

A Guide to the Management of Tailings Facilities

Second Edition, 2011



The Mining Association | L'association minière
of Canada | du Canada

A Guide to the Management of Tailings Facilities



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of Canada | du Canada**

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Foreword

It is with pleasure that I present, on behalf of the members of The Mining Association of Canada (MAC), this updated edition of *A Guide to the Management of Tailings Facilities*. The *Guide* is the result of collaboration by members of a team of Canadian industry practitioners and experts that make up the MAC Tailings Working Group (TWG). We owe a debt of gratitude to the team members who have brought tremendous skill, dedication and enthusiasm to the task of building consensus in the treatment of such important and complex subject matter.

We also acknowledge the efforts of many companies and individuals that have worked so hard to implement these recommendations for effective tailings facility management. This document builds both on more than a decade's worth of experience gained in implementing the tailings management framework and on the comments and suggestions received from practitioners throughout the industry.

Since publishing the first edition of the *Guide* in 1998, MAC has embarked on the Towards Sustainable Mining (TSM) initiative. In keeping with MAC's commitment to sustainable development, this *Guide* encourages mining companies to practise safe and environmentally responsible management of tailings facilities. Tailings management is integral to TSM, and I am pleased to note that the updated management framework in this *Guide* forms the basis of the tailings management performance indicators under TSM.

The *Guide* has been designed to meet the needs of the mining industry and present a management system approach. I trust that the industry and others will find it a useful contribution to improving performance in this important area.

Pierre Gratton
President & CEO
The Mining Association of Canada

Preface to the first edition (September 1998)

In June 1996, The Mining Association of Canada (MAC) Board of Directors established a task force to promote the safe and environmentally responsible management of tailings and mine rock.

The task force determined that engineering capability exists and generally is applied throughout the Canadian mining industry in the safe design, construction, operation and closure of tailings facilities. The key to managing tailings is consistent application of that engineering capability within an effective management framework through the full life cycle.

To promote the exchange of information and best practices, the task force arranged two workshops, one on management of tailings and mine rock (December 1996) and another on tailings risk assessment (May 1997). These workshops and related consultations identified the need for a guide to tailings management.

A Guide to the Management of Tailings Facilities was developed through a collaborative effort by representatives of the Canadian mining industry, through MAC, to provide guidance on good practices for the safe and environmentally responsible management of tailings facilities. Its purpose is threefold: to provide information on safe and environmentally responsible management of tailings facilities; to help companies develop tailings management systems that include environmental and safety criteria; and to improve the consistency of application of sound engineering and management principles to tailings facilities.

The *Guide* reflects sound management practices already in place. It adopts principles and approaches from sources that include mining company manuals, proceedings of the two workshops, the MAC Environmental Policy and Environmental Management Framework, the ISO 14000 Essentials, Canadian Dam Association (CDA) draft Dam Safety Guidelines (September 1997), and international guidelines and standards.

Update 2011

Since the first edition of the *Guide* was published in 1998, the tailings management framework has been applied at mining operations across Canada and around the world. During this time, the MAC Tailings Working Group has also developed two companion guides:

- ***Developing an Operation, Maintenance and Surveillance Manual for Tailings and Water Management Facilities (2003)***
- ***A Guide to Audit and Assessment of Tailings Facility Management (2011)***

Preface

This updated *Guide* reflects information and experience gained throughout the course of developing the companion guides and working with tailings management systems around the world. Together, the three MAC guides provide a strong and consistent message to tailings facility owners, operators and contractors: the key to safe and environmentally responsible management of tailings is the consistent application of sound engineering capability within an effective management framework and through the full life cycle of a facility.

The mining industry is cyclical; it can change rapidly from periods of unprecedented boom in activity and high commodity prices to periods of downturn with limited economic development, falling prices and shrinking demand. Both situations present different challenges to the industry to secure and maintain seasoned expertise to design and manage tailings. It is hoped that this updated *Guide* will indeed help maintain focus on sound tailings management through the implementation of effective tailings management systems.

Since 1998, MAC has also embarked upon the Towards Sustainable Mining (TSM) initiative, the Guiding Principles of which are appended to this Guide. The updated management framework presented in the Guide is consistent with the principles of TSM and forms the basis of the tailings management performance indicators under TSM.

As with the first edition of the *Guide*, this updated version was prepared through a collaborative effort by members of the MAC Tailings Working Group. It incorporates comments and suggestions received since the publication of the first edition, and it also benefits from experience gained through application of the recommended tailings management framework at mines around the world.

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Tailings facilities are site-specific complex systems that have unique environmental and physical characteristics. They pose a significant business risk that must be effectively managed for the long term. The mining industry has the technology and resources to safely site, design, construct, operate, decommission and close tailings facilities, but there remains a need to continually improve their management in a consistent, safe and environmentally responsible manner through the full life cycle.

One way to do this is to establish a comprehensive tailings management system, one that integrates technical and managerial aspects, and one that individual companies may adapt and implement under often widely ranging conditions. With this approach, the industry can self-regulate, demonstrate due diligence, complement government legislation and regulations, and protect the environment and the public. Perhaps more importantly, such an approach will help companies to integrate environmental and safety considerations in a manner that is consistent with continual improvement in their tailings operations.

A Guide to the Management of Tailings Facilities provides a basis for the development of customized tailings management systems that address the specific needs of individual mining companies and local regulatory and community requirements. The *Guide* includes:

- a framework for tailings management; and
- sample checklists for implementing the framework through the life cycle of a tailings facility.

The framework offers a foundation for managing tailings in a safe and environmentally responsible manner through the full life cycle of a tailings facility from site selection and design, through construction and operation, to eventual decommissioning and closure.

The tailings management framework is expanded into sample checklists that address the various stages of the life cycle. These checklists provide a basis for developing customized management systems, operating procedures and manuals, exposing gaps within existing procedures, identifying training requirements, communicating with Communities of Interest, obtaining permits, conducting internal audits, and aiding compliance and due diligence, at any stage of the life cycle.

The *Guide* complements MAC's *Towards Sustainable Mining Guiding Principles*, which are appended. It is designed to help companies manage their tailings responsibly and safely and to be able to demonstrate this practice to regulators and the public. As well, it will help companies implement due diligence.

► A **tailings facility** includes the collective structures, components and equipment pertaining to tailings impoundment and management, including dams and reservoirs, other related facilities and appurtenances.

Introduction

► *Communities of Interest (COI) include all of the individuals and groups who have or believe they have an interest in the management of decisions about our operations that may affect them. This includes employees, contractors, Aboriginal or indigenous peoples, mining community members, suppliers, customers, environmental organizations, governments, the financial community and shareholders.*

The *Guide* is not a technical manual; technical guidance may be found in other publications. Nor does the *Guide* replace professional expertise or regulatory requirements. Mining companies should obtain professional and/or expert advice to be sure that each company's specific needs are addressed. Mining companies and tailings facility owners and operators are encouraged to adapt and extend the principles contained in this *Guide* to meet their own site, operational and community requirements, incorporating appropriate site-specific performance measures.

This chapter presents the key elements of a framework to manage tailings facilities in a safe and environmentally responsible manner. It is the foundation for a management system, which can then be built on by completing the management action checklists in subsequent chapters that address tailings management through the full life cycle. The essentials of this framework are illustrated in Figure 1.

Policy and Commitment

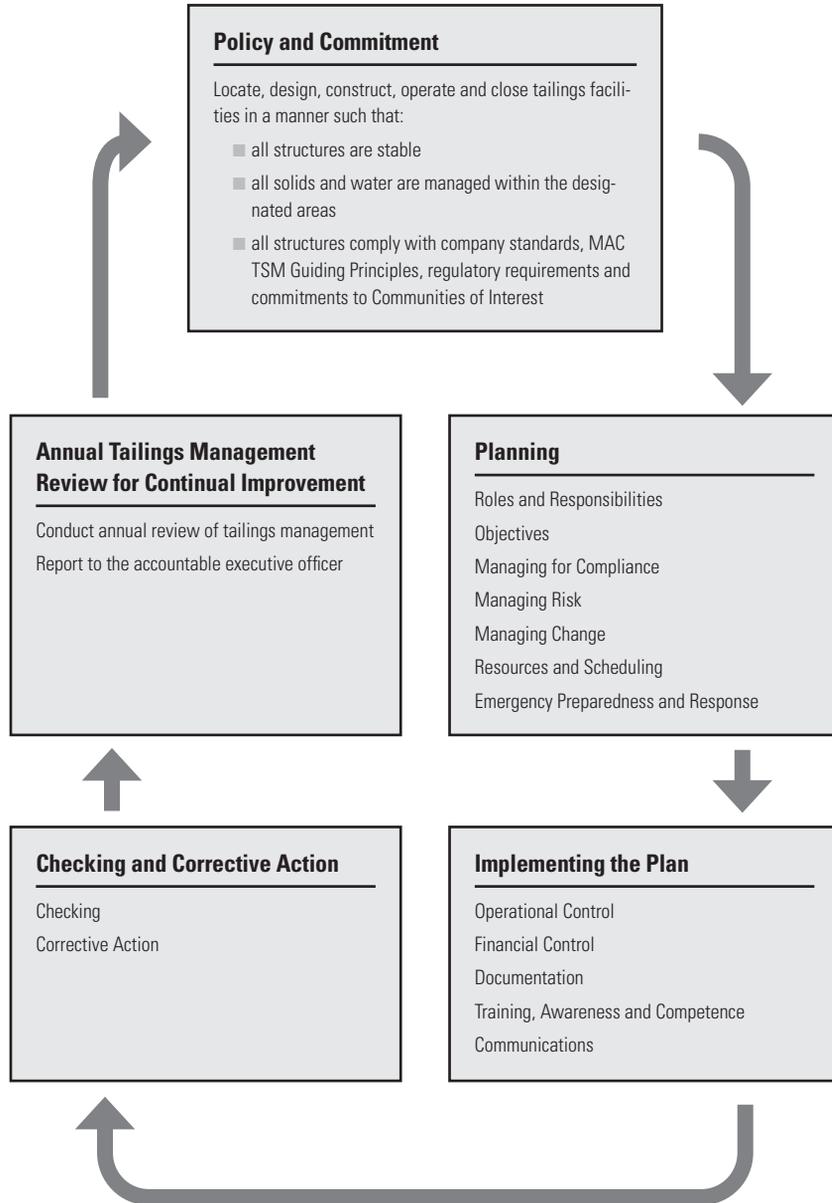
Establish tailings management policies that include commitments to:

