

Giant Mine Remediation Project



Canada

PERPETUAL CARE AND ADAPTIVE MANAGEMENT



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1. Perpetual Care and Related Risks
2. Adaptive Management

“PERPETUAL CARE”

- Comprises two distinct components:
 - Physical systems
 - Management and oversight systems

PERPETUAL CARE – PHYSICAL SYSTEMS

- Physical systems will need to be operative over the very long term, e.g., frozen blocks, water treatment.
- Each of these systems include BOTH
 - Physical components (with a finite lifetime)
 - AND
 - Monitoring, maintenance, repairs and replacements of individual components.

PERPETUAL CARE – PHYSICAL SYSTEMS

- Example – Frozen blocks
 - Over time, individual thermosyphons will need to be re-filled, repaired or even replaced.
 - The frozen block as a whole remains complete.
 - That's why the “frozen block method” includes both the thermosyphons AND the commitment to monitor, maintain and repair as needed.

PERPETUAL CARE – PHYSICAL SYSTEMS

- The project has been very thorough in its assessment, analysis and design of long term physical components.
- We have demonstrated that the design will control risk effectively over the very long term, and with a minimum of active inputs.

PERPETUAL CARE

MANAGEMENT AND OVERSIGHT

- Initially, the project team focused on the design of physical systems.
- Constructive feedback and examples from the Parties led to:
 - Clarifying GMRPT's vision of the site status over the long term
 - Understanding areas of concern and incorporating many suggestions.

MANAGEMENT & OVERSIGHT - VISION

- Our vision is **positive**:
 - Portion of site that remains under perpetual care is small relative to area that will be available for other uses.
 - This is a great opportunity for the community to build something of value for the future.

MANAGEMENT & OVERSIGHT - VISION

- Case histories of closed mine sites becoming productive assets for communities
 - Britannia, Sullivan, WISMUT and Flambeau
 - Many other examples available



MANAGEMENT & OVERSIGHT - VISION

- This positive vision makes it more likely that communities and governments will remain engaged over the long term.



MANAGEMENT AND OVERSIGHT - IMPROVEMENTS

- As a result of feedback from the Review Board and Parties, improvements are being pursued in five areas:
 1. Records Management
 2. Land Use Constraints
 3. Communicating with Future Generations
 4. Scenario Analysis
 5. Transition Planning

RECORDS MANAGEMENT

1. “Comprehensive inventory of historical and project-related records and a records management and preservation system including full public disclosure”
 - We will implement a comprehensive records and information management program, in accordance with Government of Canada directives, standards and guidelines.
 - We will explore, with an advisory group, innovative techniques used elsewhere.

LAND USE CONSTRAINTS

2. “Appropriate land use controls and site designations”
 - Part of site will be restricted for long-term operations and management activities.
 - Rest of site will be available for other uses with varying limitations.
 - Future uses will be determined through a public consultation and engagement process.
 - Appropriate land use controls will be part of that discussion.

COMMUNICATING WITH FUTURE GENERATIONS

3. “Communicating with future generations”

- Overlapping interests of YKDFN, City, historical, environmental, and tourism groups – combined with technical requirements – make these ideal topics for discussions with stakeholders as the project advances.
- Best communication practices at long-term sites will be explored, and adopted as appropriate to the circumstances of the Giant Mine site.

SCENARIO ANALYSIS

4. “Building possible future scenarios that include: human intrusion; collapse or transition of government authority; and long-term but high consequence events”

- Scenarios like a complete collapse of government **were** included in assessment of options by the project team.
- In future we will include stakeholders in these analyses.
- Existing methods of risk analysis can be modified to support stakeholder participation.

TRANSITION PLANNING

5. “Transition planning for the change of the site from active remediation to passive care and maintenance”
- This will be more of a focus between now and completion of the remediation phase.
 - Details will depend in large part on yet-to-be-determined factors, i.e. operators and contracts.
 - Discussion and conditions will likely be in water licence stage.

COMPREHENSIVE PERPETUAL CARE PLAN

- The selection and engineering of physical systems has considered the very long term, and will continue to do so.
- We will develop a “Comprehensive Perpetual Care Plan” to define requirements and commitments related to the management and oversight of the physical systems.

COMPREHENSIVE PERPETUAL CARE PLAN

- To include:
 - Long Term Risk Management Requirements AND a positive vision of the future opportunities
 - Records Management
 - Land Use Constraints
 - Communicating with future generations
 - Scenario Analysis
 - Transition Planning

“ADAPTIVE MANAGEMENT PLAN”

- Adaptive Management is a structured, iterative approach of optimal decision making in the face of uncertainty, with an aim to reducing uncertainty over time via system monitoring.

