

Underground Miner Final Report: A Sector Labour Market Partnership – Phase 3 Project

2018



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A Sector Labour Market Partnership (LMP) Underground Miner Phase 3 Project Deliverable.
Provided by B.C. Centre of Training Excellence in Mining (CTEM).

For more information on this document please contact CTEM: info@bc-ctem.ca or visit www.bc-ctem.ca.

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About CTEM

CTEM is a province-wide virtual hub that facilitates collaborative, innovative training opportunities for the British Columbia mining industry (inclusive of mineral exploration, mining and aggregate operations), job seekers and communities. CTEM connects industry, students, job seekers, training providers and communities to meet their respective needs by playing a leading role in understanding industry skills requirements, facilitating industry-driven training, building alliances, and supporting partners.

About Howegroup

The Howegroup is a Vancouver-based boutique consulting practice specializing in strategic planning, evaluation, project management, change management, stakeholder engagement and facilitation. The Howegroup's partners, Wynona Giannasi, MPA, and Jennifer Hystad, MSc, provide services to public and not-for-profit clients including provincial governments, health authorities, professional associations and not-for-profit organizations in British Columbia and Alberta.

1. Introduction

1.1 Background

Historically, due to the absence of a provincial or national curriculum, entry-level training for underground miners has become the responsibility of mining industry employers. This ad hoc training and recruitment process has added significant time and cost. Having each site working in isolation has limited the recognition of common competencies and transferable skills. These competencies and skills are important to recognize as it provides a road-map to additional training, allows for skills upgrading, and skills acknowledgment when transferring between company sites or when a mine closes, transferring skills to other sites supporting long-term employment.

There is a clear need across British Columbia's (B.C.) mining industry, post-secondary training providers and local communities to establish underground miner baseline skills, transferable skills and curriculum that is available for provincial delivery:

- A report by the Mining Industry Human Resources Council (MiHR) from 2013, *British Columbia Underground Miner Occupational Analysis and Skills Development*, details that B.C. lacks the adequate provincial curriculum for underground miner training.
- The 2017 B.C. Mining Labour Market Information Study by CTEM, *Preparing for the Future: Mining Labour Market Outlook for British Columbia*, identified the underground miner occupation as in-demand and lacking a sufficient supply of individuals being trained to meet demand.
- MiHR's 2017 report *Canadian Mining Labour Market Outlook* documented that underground miners were one of the most difficult occupations to recruit for.

In response to this, the B.C. Centre of Training Excellence in Mining (CTEM), the province-wide virtual hub that facilitates collaborative, innovative training opportunities for the B.C. mining industry, job-seekers and communities, has been overseeing a project to confirm baseline skills, develop a provincial training curriculum, and create a transferable skills toolkit for the underground miner occupation. This work is funded through a Shared Cost Agreement provided by the B.C. Ministry of Advanced Education, Skills and Training, Sector Partnerships Program and is guided by the Underground Mining Subject Matter Expert (UM-SME) Committee.

The Labour Market Partnership Program has five phases:

- Phase 1: Sector Engagement
- Phase 2: Labour Market Information (the 2017 BC Mining LMI Report)
- Phase 3: Strategy Development (deliverables include underground miner curriculum and toolkit, with a supporting train-the-trainer guide)
- Phase 4: Implementation
- Phase 5: Evaluation

CTEM completed Phase 2 in 2017 and is scheduled to complete Phase 3 in October 2018. A Phase 4 Sector Partnership application is currently being reviewed with an anticipated implementation date of 2019, dependent on partner needs and capacity.

1.2 About the Curriculum Framework and Toolkit

The Underground Miner Curriculum Framework (Curriculum) has been developed as stand-alone provincial training comprised of three modules. The first module provides provincial theory and common competencies, the second provides site-specific theory and the third module provides hands-on equipment training. Due to the site-specific nature of underground mines, the second and third modules are frameworks that require additional information to be site-relevant. The curriculum is aligned with the Mining Industry Human Resources Council's (MiHR's) National Occupational Standard for Underground Miner, enabling individuals to document their training and experience from the beginning of their career, which can later to be used in their path towards certification through MiHR's Canadian Mining Certification Program (CMCP). It is aligned with key aspects of the Ontario Common Core – further enhancing the skills transferability and employability of the individuals/students.

