers: the Petaquilla, the Caimito, and the San Juan. Rainfall flows into the three river basins, which then drain north to the Caribbean Sea (Map 1):

- The Petaquilla River basin drains northwest, from the west side of the mine site to the Caribbean coast.
- The Caimito River basin has four sub-basins: the Uvero, del Medio, Pifa and Caimiton, which mostly drain northward to the Caribbean coast.
- The San Juan River basin has four sub-basins including the Upper San Juan, Turbe, Limon and Botija rivers. The San Juan River basin drains eastward to the much larger Cocle del Norte River basin, which drains north to the Caribbean coast and combines runoff from the Coclesito, Cascajal, Toabre and Cuatro Calles river basins, in addition to that of the San Juan River basin.

Golder measured the amount of water available in the project area and how and where it flows by:

- reviewing available hydrologic and climate information (to characterize rainfall, evaporation and stream flow)
- consulting staff from Empresa de Transmision Electrica S.A. and the Panamá Canal Authority (Autoridad del Canal de Panamá)

- assessing stream flows at six locations in the project area, monitoring flow levels and the amount of rainfall and turbidity (the quantity of particles suspended in the water, like silt or clay).

Streams in the project area are very responsive to rainfall: flows increase rapidly during or immediately after rain, and then quickly return to pre-rain levels. The turbidity level in local streams (cloudiness from small particles in the water) also increases when it rains, and flows are higher. The base flow in streams in the project area is very consistent – it does not change much from month to month or in different seasons.

Potential effects

The project will affect the flow of surface water in several ways:

- clearing vegetation and compacting soil will increase surface water runoff
- excavating and dewatering the mine pits may decrease baseflow (ground water seepage) to local streams
- diverting water around the mine facilities will change flow patterns
- water storage facilities will affect the timing of flows after rainfalls.

Golder assessed how much water flow will be needed to maintain the ecology of local streams and their potential for flooding, the availability of surface water for local communities to use, expected changes to river shape as a result of our activities (for example, changes to the width and depth of a stream or river), and the sustainability of the landscape and drainage systems at closure.

We will mitigate our effects on surface water using best management practices to control erosion, sedimentation and the risk of floods, including:

- designing appropriate storage facilities, spillways, ditches, culverts and bridges
- protecting adjacent water basins by not diverting water between drainage basins
- reducing runoff by progressively re-vegetating disturbed sites throughout the mine life
- limiting the effects of higher runoff and erosion by building sedimentation ponds where the stream leaves the mine site (places to catch runoff and hold the water while the soil and debris settles and becomes sediment).

All communities near the project will have enough surface water for their needs. The project will not cause flooding in any communities downstream of the mine. We expect negligible to moderate changes in the potential for flooding and river morphology, with the highest impact nearest the mine site. The impact on water flows in the port area won't be significant because we are only affecting a small area.

At closure, the landscape and drainage features will be similar to the natural drainage pattern.

Groundwater

Current state

Groundwater is water in the soil and rocks beneath the ground surface. This water, which comes from rain, rivers or lakes, seeps down from the surface over a long period of time (decades or more). Some communities use groundwater for drinking or other household purposes, although the communities near our project area rely on water from local streams.

Golder assessed current groundwater conditions in the project area by:

- reviewing reports on the geologic and hydrogeologic setting
- developing a conceptual model of where the groundwater is thought to be and how it moves
- identifying missing information and collecting relevant data
- revising the conceptual model to include the new information.

They also completed field investigations. The field program involved two parts:

- investigating the shallow groundwater found in the top 50 metres of the saprock, saprolite (weathered rock) and shallow bedrock (rock that is under the soil, gravel, clay or other material) by drilling vertical boreholes and wells near our proposed mine facilities
- studying deeper groundwater through boreholes drilled inside the footprint of our proposed mine pits. These deep boreholes extended from the top of the bedrock to near the bottom of the deepest pit we're proposing.

For the shallow groundwater investigation, Golder supervised groundwater drilling, monitoring well installation, hydraulic testing and water quality sampling at 16 wells drilled at eight locations in the project area. Most of the wells were installed in pairs: a shallow monitoring well within about 10 metres of the water table (the shallowest saturated ground below ground level) and a deeper monitoring well of up to 50 metres. This allowed Golder to see how easily groundwater can move through the soil or rock and create a conceptual model of where this movement is occurring.

Based on Golder's conceptual model, groundwater enters the saturated zone by moving through the soil in the higher areas and discharging primarily to the nearest stream. In this kind of shallow groundwater system, we expect the capture area where groundwater enters the ground to be significantly larger than the area of discharge.

Most of the groundwater samples collected from the wells exceeded Panamanian Potable Water Quality Standards criteria for total and fecal coliform, turbidity, total hardness, dissolved manganese, and total aluminum, manganese, iron and lead. Elevated concentrations of aluminum, copper, iron and lead were observed at most of the wells, reflecting natural weathering of soils and rocks in this mineralized area.

These data are consistent with the surface water quality data, confirming the mineralized nature of the area and the communication between the subsurface and surface flow systems. The elevated coliform results are an existing health concern for local communities.

Potential effects

Golder used groundwater modelling to predict the potential effects of our activities on groundwater in the project area. They concluded that:

- The mine facility will affect local groundwater levels because groundwater will be pumped from the mine pits to keep them from flooding. Groundwater levels within 1 to 2 kilometres of the open pits are expected to be at least 2 metres lower, which will affect baseflows to streams within the area. Groundwater levels will recover when the mine is closed and pit water levels are allowed to recover, but we do not expect them return to the original water level.
- The tailings management facility will act as an area where groundwater will be replenished both during operations and after the end of mine life. While we expect baseflows to the del Medio River to be lower, we expect local groundwater levels to increase because of seepage from the facility. Concentrations of potential contaminants in the groundwater will disperse as it flows away from the facility and is discharged to surface water bodies.
- The port facility may affect groundwater quality by changing runoff and infiltration rates, or because of infiltration of ash from the ash lagoons.

