Workshop on Producing Environmental Codes of Practice for the Mining Industry
Georgetown, Guyana

Summary Report

NRCan (CANMET) – GENCAPD Mining Project

Our File M-6763 (603430)
October 2003

SNC·LAVALIN
Environment

Member of the SNC·LAVALIN Group

Workshop on Producing Environmental Codes of Practice for the Mining Industry
Georgetown, Guyana

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SNC-LAVALIN
Environment Inc.
455 René-Lévesque Blvd. W.
Montréal (Québec) Canada
H2Z 1Z3

Telephone:
(514) 393-1000
Telecopier:
(514) 393-9540

SNC·LAVALIN
Environment

October 10th, 2003

Mr. Richard Couture
Project Technical Director - GENCAPD
Natural Resources Canada - CANMET
555, Booth Street
Room 339B
Ottawa (Ontario)
K1A 0G1

SUBJECT: Summary report
Workshop on producing Codes of Practice
PWGSC contract No. 23440-021003
Our file M-6763 (603430)

Sir:

Please find enclosed three (3) copies of the Summary Report regarding the Workshop on Producing Codes of Practice for the Mining Industry of Guyana, held in Georgetown, Guyana on September 30, 2003.

Should you have further questions or comments please do not hesitate in communicating with the undersigned.

Yours truly,

SNC-LAVALIN Environment inc.

Marc Arpin, M.Sc., P.Geo.
Project Director

MA/lj

Encl.

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1.1 General

On September 30, 2003, the GENCAPD Mining Project held a Multi-Stakeholder Workshop at Hotel Tower in Georgetown, Guyana on Producing Environmental Codes of Practice for the Mining Industry in Guyana.

1.2 GENCAPD Mining Project and context of the workshop

The Canada Centre for Mineral and Energy Technology (CANMET) of Natural Resources Canada has been selected by the Canadian International Development Agency (CIDA) to execute the Guyana Environmental Capacity Development Mining Project (GENCAPD). The project's main partner in Guyana is the Guyana Geology and Mines Commission (GGMC). The objective is to modernize Guyana's environmental protection standards in the mining sector.

Guyana has extensive alluvial gold deposits and artisanal gold mining contributes significantly to its economic development. In the near future, GGMC is seeking to regularize mining activities and to ensure that environmental concerns are integrated within, and become central in mining operations. In support of the industry, Environmental Codes of Practice have to be issued so that miners can extract precious metals and stones in an environment-friendly way. While the first Codes will be written by SNC-LAVALIN Environment Inc (SLEI) and validated by the stakeholders, future Codes of Practice applying to the mining sector shall be produced by GGMC.

1.3 Purpose of Workshop

The purpose of the Workshop was to provide GENCAPD's main stakeholders, that is GGMC, the Guyana Environmental Protection Agency (EPA) and Guyana Gold and Diamonds Miners Association (GGDMA) with an appropriate methodology on producing Environmental Codes of Practice. The main objective of the Workshop was to ensure that all participants understood the basic concepts that make up the framework of a Code of Practice. The agenda for the Workshop is provided in Appendix A.

1.4 Methodology

In order to achieve its objective, the Workshop has been designed to be interactive and participative. Examples of existing Codes were provided followed by practical exercises carried out in small groups. The participants were led to draft a simple but complete (with all the major elements) Code of Practice for the use of mercury. Mercury was taken as a tangible example since most of the attendance was familiar with health and environmental problems related to its use in the mining industry.

1.5 Participants

A total of 35 people, representing GGMC, EPA, GGDMA, University of Guyana and the World Wildlife Fund attended the Workshop. The attendees are listed in Appendix B.

2. WORKSHOP

2.1 Opening remarks

Mr. Ayalew Legesse, Project Manager for GENCAPD, welcomed the attendants and presented the facilitator, Mr. Marc Arpin. He was followed by Mr. Robeson Benn, Commissioner of GGMC, who, prior to inaugurating the Workshop, said a few words on the environmental context in which mining is taking place in Guyana emphasizing the importance of actually implementing in the field the Codes of Practice that will be produced.

2.2 Activities

Workshop activities started slightly before 09:30 and concluded at 16:30. Speaker's remarks and guidance alternated with 30-60 minutes small-group practical exercises. Once an exercise was completed, a spokesperson designated by each individual group would report to the main group about the work performed and the conclusions arrived at in their respective team.

For more details about the content of the exercises, please refer to Appendix C which contains the detailed methodology for producing Codes of Practice employed during the workshop.

Photo 2-1
Work in small group

Photo 2-2
Presentation by spokesperson

This report has been prepared par Marc Arpin, M.Sc., P.Geo., project manager, and reviewed by Benoit Demers, M.Sc.A., Eng., Director, Mining and Environment.

GEOCON
Division of SNC-LAVALIN Environment Inc.

Marc Arpin, M.Sc., P.Geo.
Project Manager

Verified for conformity
with ISO 9001 by : _____

Benoît Demers, M.A.Sc., Eng.
Director
Mining and Environment

MA/lj

Distribution:

3 copies – GENCAPD
1 copy – SLEI

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APPENDIX A

Workshop agenda

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AGENDA
WORKSHOP ON PRODUCING ENVIRONMENTAL CODES OF PRACTICE FOR THE MINING INDUSTRY OF GUYANA

September 30, Location: Hotel Tower, Georgetown

Facilitator: Mr. Marc Arpin, M.Sc., P.Geo.