Canadian Mining Certification Program

The Canadian Mining Certification Program (CMCP) is the industry-standard for validating the skills, knowledge, and experience of workers in the mining sector. The CMCP recognizes individual mine workers who have demonstrated their competencies and expertise by meeting the National Occupational Standards established for the Canadian mining industry.

More info at: <https://www.mihrc.ca/certification-training-standards/the-canadian-mining-certification-program>

The Underground Miner Toolkit (Toolkit), developed by CTEM as part of this Phase 3 project, is intended to be a resource for both individuals wanting to identify and document their transferable skills and organizations that want to access the transferable skills of their job-seekers.

The Train-the-Trainer provides an overview of the Curriculum and Toolkit. It recommends when, how, and where to utilize the resources; provides additional resources to reference; and additional suggestions worth considering when implementing the Curriculum and Toolkit. The Train-the-Trainer is designed to be a guide for the use of the Curriculum and Toolkit and does not have implementation aspects.

National Occupational Standards

National Occupational Standards (NOS) establish clear, objective benchmarks of the skills and knowledge required for workers to perform in a particular occupation. They list the skills and competencies of a fully experienced worker.

More info at: <https://www.mihrc.ca/certification-training-standards/the-canadian-mining-certification-program/national-occupational-standards>

1.3 Purpose

The purpose of this this document is to create the foundation for the Underground Miner Curriculum and Toolkit to be used within the sector. The Final Report includes:

- Strategic objectives (related to training and information sharing, industry acceptance and funding);
- Specific goals and measurable actions;
- Timelines; and
- Resources with clear roles and responsibilities allocated between industry, post-secondary training providers, government partners and CTEM.

The intention is that the Curriculum and Toolkit, developed by the UM-SME Committee, are valued and embeded within the sector. This will support training and build a safe and highly skilled workforce.

1.4 Approach

The Howegroup was retained by CTEM to support the development of the strategic plan, implementation framework and evaluation framework. The Howegroup consultants:

- Reviewed the Curriculum and Toolkit and other background documents relevant to the project such as the Phase Three Interim Report;
- Interviewed the Underground Miner Subject Matter Expert (UM-SME) Committee Chair and the Curriculum and Toolkit developers;
- Surveyed 8 UM-SME Committee members (3 - underground miner experts, 1 - industry training and labour market information expert, 1 - government safety expert, and 3 - post-secondary training experts) for their input on the vision for the Underground Mining Project and perspectives on what is needed to sustain the Curriculum and Toolkit, barriers to overcome in implementing training, and strengths to leverage;
- Facilitated a session with UM-SME Committee members to develop the objectives, goals and actions/tactics; and
- Synthesized data and developed key elements.

1.5 About this Report

The Final Report comprises three key elements: the strategic plan, the implementation plan and the evaluation plan.

- The strategic plan clearly identifies three pillars to support the implementation of the Curriculum and Toolkit – training and information sharing, industry acceptance, and sustainable funding. For each pillar, strategic objectives and goals have been developed.
- The implementation plan builds on the strategic plan which has been created to operationalize goals through specific actions along with timelines and clear roles and responsibilities among industry, post-secondary training and government partners, as well as CTEM, as the leading organization.

- The evaluation plan identifies specific short-term, medium-term, and long-term outcomes, along with specific indicators and measurement tools. The intention of the evaluation plan is to create the foundation for the execution of an evaluation to determine the extent to which progress has been made toward reaching the intended outcomes of the project.

2. Strategic Plan

2.1 Overview – vision and pillars

The vision of the UM-SME Committee is to ensure the long-term usability of the Underground Miner Curriculum and Toolkit through a shared understanding of sustainability, including the roles of stakeholders.