We will manage our affects on groundwater by:

- phasing development: as each pit is mined out, it will be allowed to fill with water
- collecting part of the water seeping from the tailings management facility in a system of collection ponds and ditches
- controlling seepage from the waste rock facilities into local aquifers during closure by covering the facilities with saprolite and re-vegetating the area
- developing a network of groundwater monitoring wells in areas where groundwater quality may be affected. This will allow us to regularly sample and evaluate water quality to see if groundwater is being affected, and to design and implement mitigation measures if necessary.

Water and sediment quality

Current state

Golder's baseline water studies also evaluated the water and sediment quality in local rivers, streams and lakes (water and the minerals, nutrients and other dissolved substances that are in it). Looking at the water quality in rivers and streams helps determine if it is good for fish and good for people to drink.

Golder measured surface water and community water supplies and sediment at 37 locations in the project area. These water samples indicated that:

- the quality of the local water is affected by the intensity and duration of the area's frequent precipitation
- artisanal mining (independent, small-scale subsistence mining), construction, and existing mining operations in the area all increase suspended solids and turbidity in adjacent streams
- streams are more turbid (less transparent) in areas of higher flow

- there are elevated background concentrations of aluminum, copper and iron in the water now (above typical environmental levels)
- fecal coliform is commonly found in both surface water and community water supplies throughout the region, representing an existing health concern for local residents.

Some sediment taken from the rivers had elevated concentrations of copper, chromium and zinc, reflecting the mineralized nature of the area, natural weathering of the soils and the activity of residents in the area.

Potential effects

Clearing the site and disrupting natural drainage patterns, stockpiling waste rock and disposing of it, ore and tailings, ore processing, effluent from sewage treatment, accidental releases and spills, and site reclamation and closure activities could all affect local water quality.

Golder created its water quality model using conservative assumptions, however, and all water released from the mine site will be treated if necessary to meet discharge criteria. Golder's modelling predicts that drinking water standards will be met at all communities downstream from the project.

Concentrations of metals in sediment in local waterways may increase. The project has committed to meeting total suspended solids effluent criteria under normal operating conditions, using proper erosion control and suspended solids management.

The cooling water discharged to local waterways from the diffuser at the power generation plant could contain dissolved metals. Golder's modelling predicts that concentrations of these elements will be only slightly higher than they should ideally be. Actual levels of these metals are expected to be much lower than our predictions.

We expect that at some surface water quality monitoring stations, the levels of aluminum, cadmium, copper, iron and molybdenum will exceed guidelines for aquatic life mainly because existing concentrations are already high. Golder's human health and ecological risk assessment, however, found that their predicted concentrations would pose a negligible to low risk to humans and animals. Please see page 29 for more details.

During site clearing and construction, we will use best management practices to minimize erosion and sedimentation. This will include diverting runoff from roads and disturbed areas, and using sedimentation ponds and silt fences. We will divert storm water around our site and most of the water that falls on our site will be diverted to our tailings management facility, where the sedimentation system and polishing ponds will reduce the sediment in the water before it is released to the environment.

Limiting total suspended solids in our effluent will limit the amount of suspended sediments released to the environment. Sediment control structures planned for all discharge locations will also help. We will also monitor sediment levels to confirm that Golder's assessment of potential effects was accurate.

Sewage treatment plants will be installed at the both the mine and port sites. Sewage will be treated so that all effluent meets discharge criteria. We will compost solids and add them to the soil or place them in an approved landfill. We will have secondary containment for all surface tanks and storage areas with potential contaminants.

We will continue to use best management practices during our closure/post-closure phase, designing the landscape with sustainable drainage and a vegetation cover to reduce erosion and sedimentation and minimize contact between runoff water and mine or waste material.

Oceanography

Current state

To evaluate baseline conditions at our proposed port site, Golder studied water and sediment from the ocean and the patterns of ocean currents and waves.

They collected marine surface water samples from nine sampling stations. As expected, the surface water samples had higher concentrations of major ions compared to fresh water samples because it is salt water. They also had higher concentration of copper and aluminum.

Marine sediment samples were collected from the mouths of the Petaquilla, Caimito and Cocle del Norte rivers (where these rivers drain into the ocean). The sediment samples had higher background concentrations of arsenic than samples from the local fresh water environment.

Coastal waters near the port site are generally clear, tropical marine waters, with few suspended solids. The seabed slope is relatively shallow, with a rocky reef outcropping at about 20 metres below the surface that extends parallel to the shore near the proposed port. Waters in the region are generally well-mixed, with no observable temperature difference in depths less than 50 metres. This is consistent with shallow seas in tropical regions.

Salt water intrusion (where salt water enters a river) is a natural condition commonly found in coastal rivers and estuaries when a river has a low flow and the ocean has a high tide. Golder observed intrusions of salt water in the estuaries of the rivers sampled for the study that drain into the Caribbean Sea (the Petaquilla, Caimito, and Cocle del Norte rivers noted above). Tides along the coast near the project area tend to be weak, so the main cause of salt water intrusion in these rivers is low river flow. Golder investigated the salt water intrusion in the Caimito River in more detail because the river is near the port site and found that salt water intrusion in that river extends about 6 kilometres upstream of the river mouth.

Potential effects

Building the port, berthing large ships and discharging waste water could affect ocean currents, wave climate, coastal morphology and ocean water temperature.

We will be constructing a breakwater that will extend about 350 metres from the shore. The wharf will extend another 300 metres out into the sea. These could affect water circulation and local wave patterns, which could affect water quality and sediments along the coast, and change the rates of erosion or sediment deposit along the shoreline. However, Golder's assessment predicts that changes in currents and wave patterns and the potential for erosion or sediment deposition at distances of more than 250 metres from the port are low. The effect of ship propellers and changes in coastal morphology rates are also predicted to be low.