08:00-08:30	Registration
08:30-09:00	Word of welcome and opening remarks (Mr. Ayalew Legesse, GENCAPD and Mr. Robeson Benn, Commissioner of GGMC
09:00-09:30	General definitions and framework of a Code of Practice
09:30-10:30	Exercise 1 on the preamble of the mercury Code
10:30-10:50	Coffee break
10:50-11:15	Mission and objectives of a Code of Practice
11:15-12:15	Exercise 2 on mission and objectives of the mercury Code
12:15-13:15	Lunch break
13:15-13:45	Scope, commitments and standards of practice
13:45-14:45	Exercise 3 on the standards of practice for mercury in mining
14:45-15:00	Coffee break
15:00-15:30	Impacts-based approach to implementation of the Code
15:30-16:30	Exercise 4 on mitigation measures
16:30-17:00	Discussion on mitigation measures followed by closing remarks
17:00	End of workshop

APPENDIX B

List of participants

WORKSHOP ON PRODUCING CODES OF PRACTICE
FOR THE MINING INDUSTRY
Hotel Tower, Georgetown, Guyana
September 30, 2003

No	Mr/Ms	NAME	INSTITUTION	POSITION HELD
1	Mr.	Marc Arpin	SNC-Lavalin Environment	Project Manager
2	Mr.	Ayalew Legesse	GENCPAD	Field Manager
3	Mr.	Mohan Persaud	GGMC	Mines Officer
4	Mr.	Renwick Solomon	GGMC	Technician
5	Mr.	Lloyd Stephen	GNENCAPD/GGMC	Env. Officer
6	Mr.	Peter Hudson	GGMC	Mining Engineer
7	Ms.	Anna Iles	CIDA	Program Officer
8	Mr.	Ryan Smith	GGMC	Env. Technician
9	Mr.	Wendell Alleyne	GGMC	OHS Officer
10	Mr.	Linton Butters	GGMC	Snr. Mines Officer
11	Mr.	Jack Morgan	GGMC	Chief Mines Officer
12	Mr.	Robeson Benn	GGMC	Commissioner
13	Mr.	Sydney Edwards	GGMC	Senior Mining Engineer II
14	Ms.	Rosemary Benjamin	GGMC	Legal Adviser
15	Mr.	Diane McDonald	GGMC	Mines Manager (a.g)
16	Mr.	Trevor Hurry	GGMC	Mines Technician
17	Mr.	Paul Atkinson	E.P.A	Environmental Officer
18	Mr.	Edward Shields	GGDMA	Executive Secretary
19	Mr.	Alexander Ramsaywack	E.P.A	Environmental Officer
20	Ms.	Simone Osbourne	E.P.A	Environmental Officer
21	Mr.	Renwick English	E.P.A	Environmental Officer
22	Mr.	Ronald Cummerbatch	E.P.A	Environmental Officer
23	Ms.	Priya Rampersaud	E.P.A	Environmental Officer
24	Mr.	Khalid Alladin	E.P.A	Environmental Officer
25	Mr.	Michael Abrahim	GGMC	Geological Technician
26	Mr.	Ronald Glasow	GGMC	Mining Engineer
27	Mr.	Joel Wladron	University of Guyana	Student
28	Ms.	Jewel Kiddel	University of Guyana	Head of Department
29	Ms.	Karen Livan	GGMC	Manager, Env. Division
30	Mr.	Evan Persaud	University of Guyana	Lecturer
31	Mr.	Calvin Bernard	University of Guyana	Lecturer I
32	Mr.	Patrick Williams	World Wildlife Fund	Programme Officer
33	Mr.	Scot Stadun	World Wildlife Fund	I T Specialist
34	Ms.	Elise Florendo	E.P.A	Acting Director
35	Mr.	Kerion Husbands	GGMC	Env. Technician

APPENDIX C

Workshop notes and methodology for producing Codes of Practice

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WORKSHOP ON PRODUCING ENVIRONMENTAL CODES OF PRACTICE FOR THE MINING INDUSTRY OF GUYANA

By:

Marc Arpin, M.Sc, P.Geo.
SNC-LAVALIN Environment Inc.

Hotel Tower, Georgetown, Guyana
September 30, 2003

SNC·LAVALIN Environment

GENCAPD MINING

WORKSHOP ON PRODUCING ENVIRONMENTAL CODES OF PRACTICE FOR THE MINING INDUSTRY OF GUYANA

INTRODUCTION

The Guyana Geology and Mines Commission (GGMC) is required, by Mining Environmental Regulations, to publish Environmental Codes of Practice. To fulfill this objective, the Guyana Environmental Capacity Development project (GENCAPD) has mandated SNC-LAVALIN Environment Inc. (SLEI) to provide GGMC with training and technical assistance, and to facilitate the Code production process.

This workshop represents the first step toward producing Codes of Practice for Guyana's small-scale and medium-scale mining operations. We believe that this training in the drafting of Codes of Practice will prove to be very useful for approval of the draft codes to be provided by SLEI, and for the production of other codes for future needs by GGMC.

METHODOLOGY

A wide range of Codes of Practice exist throughout the world, but few are written expressly for the mining industry, and virtually none for small-scale mining operations. Since their structure and content can vary considerably, there are many possible approaches to developing a Code of Practice. The one chosen by SLEI is designed to familiarize GGMC professionals with the basic concepts upon which codes in general are built – concepts that are intended to comprise the framework or skeleton of any code whatsoever. Examples taken from various Codes of Practice or Best Practice Manuals from a number of mining countries will be provided.

Once the skeleton is defined, the more difficult part of fleshing it out remains. An impacts-based approach is proposed to overcome that difficulty.