The Underground Miner Curriculum and Toolkit will become sustainable through these pillars: (1) training and information sharing, (2) industry acceptance, and (3) funding. For each pillar, strategic objectives and goals have been developed. Figure 1 provides a summary. The implementation plan (provided in Section 3) details specific actions and tactics, timelines and responsibilities to accompany each goal.

2.2 Strategic objectives and goals

Pillar #1: Training and information sharing

Objective: To have the tools widely available, adapted for site specific use, and enhanced to best benefit the community and industry needs.

The specific goals include:

- a. Curriculum, Toolkit and Train-the-Trainer are accessible through BCcampus, an open-learning platform that hosts open textbooks and open education.
- b. Blended and versatile delivery methods of the Curriculum are available to leverage industry expertise, improve delivery methods, and enhance credibility of the training through varied mechanisms, including:
 - Online, in-person, at a mine-site, use of a simulator, and
 - Industry and post-secondary training providers collaborate to jointly provide subject matter expertise.
- c. Additional supports are provided to industry newcomers (e.g. mentors at mine sites who are familiar with the site and the culture, and who can troubleshoot as needed).

- d. The Curriculum is expanded to include training for underground mine rescue.
- e. The Curriculum may be delivered in a 14-week, or longer duration to enable participants to apply for student loans (the Curriculum is, however, not prescriptive, allowing for flexibility dependent upon student and site needs).
- f. That a repository of support information be developed for mines, including a list of post-secondary training institutions, a list of trainers, a list of available sites to tour, and a list of available simulator locations to be available by CTEM and MiHR.
- g. That capacity is developed for training through a site-sharing model where an active mine site agrees to allow students the opportunity to visit and train on their site while the developing site is built or prior to applying for an underground miner job.

Pillar #2: Industry acceptance

Objective: To have underground miner training that is regarded and trusted as the industry standard in B.C.

The specific goals include:

- a. The Curriculum aligns with MiHR's National Occupational Standard (NOS) for Underground Miner.
- b. Learners track, in MiHR's portal (online database), the common competencies acquired.
- c. There is awareness across the mining industry and post-secondary training institutions within each region about the Curriculum and Toolkit.
- d. The Curriculum and Toolkit is respected by industry and post-secondary training providers by its continued long-term use.
- e. The Curriculum and Toolkit is endorsed by the provincial government with an official statement of endorsement (i.e. a written statement or link from website).
- f. The Curriculum and Toolkit is endorsed by WorkSafeBC with an official statement of endorsement.
- g. Acceptance by industry that workers are qualified (i.e. employers have access to the Curriculum to confirm training content, mining sites conduct skills assessment to verify skills (without having to retrain), and employers have access to a Registry to confirm training was completed in compliance with Freedom of Information and Protection of Privacy (FOIPOP).
- h. Inform the sector that the training is reliable and trustworthy, through demonstrating the benefits and outcomes of the training.

Pillar #3: Funding

Objective: To have the tools available to industry through sustained and various funding streams.

The specific goals include:

- a. Funding is secured for the implementation phase through the Sector Partnerships program with

cash contributions from government and industry.

- b. See the implementation of the tools at two different sites within one-year and that the training is evaluated, updated, and the benefits are demonstrated.
- c. That the Curriculum and Toolkit is self-sustained (i.e. through cost-recovery model options and alternate funding sources).

Figure 1. Strategic Plan Summary

Vision: to ensure long-term usability of the Underground Miner Curriculum and Toolkit through a shared and reasonable understanding of sustainability, including roles of stakeholders and partners.