The power generation facility at the port site will use seawater for cooling. The associated water intake and outfall pipes near the shoreline may affect the movement of sediment and the local water temperature, which could have an adverse effect on marine life. Golder's study predicts that the water intake and outfall pipes will have little or no impact on sediment movement during the construction and operations phases. The outfall pipes will be equipped with diffusers to minimize the change in water temperature, and we expect that, beyond a 30 metre mixing zone, the water temperature will increase by no more than 0.7 degrees Celsius, well within the site's natural annual variation in water temperature of 3.8 degrees Celsius.

There will be diesel fuel, coal, copper concentrate, chemicals, equipment, and other materials at the port site. We have management practices and spill response plans in place to reduce the potential for accidental spills when we are loading and unloading ships.

The port and power plant will not affect the nearby Caimito River estuary.

Natural and industrial hazards

Current state

Baseline conditions for natural and industrial hazards, including climatic events (storms), seismic events (earthquakes), oceanographic conditions, landslides and traffic, were assessed to characterize the potential for these hazards in the project area. Golder found that:

- during periods of rain, stream flow in the local rivers can quickly increase 10 to 100 times
- the highest average wind speed measured during field surveys ranged from about 2 to 4 metres per second
- data are scarce for extreme offshore wind conditions, but sustained offshore wind speeds of 80 knots (about 150 kilometres per hour) were observed during Hurricane Martha in 1969. Offshore waves may reach the port site during storms and hurricanes. Hurricanes are rare in the area
- storms at the coast usually occur during mid-October to mid-April. Conditions are mostly calm the rest of the year, when swells are generally less than 1 metre
- some geomorphic features associated with mass movement and landslides were observed in the study area
- central Panamá has experienced few earthquakes in general, and even fewer in the north and along the Caribbean coast
- vehicular traffic is greater in urban areas and decreases as communities become more rural. The number of pedestrians and livestock on the road (for example, cattle) increases with distance from the more urban environments.

Potential effects

A natural hazard is a naturally occurring event that could lead to a potential failure of our facilities, affecting the public or the environment. The main natural hazards are earthquakes and extreme climatic events that can cause geotechnical events (like slope failure, for example). Industrial hazards include accidents or malfunctions in the processing plant or other facilities, including ship, port material handling and road transportation accidents (like spills or collisions with people, for example), affecting human health, safety and the environment.

We will manage the impacts from these hazards during construction and operations using risk assessment and mitigation. We will complete risk analyses and implement an ongoing management program, including putting risk control measures in place for all potential hazard scenarios. The processing plant, mine site, tailings management facility and port will be designed using international standards to minimize the related risks to within acceptable levels for the public and the environment. Our transportation program will include mitigation measures to minimize risks from accidental spills and collisions.

Other specific mitigation measures will be implemented at each of the project sites to minimize the risks from natural hazards. Examples of these mitigation measures include:

- geotechnical drilling and rock strength testing to provide guidelines for pit slope stability
- designing our tailings management facility for extreme storm and wet year water cycles
- using international standards for acceptable safety factors in the design of facilities
- designing our facilities for potential seismic, wind and wave conditions
- designing our foundations appropriately for the existing geotechnical conditions
- designing site drainage for extreme flooding events
- regularly monitoring the stability of all facilities.

Risks associated with industrial hazards will be minimized by:

- operating, maintaining and monitoring our facilities according to international guidelines
- mine traffic management, including traffic control, safety berms, road maintenance, and separate roadways for large vehicles
- using scrubbers for dust control at all concentrate and coal transfer points
- emergency port equipment, including floating booms, skimmers and absorbent materials to respond to an ocean spill, if there is one
- using pipelines to transport concentrate and fuel, which will reduce transportation risk because it will reduce the need for trucks
- the new coast road and bridges, and upgrades to the existing Colina to Penonomé roads and bridges, which will be constructed according to international standards.

These mitigation efforts will bring our industrial risk levels for the project to within international standards for mining operations for minimizing risk to the public and environment.

Odour

Odours from our vehicles, the power plant, material handling at the port site and shipping will be emitted in relatively small amounts. Some odours may also be released during the copper concentration process. Overall, we expect odours created by the project to have a negligible effect on odour levels in the area.

Biological environment

(plants, animals and fish)

Golder also assessed the current conditions and features of the biological environment (plants, animals and fish) and our potential impact on them, organizing their study into the following categories:

- protected areas
- biodiversity (the variety of plant and animal life in a particular habitat)
- flora (plants)
- fauna (animals)
- freshwater fish and their habitat
- marine animals and fish and their habitat

Protected areas

Current state

The project is within 50 km of four protected areas and one private reserve. These include two major national parks (General Omar Torrijos and Santa Fe), a forest reserve (La Yeguanda) and a national monument (Los Pozos de Calobre).

The project area is also in the Mesoamerican Biological Corridor, a land-use planning system designed to help preserve biodiversity and ensure that all development is sustainable. The system aims to connect useable plant and animal habitat, ultimately creating a biological corridor that extends from Mexico to Colombia.

Our project is in a portion of the corridor that includes ecosystems that support animals that migrate seasonally between lower and higher elevations, and wide-ranging species such as the jaguar and the harpy eagle. Although these species were not observed during baseline surveys in the project area, they have been reported. This suggests that the region currently functions as an effective biological corridor for corridor-dependent species.

Potential effects

The project will have both negative and positive effects on the Mesoamerican Biological Corridor.

Adverse environmental effects include loss of tropical lowland forest and reduced connectivity east to west and north to south near the project. While these effects are expected to be important during the construction and operations phases, the phased nature of the development and progressive reclamation of sites when they are no longer needed will help reduce the effects.