- implement the principles outlined in this framework;
- locate, design, construct, operate, decommission and close tailings facilities in a manner such that:
 - all structures are stable;
 - all solids and water are managed within designated areas; and
 - all aspects of tailings management comply with regulatory requirements and conform with sound engineering practice, company standards, the MAC TSM Guiding Principles, this tailings management framework and commitments to Communities of Interest;
- take responsibility for implementing this framework through the actions of its employees;
- consult with Communities of Interest, taking into account their considerations relating to the tailings facility management; and
- establish an ongoing program of review and continual improvement to manage health, safety and environmental risks associated with tailings facilities.

Policy and Commitment

► *The requirement for a tailings management policy can be met within an overarching company operations, environmental or sustainable development policy if that policy contains specific reference to tailings management and includes the policies and commitments as outlined here.*

Figure 1: Elements of the Tailings Management Framework



Planning

Roles and Responsibilities

Assign overall accountability for tailings management to an executive officer of the company (CEO or COO), with responsibility for putting in place an appropriate management structure and for providing assurance to the corporation and its Communities of Interest that tailings facilities are managed responsibly.

Assign responsibility and budgetary authority for tailings management.

Define the personnel roles, responsibilities and reporting relationships, supported by job descriptions and organizational charts, to implement the tailings management framework through all stages in the facility life cycle.

Objectives

Plan to manage tailings through the full life cycle in conformance with regulatory requirements, company standards, this framework, commitments to Communities of Interest, and sound engineering and environmental practices.

Plan for eventual closure, including:

- protection of public health and safety;
- mitigation of negative environmental impacts; and
- acceptable post-closure use within a feasible technical and economic framework.

Identify and assess significant environmental, health and safety aspects and their associated risks.

Prepare and document tailings facility plans, including descriptions of:

- objectives and performance measures;
- permits and approvals;
- communication procedures among the team and with management and Communities of Interest;
- site selection and characterization criteria;
- safety, environmental and engineering design criteria;
- construction, operating, decommissioning and closure procedures;
- requirements for documentation, including as-built records;
- maintenance, surveillance, inspection, reporting and review requirements; and
- knowledge and skills (awareness, training and competence) requirements.

Incorporate Communities of Interest considerations in tailings facility planning.

Planning

Roles and
Responsibilities

Objectives

► *It is expected that the executive officer will delegate responsibility for tailings management, budgetary issues and other tailings-related functions to operations and other senior corporate personnel while retaining overall accountability for tailings management performance.*

Planning

Managing for Compliance

Managing Risk

Managing Change

Resources and Scheduling

Emergency Preparedness and Response

► **Risk** denotes a potential negative impact, detrimental to operations, the environment, public health or safety, that may arise from some present process or future event. In evaluating risk, both the potential severity or consequence of the impact and its probability of occurrence are considered.

► A **failure** is not necessarily failure of the whole facility; it can include malfunction of system components or processes.

► **Resource requirements include:**

- staffing
- skills development
- budget/financial
- technology
- contractors
- equipment

Managing for Compliance

Ensure that:

- applicable legislation, regulations, permits and commitments are identified, documented and understood;
- actions needed to ensure compliance are understood; and
- processes and procedures to ensure measurement and compliance have been established, documented and communicated to all facility employees.

Establish procedures for reporting compliance and non-compliance.

Managing Risk

Conduct risk assessment, define acceptable risk in the context of the facility, and identify and evaluate possible triggers and failure modes.

Plan for risk management to:

- minimize the likelihood of adverse safety or environmental impacts; and
- detect and respond to potential failures at the facility.

Prepare contingency plans as well as emergency preparedness and response plans.

Managing Change

Prepare and document procedures to ensure that the integrity of both the management system and the approved facility designs and plans is maintained by:

- managing changes in personnel, roles and responsibilities;
- managing changes, including temporary changes, made to approved designs and plans; and
- responding to changes in regulatory requirements.

Resources and Scheduling

For effective and efficient implementation of the tailings management system, including eventual decommissioning and closure, identify and secure:

- adequate human and financial resources; and
- a schedule.

Emergency Preparedness and Response

Develop and maintain emergency preparedness and response plans to identify possible accident or emergency situations, to respond to emergency situations and to prevent and mitigate on- and off-site environmental and safety impacts associated with emergency situations.

Establish procedures for periodic review, testing and distribution of the emergency preparedness and response plans within the organization and to potentially affected external parties.

Typical site selection and materials characterization

a) Tailings and dam construction materials

Tailings—daily/annual throughput and total quantity, mineralogy, size distribution, percentage of solids, density of solids, specific gravity, plasticity, compressibility, liquid phase chemistry, sulphide oxidation and/or metal leaching potential

Mill operation parameters related to tailings—reagents used, water re-circulation, mill treatment processes (e.g., cyanide destruction), miscellaneous inflows to tailings basin, pipes and appurtenances, open pit and/or underground backfilling

Ore, mine rock and other construction materials—reserves, mineralogy, chemical properties, physical and engineering properties (e.g., strength, gradation, slaking potential), acid-generating potential, leachable contaminants, availability of construction materials

b) Environmental and scientific data and studies

Climate—temperature, wind, precipitation, evaporation, air quality, climate change

Water—hydrology, watershed delineation and flow patterns, stream flow, runoff, floods, lake bathymetry, hydrogeology characteristics, and water and sediment quality

Land forms—including muskeg, peat or talus slopes

Unique geographic considerations—such as permafrost and ice

Existing infrastructure—including roads, buildings, open pits and waste dumps

Geology and geochemistry—surficial deposits (type, location, density, permeability, soils characterization), stratigraphy, geomorphology, seismicity, mineral resources, background elemental content

Topography—regional and detailed topography

Natural hazards—landslides, debris flows, avalanches, seismic events, frost

Ecosystem identification

Planning

Emergency Preparedness and Response

► *The tailings facility emergency preparedness and response plan must be integrated with the overall company and site emergency preparedness and response plan.*

Implementing the Plan

Operational Control

Financial Control

Documentation

Terrestrial survey—flora, natural pastures, fauna, endangered and threatened species, migratory species

Aquatic survey—benthos, macro-invertebrates, fish, aquatic plants, endangered and threatened species

Socio-economic—historical background, demographics, regional economy (e.g., health, education, culture)

Implementing the Plan**Operational Control**

Assemble a qualified team and assign responsibilities for implementation of the tailings facility.

Select a site, design, construct, operate, decommission and close tailings facilities in compliance with regulatory requirements and in conformance with the approved plans, appropriate engineering and environmental practices, risk management, the MAC TSM Guiding Principles, commitments to Communities of Interest and this tailings management framework.

Identify, evaluate the impact of, and document changes made to approved designs, plans and procedures.

Routinely inspect, monitor, test, record, evaluate and report on key characteristics of the tailings facility, including compliance with requirements and commitments.

Implement and periodically test contingency plans and emergency preparedness and response plans.

Financial Control

Establish a budget and financial controls, obtain budget approval, and track capital and operating costs against the budget.

Documentation

Prepare, maintain, periodically review and revise the documents required to design, construct, operate, decommission and close a tailings facility.

Maintain current versions of all documents at designated, readily accessible locations.

Promptly remove from use and archive obsolete versions of documents.

Typical tailings facility studies and plans

- Site selection
- Environmental impact assessment
- Facility design
- Deposition plan
- Water balance and management plan
- Water quality plan
- Decommissioning, reclamation and closure plan
- Quality control plan
- Risk assessment and management plan, including contingency plans
- Operation, maintenance and surveillance manual
- Emergency preparedness and response plans
- Construction and as-built drawings
- Inspection and monitoring records and analysis

Additional guidance on these studies and plans may be found in MAC's *Developing an Operation, Maintenance and Surveillance Manual for Tailings and Water Management Facilities* and other technical references.

Training, Awareness and Competence

Employ qualified personnel.

Provide appropriate training to all personnel, including contractors and suppliers, whose work may significantly affect the tailings facility. Maintain records of all training.