“ADAPTIVE MANAGEMENT PLAN”

- Two schools of thought:
 - Write a plan today to set out monitoring, evaluation and response rules for all future people to follow.
 - Develop a system today that will enable the right people to make good decisions in the future.

“ADAPTIVE MANAGEMENT PLAN”

- We believe both are needed with the initial emphasis on developing the system.
- That’s why we connect this topic directly to our commitment to develop an **Environmental Management System (EMS)**.

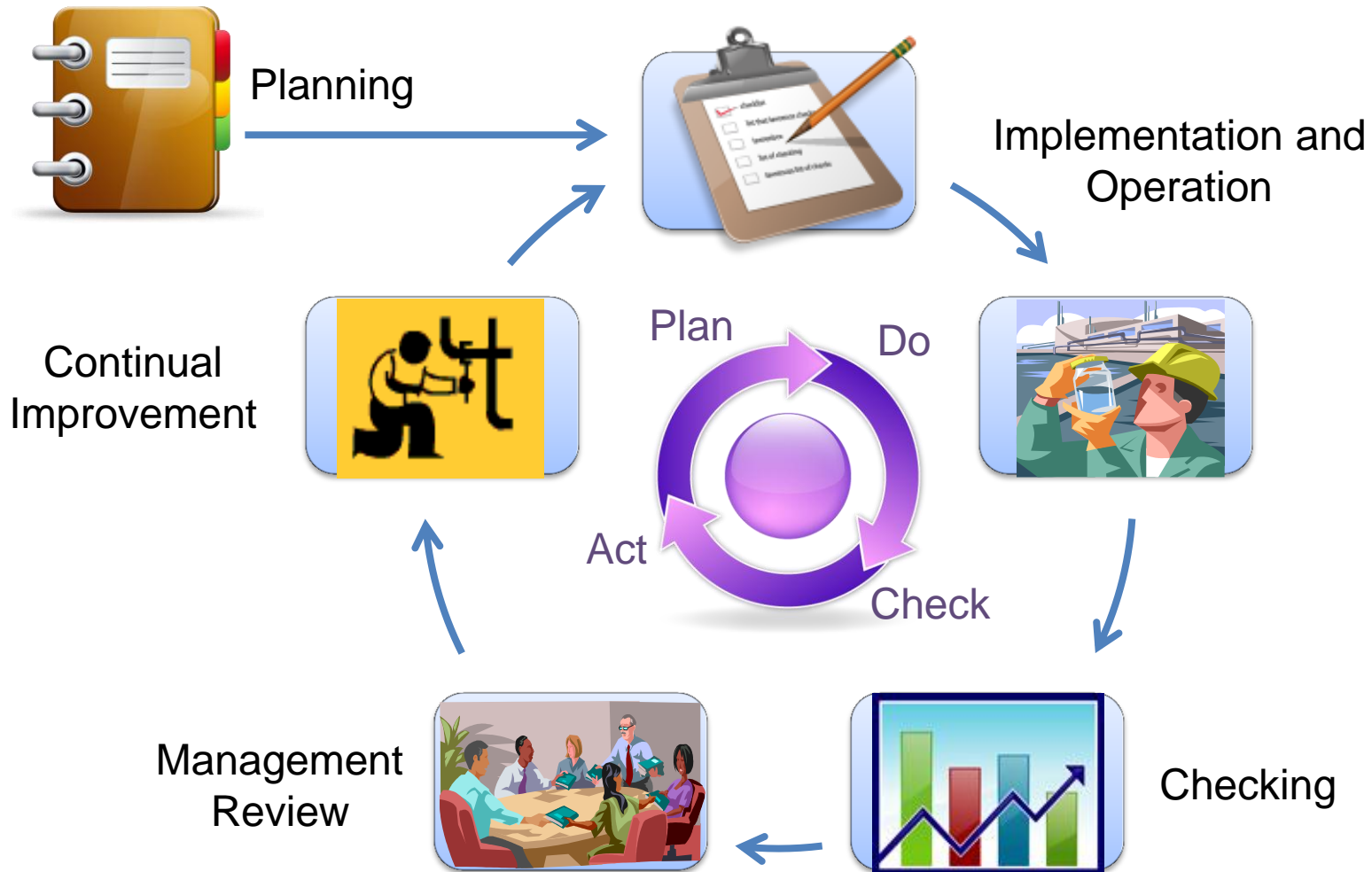
WHY AN ENVIRONMENTAL MANAGEMENT SYSTEM?