The workshop is intended to be as interactive and practical as possible. Because of the limited time available (one day), the facilitator's remarks will be kept to a minimum so that most of the time can be spent working in small groups. To make the workshop more practical and realistic, the participants will be asked to produce the fundamentals of a Code of Practice for mercury. This topic has been selected because:

- mercury is an issue that is familiar to all the participants;
- much work has already been done in Guyana to produce a mercury Code.

GENERAL DEFINITIONS

A Code of Practice is a collection of rules and ethical principles related to a specific field of activity, describing the procedures and setting forth standards considered to be Best Practices in said field of activity. The code may be either voluntary or mandatory.

Best Practice is about preventing or (when this is not possible) minimizing risks to human health, as well as adverse environmental, social and economic impacts. In other words, it is "*the best way of doing things*".

Sustainable Development (SD) is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Best Practice is in direct line with the concept of SD and one of the ways to achieve it.

Guidelines are a non-abiding document, generally designed to provide the user with information, explanations, guidance and help on a specific topic. It is a commonly used tool in enforcing a new regulation. The user can be the Regulator himself or the industry.

Regulation is a type of "delegated legislation" promulgated by a state, federal or local administrative agency given authority to do so by the appropriate legislature. Regulations generally are very specific in nature, they are also referred to as "rules" or simply "administrative law". Regulations are official rules and must be followed.

FRAMEWORK OF A CODE OF PRACTICE

While it may have many different structures, a Code of Practice usually includes the following main elements:

1. Preamble or foreword
2. Glossary of terms
3. Mission and objectives
4. Scope
5. Commitments and Standards of Practice
6. Code implementation
7. References

1. Preamble or foreword

The purpose of this section is to introduce the context in which the Code has been prepared. It basically explains the factors that motivated or led to the production of the Code. Such factors can be extremely varied. For instance, in the case of an environmental Code of Practice, the following are good examples of events that may have had an influence:

- adoption of a new regulation;
- an increase in public awareness following a major spill;
- results of a risk assessment classifying this activity as "high risk";
- a desire to establish industry-wide standards.

Of relevance here might be which institutions were involved in producing the Code and the methodology used (roundtables, workshops, special committees, etc).

Exercise 1
Topic: Write the preamble of Guyana's Code of Practice for the use of mercury in mining.
Duration: 60 minutes
Organization: Participants are divided into two sub-groups. Each group will draft its own preamble. Both preambles will be read and briefly discussed back in the main group.

2. Glossary of terms

The most commonly used terms must be defined to ensure that all users have the same understanding of the Code. The glossary should always include the expression "Best Practice" since it makes up the foundation of any Code.

3. Mission and objectives of the Code

Codes of Practice are not prepared just for the fun of it! Codes are written to achieve a goal or to correct or improve a situation. What is the ultimate purpose of the Code? The answer to that question will feed into the statement of the Code's Mission.

The importance of this step in the overall Code drafting process cannot be overemphasized. Given a clear vision and understanding at the outset of what the Code is to accomplish, the various sections of the Code – i.e., how we achieve that goal - will be straightforward. Following is an example of a Code Mission Statement, taken from the *Cyanide Management Code* :

★ **Example 1 (Cyanide Management Code)**

> ***"To assist the global gold mining industry in improving cyanide management, thereby minimizing risks to workers, communities and the environment from the use of cyanide in gold mining, and reducing community concerns about its use"***

The Code's objectives describe the main lines of action it intends to follow in order to fulfill its mission. They should, in all cases, be very general and serve as

a declaration of good intentions. The example that follows is abstracted from the Cyanide Code objectives:

★ **Example 2 (Cyanide Management Code)**

- ***To protect workers, communities and the environment from cyanide;***
- ***To control, manage and improve the management of cyanide;***
- ***To be used by large and small gold mining companies and to serve as a form of assurance for interested parties including regulators, financiers, and non-governmental organizations;***
- ***To be applicable internationally, in both developed and developing countries;***
- ***To be credible and verifiable;***
- ***To be dynamic over time.***

Exercise 2
Topic: Agreeing on the mission and objectives of a Code of Practice for mercury
Duration: 60 minutes
Organization: Participants are divided into two sub-groups. Each group will define the mission and objectives of the Code. The missions and objectives will then be discussed briefly back in the main group.

4. Scope

The activities that the Code will and *will not* address must be determined at the outset. For example, a Code of Practice for blasting operations in mining may focus on transportation, handling and storage of explosives without addressing potential related environmental issues. On the other hand, one may choose to include all issues, ranging from occupational health and safety (OH&S) concerns to environmental and social impacts. Ideally, a Code of Practice should encompass all the relevant issues, although they often do not, for the sake of simplicity.

This section is also intended to clarify how the Code interfaces with national or local regulations. A Code of Practice is always subordinate to the laws and regulations of the applicable jurisdiction. It may be more stringent or complementary, but will never weaken or supersede any otherwise applicable regulatory requirements. When a code is national by nature, it is important to specify how it is associated with relevant regulations. The Codes to be produced in Guyana in cooperation with GENCAPD are in compliance with Article 250 of Guyana's Mining Environmental Regulations which calls for GGMC to publish an Environmental Code of Practice within 12 months of promulgation of the regulations.

5. Commitments and standards of practice

Any concrete action undertaken in the field must rely on Commitments made by the Code's users to achieve its objectives (see above).
Those Commitments must be based upon the following Best Practice Principles:

1) Ecologically sustainable development;
2) Intra- and inter-generational equity;
3) Accountability and compliance with international human rights and environmental standards and principles;
4) The Precautionary principle:

   > *Where threats of serious or irreversible damage exist, lack of definitive scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.*

5) Well-informed and trained staffs;
6) Effective and transparent communication;
7) Flexibility;
8) Continual improvement.