Implementing the Plan

Documentation

Training, Awareness and Competence

Implementing the Plan

Training, Awareness and
Competence

Communications

**Checking and
Corrective Action**

Checking

Typical tailings management aspects to be covered in training

- Tailings facility management plans, permits, approvals and commitments
- Individual roles, responsibilities and reporting relationships
- The importance of conformance to design, operational controls, financial controls and change management procedures
- Potential risks and environmental impacts
- Risk management
- Emergency preparedness and response

Communications

Implement documented procedures for communications among tailings and related personnel and with management and Communities of Interest.

Checking and Corrective Action**Checking**

In addition to routine monitoring and inspections, conduct periodic inspections and reviews of the tailings facility to:

- evaluate operating and financial performance, compliance with regulatory requirements, and conformance with plans and commitments;
- revisit the facility design, construction, operation and decommissioning and closure plans;
- re-evaluate downstream risks (which may change during the life of the facility);
- update the risk assessment; and
- evaluate need for changes or updates to risk management plans, contingency plans and emergency preparedness and response plans.

Conduct periodic audit and assessment of the entire tailings management system.

Identify items requiring corrective action.

Document and promptly report to the designated responsible official, observations and recommendations arising from inspections, reviews, audits and assessments.

Corrective Action

Develop and implement action plans to address items that require corrective action as identified during inspections, reviews, audits or assessments.

Document completion of corrective actions.

Annual Tailings Management Review for Continual Improvement

Conduct an annual review of tailings management to:

- evaluate the performance of the tailings management system, considering inspection, audit and assessment reports, changing circumstances, monitoring results, spills and other incidents, recommendations, and the commitment to continual improvement;
- evaluate the continuing adequacy of, and need for changes to, policies and objectives for, performance of, and financial resources allocated to the tailings management system; and
- address the need for changes to commitments to Communities of Interest.

Report the observations and conclusions of the annual review of tailings management to the accountable executive officer.

Checking and Corrective Action

Corrective Action

Annual Tailings Management Review for Continual Improvement

► *The annual review of tailings management is reported to the accountable executive officer to ensure that the corporation is satisfied that the tailings management system is effective and continues to meet the needs of the organization.*

The annual review of tailings management goes beyond technical performance to address all aspects of the management of the tailings facility.

Managing through the Life Cycle of a Tailings Facility

Mining companies face the challenge of effectively and efficiently managing tailings facilities through a life cycle from initial site selection and design, through construction and operation, to eventual decommissioning and closure, as illustrated schematically in Figure 2.

The tailings management framework presented in the preceding chapter provides the essential elements for managing through the life cycle of a tailings facility. There is an ongoing need for planning the work to be done on the facility, for implementing activities, for checking and for reviewing the management. Figure 3, on the following page, illustrates the integration of the tailings management framework with the life cycle of a tailings facility. (It is recognized that some activities, such as construction, extend beyond the specific life cycle stage.)

Figure 2: Stages in the Life Cycle of a Tailings Facility

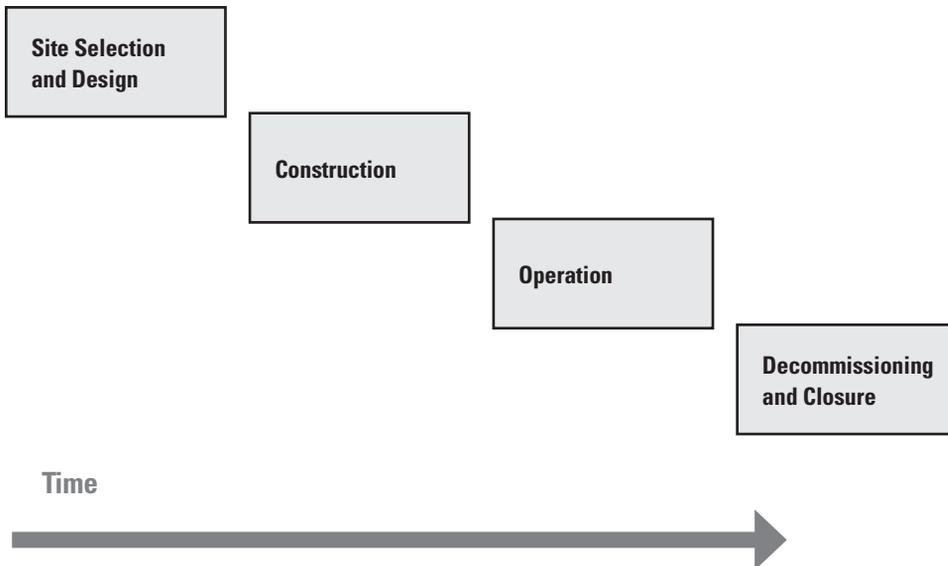
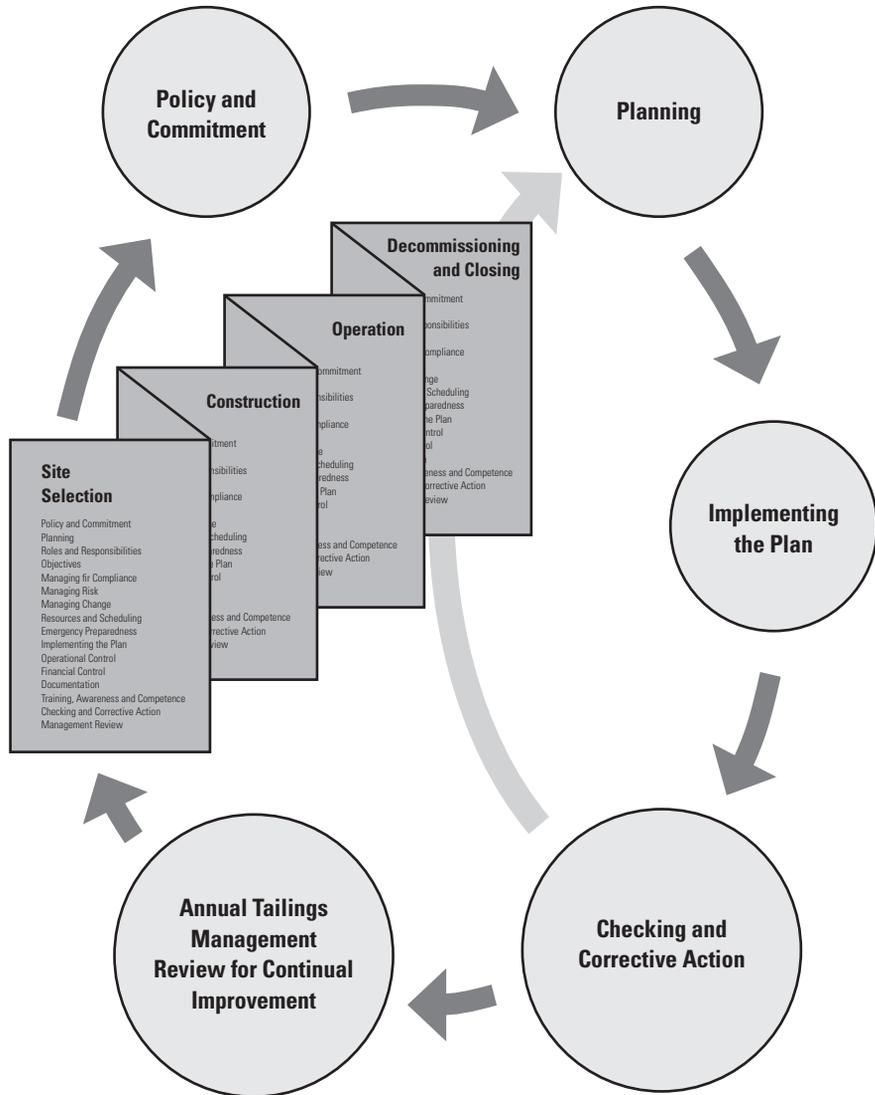


Figure 3: Application of the Tailings Management Framework through the Life Cycle



Managing through the Life Cycle of a Tailings Facility

At each stage in the tailings facility life cycle, implementation of the management framework requires that actions be planned within the context of policies and commitments, implemented in accordance with plans, checked and corrected, and subjected to management review.

Different people will typically take the lead in the management of a tailings facility at different stages of the life cycle:

- site selection and design are usually managed by headquarters-based project development teams;
- facility construction up to the commissioning of a facility is usually managed on-site by a mine project development and construction management team;
- facility operations and continuing construction through the operating life are usually managed by site operators; and
- a specific project team often takes the lead in preparing for decommissioning and closure.

Implementing the Tailings Management Framework

The tailings management framework has been designed for application through the full life cycle of a tailings facility, beginning at any stage. Companies are encouraged to implement the framework at the earliest opportunity.

Implementing the tailings management framework requires the following:

- confirming and/or customizing the relevant **management actions** as derived from the tailings management framework;
- assigning **responsibility** and authority for the management actions to individuals within the organization;
- determining relevant site-specific **performance measures** as indicators of progress on management actions and objectives, quantified where practicable, to enable tracking of progress;
- identifying a **schedule** to provide a time frame for completing significant milestones for a management action, which may include specific delivery dates or times, and/or frequency of ongoing or periodic activities such as monitoring and reviews, and providing a clear timeline for key actions; and
- adding **references**, including technical, managerial and regulatory information relevant to the management action and to the site.