<h1>1</h1> <h2>Training and information sharing</h2>	<p><i>Objective: To have the tools widely available, adapted for site specific use, and enhanced to best benefit the community and industry needs.</i></p> <ul style="list-style-type: none">▪ Curriculum, Toolkit, and Train-the-Train are accessible▪ Delivery of the Underground Miner training is blended▪ Curriculum is taught by industry subject matter experts▪ Additional supports are provided to industry newcomers▪ Curriculum is expanded to include training for underground mine rescue▪ Students are able to apply for student loans to take the training▪ A repository of certifying information for mines is developed▪ Capacity is developed for training through a site-sharing model
<h1>2</h1> <h2>Industry acceptance</h2>	<p><i>Objective: To have underground miner training that is regarded and trusted as the industry standard in B.C.</i></p> <p>Goals:</p> <ul style="list-style-type: none">▪ Alignment with MiHR's National Occupational Standard for Underground Miner▪ Tracking of common competencies with MiHR's portal for Underground Miner▪ Awareness across the mining industry and post-secondary training institutions about the Curriculum and Toolkit▪ The Curriculum and Toolkit is respected by industry and post-secondary training providers▪ The Curriculum and Toolkit is endorsed by the provincial government (Ministry of Energy, Mines and Petroleum Resources)▪ The Curriculum and Toolkit is endorsed by WorkSafeBC▪ Qualified entry-level workers▪ Inform the sector that the training is reliable and trustworthy
<h1>3</h1> <h2>Funding</h2>	<p><i>Objective: To have the tools available to industry through sustained and various funding streams.</i></p> <p>Goals:</p> <ul style="list-style-type: none">▪ Funding for the implementation phase is secured▪ Two implementation sites are delivering training▪ The Curriculum and Toolkit is self-sustained (i.e. through cost-recovery model options and alternative funding sources)

3. Implementation Framework

3.1 Overview

The implementation plan, which builds on the strategic plan, has been created to operationalize goals through specific actions along with timelines and clear roles and responsibilities among industry, post-secondary training providers, government partners and CTEM as the leading organization.

An implementation plan is provided for each of the three pillars:

- 1. Training and information sharing:** The Underground Miner Curriculum and Toolkit is customizable
- 2. Industry acceptance:** The Underground Miner Curriculum and Toolkit is accepted and trusted as the industry standard
- 3. Funding:** The Underground Miner Curriculum and Toolkit has sustainable funding which allows for long-term planning

Specific timelines identified in this document are:

- Short-term (Six months - 18 months)
- Medium-term (Two - three years)
- Long-term (Five years)
- Ongoing

Resources include responsibility and financial commitment. Responsibilities have been identified for the following organizations:

- CTEM
- Government
- Industry
- MiHR
- Post-secondary training providers (Post-secondary)

The tools created in Phase 3 are developed to enable adaptation to site-specific criteria along with industry and community needs. The responsibility listed as 'Industry' refers to industry that are exploring for, developing, or operating an underground mine; suppliers and contractors associated with underground mining; and other associations outside of CTEM and MiHR (i.e. Mining Association of British Columbia, Canadian Institute of Mining, Mining Association of Canada, etc.). The responsibility listed as 'Post-secondary' refers to public or private post-secondary training institutions. Although the project is focused on British Columbia, 'Industry' and 'Post-secondary' responsibilities could be met by representatives outside of British Columbia. For a list of Phase 3, project participants, view the previous Acknowledgments section.

Financial commitment needed to complete a goal has been estimated based on prior project implementation experience and industry experts opinion; it has been identified as:

- None (NA)
- Minimal (\$), less than \$5,000
- Medium (\$\$), between \$5,000 and \$20,000
- Significant (\$\$\$), over \$20,000

It is understood that CTEM has the lead responsibility and will be accountable to report to government on the project's ongoing progress. It is also understood that partners will be consulted and kept informed throughout the project.