We will compensate for the loss of tropical forest by developing and implementing an off-site reforestation program that will reforest two hectares for every hectare of original forest lost after re-vegetation. We will also create hard bottom marine habitat and provide financial and management support for local conservation areas. These actions will help ensure our project has an overall positive effect on biodiversity and the corridor.

We will also contribute to the scientific knowledge of flora and fauna in the region through project studies, including studies to be conducted by a biodiversity chair at a Panamanian university that we will institute and fund.

We will develop our biodiversity action plan using International Finance Corporation Performance Standard 6 (International Finance Corporation 2006a, 2007).

Adverse social effects include in-migration of people to the region and the resulting development that could increase the rate of deforestation, plant collection and hunting. The community development foundation will support sustainable economic development in the region, increasing self-sufficiency, training and direct and indirect employment, which will reduce pressure on local plants and animals. An environmental education plan for local communities will also help reduce their impact on the corridor. See page 58 for more details.

Biodiversity

Current state

Panamá has a rich and diverse mix of plants and animals because its climate, topography and vegetation are varied and because it is a land bridge between North and South America.

Large herbivores (plant-eating animals) and predators appear to be rare in the immediate project region, perhaps because local hunting and human disturbances, such as agriculture, ranching and mining, have affected their populations.

The Isthmian-Atlantic moist forest ecoregion (an area that has broad similarities in soil, terrain and dominant vegetation) spans most of the region surrounding the project. The rest of the project is within the Talamancan montane forest ecoregion.

The lowland tropical rainforest found throughout the study area supports a rich collection of plant and animal species, as well as many endemic and listed plant and land-based (terrestrial) animal species.

Golder's study found two fragile ecosystems, as defined by Autoridad Nacional del Ambiente:

- the area's freshwater ecosystems are considered fragile because they are sensitive to human disturbance, provide important ecosystem services, have been identified as a primary concern for local communities, and support nationally endemic species of fish
- the Caimito estuary is considered fragile because it contains the habitat for a large number of organisms and because it supports high biological productivity (that is, the nutrients and environment in the estuary promote growth).

We have classified the entire 414,000-hectare ecoregion as critical habitat because of the presence of listed threatened and endangered species and species new to science. Critical habitat, as defined by the International Finance Corporation, is habitat required for the survival of these species. Our project area occupies 5,900 hectares within the 414,000-hectare ecoregion.

Possible effects

Golder assessed the project area's biodiversity by analysing its sensitive ecosystems and landscape connectivity (how effectively the area acts as a biological corridor).

Species were evaluated in four categories:

- flora (plants)
- fauna (animals)
- freshwater fish and their habitat
- marine animals and fish and their habitat.

The following activities could affect the critical habitat and species within it:

- clearing tropical lowland forest within the project area
- introducing non-native or invasive native species
- creating edge effects (when the outer edge of a plant community differs from the interior of the plant community)
- increasing air emissions and fugitive dust
- changing water quantity and quality
- clearing tropical lowland forest, harvesting timber, and collecting other plant species outside the project area.

The project may also affect other sensitive ecosystems (for example, hard bottom marine habitat, estuarine habitat and freshwater habitat). This is discussed in the freshwater and marine sections that follow.

The project could have the following effects on landscape connectivity:

- changing the balance of representation in the ecosystem
- changing the capacity of protected areas to support biodiversity
- reducing connectivity through loss of habitat and fragmentation.

We will manage these effects by:

- catalyzing and participating in effective regional land-use planning and management with governments and other stakeholders
- minimizing our project footprint
- progressively reforesting during operations and reforesting as much of the footprint as possible
- reforesting areas outside the project site
- establishing cooperative forest and conservation areas
- evaluating whether we can create a conservation area on the concession.

You can read more about these plans in our biodiversity action plan. See page 58 for more details.

Our biodiversity action plan includes establishing and funding a biodiversity working group and a biodiversity chair at a Panamanian university. We also expect that the rising standard of living in the project area and work of the Community Development Foundation will help protect biodiversity over the long term by transitioning local people to sustainable livelihoods. See page 24 for more details.

The project will remove about 5,900 hectares of tropical lowland forest during construction and operations, and will reforest about 2,700 hectares during closure/post-closure.

We will carry out progressive reclamation during operations, but because the reclaimed forest will take about 50 years to reach structural maturity, there will be a moderately significant negative effect on the tropical lowland forest . We will offset the permanent loss of about 2,800 hectares of tropical lowland forest inside the project footprint by reforesting 5,600 hectares outside the project area. This means that, 50 years after closure, the residual effect of our project will be reduced to negligible.

Golder predicts that our impacts will range from negligible to moderate during construction and operations for several issues, including:

- the effect of invasive species
- edge effects
- loss of plant vigour (due to air emissions and dust)
- effects on the forest along the Uvero River (due to changes in water quantity)
- increased clearing, harvesting and collection of flora resources outside the footprint (due to induced development and increased access).

As required by the International Finance Corporation, we are committed to no loss of critical habitat that is essential for the survival of a species. We will achieve this through on and offsite reforestation efforts, and by locating all high-priority species of concern in at least three widely separated designated or proposed conservation areas off-site. Since the ecoregion is dominated by tropical lowland forest similar to that of the forest in the project area, we believe that our commitment to ongoing research and field surveys, focusing on priority species of concern, will confirm that habitat supporting these species exists outside of the environmental effects area.

The mine will affect the landscape's function as a biological corridor. During construction, we expect connectivity within the north-south biological corridor of the ecoregion to be reduced by about 4 percent, and within the east-west corridor by 7 percent. During operations, we expect connectivity within the north-south biological corridor to be reduced by about 11 percent, and within the east-west corridor by about 15 percent.

At closure/post-closure, we expect the effect of the project on biological corridors to be negligible to minor because our closure plans include reforestation in areas that will promote north-south and east-west biological movements. We will test the effectiveness of the biological corridors using a regional monitoring program that tracks the movement of wide-ranging mammals (for example, the tapir and jaguar), and samples their DNA to understand gene flow among migrants.