The framework is intended to be customized to suit the requirements of specific sites, company policies and local regulatory and community requirements. It can be implemented through the use of checklists that address the various life cycle stages. These sample checklists are provided following the Glossary:

- Checklist for Site Selection and Design of a Tailings Facility;
- Checklist for Construction of a Tailings Facility;
- Checklist for Operating a Tailings Facility; and
- Checklist for Decommissioning and Closing a Tailings Facility.

These checklists provide a basis for developing customized, site-specific tailings management systems. Completing the checklists can help identify gaps and/or deficiencies in tailings management.

When fully implemented at a particular site, a management system based on this framework will encourage continual improvement in the safe and environmentally responsible management of tailings facilities.

► *Site-specific performance measures to be implemented require identifying both a target to be achieved and indicating progress towards that achievement.*

► *Additional guidance for implementing the principles of the tailings management framework through the operating, decommissioning and closing stages of the life cycle are provided in MAC's companion guide: **Developing an Operation, Maintenance and Surveillance Manual for Tailings and Water Management Facilities.***

Glossary

Acceptable risk The level of risk deemed acceptable to the corporate management taking into account government standards and guidelines, corporate policy and business factors.

Accident An unplanned event that causes injury, loss or damage to people, equipment, property or the environment.

As-built drawings Engineering drawings portraying the facility, or components of the facility, as constructed that document actual locations of the components and changes from the original engineering drawings implemented during construction of a facility.

Communities of Interest (COI) All of the individuals and groups who have or believe they have an interest in the management of decisions about operations that may affect them. This includes employees, contractors, Aboriginal or indigenous peoples, mining community members, suppliers, customers, environmental organizations, governments, the financial community and shareholders.

Continual improvement The culture of continual aligned small improvements and standardization, with the overarching aim of compound overall performance improvement.

Emergency A situation that poses an immediate risk to health, life, property, the environment or the integrity of a tailings facility and that requires urgent intervention to prevent a worsening of the situation.

Life cycle The succession of phases, from initial site selection, design and construction, through operations, to decommissioning and closure of a tailings facility, each involving discrete professional disciplines and requiring applied skills, tools and processes.

Risk A potential negative impact, detrimental to operations, a facility, the environment, public health or safety, that may arise from some present process or future event. When evaluating risk, both the potential severity and the consequence of the impact and its probability of occurrence are considered.

Tailings Material remaining after valuable minerals have been extracted from mined ore and that are typically stored or impounded in a managed tailings facility or placed as engineered fill. *See also: Tailings facility*

Tailings facility The collective structures, components and equipment pertaining to tailings impoundment and management including, but not limited to, dams and reservoirs, pipelines, spillways, drains, chutes, gates, intake towers, decant structures, tunnels, canals, low-level outlets, water treatment, control and release facilities, monitoring and surveillance installations, mechanical and electrical controls, power supply, and other appurtenances.

Checklist for Site Selection and Design of a Tailings Facility

6

Management Action	Responsibility	Performance Measure	Schedule	References
1 POLICY AND COMMITMENT				
Select a site and design a tailings facility in compliance with regulatory requirements and in conformance with sound engineering practice, company standards, the MAC TSM Guiding Principles, the MAC tailings management framework, and commitments to Communities of Interest				
Ensure that the tailings management framework is implemented through the actions of all employees working at the facility				
Consult with Communities of Interest, taking into account their considerations relating to the tailings facility site selection and design				
Establish an ongoing program of review and continual improvement to manage health, safety and environmental risks associated with tailings facilities				
2 PLANNING				
2.1 ROLES AND RESPONSIBILITIES				
Assign overall accountability for tailings management to an executive officer of the company (CEO or COO), with responsibility for putting in place an appropriate management structure and for providing assurance to the corporation and its Communities of Interest that tailings facilities are managed responsibly				
Assign responsibility and budget authority for tailings management				
Define the roles, responsibilities and reporting relationships for the site selection and design team, supported by job descriptions and organization charts				
2.2 OBJECTIVES				
Develop criteria and procedures to ensure that tailings facility site selection and design will:				
<ul style="list-style-type: none"> ■ meet regulatory requirements, company policies and standards, sound engineering and environmental practices, and commitments to Communities of Interest 				

6

Checklist for Site Selection and Design of a Tailings Facility

Management Action	Responsibility	Performance Measure	Schedule	References
<ul style="list-style-type: none"> ■ facilitate eventual decommissioning and closure, including: 				
<ul style="list-style-type: none"> ■ protection of public health and safety 				
<ul style="list-style-type: none"> ■ mitigation of negative environmental impacts 				
<ul style="list-style-type: none"> ■ acceptable post-closure use within a feasible technical and economic framework 				
<ul style="list-style-type: none"> ■ incorporate risk assessment and risk management, including contingency plans and emergency preparedness and response plans 				
<ul style="list-style-type: none"> ■ provide continued protection of the environment and public health and safety 				
<ul style="list-style-type: none"> ■ enable the specified performance to be achieved 				
Define the interaction and communication procedures among the design team and with management and Communities of Interest				
Identify requirements for documentation				
Identify knowledge and skills (awareness, training and competence) requirements				
Plan for site selection and design; establish a process of evaluation, including:				
<ul style="list-style-type: none"> ■ identification of significant environmental, health and safety aspects and their associated risks 				
<ul style="list-style-type: none"> ■ standards for collection and interpretation of environmental, scientific and engineering data 				
<ul style="list-style-type: none"> ■ environmental assessment 				
2.3 MANAGING FOR COMPLIANCE				
Compile and maintain a log of all applicable legislation, regulations, permits and commitments				
Ensure that the applicable legislation, regulations, permits and commitments are understood				
Ensure that the actions needed to ensure compliance are understood				

Checklist for Site Selection and Design of a Tailings Facility

6

Management Action	Responsibility	Performance Measure	Schedule	References
Establish and document processes and procedures to ensure compliance				
Establish procedures for reporting of compliance and non-compliance				
Communicate the requirements, processes and procedures to ensure compliance to all employees				
2.4 MANAGING RISK				
Evaluate hazards and prepare risk assessment for the site selection and design				
Develop risk management plans for the site selection and design, including:				
■ plans to minimize the likelihood of adverse safety or environmental impacts				
■ contingency plans				
■ emergency preparedness and response plans				
2.5 MANAGING CHANGE				
Prepare and document procedures to ensure that the integrity of the management system and the approved designs and plans is maintained by managing:				
■ changes in personnel, roles and responsibilities				
■ changes, including temporary changes, made to approved plans and procedures				
■ changes in regulatory requirements				
2.6 RESOURCES AND SCHEDULING				
Identify budget requirements and secure adequate human and financial resources for site selection and design				
Develop a schedule for site selection and design				
Identify the resource requirements for construction, operations and eventual decommissioning and closure				

6

Checklist for Site Selection and Design of a Tailings Facility

Management Action	Responsibility	Performance Measure	Schedule	References
2.7 EMERGENCY PREPAREDNESS AND RESPONSE				
Develop and maintain emergency preparedness and response plans to identify possible accident or emergency situations, to respond to emergency situations, and to prevent and mitigate on- and off-site environmental and safety impacts associated with emergency situations				
Establish procedures for periodic review, testing and distribution of the emergency preparedness and response plans within the organization and to potentially affected external parties				
3 IMPLEMENTING THE PLAN				
3.1 SITE SELECTION AND DESIGN CONTROL				
Assemble a qualified team and assign responsibilities for site selection and design of the tailings facility				
Obtain approvals and permits for the site selection and design				
In accordance with the objectives:				
■ select an appropriate site				
■ design the tailings facility				
■ prepare a comprehensive risk assessment				
■ develop related plans and procedures, including				
■ management system				
■ documentation procedures				
■ construction procedures				
■ operation, maintenance and surveillance (OMS) procedures				
■ communication procedures				
■ knowledge and skills requirements				
■ decommissioning and closure plan				
■ risk management plans				

Checklist for Site Selection and Design of a Tailings Facility

6

Management Action	Responsibility	Performance Measure	Schedule	References
■ contingency plans				
■ emergency preparedness and response plans				
Implement management control to:				
■ ensure conformance with design objectives and criteria, appropriate engineering and environmental practices, risk management, the MAC TSM Guiding Principles, the MAC tailings management framework, and commitments to Communities of Interest				
■ ensure compliance with legislation, regulations, permits and commitments				
■ manage risk				
■ manage change				
■ identify, evaluate the impact of, and document deviations from approved plans, procedures, schedule and budget				
Implement and periodically test contingency plans and emergency preparedness and response plans for site selection and design				
3.2 FINANCIAL CONTROL				
Establish a budget and financial controls				
Obtain budget approval for the works				
Track capital and operating costs against the budget				
3.3 DOCUMENTATION				
Prepare, maintain, periodically review and revise the documents required to select a site and design the tailings facility				
Maintain current versions of all documents at designated, readily accessible locations, including:				
■ submissions to and from regulatory agencies				
■ training records				
■ quality control reports, photos, videos, etc.				

