

Renaissance Arlington Capital View ♦ October 6, 2011 ♦ www.MiningWorkshop.org



Innovative Approaches to Mining Site Remediation and Reuse Workshop

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

ICCL international committee on contaminated land

Realizing Social and Economic Opportunities through the Remediation of Contaminated Sites

Lou Spagnuolo
Senior Project Manager
Aboriginal Affairs and Northern Development Canada

Introduction

- ◆ Aboriginal Affairs and Northern Development Canada (AANDC) is the custodian of federal lands in the North:
 - Responsible for the remediation of contaminated sites in the Yukon, Northwest Territories and Nunavut
- ◆ The mining industry is an important economic driver:
 - Mines were developed within historical legal frameworks when many environmental protection measures were inadequate.
- ◆ In 1999, the price of commodities dropped considerably and many mining companies filed for bankruptcy:
 - These abandoned mines became the responsibility of AANDC leaving the federal government with a significant liability.
- ◆ A mine site reclamation policy has since been developed to limit any future legacy of new and/or existing mines.
- ◆ The Northern Contaminated Sites Program was formed within AANDC to deal with abandoned contaminated sites in the North.

Federal Contaminated Sites Action Plan

- ◆ \$3.5 billion, 15 year FCSAP funding established in 2005 to address federal contaminated sites.
 - There 18 custodians (departments, agencies or Crown corporations) that receive funding under FCSAP.
- ◆ Co-chaired by Environment Canada and the Treasury Board Secretariat
 - Expert support Departments provide technical review of proposals and advice to custodians.
- ◆ Priority setting
 - Projects ranked primarily according to health and ecological risk using science-based criteria.
 - Other considerations may include: impact on traditional lifestyles, risk of increasing liability if no action taken, potential legal issues.
- ◆ Cost-share, between FCSAP and custodian, ranges from 80% to 100% depending on total budget of the project.

Northern Contaminated Sites Program Mandate

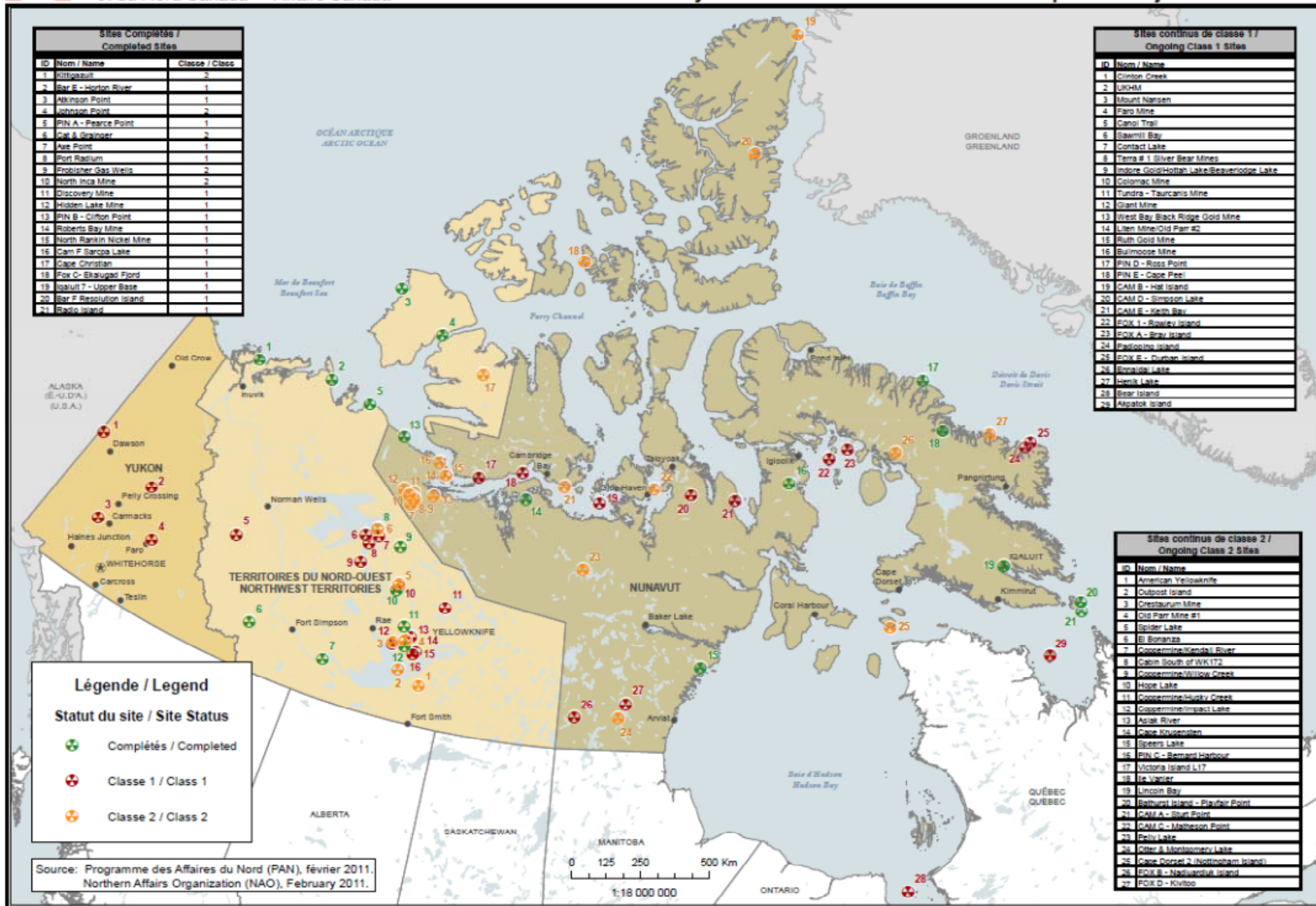
- ◆ Our Policy, which was adopted in 2002, is:

“to manage contaminated sites in a cost-effective and consistent manner, to reduce and eliminate, where possible, risk to human and environmental health and liability associated with contaminated sites.”

- ◆ Contaminated sites are classified according to their priority for action, following the Canadian Council of Ministers of the Environment (CCME) National Classification System (NCS) guidelines:
 - Class 1: high priority
 - Class 2: medium priority
 - Class 3: low priority
 - Class N: not a priority
 - Class INS: insufficient information
- ◆ The Program’s database contains over 2,100 suspected contaminated sites, including 86 Class 1 and 2 sites with a liability of over C\$ 1.8 billion:
 - Faro Mine (~C\$ 685 million); and
 - Giant Mine (~C\$ 615 million).



Sites prioritaires de SCN classe 1 et 2 et projets complétés du PAN - 2010-2011 NAO Priority NCS Class 1 and 2 Sites and Completed Projects - 2010-2011



Typical Sites

- ◆ Mega Sites (Faro Mine C\$685M and Giant Mine C\$615M)
 - Over one hundred million dollars to remediate
 - Over ten years to complete
 - No walk-away solution
- ◆ Large Sites (Tundra Mine C\$65M and Resolution Island C\$60M)
 - Twenty to one hundred million dollars to remediate
 - Five to ten years to complete
 - Long term monitoring required
- ◆ Medium Sites (Discovery Mine C\$15M and PIN-B Clifton Point C\$10M)
 - One to twenty million dollars to remediate
 - One to five years to complete
 - Walk away solution with minimal short-term monitoring required
- ◆ Small Sites (Casino Mine C\$0.5M and Arctic Mine C\$1M)
 - Up to one million dollars to remediate
 - Less than one year to complete
 - Walk away solution with no monitoring required

Stakeholder Consultation Process

◆ Consult early, consult often:

- Step 1: Identify Suspected Site (1,2)
- Step 2: Historical Review (1,2,3)
- Step 3: Initial Testing Program (1,2,3)
- Step 4: Classify Site
- Step 5: Detailed Testing Program (1,2,3)
- Step 6: Reclassify Site
- **Step 7: Develop Remediation Plan (1,2,3,4,5)**
- Step 8: Implement Remediation Plan (1,2,3,4,5)
- Step 9: Confirmatory Sampling
- Step 10: Long Term Monitoring (1,2,3)