Principles 7 (Flexibility) and 8 (Continual improvement) recognize that Best Practices are not fixed in space and time. A Best Practice technique at one mine may not be suitable at a similar mine elsewhere. Examples include variations in sensitivity of the surrounding environment and different risk factors with respect to higher rainfall or earthquakes.[1] On the other hand, a technique chosen during mine planning may, years later, be found to offer less security against environmental harm than a recently-developed technology. Monitoring may indicate that the desired level of protection is not being achieved and that improved techniques or management methods need to be introduced to ensure the standard of protection expected by stakeholders.[2]

Commitments are in turn complied with through a number of Standards of Practice that consist of performance goals and objectives. The following are excerpts, taken as examples, from the Mining Association of Canada's (MAC) Guide to the Management of Tailings Facilities. For the sake of simplicity, not all the principles and standards of practice that appear in the guide are included:

★ **Example 3 (MAC's Guide to the Management of Tailings Facilities)**

1. Site selection and design of a tailings facility:

Principle: Select a site and design a tailings facility in accordance with sound engineering practice, in compliance with company standards, the MAC Environmental Policy, the MAC tailings management framework, permits, legislative requirements and commitments to stakeholders.

Standards of practice:

a) Develop site selection and design criteria.

b) Establish a process for site selection, evaluation and risk assessment of design option.

c) Establish an appropriate process of external stakeholder consultation for site selection and design.

d) Select an appropriate site, including conceptual risk assessment.

e) Obtain approvals for the site selection and design.

2. Construction of a tailings facility

Principle: Construct the tailings facility as per design and in a safe and environmentally acceptable manner, in compliance with company standards, the MAC Environmental Policy, the MAC tailings management framework, permits, legislative requirements and commitments to stakeholders.

[1] See Environment Australia (2002): Best Practice Environmental Management in Mining.
[2] Idem.

Standards of practice:

a) Establish criteria and procedures that ensure tailings facility construction will be in conformance with design and will meet legal requirements.

b) Prepare detailed plans for construction of the tailings facility.

c) Obtain approvals and permits.

d) Construct the tailings facility in conformance with design and plans

3. Operation of a tailings facility

Principle: Operate the tailings impoundment facility in a manner such that all structures are stable, all solids and water are managed within the area designated in the design, and in compliance with company standards, the MAC Environmental Policy, the MAC tailings management framework, legislative requirements and commitments to stakeholder.

Standards of practice:

a) Develop plans to operate in conformance with design and to meet legal requirements.

b) Review design documents, as-built construction drawings, conceptual operating and closure plans environmental assessment and commitments to stakeholders.

c) Prepare, review and update on a regular basis detailed plans for operation of the tailings facility.

d) Conduct comprehensive risk assessment.

e) Obtain approvals and permits.

f) Operate the tailings facility in conformance with the design specifications, plans and legal requirements.

g) Establish preventive maintenance schedule and reporting system.

h) Verify emergency preparedness plan requirements.

4. Decommissioning and closing a tailings facility

Principle: Decommission and close the tailings facility in such a manner that all remaining dams and associated structures are safe and stable. All solids and water will be managed within the area designated in the closure plan, and in compliance with company standards, the MAC Environmental Policy, the MAC tailings management framework, legislative requirements and commitments to stakeholders.

Standards of practice:

a) Close the tailings facility in conformance with design and to meet legal requirements.

b) Prepare detailed plans for implementation of closure.

c) Obtain all permits, licences and approvals required.

d) Establish responsibility for long-term care and maintenance

e) Ensure that final land-use issues are determined.

f) Ensure that inherent dangers and hazards are identified and mitigation measures developed.

g) Decommission and close the tailings facility as per detailed closure design and plans.

Exercise 3
Topic: Defining standards of practice for mercury in mining
Duration: 60 minutes
Organization: The facilitator will provide five principles. Participants will then be divided into small, four-person groups. Each of these small groups will be given one (1) principle to work on. The groups will be required to draft standards of practice for the principle that was assigned to them.
Principles to work on: **1- Storage and handling of mercury** Principle: Protect workers, their families and the environment during mercury handling and storage. **2- Amalgamation of gold particles** Principle: Protect workers, their families and the environment from mercury while ensuring a fair recovery of gold through sound and efficient amalgamation practices. **3- Disposal of amalgamation tailings** Principle: Protect communities and the environment from mercury through development and implementation of proper amalgamation tailings disposal techniques **4- Burning of amalgam to recover gold** Principle: Protect workers, their families and the environment through the use of proper gold-mercury separation technology **5- Burning of residual mercury to refine gold (in gold shops)** Principle: Protect workers, the community and the environment from mercury through the application of sound mercury vapor abatement technology. **N.B.** Most principles should begin with verbs like “Implement”, “Prepare”, “Introduce”, “Establish”, “Ensure”, “Develop” (see Example 3).

6. Code implementation

The purpose of this section of a Code is to describe in detail how the Standards of Practice will actually be implemented. This is where we get to the heart of the matter.

The Best Practice principles set out above must guide the authors in the choice of activities and topics that the implementation guidelines will be made of. Over the past three years (2000-2003), the Sustainable Development (SD) approach has become increasingly present in the mining community. As applied to the mining industry, the concept of SD itself has evolved enormously to include not only sound

relationships with the community during the operating years of a mine (i.e., the so-called *intra*-generational equity), but also how the life of that same community can be positively affected beyond the mine's life expectancy (the so-called *inter*-generational equity). Sustainable Development is therefore embodied in the Best Practice principles and must be reflected in any Code of Practice. This means that social and community issues should be addressed. The mining cycle no longer ends with decommissioning of the mine and reclamation of the mine site.