Flora (plants)

Current state

It is important to study vegetation to identify any rare or unusual plant species, to plan for the protection of endangered species and to plan for re-vegetation at closure.

Golder carried out baseline vegetation and forest studies mostly within the tropical lowland evergreen broadleaf forest. They mapped what grows on the land, where it is found, and how well it grows. The

studies looked for the types of plants that are present, plants used by local people for food or medicine, and whether the forests have potential for commercial forestry.

Golder found four natural vegetation types and two disturbance vegetation types in the project area. In about 13 percent of the project development area, natural vegetation has already been cleared or altered for agriculture or development activities.

The disturbance vegetation included:

- low vegetation (including pasture and cropland)
- bare ground

The natural vegetation included:

- tropical lowland evergreen broadleaf forest (the most common type of vegetation in the area, at 85 percent)
- tropical lowland evergreen broadleaf alluvial forest, occasionally flooded (plus some small areas of secondary forest and mature secondary forest)
- tropical coastal vegetation
- littoral river (plants growing on or near the shore of a river; the least common type of vegetation in the area, at less than 0.1 percent)

Caribbean mangrove forest vegetation is also present in the project area, but this category was only identified in four small patches and is restricted to a very small portion of the study area (less than 0.1 percent).

Golder completed an inventory of forests in the project area by studying 1,405 inventory plots and measuring more than 25,000 trees.

They found two types of forest in the project area: disturbed and intact.

The disturbed forest areas generally had more fast growing pioneer, shade-tolerant species, and the diameter of the trees tended to be smaller than in the intact forest areas. Canopy height (the tallest layer of vegetation in an area) was similar in both areas.

There were 225 different species of trees that could be harvested for lumber or wood pulp, 61 of these with commercial or potential commercial value. There were more harvestable trees in the intact forest plots (about 126 cubic metres per hectare) than in the disturbed forest plots (85 cubic metres per hectare), but not enough to be comparable to the productivity of a commercial forest plot. We also don't plan to commercially log the site for safety and operational reasons.

Golder completed an inventory of flora in forested areas along roads, streams, trails and helicopter landing locations within the proposed project area. They carried out 102 days of field surveys throughout the year to capture seasonal flowering variations and found a high level of species diversity in a relatively small area, similar to other locations in Panamá and Central America.

During their inventory, Golder collected 1,845 plants, representing 911 different species. Sixty-four of these are new or potentially new to science.

Of the species identified, 208 fit the criteria of being species of concern, as defined by the International Union for Conservation of Nature. Flora species of concern are species that are potentially threatened, endemic (native to Panamá but not found in other places) or endangered.

We are currently surveying areas outside of the area affected by the project to document the occurrence of species of concern. If we find a species of concern in at least three protected locations (or locations that are candidates for protection) outside of the flora effects assessment area or, in rare cases, in long-term conservation facilities, such as botanical gardens, we will remove it from the species of concern list. This work ensures that the project will not result in the extinction of any flora species.

Possible effects

Clearing the forest during construction and operations will have the biggest impact on local flora.

We are committed to not clearing areas where we have identified high-priority species of concern unless we have either found them outside the project area, as described above, or have rescued samples that we will introduce to a similar habitat outside the project area.

We have also proposed to evaluate whether a conservation area within the concession where mining is not taking place is a possible option. We would collect species of concern from this area for direct planting in protected sites, or to preserve them as seeds or live plants in a nursery until we could find a suitable protected site.

During the mine's life, we will progressively reclaim the mine site, reforest offsite, and support protected areas in the region, as described in the section on biodiversity.

With successful mitigation, we expect the potential effects on flora species of concern to be negligible.

Fauna (animals)

Current state

Panamá is rich in amphibian, reptile, bird, butterfly and mammal species.

Golder's fauna studies focused on learning about what species are found in the project area, what rare or endangered species are present, how they should be protected and how they use the area at different times of the year.

They carried out six rounds of baseline surveys in the project area, surveying amphibians, reptiles, birds and butterflies, and capturing 2,688 days of photographs for the mammal surveys. The surveys identified 57 amphibian, 53 reptile, 308 bird, 186 butterfly and 19 mammal species. Of these, 7 amphibians, 9 reptiles, 56 birds and 11 mammals are nationally listed, and 12 amphibians, 8 reptiles, 15 birds and 10 mammals are species of concern.

Within the project region, 13 amphibians, 22 reptiles, 112 birds and 20 mammals are endemic and nationally listed as threatened or endangered. No butterflies are nationally listed or endemic to Panamá.

We are surveying areas outside of the area affected by the project to look for species of concern in at least three conservation areas, and will remove those we find from the species of concern list.

Possible effects

Progressive clearing of the site over time will cause a direct loss of habitat. Changes in dust or air emissions, stream flow and noise, and fencing or other obstructions that impede movement may cause an indirect loss of habitat.

Fauna may be affected by project ponds, power lines, stacks and other mine infrastructure, and may be killed or injured by vehicles. As the human population grows in the area, hunting of fauna may also increase.

We will manage these effects by:

- designing the project footprint to be as small as possible, while still allowing for successful commercial development of the resource
- designing the tailings management facility to ensure the surface area is as small as possible, and using safely engineered dams to contain tailings
- designing the road from the mine site to the coast to be as narrow as possible, while still safely accommodating project traffic
- backfilling pits with waste rock and tailings to minimize the amount of natural habitat cleared for waste storage
- cutting clearings only for pylons that will support the electric transmission line towers and suspending the power lines between the pylons above the forest
- building crossing structures that animals will use to cross under or over the Coast Road
- introducing measures to control traffic
- not allowing staff and contractors to hunt
- developing and implementing plans to control in-migration of people to the area.

Before clearing the land, we will carry out a fauna rescue and relocation program and develop a captive breeding program for species most at risk (for example, frog species new to science and so far found only in the project footprint).