3.2 Implementation Plan

1. Training and information sharing

Objective: The Underground Miner Curriculum and Toolkit is customizable

Goal	Tactic	Timeline	Cost	Responsibility
a. The deliverables are accessible	Post deliverables on BCcampus and CTEM websites	6 months	NA	CTEM
b. The delivery of the Underground Miner training is blended	Offer training using multiple methods (i.e. classroom, online and field training)	6 months and ongoing	\$\$\$	CTEM, Post-secondary, Industry
c. Curriculum is taught by industry SMEs	Recruit trainers who have industry experience (e.g. retired miners)	6 months and ongoing	\$\$\$	Post-secondary, Industry, MiHR
d. Additional supports are provided to industry newcomers	Use mentors at mine sites to support newcomers to the industry (i.e. someone who is familiar with the site and the culture and can troubleshoot as needed)	6 months and ongoing	\$\$	Industry
e. Curriculum is expanded to include training for underground mine rescue	Write a module for underground mine rescue training	3-5 years	\$\$	CTEM, Industry, MiHR
f. Students are able to apply for student loan to take the training	The Curriculum delivery is 14 weeks, or longer, in duration to qualify students for loans	6 months	NA	Post-secondary
g. A repository of certifying information for mines is developed	Compile a list of post-secondary institutions that provide training and post on websites	1 year and ongoing	\$	CTEM, Industry Associations
	Compile a list of trainers (at the organizational and individual level)	1 year and ongoing	\$	CTEM, Industry
	Compile a list of available onsite/ simulator training locations	1 year and ongoing	\$	CTEM and Industry
h. Capacity is developed for training through a site-sharing model	Create a site-sharing agreement to allow for students to visit and train at active mine sites.	1 year	\$\$	CTEM, MiHR
	Facilitate site-sharing among users	1 year	NA	CTEM, MiHR

Cost commitment is defined at none - NA, minimal - \$ (less than \$5,000, medium - \$\$ (between \$5,000 - \$20,000), and significant - \$\$\$ (over \$20,000).

2. Industry acceptance

Objective: The Underground Miner Curriculum and Toolkit is accepted and trusted as the industry standard

Goal	Tactic	Timeline	Cost	Responsibility
a. The Curriculum and Toolkit is aligned with MiHR's National Occupational Standard (NOS) for Underground Miner	Test alignment of Curriculum with MiHR's Canadian Mining Certification Program Level 1	1 year	\$\$	CTEM, MiHR
b. Learners track, in MiHR's portal (online database), the common competencies acquired	Post student learnings in MiHR's portal and track statistics over time	1 year and ongoing	\$	Industry, MiHR
c. There is awareness across the mining industry and post-secondary institutions within each region about the Curriculum and Toolkit	Presentation at MiHR Board Meeting in Vancouver	6 months	\$	CTEM, MiHR
	Presentation at MABC Mine Managers Meeting	6 months	\$	CTEM, Industry
	Inform through Continuing Education and Training Association of BC (CETABC)	1 year	\$	CTEM, Post-secondary
	Identify other mining associations and post-secondary institutions to present to	6 months and ongoing	NA	CTEM, Industry, Post-secondary, MiHR
d. The Curriculum and Toolkit is respected by industry and post-secondary training providers	Identify industry spokesperson to communicate success stories and benefits of the Curriculum and Toolkit	1 year	NA	CTEM, Industry, MiHR
e. The Curriculum and Toolkit is endorsed by the provincial government (Ministry of Energy, Mines and Petroleum Resources)	Secure an official statement of endorsement*	2 years	NA	CTEM, Government
f. The Curriculum and Toolkit is endorsed by WorkSafeBC	Secure an official statement of endorsement *	2 years	NA	CTEM, Government
g. Qualified entry level workers	Employers have access to curriculum to confirm training content	6 months and ongoing	NA	CTEM, Industry, Post-secondary
	Mining sites conduct skills assessment to verify skills (without having to retrain)	1 year and ongoing	\$\$	CTEM, Industry, Post-secondary
	Employers have access to a registry to confirm training was completed	1 year and ongoing	\$\$	CTEM, Industry, Post-secondary, MiHR
h. Inform the sector that the training is reliable and trustworthy	Communicate the content and learning outcomes/benefits of the training	6 months and ongoing	\$\$	CTEM, Industry, Government, MiHR, Post-secondary

Cost commitment is defined at none - NA, minimal - \$ (less than \$5,000, medium - \$\$ (between \$5,000 - \$20,000), and significant - \$\$\$ (over \$20,000).

*The request for an official statement would be best following implementation (Phase 4) which is anticipated to take over 12 months duration to complete once started.