Checklist for Site Selection and Design of a Tailings Facility

Management Action	Responsibility	Performance Measure	Schedule	References
■ monitoring results and analyses				
■ unusual or special conditions				
■ conditions encountered				
■ communications with Communities of Interest				
Promptly remove from use and archive obsolete versions of documents				
3.4 TRAINING, AWARENESS AND COMPETENCE				
Employ qualified personnel				
Ensure that all personnel understand:				
■ the design intent				
■ the potential health, safety and environmental risks and impacts of the work				
■ appropriate measures to minimize risks and impacts				
Identify training needs, conduct training as appropriate, and maintain records of all training provided				
3.5 COMMUNICATIONS				
Implement documented procedures for communications				
■ among tailings personnel				
■ with management				
■ with Communities of Interest				
4 CHECKING AND CORRECTIVE ACTION				
4.1 CHECKING				
Review site selection and design to ensure compliance with regulatory requirements and conformance with policies and commitments				
Consider independent review of design				
Document and promptly report to the designated responsible official any observations and recommendations arising from reviews, specifically identifying items requiring corrective action				

Checklist for Site Selection and Design of a Tailings Facility

6

Management Action	Responsibility	Performance Measure	Schedule	References
4.2 CORRECTIVE ACTION				
Develop and implement action plans to address items that require corrective action				
Document completion of corrective actions				
5 ANNUAL TAILINGS MANAGEMENT REVIEW FOR CONTINUAL IMPROVEMENT				
Conduct an annual review of tailings management to:				
<ul style="list-style-type: none"> ■ evaluate the performance of the tailings management system, considering inspection, audit and assessment reports, changing circumstances, recommendations, and the commitment to continual improvement 				
<ul style="list-style-type: none"> ■ evaluate the continuing adequacy of, and need for changes to, policies and objectives and performance of the tailings management system 				
<ul style="list-style-type: none"> ■ address the need for changes to commitments to Communities of Interest 				
Report the observations and conclusions of this annual review of tailings management to the accountable executive officer				

Checklist for Construction of a Tailings Facility

Management Action	Responsibility	Performance Measure	Schedule	References
1 POLICY AND COMMITMENT				
Construct the tailings facility according to the design in a safe and environmentally responsible manner, in compliance with regulatory requirements, and in conformance with sound engineering practice, company standards, the MAC TSM Guiding Principles, the MAC tailings management framework, and commitments to Communities of Interest				
Ensure that the tailings management framework is implemented through the actions of all employees working at the facility				
Consult with Communities of Interest, taking into account their considerations relating to the tailings facility construction				
Establish an ongoing program of review and continual improvement to manage health, safety and environmental risks associated with tailings facilities				
2 PLANNING				
2.1 ROLES AND RESPONSIBILITIES				
Assign overall accountability for tailings management to an executive officer of the company (CEO or COO), with responsibility for putting in place an appropriate management structure and for providing assurance to the corporation and its Communities of Interest that tailings facilities are managed responsibly				
Assign responsibility and budget authority for tailings management				
Define the roles, responsibilities and reporting relationships for the tailings facility construction, supported by job descriptions and organization charts, and including:				
■ project management				
■ ongoing liaison with the design team regarding found conditions, design changes and site supervision				
■ selection of contractors				
■ quality control				

Checklist for Construction of a Tailings Facility

Management Action	Responsibility	Performance Measure	Schedule	References
■ environmental protection				
■ construction supervision, health and safety				
■ temporary works				
■ instrumentation				
■ commissioning				
■ documentation, including changes to design and management				
■ communications, both internally and to Communities of Interest				
2.2 OBJECTIVES				
Develop criteria and procedures to ensure that tailings facility construction will:				
■ be in conformance with design				
■ meet regulatory requirements, company policies and standards, sound engineering and environmental practices, and commitments to Communities of Interest				
■ facilitate eventual decommissioning and closure				
■ provide continued protection of the environment and public health and safety				
■ enable the specified performance to be achieved				
Define procedures for communication among the construction team and with management and Communities of Interest				
Identify requirements for documentation				
Identify knowledge and skills (awareness, training and competence) requirements				
Prepare detailed plans for construction of the tailings facility to:				
■ establish a quality control system for construction				
■ identify and review deviations from design				
■ produce as-built drawings and construction reports				

Checklist for Construction of a Tailings Facility

Management Action	Responsibility	Performance Measure	Schedule	References
■ ensure availability of suitable quality and quantity of construction materials				
■ install instrumentation				
■ meet environmental objectives				
■ obtain all required construction permits				
■ specify contractor bonding requirements and				
■ establish contractor tendering procedures				
2.3 MANAGING FOR COMPLIANCE				
Compile and maintain a log of all applicable legislation, regulations, permits and commitments				
Ensure that the applicable legislation, regulations, permits and commitments are understood				
Ensure that the actions needed to ensure compliance are understood				
Establish and document processes and procedures to ensure compliance				
Establish procedures for reporting of compliance and non-compliance				
Communicate the requirements, processes and procedures to ensure compliance to all employees				
2.4 MANAGING RISK				
Prior to the start of construction, prepare a risk assessment for the facility:				
■ the risks associated with possible triggers and failure modes for construction				
■ possible impacts on the environment, public health and safety				
■ the construction parameters that can affect the triggers and failure modes				
Develop:				
■ risk management plans to minimize the likelihood of adverse safety or environmental impacts				

Checklist for Construction of a Tailings Facility

Management Action	Responsibility	Performance Measure	Schedule	References
■ contingency plans				
■ emergency preparedness and response plans				
that include:				
■ control strategies to manage the identified risks and/or reassess the design				
■ identification of thresholds to trigger implementation of contingency plans and emergency response plans				
■ communication procedures				
2.5 MANAGING CHANGE				
Prepare and document procedures to ensure that the integrity of both the management system and the approved designs and plans is maintained by managing:				
■ changes in personnel, roles and responsibilities				
■ changes, including temporary changes, made to approved plans and procedures				
■ changes in regulatory requirements				
2.6 RESOURCES AND SCHEDULING				
Identify budget requirements and secure adequate human and financial resources for construction				
Develop a schedule for construction				
Update the resource requirements for operations, decommissioning and closure				
2.7 EMERGENCY PREPAREDNESS AND RESPONSE				
Develop and maintain emergency preparedness and response plans to identify possible accident or emergency situations, to respond to emergency situations, and to prevent and mitigate on- and off-site environmental and safety impacts associated with emergency situations				

Checklist for Construction of a Tailings Facility

Management Action	Responsibility	Performance Measure	Schedule	References
Establish procedures for periodic review, testing and distribution of the emergency preparedness and response plans within the organization and to potentially affected external parties				
3 IMPLEMENTING THE PLAN				
3.1 CONSTRUCTION CONTROL				
Assemble a qualified team and assign responsibilities for construction of the tailings facility				
Obtain approvals and permits				
Implement management control to:				
<ul style="list-style-type: none"> ■ ensure conformance with design and plan specifications, appropriate engineering and environmental practices, risk management, the MAC TSM Guiding Principles, the MAC tailings management framework and commitments to Communities of Interest 				
<ul style="list-style-type: none"> ■ ensure compliance with legislation, regulations, permits and commitments 				
<ul style="list-style-type: none"> ■ manage risk 				
<ul style="list-style-type: none"> ■ manage change 				
<ul style="list-style-type: none"> ■ identify, evaluate the impact of, and document deviations from approved design, plans, procedures, schedule and budget, and to ensure modifications are subjected to appropriate approval processes 				
Monitor and inspect the works to:				
<ul style="list-style-type: none"> ■ verify actual field conditions against design assumptions 				
<ul style="list-style-type: none"> ■ determine conformance with objectives 				
<ul style="list-style-type: none"> ■ assess environmental, health and safety performance of the construction 				
<ul style="list-style-type: none"> ■ identify, document and report construction deficiencies, unusual and/or unsafe conditions 				

Checklist for Construction of a Tailings Facility

Management Action	Responsibility	Performance Measure	Schedule	References
Implement and periodically test contingency plans and emergency preparedness and response plans				
3.2 FINANCIAL CONTROL				
Establish a budget and financial controls				
Obtain budget approval for the works				
Track capital and operating costs against the budget				
3.3 DOCUMENTATION				
Prepare, maintain, periodically review and revise the documents required for construction of the tailings facility				
Maintain current versions of all documents at designated, readily accessible locations, including:				
■ permits, licences and other regulatory requirements				
■ submissions to and from regulatory agencies				
■ facility design and plans				
■ training records				
■ quality control reports, construction reports, photos, videos, etc.				
■ monitoring results and analyses				
■ unusual or special conditions				
■ conditions encountered				
■ as-built drawings and records				
■ modifications to the tailings facility design and operating plans				
■ communications with Communities of Interest				
Promptly remove from use and archive obsolete versions of documents				
3.4 TRAINING, AWARENESS AND COMPETENCE				
Employ qualified personnel				

Checklist for Construction of a Tailings Facility

Management Action	Responsibility	Performance Measure	Schedule	References
Ensure that personnel understand:				
■ the design intent				
■ the potential health, safety and environmental risks and impacts of the work				
■ appropriate measures to minimize risks and impacts				
Identify training needs, conduct training as appropriate, and maintain records of all training provided				
3.5 COMMUNICATIONS				
Implement documented procedures for communications:				
■ among tailings personnel				
■ with management				
■ with Communities of Interest				
4 CHECKING AND CORRECTIVE ACTION				
4.1 CHECKING				
Inspect, review and audit construction to ensure compliance with regulatory requirements and conformance with design objectives, plans and commitments				
Consider independent review of design and construction should problems occur during construction				
Document and promptly report to the designated responsible official any observations and recommendations arising from reviews, audits and assessments, specifically identifying items requiring corrective action				
4.2 CORRECTIVE ACTION				
Develop and implement action plans to address items that require corrective action				
Document completion of corrective actions				