We expect the project to have the following effects after we have applied our mitigation plans:

- land clearing will have a minor to moderate effect on species of concern during construction, and a minor effect during operations
- noise and other sensory disturbances will have a moderate effect on wary faunal species during construction and operations
- interactions with facilities and infrastructure will have a minor effect on amphibians and reptiles but a moderate effect on mammals and birds during construction, and a moderate effect on all species during operations
- non-native and invasive species will have a minor effect on most fauna species of concern, and a moderate effect on species of concern that are prey of, or competitors with, invasive species
- in-migration to the concession area will have a moderate effect on hunting species of concern (for example, the paca) during construction and operation.

Freshwater fish and their habitat

Current state

Golder completed baseline studies of the local freshwater fish and their habitat to find out what types of fish live in the local water, how many there are and if the lakes and streams are good for fish to live in now. Fish are a food source for people in the community, so the health of local fish is also a human health concern.

Golder's baseline studies assessed the types of fish in the water, and whether the different habitats in the lakes and streams can be used throughout the fish lifecycle (spawning, nursery, rearing, feeding and migration). They gathered information about water conditions (deep, shallow, slow, fast, smooth, turbulent), stream channel widths, water depths, types of cover for fish, and the different types of sediment in the stream beds.

The study included samples from 26 sites in the Caimito, Petaquilla and San Juan river basins

- Fish – Golder captured 1,141 fish, representing 34 species. They found no rare, threatened or endangered fish species in the area, although 29 freshwater fish species are endemic to Panamá.
- Benthic invertebrates (invertebrate organisms living at the bottom of lakes and rivers that are often major food sources for fish) – the benthic invertebrate communities sampled indicated that water quality was good to excellent at most sites.
- Periphyton (the algae, bacteria, fungi and organic matter found on surfaces at the bottoms of lakes and rivers) – periphyton results indicate that the communities within the project area are similar between basins.
- Habitat – fish habitat is generally undisturbed in the project area. Riffle (shallow with fast, turbulent water running over rock) and run (deep with fast turbulent water and little or no turbulence) are the most prevalent types of habitat found. Pool and flat habitat are relatively rare. Cobble is the dominant bed material in all streams. Smaller streams have mostly gravel and cobble while larger streams have boulder and cobble.

Different species and numbers of fish were captured during the wet and dry seasons (September and March), suggesting that some fish species in the project area have seasonal movement patterns. The macroinvertebrate community is similar in both seasons.

Possible effects

We expect the project to have a moderate impact on the quantity and quality of aquatic habitat and the abundance of fish and aquatic biota, during all project phases:

- changes in surface water flows, sedimentation and water quality could disturb or destroy existing fish habitat
- new people coming into the area could reduce the populations of some fish species through an increase in fishing, although there are no freshwater fish of local importance in the areas immediately downstream of the project area.

We will manage these effects by:

- monitoring fish and fish habitat in the three affected basins, to collect population data on fish species and information on habitat use, physical habitat characteristics, and benthic macroinvertebrates

- collecting samples of fish tissues to assess contaminant loading in selected species
- building and operating watercourse crossing according to guidelines designed to protect aquatic habitats
- dewatering and diverting watercourses in ways that do not strand fish
- wherever possible, salvaging and relocating any fish that do get stranded
- minimizing erosion and sediment loading to streams
- re-establishing natural drainages during reclamation, where possible, to return flows and aquatic habitats to their original conditions.

Marine animals and fish and their habitat

Current state

Based on historical studies and project surveys, Golder identified four marine species as species of concern in the marine port site along the Caribbean coast: sea turtles, manatees, dolphins, groupers and grunt fish species.

They assessed biophysical conditions using four field surveys. These identified eight habitats:

- sand intertidal areas and beaches
- rocky intertidal areas and headlands
- the Caimito River estuary
- shallow and hard bottom areas
- soft bottom areas with shifting sand
- soft bottom areas with stable sand and algae
- deep and hard bottom areas
- open pelagic areas (any water in the sea that is not close to the bottom).

The study area included mostly pelagic and sand bottom habitats, with few structurally complex areas.

Species are typically more diverse (and in some cases more abundant) in more complex habitats, like estuaries (areas where rivers and streams flow into the ocean and are met by tides), rocky intertidal areas, and hard bottom areas. These areas are more important for less mobile species (fish, invertebrates like sponges, and crustaceans) than they are for highly migratory species of concern, like fish, dolphins and turtles.

The marine environment next to the project area on the coast is likely a migratory corridor for a number of rare or endangered species and species of concern, including grouper, sea turtles and marine mammals like dolphins. Sand beaches in the study area have little to no nesting habitat for sea turtles and Golder did not observe any nesting activity.

Golder did not observe any sea turtles or manatees during the studies. There have been reports of sea turtles, marine mammals (dolphins and manatee), and reef fish in the area around the proposed port

development, but previous resource use along the Mosquito Coast area has affected the abundance, diversity and distribution of many of these marine species.

Possible effects

We expect the project to have a minor impact on marine animals and fish and their habitat during all project phases.

Building wharfs, shoreline protection, seawater pipelines and the diffuser for the power plant could potentially:

- destroy habitat
- destroy or disturb species of concern
- change the water quality
- cause sensory disturbance
- introduce invasive species
- increase hunting and fishing

We will manage these effects by:

- avoiding sensitive marine habitats, like hard bottom and estuarine habitats, where possible during construction
- using erosion and sediment control, spill response plans and other best practices to limit any impact on marine habitat and species of concern
- managing and controlling traffic and introducing restricted areas to prevent ships from entering sensitive habitats and the habitats of species of concern
- operating the port facilities with lighting schedules and directional lighting to avoid and limit effects to marine life
- enhancing and restoring local marine habitat to offset any negative effects
- minimizing ballast water exchange between vessels and keeping hulls in good condition to avoid introducing invasive and exotic marine species
- designing the cooling water intake structure to avoid and limit intake of marine organisms
- introducing ongoing monitoring programs to assess any impact to marine habitats and species in the project development area and near the port site
- using enhancement and restoration programs to help rebuild habitats and potentially support marine species in the area.