- Our adaptive management plan is to put in place a rigorous system to manage environmental monitoring, data review and responses, i.e. an EMS.

WHY AN ENVIRONMENTAL MANAGEMENT SYSTEM?

- Historically, complex projects have dealt with a multitude of license requirements, guidelines and checklists.
- An EMS integrates all of that into a system that can be more easily managed and readily audited.
- EMS facilitates stakeholder involvement.

HOW IT WORKS

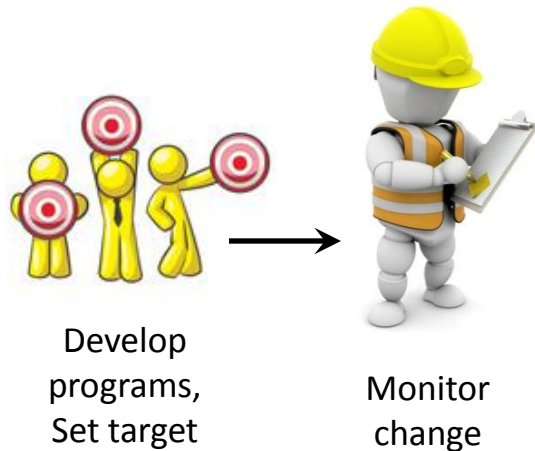


EMS HELPS IMPLEMENT ADAPTIVE MANAGEMENT