Level of consultation

1 – Inform

2 – Gather

3 – Discuss

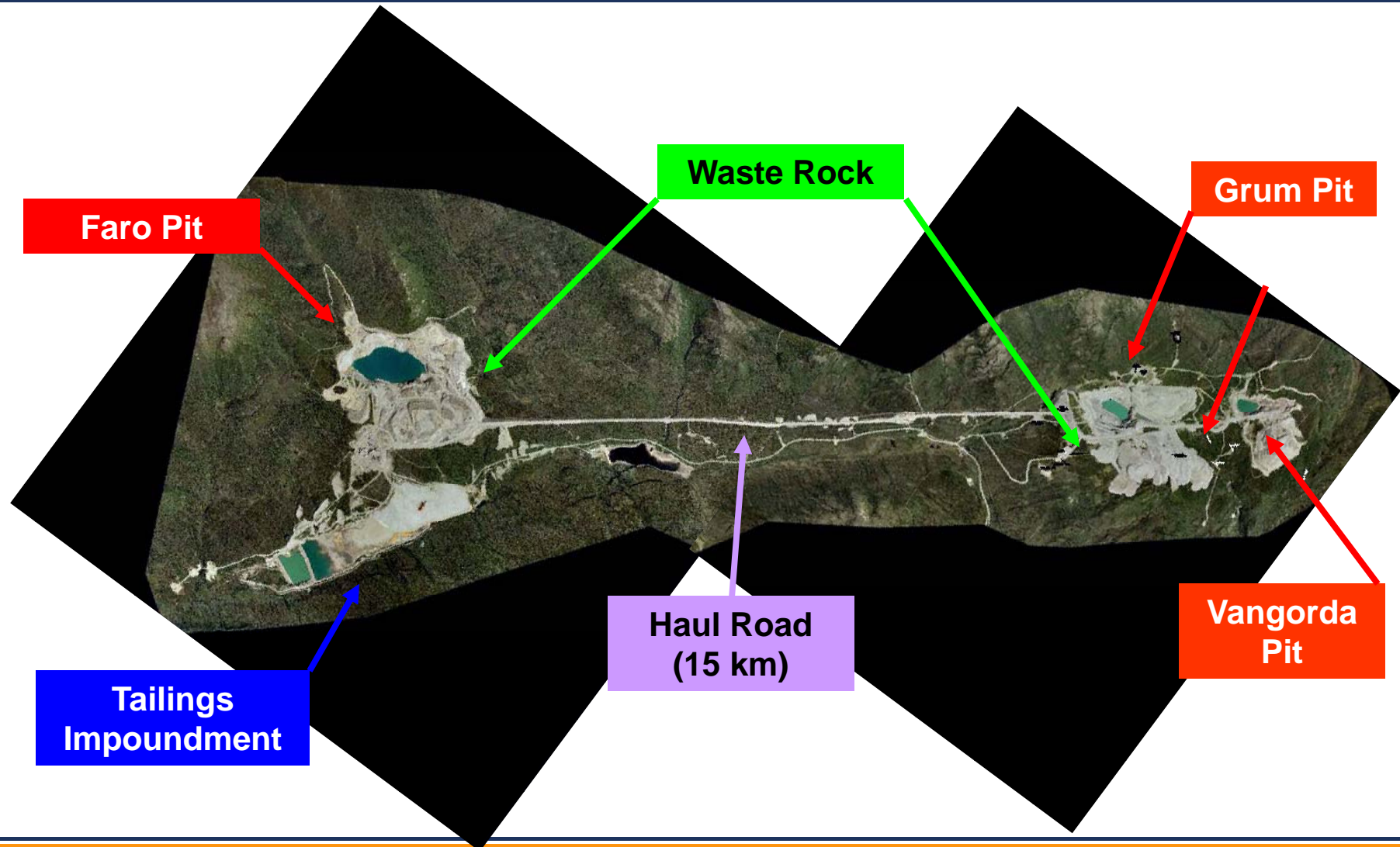
4 – Engage

5 - Partner

Faro Mine Complex

- ◆ Lead/Zinc mine operational from 1969 to 1998
 - Largest lead/zinc mine in Canada producing 15% of the worlds lead/zinc output
 - Located in the traditional territory of the Ross River Dena Council
 - Upstream of the community of Pelly Crossing
- ◆ 3 open pits (one pit with water having pH<3)
- ◆ 70 million MT of tailings including 4 dams
 - Covering 200 hectares (500 acres)
- ◆ 320 million MT of waste rock

Faro Site Layout



Closure Options

- ◆ Based on Peer Review recommendations and outputs of community consultation, large selection of closure alternatives were eliminated/refined.
- ◆ Common elements include:
 - Resloping and covering waste rock
 - Revegetation of soil covers and other areas
 - Diversion of clean water around the site
 - Long-term collection and treatment of contaminated water
 - Long-term management of water treatment sludge
 - Long-term storage of water in pits
 - Long-term maintenance of remaining site facilities (diversions, covers, water collection systems, water treatment systems, dams, etc.)
 - Long-term monitoring of environmental conditions (water, animals, plants, climate, etc.)