Checklist for Construction of a Tailings Facility

Management Action	Responsibility	Performance Measure	Schedule	References
5 ANNUAL TAILINGS MANAGEMENT REVIEW FOR CONTINUAL IMPROVEMENT				
Conduct an annual review of tailings management to:				
<ul style="list-style-type: none"> ■ evaluate the performance of the tailings management system, considering inspection, audit and assessment reports, changing circumstances, monitoring results, spills and other incidents, recommendations, and the commitment to continual improvement 				
<ul style="list-style-type: none"> ■ evaluate the continuing adequacy of, and need for changes to, policies and objectives and performance of the tailings management system 				
<ul style="list-style-type: none"> ■ address the need for changes to commitments to Communities of Interest 				
Report the observations and conclusions of this annual review of tailings management to the accountable executive officer				

Checklist for Operating a Tailings Facility

Management Action	Responsibility	Performance Measure	Schedule	References
1 POLICY AND COMMITMENT *				
Operate the tailings facility in such a manner that all structures are stable, all solids and water are managed within the designated areas, and all aspects of tailings management are in compliance with regulatory requirements and in conformance with sound engineering practice, company standards, the MAC TSM Guiding Principles, the MAC tailings management framework, and commitments to Communities of Interest				
Ensure that the tailings management framework is implemented through the actions of all employees working at the facility				
Consult with Communities of Interest, taking into account their considerations relating to the tailings facility management				
Establish an ongoing program of review and continual improvement to manage health, safety and environmental risks associated with tailings facilities				
2 PLANNING				
2.1 ROLES AND RESPONSIBILITIES				
Assign overall accountability for tailings management to an executive officer of the company (CEO or COO), with responsibility for putting in place an appropriate management structure and for providing assurance to the corporation and its Communities of Interest that tailings facilities are managed responsibly				
Assign responsibility and budget authority for tailings management				

* Additional guidance for implementing the principles of the tailings management framework through the operating stage of the life cycle are provided in MAC's companion guide, *Developing an Operation, Maintenance and Surveillance Manual for Tailings and Water Management Facilities*.

Checklist for Operating a Tailings Facility

Management Action	Responsibility	Performance Measure	Schedule	References
Define the roles, responsibilities and reporting relationships for the tailings facility operation, supported by job descriptions and organization charts, and including:				
■ site management				
■ operating plans				
■ operating strategy				
■ obtaining and maintaining approvals				
■ operation of the tailings facility, including maintenance and surveillance				
■ health, safety and environmental protection				
■ emergency preparedness and response				
■ continuing expert support				
■ documentation, including changes to design and management				
■ communications, both internally and to Communities of Interest on:				
■ routine performance issues				
■ emergency preparedness				
■ regulatory compliance and/or incident reporting				
■ the closure plan				
2.2 OBJECTIVES				
Develop criteria and procedures to ensure that tailings facility operations will:				
■ be in conformance with design				
■ meet regulatory requirements, company policies and standards, sound engineering and environmental practices, and commitments to Communities of Interest				
■ integrate preparation for eventual decommissioning and closure into ongoing operations to ensure:				

Checklist for Operating a Tailings Facility

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Management Action	Responsibility	Performance Measure	Schedule	References
■ protection of public health and safety				
■ mitigation of negative environmental impacts				
■ acceptable post-closure use within a feasible technical and economic framework				
■ provide continued protection of the environment and public health and safety				
■ enable the specified performance to be achieved				
Define procedures for communication among the operations team and with management and Communities of Interest				
Identify requirements for documentation				
Identify knowledge and skills (awareness, training and competence) requirements				
Plan for operation and review design documents, regulatory requirements, as-built construction drawings, conceptual operating and closure plans, environmental assessment and commitments to Communities of Interest				
Prepare, review and update on a regular basis an operation, maintenance and surveillance (OMS) manual for the facility (reference: MAC's companion guide, <i>Developing an Operation, Maintenance and Surveillance Manual for Tailings and Water Management Facilities</i>), including:				
■ tailings deposition plan				
■ water balance and management plan				
■ water quality plan				
■ maintenance plan for mechanical, civil works and electronic devices				
■ contaminant release plan				
■ environmental control and monitoring plan				
■ dam stability monitoring plan				

Checklist for Operating a Tailings Facility

Management Action	Responsibility	Performance Measure	Schedule	References
■ calibration program for key instrumentation				
■ emergency preparedness and response plan				
■ decommissioning and closure plan, including progressive rehabilitation				
2.3 MANAGING FOR COMPLIANCE				
Compile and maintain a log of all applicable legislation, regulations, permits and commitments				
Ensure that the applicable legislation, regulations, permits and commitments are understood				
Ensure that the actions needed to ensure compliance are understood				
Establish and document processes and procedures to ensure compliance				
Establish procedures for reporting of compliance and non-compliance				
Communicate the requirements, processes and procedures to ensure compliance to all employees				
2.4 MANAGING RISK				
Prepare and periodically update a comprehensive risk assessment for the facility, to:				
■ evaluate the risks associated with possible triggers and failure modes for both the operating and closure stages				
■ identify possible impacts on the environment, public health and safety				
■ determine the operating parameters that can have an impact on the triggers and failure modes				
Develop:				
■ risk management plans to minimize the likelihood of adverse safety or environmental impacts				
■ contingency plans				
■ emergency preparedness and response plans				

Checklist for Operating a Tailings Facility

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Management Action	Responsibility	Performance Measure	Schedule	References
that include:				
<ul style="list-style-type: none"> ■ control strategies to manage the identified risks and/or reassess the design 				
<ul style="list-style-type: none"> ■ identification of thresholds to trigger implementation of contingency plans and emergency response plans 				
<ul style="list-style-type: none"> ■ communication procedures 				
2.5 MANAGING CHANGE				
Prepare and document procedures to ensure that the integrity of the management system and of approved designs and plans is maintained by managing:				
<ul style="list-style-type: none"> ■ changes in personnel, roles and responsibilities 				
<ul style="list-style-type: none"> ■ changes, including temporary changes, made to approved plans and procedures 				
<ul style="list-style-type: none"> ■ changes in regulatory requirements 				
2.6 RESOURCES AND SCHEDULING				
Identify budget requirements and secure adequate human and financial resources for operating the facility, including				
<ul style="list-style-type: none"> ■ operations, maintenance and surveillance 				
<ul style="list-style-type: none"> ■ inspection, review, audit and assessment 				
Develop a schedule for operating the facility				
Update on a periodic basis the resource requirements for decommissioning and closure				
2.7 EMERGENCY PREPAREDNESS AND RESPONSE				
Develop and maintain emergency preparedness and response plans to identify possible accident or emergency situations, to respond to emergency situations and to prevent and mitigate on- and off-site environmental and safety impacts associated with emergency situations				

Checklist for Operating a Tailings Facility

Management Action	Responsibility	Performance Measure	Schedule	References
Establish procedures for periodic review, testing and distribution of the emergency preparedness and response plans within the organization and to potentially affected external parties				
3 IMPLEMENTING THE PLAN				
3.1 OPERATIONAL CONTROL				
Assemble a qualified team and assign responsibilities for operating the tailings facility				
Obtain approvals and permits				
Implement management control to:				
<ul style="list-style-type: none"> ■ apply the operation, maintenance and surveillance (OMS) manual for the facility 				
<ul style="list-style-type: none"> ■ ensure conformance with design and plan specifications, appropriate engineering and environmental practices, risk management, the MAC TSM Guiding Principles, the MAC tailings management framework and commitments to Communities of Interest 				
<ul style="list-style-type: none"> ■ ensure compliance with legislation, regulations, permits and commitments 				
<ul style="list-style-type: none"> ■ manage risk 				
<ul style="list-style-type: none"> ■ manage change 				
<ul style="list-style-type: none"> ■ identify, evaluate the impact of and document deviations from approved plans, procedures, schedule and budget, and to ensure modifications are subjected to appropriate approval processes 				
Implement the operation, maintenance and surveillance (OMS) manual for the facility, including:				
<ul style="list-style-type: none"> ■ operational procedures and controls addressing: 				
<ul style="list-style-type: none"> <ul style="list-style-type: none"> ■ water balance 				
<ul style="list-style-type: none"> <ul style="list-style-type: none"> ■ water quality 				
<ul style="list-style-type: none"> <ul style="list-style-type: none"> ■ contaminant mass balance 				

Checklist for Operating a Tailings Facility

Management Action	Responsibility	Performance Measure	Schedule	References
■ groundwater, pore pressure regime and seepage				
■ tailings characteristics and deposition				
■ physical stability of structures and appurtenances				
■ dust				
■ environmental impacts				
■ site security				
■ protection of flora and fauna				
■ routine inspection, monitoring, testing, evaluation and reporting of:				
■ conformance with operating objectives				
■ compliance with requirements and commitments				
■ environmental and safety performance				
■ deficiencies, unusual and/or unsafe conditions				
Implement and periodically test contingency plans and emergency preparedness and response plans				
3.2 FINANCIAL CONTROL				
Establish a budget and financial controls				
Obtain budget approval for the tailings management				
Track capital and operating costs against the budget				
3.3 DOCUMENTATION				
Prepare, maintain, periodically review and revise the documents required for operating the tailings facility				
Maintain current versions of all documents at designated, readily accessible locations, including:				
■ permits, licences and other regulatory requirements				
■ facility design and plans				
■ submissions to and from regulatory agencies				