7. References

These include all publications and sources (personal communications, web pages, etc) from which information has been derived in preparing the Code.

AN IMPACTS-BASED APPROACH TO IMPLEMENTATION

Let's repeat here the definition of Best Practice given above:

Best Practice is about preventing or (when this is not possible) minimizing risks to human health as well as adverse environmental, social and economic impacts. In other words, it is **"the best way of doing things".**

In terms of risks to human health, as mentioned previously (see Scope above), OH&S considerations may be included in the Code of Practice. In some cases, such as the Mercury Code of Practice, it is relevant to do so given the serious health problems brought about by the improper use of amalgamation. In other circumstances, OH&S may not be deemed necessary in the Code.

Since Best Practice is about avoiding or minimizing environmental, social and economic impacts, we must know what these impacts will be in order to adopt the appropriate practices. Therefore, the first step toward producing a Code of Practice is to identify the impacts the specific field of action (e.g., mercury amalgamation, tailings management, effluent management, etc) has on the surroundings. Once this is done, writing the implementation section of the Code becomes quite straightforward as it consists basically of how we will avoid or mitigate these impacts. Let's take the case of mercury amalgamation.

★ **Example 4 (Environmental and social Impacts of the use of mercury for gold amalgamation)**

The environmental and social impacts of using mercury are the result of a number of major activities or steps upon which the Code will focus in determining Best Practices. For mercury amalgamation, these activities include:

- Storage and handling of mercury;
- Amalgamation of gold particles;

- Disposal of amalgamation tailings;
- Burning of amalgam to recover gold;
- Burning of residual mercury to refine gold (in gold shops).

Each of these steps have environmental and social impacts as summarized in Table 1.

Table 1
Environmental and social impacts of using mercury for gold amalgamation in mining

Environmental component	Source of impact activity	Impact description	Mitigation measures	Remarks
Physical setting				
Air quality	▪ Burning amalgam to recover gold. ▪ Burning residual mercury in gold shops	Mercury is volatilized into the atmosphere	▪ Distil mercury using a retort. ▪ Use fume hoods fitted with mercury scrubbers	
Streams and lakes (quality)	▪ Improper storage or handling of mercury. ▪ Open-circuit amalgamation ▪ Discharging amalgamation tailings into streams	Dispersal of liquid mercury (Hg^0) into waterways results in mercury methylation. (See biological setting).	***To be completed as part of Exercise 4***	
Groundwater quality	▪ Improper storage or handling of mercury ▪ Open-circuit amalgamation ▪ Improper storage of amalgamation tailings	Contamination of groundwater by liquid mercury	***To be completed as part of Exercise 4***	
Sediments of the receiving stream	▪ Open-circuit amalgamation ▪ Discharging amalgamation tailings into streams ▪ Improper storage of amalgamation tailings	Metallic mercury (Hg^0) accumulates in sediment. Mercury methylation. (See Biological setting)	***To be completed as part of Exercise 4***	
Soils	▪ Improper storage or handling of mercury ▪ Open-circuit amalgamation ▪ Improper storage of amalgamation tailings	Contamination of soils by metal mercury (Hg^0). Methylation of mercury (see Biological setting).	***To be completed as part of Exercise 4***	

Table 1
Environmental and social impacts of using mercury for gold amalgamation in mining

Environmental component	Source of impact activity	Impact description	Mitigation measures	Remarks
Wetlands	▪ Open-circuit amalgamation ▪ Improper storage of amalgamation tailings ▪ Discharging amalgamation tailings into streams	Wetlands contamination by mercury (wetlands are very sensitive to pollutants)	***To be completed as part of Exercise 4***	
▪ **Biological setting**				
Terrestrial and riparian vegetation	▪ Improper storage of amalgamation tailings ▪ Discharging amalgamation tailings into streams	Vegetation adversely affected by the presence of mercury in soils.	***To be completed as part of Exercise 4***	
Icthyofauna	▪ Open-circuit amalgamation ▪ Improper storage of amalgamation tailings ▪ Discharging amalgamation tailings into streams	Metal mercury Hg^0 in water and sediments is transformed into methylmercury through bacterial action. Methylmercury is bioaccumulated and biomagnified in the food chain. Carnivorous fishes will show higher concentrations.	***To be completed as part of Exercise 4***	
Wildlife	▪ Open-circuit amalgamation ▪ Improper storage of amalgamation tailings ▪ Discharging amalgamation tailings into streams	Wildlife reliant on fish as a primary food source may be susceptible to build-up of dangerous levels of methylmercury. *(See Icthyofauna above)*	***To be completed as part of Exercise 4***	

Table 1
Environmental and social impacts of using mercury for gold amalgamation in mining

Environmental component	Source of impact activity	Impact description	Mitigation measures	Remarks
Human setting				
Land use (agriculture)	▪ Improper storage and handling of mercury ▪ Open-circuit amalgamation ▪ Improper storage of amalgamation tailings ▪ Discharging amalgamation tailings into streams	▪ Potential loss of agriculture lands due to contamination ▪ Plants like potatoes, carrots, aquatic plants and mushrooms can absorb mercury	***To be completed as part of Exercise 4***	
Quality of life of local population	▪ Burning amalgam at home to recover gold ▪ Burning residual mercury in Gold shops ▪ Improper storage and handling of mercury ▪ Open-circuit amalgamation ▪ Improper storage of amalgamation tailings ▪ Discharging amalgamation tailings into streams	▪ Mercury-related diseases in population. ▪ Hg contamination ▪ Contaminated fishes leading to a change in food habits.	***To be completed as part of Exercise 4***	

Mitigation measures have been omitted on purpose. Participants will decide what these measures will be in the following exercise.