Cumulative effects

We looked at the impact our project could have when considered in combination with impact of three other projects and four land use activities:

Project
Petaquilla Gold Molejón Mine
Panamá Canal Expansion Project
Rural Productivity and Consolidation of the Panamá Atlantic Mesoamerican Biological Corridor Project
Land use
agriculture/ranching
artisanal and small-scale mining
hunting and gathering
Tourism

The Petaquilla Gold Molejón Mine is within 2 kilometres of the project but its footprint is relatively small (100 hectares of disturbance). While this mine has an impact on many of the same disciplines as our project, the cumulative effect does not change the level of significance already predicted for our project because of its smaller size and associated impact.

The Panamá Canal expansion project is about 100 kilometres east of the project. We predict cumulative effects between the two projects for some socio-economic factors. Most cumulative interactions are negligible except for those related to labour and working conditions, employment and economics. We expect the cumulative effect on employment to be major and positive, but a moderate negative effect resulting from competition for local labour. We expect the cumulative effects of the two projects to have a major, positive significance on the national economy.

We expect the cumulative effect of the Rural Productivity and Consolidation of the Panamá Atlantic Mesoamerican Biological Corridor Project to be positive and minor for fauna species of concern, marine natural habitats and species of concern, biodiversity, and most social disciplines.

We expect the cumulative effect of clearing additional land for agriculture and ranching to be minor, because the project will offset some of the potential deforestation through reforestation and support to conservation area programs. The cumulative effects should be minor on hydrology, flora species of concern, marine natural habitats and species of concern, biodiversity, visual aesthetics and cultural resources, minor to moderate on water quality and fauna species of concern, and moderate on freshwater fish and aquatic habitat.

We expect the cumulative effect of artisanal and small-scale mining to have a minor to moderately significant effect on water quality, and a moderate effect on freshwater fish and aquatic habitat.

We expect the cumulative effect of hunting and gathering to be of minor significance for fauna species of concern and marine natural habitats and species of concern.

Tourism, if promoted in an environmentally sustainable way, could have a positive effect on the environment. We expect the cumulative effects to be minor and positive for fauna species of concern, marine natural habitats and species of concern, and biodiversity.

Cumulative effects can be difficult to predict, and there is a low level of confidence in many of the discipline cumulative assessments. We will monitor the effects of many of the cumulative projects and land use activities throughout the life of the project.

Managing the project

Resources

Socio-economic issues and community development, health, safety and environmental protection, are all key project priorities. We will use international best practices, focusing on developing the capabilities, support mechanisms and plans necessary to administer environmental and social management programs.

Our employees and contractors will have overall responsibility for the environmental and social performance during the construction, operations, closure and post-closure phases of the project.

We are responsible for:

- developing and implementing mitigation programs to keep the impacts of the project to acceptable levels
- monitoring to ensure mitigation measures are achieving their intended results
- public consultations that support the implementation of action plans and disclose relevant information to stakeholders.

We will work together with the Government of the Republic of Panamá and third-party organizations to develop local capacity, to help upgrade skills, improve procedures and strengthen organizations, and to support community development plans.

Environmental management plan

The environmental management plan describes our management framework and the actions we will take during construction, operations, and closure/post-closure, and explains how they comply with Panamanian and international laws, regulations, international standards, Inmet standards and guidelines related to environmental and social management, including monitoring.

The plan documents how we will manage the potential environmental and social risks associated with the project, and the actions we will take if there is an emergency. It has been based on Inmet's corporate requirements for environmental management, and on the commitments we have made in the ESIA. It describes how we will monitor the assumptions we have used in ESIA and verify that mitigation goals and strategies have been implemented successfully. A system of ongoing review, feedback and evaluation will allow us to improve our strategies and goals.

The plan defines opportunities to enhance environmental protection and community development by establishing and managing conservation areas, implementing off-site reforestation, developing and implementing environmental programs, training and employment, and identifying actions to increase long-term socio-economic and environmental benefits.

The plan, and the programs and activities it contains, are living commitments that will be reviewed each year and updated (as necessary) during construction, operations and closure/post-closure. The Environmental Management Plan review mechanism is intended to continuously improve the environmental, social, health and safety performance of the project.

Citizen participation plan

We began intensive stakeholder engagement in 2007 and will continue it throughout the mine's life. The citizen participation plan is a summary of consultations we have completed to date, and a plan for ongoing consultations and stakeholder engagement. The plan includes a grievance mechanism potentially affected people can use to resolve issues that may develop.

Government and civil society at all levels have been active participants in the development of the ESIA. Consultations have been inclusive, culturally appropriate, responsive to the language preferences of affected people and communities, and sensitive to the requirements of disadvantaged or vulnerable groups.

The consultation process involves disclosing relevant project information to affected stakeholders (including individuals and communities), reviewing and discussing it, and documenting the results. As planning, construction and operations progress, we will notify people who are or potentially will be affected, using logistically and culturally appropriate means. We will consult with stakeholders to determine who should be notified, based on the particular nature of the undertaking and potential environmental effects.

Social development action plan

The social development action plan describes our immediate and future commitments to communicate, protect and potentially improve the social well-being of stakeholders. We recognize that some stakeholders will be more affected by the project than others, depending on how close they are or the kinds of interactions they experience.

The plan is designed to promote and support community development in several areas, including education and training, health and wellness, civic safety, social organization, recreation and leisure, and institutional capacity building. It includes developing an independent Community Development Foundation that will invest in development opportunities within the local communities in consultation with these communities and other key stakeholders (see page 24). Our vision is that the foundation, with a steady income stream from the project during operations, will be able to catalyze sustainable economic and community development over the mine's estimated 30-year life, and, if managed responsibly, for many years after the mine is closed.