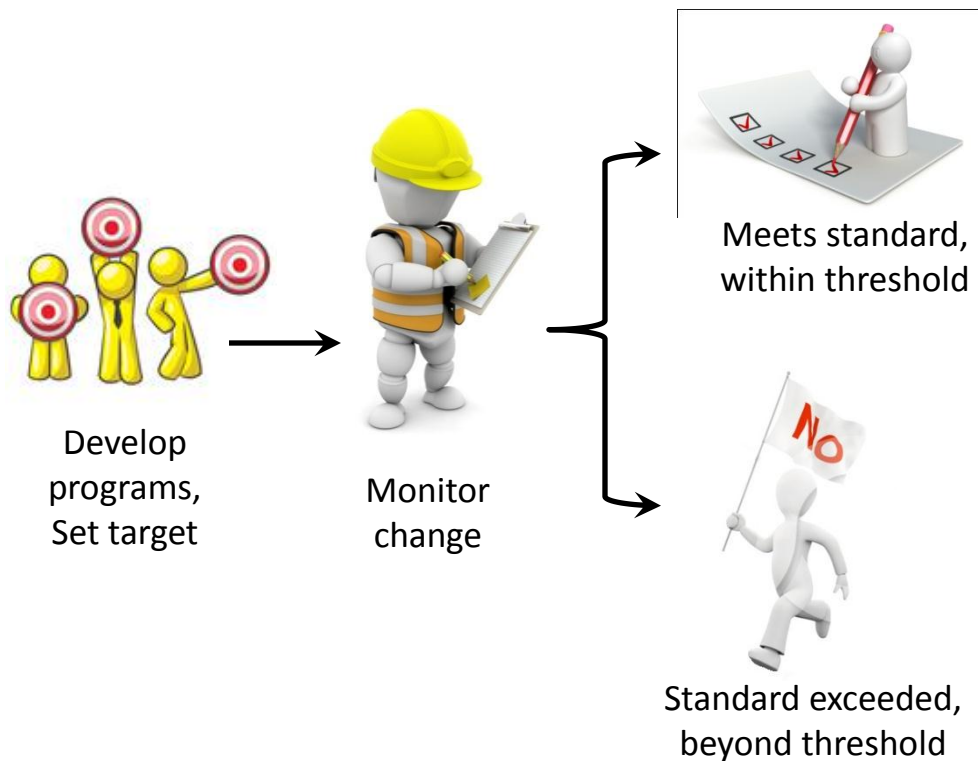


Develop
programs,
Set target

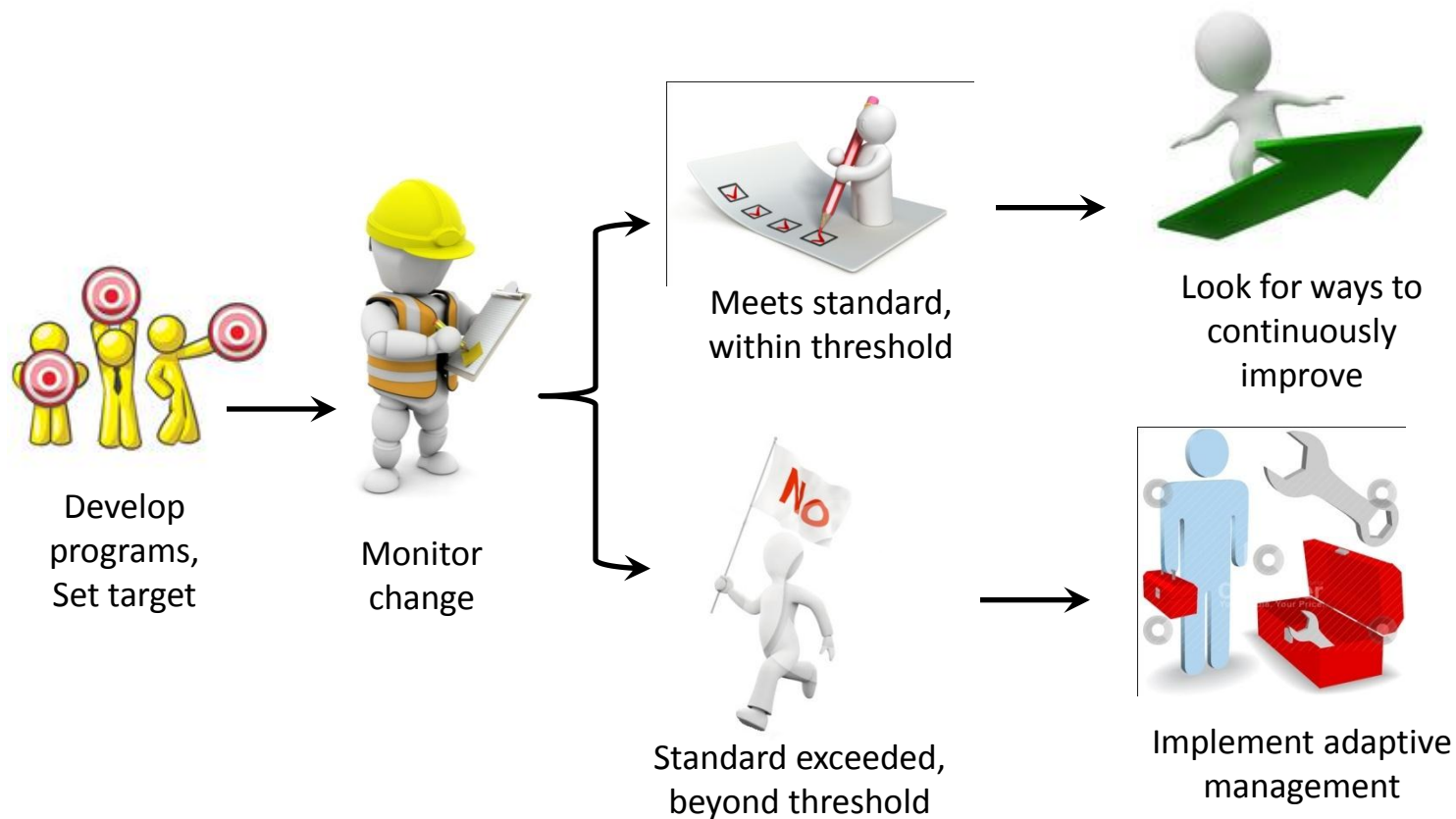
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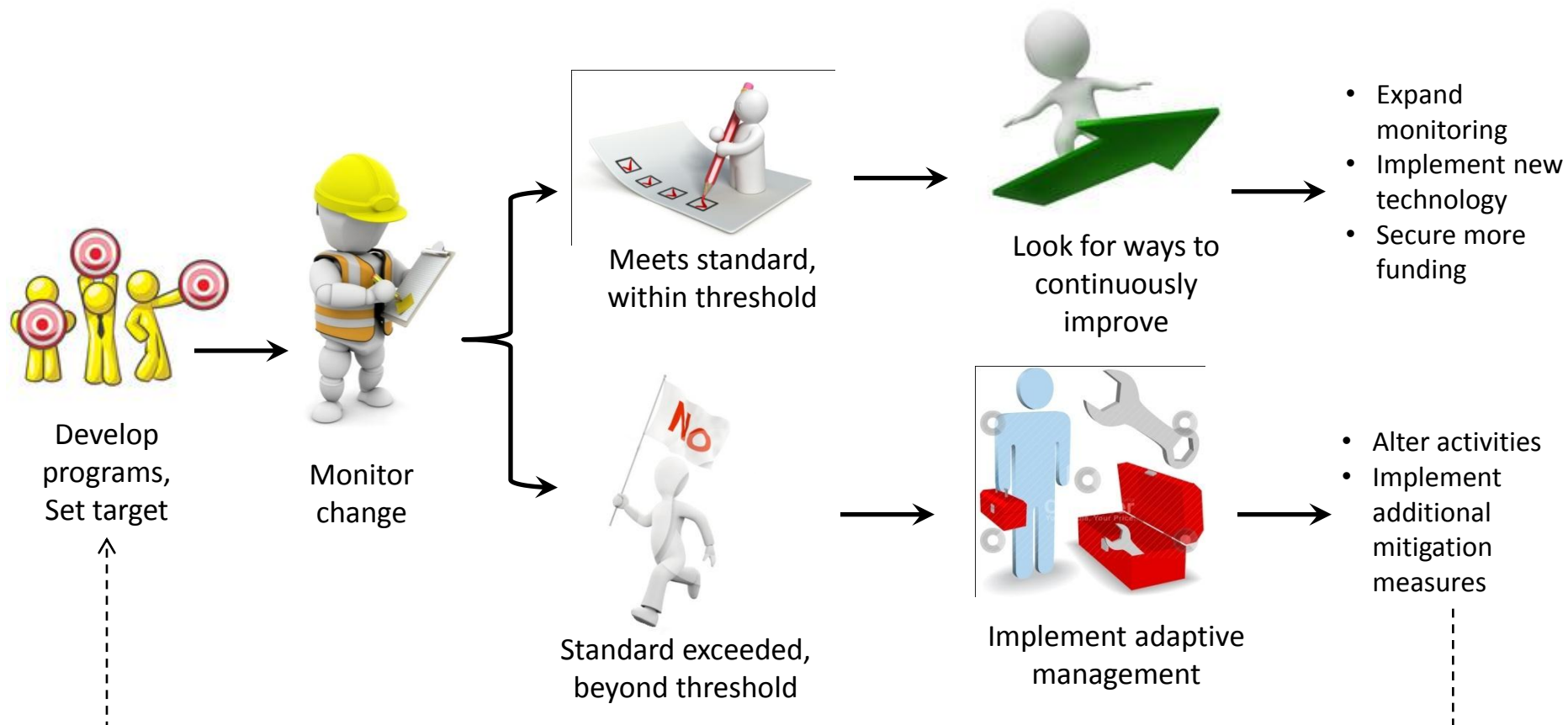
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ENVIRONMENTAL MANAGEMENT SYSTEM