Tailings Closure Options

- ◆ Option 2: Dry Cover (C\$400M)
 - Upgrade Faro Creek diversion
 - Reslope, cover and revegetate waste rock
 - Cover tailings with soil
- ◆ Option 3: Partial Relocation (C\$500M)
 - Upgrade Faro Creek diversion
 - Reslope, cover and revegetate waste rock
 - Move a portion of the tailings and cover remaining with soil
- ◆ Option 1: Complete Relocation (C\$600M)
 - Upgrade Faro Creek diversion
 - Reslope, cover and revegetate waste rock
 - Move all tailings

Selection of Preferred Option

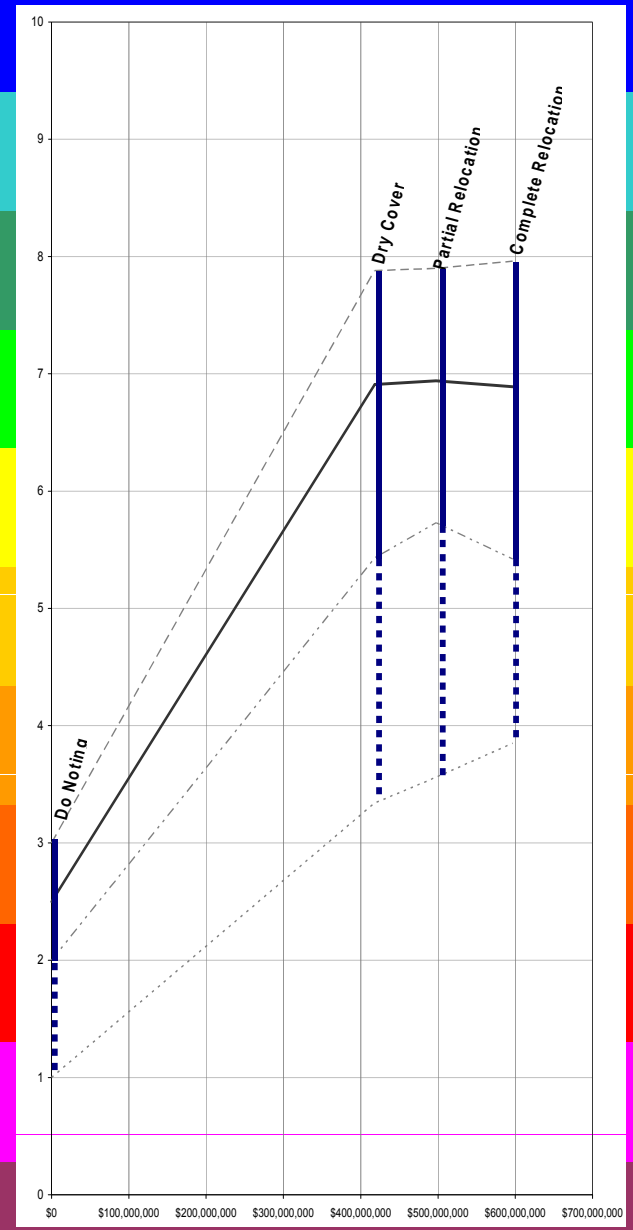
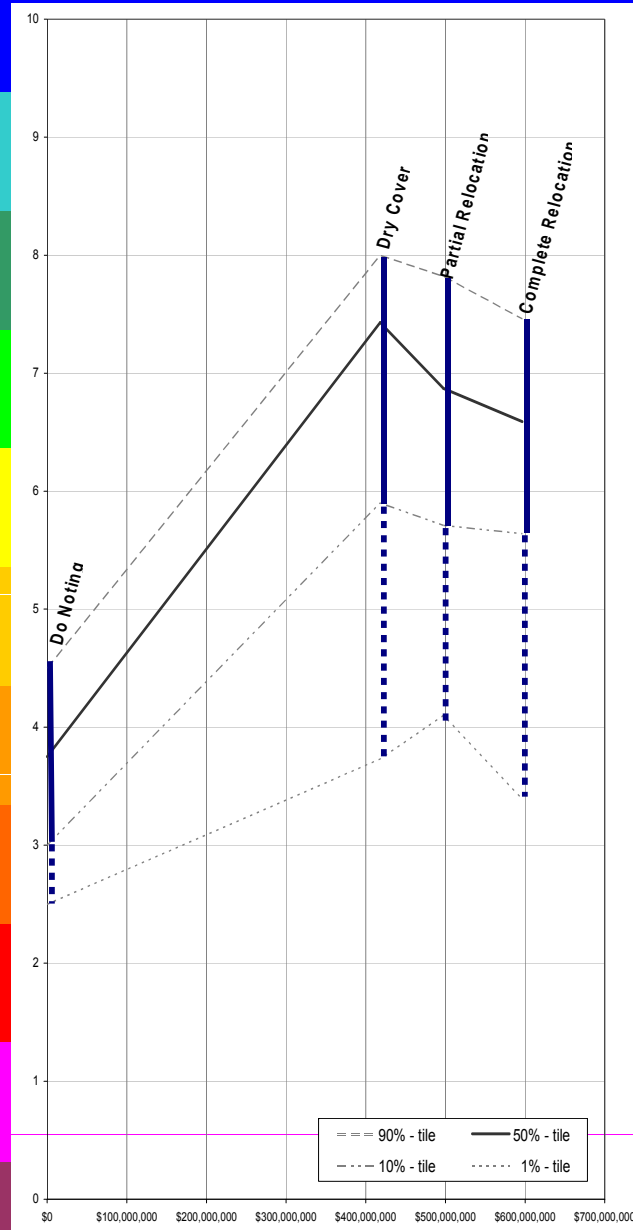
- ◆ Multi-variable Assessment (MAA) process
 - Representation by aboriginal groups, technical advisors, peer review experts, territorial government
- ◆ Each project objective converted into measurable sub-objectives:
 - Environment, public H&S, worker H&S, traditional land use, local land-use, local socio-economic benefits, regional socio-economic benefits, cost
- ◆ For each sub-objective short term (40 years) and long-term (500-1000 years) timelines were considered
- ◆ Described the performance of each alternative for each sub-objective for both short and long-terms scenarios
- ◆ Conducted assessment by individually assigning scores from 0-10 for the expected performance of each option to meet sub-objectives
- ◆ Assigned individual weightings for each sub-objective (relative importance of each objective)
- ◆ Produced bar charts of results
- ◆ Conducted sensitivity analysis to determine the influence of weightings on the results