Checklist for Operating a Tailings Facility

Management Action	Responsibility	Performance Measure	Schedule	References
■ the operation, maintenance and surveillance (OMS) manual				
■ training records				
■ quality control reports, construction and operating reports, photos, videos, etc.				
■ monitoring results and analyses				
■ unusual or special conditions				
■ conditions encountered				
■ as-built drawings and records				
■ modifications to the tailings facility design and operating plans				
■ communications with Communities of Interest				
Promptly remove from use and archive obsolete versions of documents				
3.4 TRAINING, AWARENESS AND COMPETENCE				
Employ qualified personnel				
Ensure that all personnel understand				
■ the design intent				
■ operating, maintenance and surveillance (OMS) parameters and procedures				
■ the potential health, safety and environmental risks and impacts of the work				
■ appropriate measures to minimize risks and impacts				
Identify training needs, conduct training as appropriate and maintain records of all training provided				

Checklist for Operating a Tailings Facility

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Management Action	Responsibility	Performance Measure	Schedule	References
3.5 COMMUNICATIONS				
Implement documented procedures for communications				
■ among tailings personnel				
■ with management				
■ with Communities of Interest				
4 CHECKING AND CORRECTIVE ACTION				
4.1 CHECKING				
In addition to routine monitoring and inspections, conduct periodic inspection of operations to ensure compliance with regulatory requirements and conformance with design objectives, plans and commitments				
Conduct periodic review of the tailings facility to:				
■ verify design assumptions against actual conditions and performance				
■ revisit or update the design and/or operating plans				
■ re-evaluate downstream risks				
■ update the risk assessment				
■ evaluate the need for changes or updates to risk management plans, contingency plans, emergency preparedness and response plans, and plans for eventual decommissioning and closure				
Conduct periodic audit and assessment of the entire tailings management system				
Document and promptly report to the designated responsible official any observations and recommendations arising from reviews, audits and assessments, specifically identifying items requiring corrective action				

Checklist for Operating a Tailings Facility

Management Action	Responsibility	Performance Measure	Schedule	References
4.2 CORRECTIVE ACTION				
Develop and implement action plans to address items that require corrective action, including changes to inspection and review programs, as warranted, following changes in design or fundamental operating parameters				
Document completion of corrective actions				
5 ANNUAL TAILINGS MANAGEMENT REVIEW FOR CONTINUAL IMPROVEMENT				
Conduct an annual review of tailings management to:				
<ul style="list-style-type: none"> ■ evaluate the performance of the tailings management system, considering inspection, audit and assessment reports, changing circumstances, monitoring results, spills and other incidents, recommendations and the commitment to continual improvement 				
<ul style="list-style-type: none"> ■ evaluate the continuing adequacy of, and need for changes to, policies and objectives and performance of the tailings management system 				
<ul style="list-style-type: none"> ■ address the need for changes to commitments to Communities of Interest 				
Report the observations and conclusions of this annual review of tailings management to the accountable executive officer				

Checklist for Decommissioning and Closing a Tailings Facility

Management Action	Responsibility	Performance Measure	Schedule	References
1 POLICY AND COMMITMENT *				
Decommission and close the tailings facility in a manner such that all remaining structures are stable, all solids and water are managed within the designated areas, and all aspects of tailings management are in compliance with regulatory requirements and in conformance with sound engineering practice, company standards, the MAC TSM Guiding Principles, the MAC tailings management framework and commitments to Communities of Interest				
Ensure that the tailings management framework is implemented through the actions of all employees working at the facility				
Consult with Communities of Interest, taking into account their considerations relating to the tailings facility decommissioning and closure				
Establish an ongoing program of review and continual improvement to manage health, safety and environmental risks associated with tailings facilities				
2 PLANNING				
2.1 ROLES AND RESPONSIBILITIES				
Assign overall accountability for tailings management to an executive officer of the company (CEO or COO), with responsibility for putting in place an appropriate management structure and for providing assurance to the corporation and its Communities of Interest that tailings facilities are managed responsibly				
Assign responsibility and budget authority for tailings management				

* Additional guidance for implementing the principles of the tailings management framework through the decommissioning and closing stages of the life cycle are provided in MAC's companion guide, *Developing an Operation, Maintenance and Surveillance Manual for Tailings and Water Management Facilities*.

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Checklist for Decommissioning and Closing a Tailings Facility

Management Action	Responsibility	Performance Measure	Schedule	References
Define the roles, responsibilities and reporting relationships for decommissioning and closure of the tailings facility, supported by job descriptions and organization charts, and including:				
■ site management				
■ the closure plan				
■ obtaining and maintaining approvals				
■ decommissioning and closure				
■ long-term care and maintenance				
■ health, safety and environmental protection				
■ emergency preparedness and response				
■ documentation, including changes to design and management				
■ continuing expert support				
■ ensuring financial assurance				
■ communications, both internally and to Communities of Interest on:				
■ the closure plan				
■ routine performance issues				
■ emergency preparedness				
■ regulatory compliance and/or incident reporting				
2.2 OBJECTIVES				
Develop criteria and procedures to ensure that tailings facility decommissioning and closure will:				
■ be in conformance with design				
■ provide continued protection of the environment and public health and safety				
■ mitigate negative environmental impacts				

Checklist for Decommissioning and Closing a Tailings Facility

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Management Action	Responsibility	Performance Measure	Schedule	References
<ul style="list-style-type: none"> meet regulatory requirements, land use objectives, financial assurance commitments, company policies and standards, sound engineering and environmental practices, and commitments to Communities of Interest 				
<ul style="list-style-type: none"> enable surrender of the land or transfer to non-mining use, consistent with regional land-use objectives or approved uses, or provide for long-term care and maintenance 				
<ul style="list-style-type: none"> ensure long-term stability of tailings, dams, related facilities and structures 				
Define procedures for communication among the decommissioning and closure team and with management and Communities of Interest				
Identify requirements for documentation				
Identify knowledge and skills (awareness, training and competence) requirements				
Plan for decommissioning and closure and review design documents, regulatory requirements, as-built construction and operating drawings, conceptual decommissioning and closure plans, environmental assessment and commitments to Communities of Interest				
Prepare, review and update on a regular basis an operation, maintenance and surveillance (OMS) manual for the facility (reference: MAC's companion guide, <i>Developing an Operation, Maintenance and Surveillance Manual for Tailings and Water Management Facilities</i>), including:				
<ul style="list-style-type: none"> water balance and management plan 				
<ul style="list-style-type: none"> water quality plan 				
<ul style="list-style-type: none"> maintenance plan for mechanical, civil works and electronic devices 				
<ul style="list-style-type: none"> contaminant release plan 				
<ul style="list-style-type: none"> environmental control and monitoring plan 				

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Checklist for Decommissioning and Closing a Tailings Facility

Management Action	Responsibility	Performance Measure	Schedule	References
■ dam stability monitoring plan				
■ calibration program for key instrumentation				
■ emergency preparedness and response plan				
■ decommissioning and closure plan				
■ rehabilitation work schedule for facilities no longer required				
Revisit the approved decommissioning and closure plan to:				
■ identify and assess new environmental concerns that have become apparent since the plan was approved				
■ identify and assess potential environmental impacts that may be caused by the implementation of closure				
■ assess alternative technology for closure				
Review performance of progressive reclamation to date				
2.3 MANAGING FOR COMPLIANCE				
Compile and maintain a log of all applicable legislation, regulations, permits and commitments				
Ensure that the applicable legislation, regulations, permits and commitments are understood				
Ensure that the actions needed to ensure compliance are understood				
Establish and document processes and procedures to ensure compliance				
Establish procedures for reporting of compliance and non-compliance				
Communicate the requirements, processes and procedures to ensure compliance to all employees				
2.4 MANAGING RISK				
Prepare and periodically update a comprehensive risk assessment for decommissioning and closure to:				
■ evaluate the risks associated with possible triggers and failure modes				

Checklist for Decommissioning and Closing a Tailings Facility

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Management Action	Responsibility	Performance Measure	Schedule	References
<ul style="list-style-type: none"> ■ identify possible impacts on the environment, public health and safety 				
<ul style="list-style-type: none"> ■ determine the parameters that can have an impact on these triggers and failure modes 				
Develop:				
<ul style="list-style-type: none"> ■ risk management plans to minimize the likelihood of adverse safety or environmental impacts 				
<ul style="list-style-type: none"> ■ contingency plans 				
<ul style="list-style-type: none"> ■ emergency preparedness and response plans 				
that include:				
<ul style="list-style-type: none"> ■ control strategies to manage the identified risks and/or reassess the design 				
<ul style="list-style-type: none"> ■ identification of thresholds to trigger implementation of contingency plans and emergency response plans 				
<ul style="list-style-type: none"> ■ communication procedures 				
2.5 MANAGING CHANGE				
Prepare and document procedures to ensure that the integrity of the management system and of approved designs and plans is maintained, by managing:				
<ul style="list-style-type: none"> ■ changes in personnel, roles and responsibilities 				
<ul style="list-style-type: none"> ■ changes, including temporary changes, made to approved plans and procedures 				
<ul style="list-style-type: none"> ■ changes in regulatory requirements 				
2.6 RESOURCES AND SCHEDULING				
Identify budget requirements and secure adequate human and financial resources for decommissioning and closure of the facility, including				
<ul style="list-style-type: none"> ■ operations, maintenance and surveillance 				
<ul style="list-style-type: none"> ■ inspection, review, audit and assessment 				