The Project team is following the mine component, objectives-based approach outlined in the *Board and AANDC Guidelines for Development of Closure and Reclamation Plans* as appropriate for this remediation project.

The Project has been defined into 7 mine components:

- | | |
|-----------------------|---------------------------------|
| 1. Tailings | 5. Water Treatment Plant |
| 2. Freeze/Underground | 6. Contaminated Soils |
| 3. Open Pits | 7. Buildings and Infrastructure |
| 4. Baker Creek | |

ENVIRONMENTAL MANAGEMENT PLANS

Environmental Management Plans (EMP) will address implementation, controlling and monitoring aspects of the Project. Every mine component will have an EMP. EMPs will also be developed for a number of other project aspects e.g. Fuel Storage.

ENVIRONMENTAL MANAGEMENT PLANS

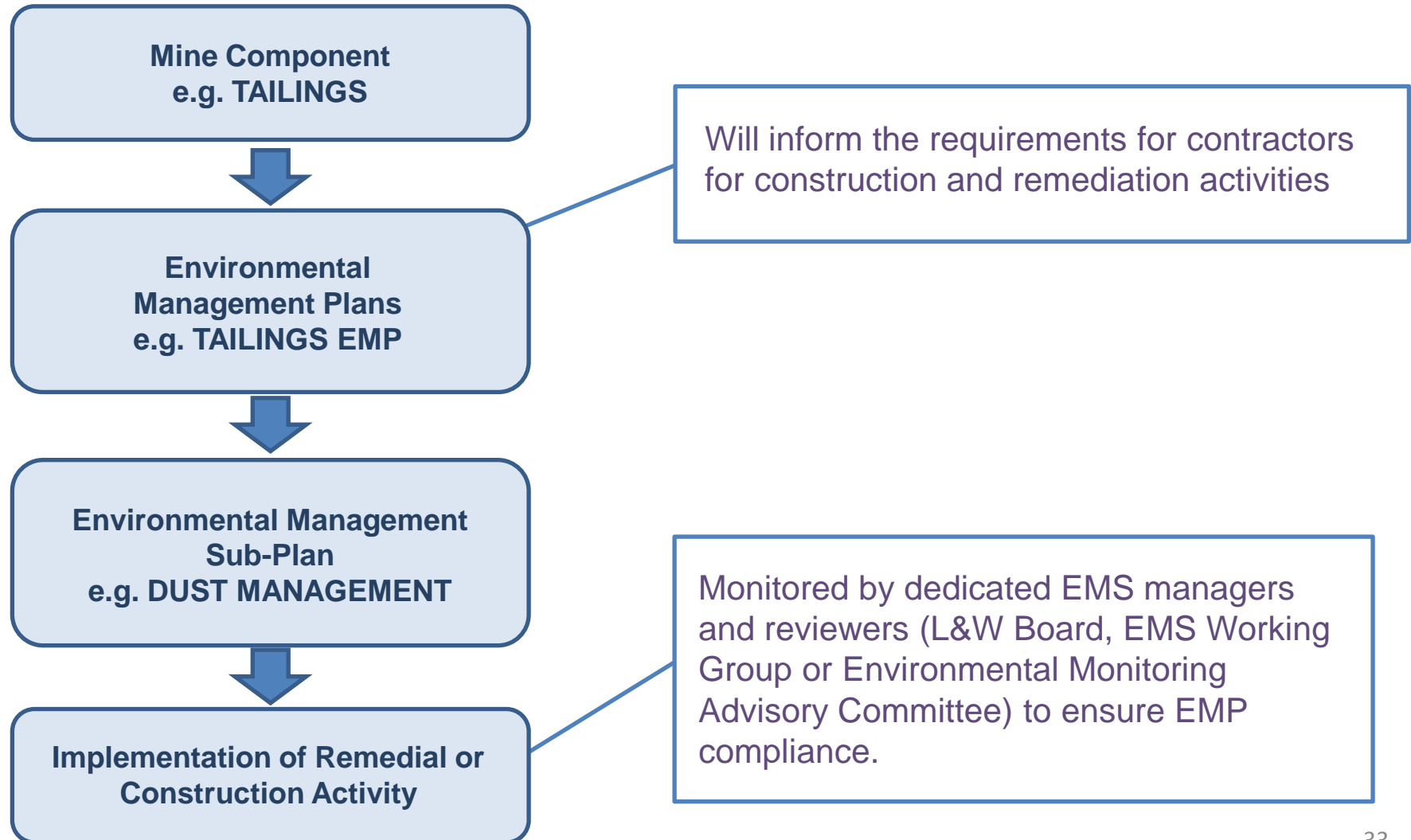
Environmental Management Plans will contain the following elements:

- Objectives
- Measurable performance and closure criteria
- Monitoring to track performance
- Triggers/Action Levels
- Research and design work
- Roles and Responsibilities
- Reporting approach

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EMS DEVELOPMENT AND IMPLEMENTATION IS COLLABORATIVE

- Project Environmental Management Group (EMG) is the primary body responsible for EMS planning, development, implementation, monitoring and engagement with Interested Parties
- The Project Team is committed to identifying priorities and developing Environmental Management Plans collaboratively with the Environmental Management Working Group with the Parties.

EMS – CURRENT ACTIVITIES

- Development of EMS is underway
- 2012 Deliverables:
 - Gap analysis of current Care and Maintenance contract
 - GMRP Environmental Health, Safety and Community Policy
- 2013 Deliverables:
 - EMS Manual compliant with ISO 14001
 - Matrices, draft Environmental Management Plans (EMPs) (≈ 20)
- Baseline Monitoring Program currently in development

SUMMARY / CONCLUSION

- All of the project components, especially the frozen block and the commitments around it, are robust and will minimize risks over the long term.
- We are committed to developing a perpetual care management plan in collaboration with the parties.
- An EMS is a proven approach and effective tool to support adaptive management.
- The community will continue to be involved extensively and meaningfully in environmental monitoring and adaptive management.