We will work cooperatively with government authorities and communities to plan community development, and will encourage the communities to determine their own futures. Consultations held to-date have indicated that health services, education (general and environmental), agricultural productivity and water supply are key community development priorities.

Framework resettlement action plan

The framework resettlement action plan is a framework for the project's resettlement activities. The plan includes the relevant background information we will use during the resettlement process, and sets out the commitments, principles, procedures, organizational arrangements, provisions for monitoring and evaluation, framework for participation, and mechanisms for redressing grievances.

We commit to fairly and transparently managing the displacement of all people and households affected by the project using a carefully planned and implemented resettlement process. The resettlement process will be based on negotiations and participatory planning. We will include details of the approach in the final resettlement action plan, which we will disclose for stakeholder review and comment.

This process will conform to international best practices and meet or exceed all legal and regulatory requirements of the Government of Panamá. It will be transparent, culturally appropriate, and characterized by good faith negotiations with displaced people and households. In essence, the process will be designed as a sustainable development initiative for the people who are displaced, so their livelihoods, standards of living and quality of life will be measurably improved. We will also carefully consult with the Government of Panamá to ensure the resettlement process conforms to their requirements.

Occupational health and safety plan

The occupational health and safety plan documents the health and safety requirements for all employees and contractors working for the project. All employees, contractors and subcontractors must comply with this plan while working on project sites.

The protection of the health and safety of our employees, contractors and nearby residents and communities from impacts of project activities is of the highest importance. The plan provides an overview of management systems and tools to reduce the risk and impact of project activities on the human health and well-being of our employees, contractors, and residents of the surrounding communities. The Plan will comply with applicable regulatory requirements and corporate internal standards for safety, environment and community affairs, industry best practices and International Finance Corporation Performance Standards and World Bank/International Finance Corporation Environmental Health and Safety Guidelines.

Where any work presents hazards beyond the provisions of the plan, the hazard will be assessed and additional precautions or hazard control measures will be put in place and approved by authorized personnel before work begins.

Risk prevention plan

The risk prevention plan will deal with emergencies and natural disasters that could occur during construction that threaten life, the environment or property, and are beyond routine operational control. We will make all employees and contractors aware of the basics of the risk prevention plan, and will train them to take appropriate measures when there is an incident.

The plan will be based on a hazard assessment that will identify all risks at the operation that have elevated consequences, and have management plans for each. We will update the hazard assessment when there are significant changes to construction, operations or to the hazards themselves.

Contingency plan

The contingency plan describes our plans for handling an emergency or crisis at the project site, along with the actions and procedures to be followed. It will guide the management of emergency situations, provide necessary support to on-site personnel and minimize impacts on project operations, neighbouring residents, communities and the environment.

The plan includes procedures for integrating with Inmet's corporate crisis communications and management plans. We will add procedures for integrating with the power plant operator's emergency response plan before construction begins.

We will carry out emergency simulations regularly. These simulations might, in some cases, include assistance from external agencies. We will document every emergency simulation and actual emergency

situation and analyze them to continuously improve our plans and resources. We will share all experiences within the company and with external stakeholders.

Environmental action plan

Environmental action plans for the construction and operations phases will identify performance-based environmental specifications for the protection of biophysical values in the project area.

The construction phase plan will help our contractors carry out their work within the project ESIA, the environmental management plan, corporate policies, Inmet's Safety, Environmental and Community Affairs Standards, regulatory requirements, international guidelines, and best management practices and protocols.

The operations phase plan will document the environmental mitigation and protection measures and standards we will use during operations, including standards for tailings management.

Biodiversity action plan

We are developing a biodiversity action plan that describes the commitments and actions we will take to conserve and enhance the biodiversity value of the Mesoamerican Biological Corridor in the project area, and to ensure no net loss of natural habitat over time.

We will identify detailed objectives with specific outcomes, rank them, discuss them with relevant stakeholders, and ensure they are realistic and time-bound. We will measure and report on our efforts at specific locations or as part of specific business activities (for example, impacts of supply chains). Company-level measures will include more process-oriented targets, like the delivery of strategic policy commitments (for example, training programs for staff).

Environmental education plan

The environmental education plan is designed to help us raise environmental awareness, and to encourage the development of sustainable communities and stewardship of the natural environment in the project area. We will use presentations, videos and pamphlets to communicate the plan to people in the project area and nationally, and with our employees.

The plan will support environmental education of the local population to promote the conservation and forest management initiatives listed in the biodiversity action plan. It will encourage conservation attitudes and responsible environmental management and mining. Specific objectives include working with project stakeholders to identify the environmental problems affecting their lives and livelihoods, and what they can do to conserve their natural resources for their future well-being.

Flora and fauna rescue and relocation plans

Rescue and relocation, particularly of fauna, is often difficult, and thorough planning is required. We have developed experience and expertise in the rescue of flora and fauna through installing approved drill platforms, and we have incorporated this knowledge into the flora and fauna rescue and relocation plans that we will use as we clear the forest for the project facilities.

We are continuing to investigate and characterize the habitats of high-priority species of concern to determine how these species should be protected, harvested, rescued or otherwise dealt with to ensure a viable population is assured or is capable of being bred and/or transplanted. We will refine and update the plans as we learn more information.

Closure plan

The closure plan describes the actions we will take as mine reserves are exhausted and project facilities are decommissioned. The plan also discusses post-closure treatment (for example, for water releases, if necessary), maintenance and monitoring measures. Mine closure and subsequent re-vegetation generally will happen during operations as components and areas of the mine are exhausted. Reclamation of the site will meet Panamanian environmental regulations and those of the International Finance Corporation Environmental, Health and Safety Guidelines for Mining.