Exercise 4
Topic: Identifying mitigation measures related to environmental and social impacts of the use of mercury for gold amalgamation.
Duration: 60 minutes
Organization: Participants are divided into small, four-person groups. Each group will be given two (2) impacts and will be required to develop the appropriate mitigation measures.

REFERENCES

Guyana Forestry Commission (2002)	Code of Practice for Timber Harvesting
Environment Australia (2002)	Best Practice - Environmental Management in Mining. Commonwealth of Australia, August 2002
GENCAPD Mining (2000)	Summary report. Workshop on Mercury Use in the Mining Industry in Guyana. May 17, 2000.
Government of Guyana (2002)	REGULATIONS made under the MINING ACT (no. 20 of 1989)
International Cyanide Management Institute (2002)	International Cyanide Management Code for the Manufacture, Transport and Use of Cyanide in the Production of Gold. Web site: www.cyanidecode.org
Mining, Minerals and Sustainable Development (2002).	Breaking New Ground The Report of the Mining and Sustainable Development Project. May 2002
The Mining Association of Canada (1998)	A guide to the Management of Tailings Facilities.
Veiga, M. (1997)	Introducing New Technologies for Abatement of Global Mercury Pollution in Latin America. UNIDO, UBC , CETEM
Wotruba, H., Hentschel,T., Hruschka,F. and Priester, M. (1998)	Manejo Ambiental en la Pequeña Minería. La Paz, Bolivia

N.B. Numerous Codes of Practice, not shown here and unrelated to mining, were consulted in preparing this course.

About the facilitator

Marc Arpin holds a B.Sc. and a M.Sc in geology from University of Montreal, Canada, where he graduated in 1981. After a one-year traineeship in the oil industry of Mexico, he returned to Canada where he started working as mine geologist in the Canadian mining industry. From 1985 to 1998, Mr. Arpin held different positions in important gold, base-metals and asbestos underground and open-pit mining operations owned by major mining companies such as Barrick Gold Corporation and Noranda.

In 1998, he moved to Bolivia where he was assigned as field manager of the CIDA-financed REFORMIN project (Bolivia Mining and Environment Reform project). In Bolivia, he worked closely with small-scale, cooperative and artisanal tin and gold miners, setting up training and technical assistance programs specifically designed for them. During his South-American assignment, Mr. Arpin lectured in Bolivia, Peru, Colombia and Canada on issues such as Mine Reclamation, Sustainable Development and Small-Scale and Artisanal Mining.

He returned to Canada in 2002 where he joined SNC-LAVALIN Environment's Mining and Environment Department. He is involved in Mine Reclamation and Institutional Strengthening projects in Africa and South America as Project Manager and Sustainable Development specialist.

Mr. Arpin is presently completing a Masters in Environmental Management at University of Sherbrooke, Canada.

APPENDIX D

Power Point presentation

Workshop on producing environmental Codes of Practice for the Mining Industry of Guyana

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Marc Arpin, M.Sc., P. Geo.

Georgetown, Sept. 30, 2003

Introduction

GGMC is required by mining regulations to publish Environmental Codes of Practice. These Codes of Practice will be prepared by SNC-Lavalin with GGMC's input.

This shortcourse is intended to provide GGMC with an approach on conceptualizing and producing Codes of Practice for future needs.

Methodology

1- Definition and description of the basic concepts a Code of Practice is built upon :

THE FRAMEWORK

2- An impacts-based approach to defining the content (how the Code will be implemented)

3- Work in small groups

4- As an exercise, the participants will produce a simple mercury Code of Practice

Basic definitions

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What is a Code of Practice ?

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Code of Practice:

A collection of rules and ethical principles, related to a specific field of activity describing the procedures and setting forth standards considered to be Best Practice in the said field of activity.

In large-scale mining, Codes of Practice are usually designed by and for the industry

What is a Best Practice ?

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Best Practice:

« The best way of doing things »

Best practice is about preventing or minimizing risks to human health as well as adverse environmental, social and economic impacts.

Best Practice *(cont'd)*

The Best Practice Principles:

- Ecologically sustainable development
- Intra- and inter-generational equity
- Accountability and compliance with international human rights and environmental standards and principles
- The Precautionary Principle
- Well informed and trained staffs
- Effective communication and openness
- Flexibility
- Continual improvement

Sustainable Development:

Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Best Practice is one of the principal ways of achieving Sustainable Development…

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What is the difference between an environmental Code of Practice and environmental Guidelines ?

Guidelines:

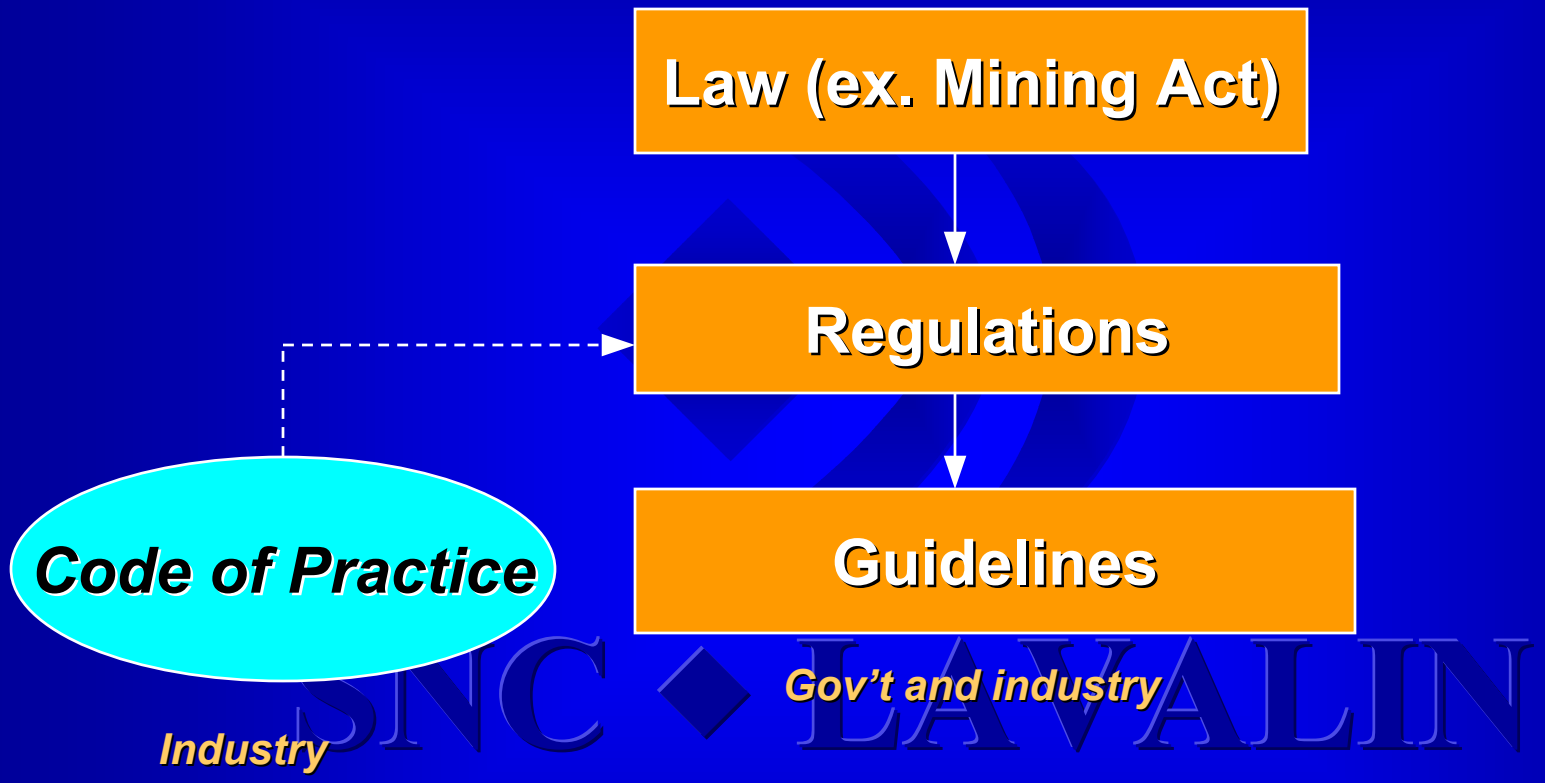
Non-abiding document, generally designed to provide the user with information, explanations, guidance and help on a specific topic. It is a commonly used tool in enforcing a new regulation. The user can be the Regulator himself or the industry.

Regulation:

A type of "delegated legislation" promulgated by a state, federal or local administrative agency given authority to do so by the appropriate legislature. Regulations generally are very specific in nature, they are also referred to as "rules" or simply "administrative law ".

Regulations are official rules and must be followed.

To summarize:



Framework of a Code of Practice

1. Preamble or foreword
2. Glossary of terms
3. Mission and objectives
4. Scope
5. Commitments and standards of practice
6. Code implementation
7. References

Preamble or foreword

Purpose:

To introduce the context in which the Code has been prepared, to explain the factors that motivated or led to the production of that Code.

1. Preamble or foreword *(cont'd)*

Events that may lead to the drafting of a Code of Practice:

- **adoption of a new regulation;**
- **an increase in public awareness following a major spill;**
- **risk assessment classifying this activity as « high risk »;**
- **a desire to set industry-wide standards.**

Exercise 1

Write the preamble of Guyana's Code of Practice for the use of mercury in mining.

2. Glossary of terms

Purpose:

To ensure that all users have the same understanding of the Code. The most common terms utilized must be defined

3. Mission and objectives

Mission:

The mission is the « ultimate » purpose of a Code of Practice. What the Code is to accomplish.

★ Example 1

Statement of the Cyanide Management Code's mission

« To assist the global gold mining industry in improving cyanide management, thereby minimizing risks to workers, communities and the environment from the use of cyanide in gold mining, and reducing community concerns about its use »

3. Mission and objectives

Objectives:

The Code's objectives describe the main lines of action it intends to follow in order to fulfill its mission. They should, in all cases, be very general and serve as a declaration of good intentions

★ Example 2

Statement of the Cyanide Management Code's objectives

- *To protect workers, communities and the environment from cyanide;*
- *To control, manage and improve the management of cyanide;*
- *To be used by large and small gold mining companies and to serve as a form of assurance for interested parties including regulators, financiers, and NGO's;*
- *To be applicable internationally, in both developed and developing countries;*

★ Example 2 *(cont'd)*

Statement of the Cyanide Management Code's objectives

- ***To be credible and verifiable;***
- ***To be dynamic over time.***

Exercise 2

Reach an agreement on the mission and the objectives of a Code of Practice for mercury.

4. Scope

Purpose:

a. To decide the activities the Code will address and those it ***will not address***
b. To clarify how the Code is interacting with national and local regulations.