Faro Mine & Tailings Environmental Scores

Short Term

Long Term

10	Ideal performance. No adverse impact to any aspect of the environment, including aesthetics. The alternative fully restores and protects all water, land, air, fish and wildlife to conditions that are equal to or exceed that which existed prior to the mine. Comprehensive monitoring provides assurance.
9	Very good performance. Impacts are insignificant. No violations to environmental standards will occur. Although some minimal aesthetic affects may remain, the alternative fully restores and protects all highvalue resources. Cleanup and monitoring is best-practice.
8	Good performance. Some minor, localized, temporary impacts to environmental resources. Any violations to standards are minor; exceedences will self-correct within the year. Monitoring is adequate to allow problems to be identified and addressed in a timely fashion.
7	Fair performance. Some exceedences of applicable standards and/or localized, short-term impacts to environmental resources will occur. Effects on plants, fish, and wildlife will be mild and self-correcting within about 3 years.
6	Mediocre performance. There will be a few serious violations of applicable environmental standards. Effects on environmental resources will be significant, but localized and correctable. Regional abundance of the important species will not be seriously affected. Self-correcting in about 10 years.
5	Poor performance. Significant violations and significant problems. There will be serious but correctable damage to some highly valued ecosystem components. Regional abundance of some important species will be affected, and adverse effects will not persist for more than a generation.
4	Very poor performance. Serious problems. Moderate-scale, long-term, ecosystem damage. Regional abundance of important species impacted over multiple generations. Not entirely correctable.
3	Bad performance. Very serious, moderate-scale problems with irreversible (permanent) damage to some of the most highly-valued ecosystem components. Between scores of 2 and 4.
2	Very bad performance. Major problems. Permanent, large-scale, ecosystem damage. Regional loss of some key resources.
1	Terrible performance. Critical problem. Loss of some ecosystem functions. Between scores of 0 and 2.
0	Abominable performance. An environmental disaster. Permanent, large-scale loss of many key species and irreparable damage to ecosystem function.



NPV Total Cost

NPV Total Cost

Final Preferred Option

- ◆ All options meet the objectives of the major stakeholders.
- ◆ Cost-benefit analysis revealed marginal, and in some cases, reduced benefit by spending an extra \$100M for the partial relocation and an extra \$200M for the full relocation of tailings over the stabilize the tailings in place option.
- ◆ Final option selected was stabilize tailings in place with a dry cover.
 - Letter of support received from all parties (Aboriginal group and Territorial Government).
- ◆ 20 year remediation phase followed by 100+ years of water treatment

Program Results

- ◆ Expenditures of almost \$1B:
 - 27 sites completed to-date, 3 more to be completed this year.
- ◆ Consultations (2005 to 2010):
 - over 8,300 people have attended 587 community consultation sessions, workshops and site tours organized by the Program.
- ◆ Economic (2005 to 2010):
 - provided over 1,000,000 person-hrs of employment:
 - includes approximately 800,000 person-hrs (80%) Northern and/or Aboriginal employment.
 - entered into remediation contracts worth in excess of \$330M:
 - includes contracts in excess of \$290M (88%) with Northern and/or Aboriginal companies.
- ◆ Training (2005 to 2010):
 - delivered close to 75,000 hours of training to over 3,700 employees

Thank you