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Checklist for Decommissioning and Closing a Tailings Facility

Management Action	Responsibility	Performance Measure	Schedule	References
<ul style="list-style-type: none"> ■ financial assurance 				
Develop a schedule for decommissioning and closure of the facility				
2.7 EMERGENCY PREPAREDNESS AND RESPONSE				
Develop and maintain emergency preparedness and response plans to identify possible accident or emergency situations, to respond to emergency situations and to prevent and mitigate on- and off-site environmental and safety impacts associated with emergency situations				
Establish procedures for periodic review, testing and distribution of the emergency preparedness and response plans within the organization and to potentially affected external parties				
3 IMPLEMENTING THE PLAN				
3.1 CLOSURE CONTROL				
Assemble a qualified team and assign responsibilities for decommissioning and closing the tailings facility				
Obtain approvals and permits				
Implement management control to:				
<ul style="list-style-type: none"> ■ apply the operation, maintenance and surveillance (OMS) manual for decommissioning and closure of the facility 				
<ul style="list-style-type: none"> ■ ensure conformance with design and plan specifications, appropriate engineering and environmental practices, risk management, the MAC TSM Guiding Principles, the MAC tailings management framework, and commitments to Communities of Interest 				
<ul style="list-style-type: none"> ■ ensure compliance with legislation, regulations, permits and commitments 				
<ul style="list-style-type: none"> ■ manage risk 				
<ul style="list-style-type: none"> ■ manage change 				

Checklist for Decommissioning and Closing a Tailings Facility

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Management Action	Responsibility	Performance Measure	Schedule	References
<ul style="list-style-type: none"> identify, evaluate the impact of, and document deviations from approved plans, procedures, schedule and budget, and to ensure modifications are subjected to appropriate approval processes 				
Implement and periodically test contingency plans and emergency preparedness and response plans				
3.2 FINANCIAL CONTROL				
Establish a budget and financial controls				
Obtain budget approval for the decommissioning and closure				
Track capital and operating costs against the budget				
Track actual costs and budget updates against the closure financial assurance				
3.3 DOCUMENTATION				
Prepare, maintain and periodically review and revise the documents required for decommissioning and closing the tailings facility				
Maintain current versions of all documents at designated, readily accessible locations, including:				
<ul style="list-style-type: none"> permits, licences and other regulatory requirements 				
<ul style="list-style-type: none"> decommissioning and closure plans 				
<ul style="list-style-type: none"> submissions to and from regulatory agencies 				
<ul style="list-style-type: none"> the operation, maintenance and surveillance (OMS) manual 				
<ul style="list-style-type: none"> training records 				
<ul style="list-style-type: none"> quality control reports, construction and operating reports, photos, videos, etc 				
<ul style="list-style-type: none"> monitoring results and analyses 				
<ul style="list-style-type: none"> unusual or special conditions 				
<ul style="list-style-type: none"> conditions encountered 				

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Checklist for Decommissioning and Closing a Tailings Facility

Management Action	Responsibility	Performance Measure	Schedule	References
<ul style="list-style-type: none"> ■ as-built drawings and records 				
<ul style="list-style-type: none"> ■ progress reports and reviews 				
<ul style="list-style-type: none"> ■ modifications to the tailings facility design, operating, decommissioning and closure plans 				
<ul style="list-style-type: none"> ■ communications with Communities of Interest 				
Promptly remove from use and archive obsolete versions of documents				
3.4 TRAINING, AWARENESS AND COMPETENCE				
Employ qualified personnel				
Ensure that all personnel understand:				
<ul style="list-style-type: none"> ■ the decommissioning and closure design intent 				
<ul style="list-style-type: none"> ■ operating, maintenance and surveillance (OMS) parameters and procedures 				
<ul style="list-style-type: none"> ■ the potential health, safety and environmental risks and impacts of the work 				
<ul style="list-style-type: none"> ■ appropriate measures to minimize risks and impacts 				
Identify training needs, conduct training as appropriate and maintain records of all training provided				
3.5 COMMUNICATIONS				
Implement documented procedures for communications				
<ul style="list-style-type: none"> ■ among tailings personnel 				
<ul style="list-style-type: none"> ■ with management 				
<ul style="list-style-type: none"> ■ with Communities of Interest 				

Checklist for Decommissioning and Closing a Tailings Facility

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Management Action	Responsibility	Performance Measure	Schedule	References
4 CHECKING AND CORRECTIVE ACTION				
4.1 CHECKING				
In addition to routine monitoring and inspections, conduct periodic inspection of decommissioning and closure to ensure compliance with regulatory requirements and conformance with design objectives, plans and commitments				
Conduct periodic review of the tailings facility to:				
<ul style="list-style-type: none"> ■ verify design assumptions against actual conditions and performance 				
<ul style="list-style-type: none"> ■ revisit or update the decommissioning and closing design and/or plans 				
<ul style="list-style-type: none"> ■ re-evaluate downstream risks 				
<ul style="list-style-type: none"> ■ update the risk assessment 				
<ul style="list-style-type: none"> ■ evaluate the need for changes or updates to risk management plans, contingency plans and emergency preparedness and response plans 				
Conduct periodic audit and assessment of the entire tailings management system				
Document and promptly report to the designated responsible official any observations and recommendations arising from reviews, audits and assessments, specifically identifying items requiring corrective action				
4.2 CORRECTIVE ACTION				
Develop and implement action plans to address items that require corrective action, including changes to inspection and review programs, as warranted, following changes in design or fundamental operating parameters				
Document completion of corrective actions				

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Checklist for Decommissioning and Closing a Tailings Facility

Management Action	Responsibility	Performance Measure	Schedule	References
5 ANNUAL TAILINGS MANAGEMENT REVIEW FOR CONTINUAL IMPROVEMENT				
Conduct an annual review of tailings management to:				
<ul style="list-style-type: none"> ■ evaluate the performance of the tailings management system, considering inspection, audit and assessment reports, changing circumstances, monitoring results, spills and other incidents, recommendations and the commitment to continual improvement 				
<ul style="list-style-type: none"> ■ evaluate the continuing adequacy of, and need for changes to, policies and objectives and performance of the tailings management system 				
<ul style="list-style-type: none"> ■ address the need for changes to commitments to Communities of Interest 				
Report the observations and conclusions of this annual review of tailings management to the accountable executive officer				

Towards Sustainable Mining Guiding Principles

As members of the Mining Association of Canada, our role is to responsibly meet society's needs for minerals, metals and energy products. To achieve this we engage in the exploration, discovery, development, production, distribution and recycling of these products. We believe that our opportunities to contribute to and thrive in the economies in which we operate must be earned through a demonstrated commitment to sustainable development.*

Accordingly, our actions must demonstrate a responsible approach to social, economic and environmental performance that is aligned with the evolving priorities of our communities of interest.** Our actions must reflect a broad spectrum of values that we share with our employees and communities of interest, including honesty, transparency and integrity. And they must underscore our ongoing efforts to protect our employees, communities, customers and the natural environment.

We will demonstrate leadership worldwide by:

- Involving communities of interest in the design and implementation of our Towards Sustainable Mining initiative;
- Proactively seeking, engaging and supporting dialogue regarding our operations;
- Fostering leadership throughout our companies to achieve sustainable resource stewardship wherever we operate;
- Conducting all facets of our business with excellence, transparency and accountability;
- Protecting the health and safety of our employees, contractors and communities;
- Contributing to global initiatives to promote the production, use and recycling of metals and minerals in a safe and environmentally responsible manner;
- Seeking to minimize the impact of our operations on the environment and biodiversity, through all stages of development, from exploration to closure;

* MAC draws on the 1987 Brundtland Commission definition of Sustainable Development: "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

** We use the term Communities of Interest to include all of the individuals and groups who have or believe they have an interest in the management of decisions about our operations that may affect them. This includes: employees, contractors, Aboriginal or indigenous peoples, mining community members, suppliers, customers, environmental organizations, governments, the financial community, and shareholders.

Towards Sustainable Mining Guiding Principles

- Working with our communities of interest to address legacy issues, such as orphaned and abandoned mines;
- Practicing continuous improvement through the application of new technology, innovation and best practices in all facets of our operations.

In all aspects of our business and operations, we will:

- Respect human rights and treat those with whom we deal fairly and with dignity.
- Respect the cultures, customs and values of people with whom our operations interact.
- Recognize and respect the unique role, contribution and concerns of Aboriginal peoples (First Nations, Inuit and Métis) and indigenous peoples worldwide.
- Obtain and maintain business through ethical conduct.
- Comply with all laws and regulations in each country where we operate and apply the standards reflecting our adherence to these Guiding Principles and our adherence to best international practices.
- Support the capability of communities to participate in opportunities provided by new mining projects and existing operations.
- Be responsive to community priorities, needs and interests through all stages of mining exploration, development, operations and closure.
- Provide lasting benefits to local communities through self-sustaining programs to enhance the economic, environmental, social, educational and health care standards they enjoy.



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