5. Commitments and Standards of Practice

The Commitments made by the Code's users to achieve its objectives

The Commitments are complied with through a number of Standards of Practice that consist of performance goals and objectives

5. Commitments and Standards of Practice *(cont'd)*

The Commitments are based on the Best Practice Principles:

- Ecologically sustainable development
- Intra- and inter-generational equity
- Accountability and compliance with international human rights and environmental standards and principles
- The Precautionary Principle
- Well informed and trained staffs
- Effective communication and openness
- Flexibility
- Continual improvement

Best Practice is not fixed in space or time. A Best Practice technique at one mine may not be suitable at a similar mine elsewhere.

On the other hand, a technique chosen during mine planning may be replaced by a better one some years later.

Example 3

MAC's guide to the management of Tailings Facilities

1. **Site selection and design of a tailings facility**

   Principle:

   Select a site and design a tailings facility in accordance with sound engineering practice, in compliance with company standards, the MAC Environmental Policy, the MAC tailings management framework, permits, legislative requirements and commitments to stakeholders.

Example 3

MAC's guide to the management of Tailings Facilities *(cont'd)*

1. **Site selection and design of a tailings facility *(cont'd)***

   Standards of practice:

a. ***Develop site selection and design criteria***

b. ***Establish a process for site selection, evaluation and risk assessment***

c. ***Establish an appropriate process of external stakeholder consultation for site selection and design***

d. ***Etc.***

Example 3

MAC's guide to the management of Tailings Facilities *(cont'd)*

2. **Construction of a tailings facility**

   Principle:

   Construct the tailings facility as per design and in safe and environmentally acceptable manner, in compliance with company standards, the MAC Environmental Policy, the MAC tailings management framework, permits, legislative requirements and commitments to stakeholders.

Example 3

MAC's guide to the management of Tailings Facilities *(cont'd)*

2. Construction of a tailings facility *(cont'd)*

   Standards of practice:

a. *Establish criteria and procedures that ensure tailings facility construction will be in conformance with design and will meet legal requirements*

b. *Prepare detailed plans for construction of the tailings facility*

c. *Obtain approval and permits*

d. *Construct the tailings facility in conformance with design and plans*

Example 3

MAC's guide to the management of Tailings Facilities *(cont'd)*

3. **Operation of a tailings facility**

Principle:

Operate the tailings impoundment facility in a manner such that all structures are stable, all solids and water are managed within the area designated in the design, and in compliance with company standards, the MAC Environmental Policy, the MAC tailings management framework, legislative requirements and commitments to stakeholders.

Example 3

MAC's guide to the management of Tailings Facilities *(cont'd)*

3. **Operation of a tailings facility *(cont'd)***

Standards of practice:

a) Develop plans to operate in conformance with design and to meet legal requirements

b) Review design documents, as-built construction drawings, conceptual operating and closure plans environmental assesment and commitments to stakeholders

c) Operate the tailings facility in conformance with the design specifications, plans and legal requirements.

Example 3

MAC's guide to the management of Tailings Facilities *(cont'd)*

4. **Decommissioning and closing of a tailings facility**

   Principle:

   Decommission and close the tailings facility in such a manner that all remaining dams and associated structures are safe and stable. All solids and water will be managed withinb the area designated in the closure plan and in compliance with company standards, the MAC Environmental policy, the MAC tailings management framework, legislative requirements and commitments to stakeholders.

★ Example 3

MAC's guide to the management of Tailings Facilities *(cont'd)*

4. **Decommissioning and closing of a tailings facility *(cont'd)***

Standards of practice:

a) Close the tailings facility in conformance with design and to meet legal requirements

b) Prepare detailed plans for implementation of closure

c) Obtain all permits, licences and approval required

d) Establish responsibility for long-term care and maintenance

e) Decommission and close the tailings facility as per detailed closure design and plan

Exercise 3

Defining standards of practice for mercury in mining

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6. Code implementation

Purpose:

To describe in detail how the Standards of Practice will actually be implemented.

6. Code implementation *(cont'd)*

The Best Practice principles set out above must guide the authors (GGMC) in the choice of activities and topics that will make up the Implementation section of the Code.

Don't forget that Sustainable Development is embodied in the Best Practice Principles !!!

The Best Practice Principles

- Ecologically sustainable development
- Intra- and inter-generational equity
- Accountability and compliance with international human rights and environmental standards and principles
- The Precautionary Principle
- Well informed and trained staffs
- Effective communication and openness
- Flexibility
- Continual improvement

7. References

All publications and sources (personal communications, web pages, etc) from which information has been derived in preparing the Code

An impacts-based approach to implementation

Since Best Practice is about avoiding or minimizing environmental, social and economic impacts, we must know what these impacts will be in order to adopt the appropriate practices.

Therefore, the first step toward implementing a Code of Practice is to identify the impacts the specific field of action has on the surroundings

An impacts-based approach to implementation *(cont'd)*

Writing the implementation section of the Code consists basically of how we will avoid or mitigate these impacts.

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Example 4

Environmental and social impacts of the use of mercury for gold amalgamation

The environmental and social impacts of using mercury are the result of a number of major activities or steps upon which the Code will focus in determining Best Practices. For mercury amalgamation these activities include:

Example 4

Environmental and social impacts of the use of mercury for gold amalgamation *(cont'd)*

a. Storage and handling of mercury
b. Amalgamation of gold particles
c. Disposal of amalgamation tailings
d. Burning of amalgam to recover gold
e. Burning of residual mercury to refine gold (in gold shops)

Exercise 4

Identifying mitigation measures related to environmental and social impacts of the use of mercury for gold amalgamation