3. Funding

Objective: The Underground Miner Curriculum and Toolkit has sustainable funding which allows for long-term planning

Goal	Tactic	Timeline	Cost	Responsibility
a. Funding for implementation phase is secured	Secure industry site(s) and post-secondary support for implementation phase	6 months	NA	CTEM, Industry, Post-secondary
	Secure funding*	6 months	NA	CTEM
b. Two implementation sites are delivering training	Secures two mine sites for implementation phase	1 year	NA	CTEM, Industry
	Training sites are evaluated and updated	12-18 months	\$\$	CTEM, MiHR
	Business case is developed of two implementation sites with cash contributions from industry partners	12-18 months	\$\$	CTEM, Industry, MiHR
c. The Curriculum and Toolkit is self-sustaining**	Develop cost recovery model options	1 year	\$\$	CTEM, Industry, Government, Post-secondary, MiHR
	Facilitate implementation of preferred cost-recovery model	3-5 years	\$\$\$	CTEM, Industry, Government, Post-secondary
	Seek alternative funding sources (e.g. rural and remote, land-use)	Ongoing	NA	CTEM, Industry

Cost commitment is defined at none - NA, minimal - \$ (less than \$5,000, medium - \$\$ (between \$5,000 - \$20,000), and significant - \$\$\$ (over \$20,000).

*The provincial tools should be implemented at two mine-sites of different underground extraction methods to enable implementation at a provincial level. Due to the focus of hands-on-equipment training, training of 30 individuals at each site should be provided in two groups of 15 students (at a maximum). Updating the tools and advancing the project Sustainability Plan are necessary within Phase 4 and following implementation. To do the above discussed items it has an anticipated cost of over \$2 million over a 16 month period. The training needs to be done over three months for each cohort of upto 15 individuals. Because of the skills assessment and hands-on-training a month of the program requires a 5 student to 1 trainer ratio. It is a highly skilled trade.

**To fully complete the 'Implementation Plan' it is estimated to take five years at a cost of over \$4 Million dollars provided through partner (in-kind and financial) and provincial (financial) contribution.

4. Evaluation Framework

4.1 Overview

The intent of the evaluation framework is to apply a theory of change (logic model) approach to evaluate the effectiveness of the Underground Miner Curriculum and Toolkit. The recent Phase 2 – BC Mining Labour Market Information Study identified underground miner as an in-demand and gap-sensitive (not enough individuals being trained to meet demand) role at the provincial level. MiHR's 2017 report 'Canadian Mining Labour Market Outlook' explained that underground miner was among the occupations identified by industry at the national level as having the most difficulty recruiting. The Phase 2 report also flagged a need to have newly trained individuals ready to replace the aging workforce. The tools developed in Phase 3 and this Sustainability Plan are meant to be provincial next steps to having training that is provincial allowing for skills transferability and site-specific to meet the needs of the industry and trainees.

Effectiveness of the Curriculum will be assessed against factors like relevance to the local community, industry recognition, training of workers, and alignment with MiHR's National Occupational Standard for Underground Miner. Factors to assess the effectiveness of the Toolkit include usability, ease of assessing transferable skills and documentation through MiHR's online portal allowing for national recognition and transferability.

The evaluation identifies short-term, medium-term and long-term outcomes of the Curriculum and Toolkit along with specific indicators and measurement tools. In addition, the evaluation will examine success factors and general accomplishments that support the project and barriers that may impede the project. Lessons learned will be drawn from interviews with the Underground Miner Committee (Committee) members. It is anticipated that the UM-SME Committee, specific to this project, will be combined with CTEM's original Underground Miner Committee allowing for information retention. Success factors and barriers will be shared with the CTEM leadership and the Committee to inform project improvements.

Results from the evaluation are intended to be used for quality improvement, accountability and sustainability. The evaluation is structured so that quantitative data (survey results) and qualitative data (interviews) are relayed back to CTEM leadership and to inform organizational learning and project improvement. The evaluation process, including evaluation findings, will also demonstrate accountability for the financial and human resources dedicated to the project.

The key evaluation target audiences (those providing evaluative data) include:

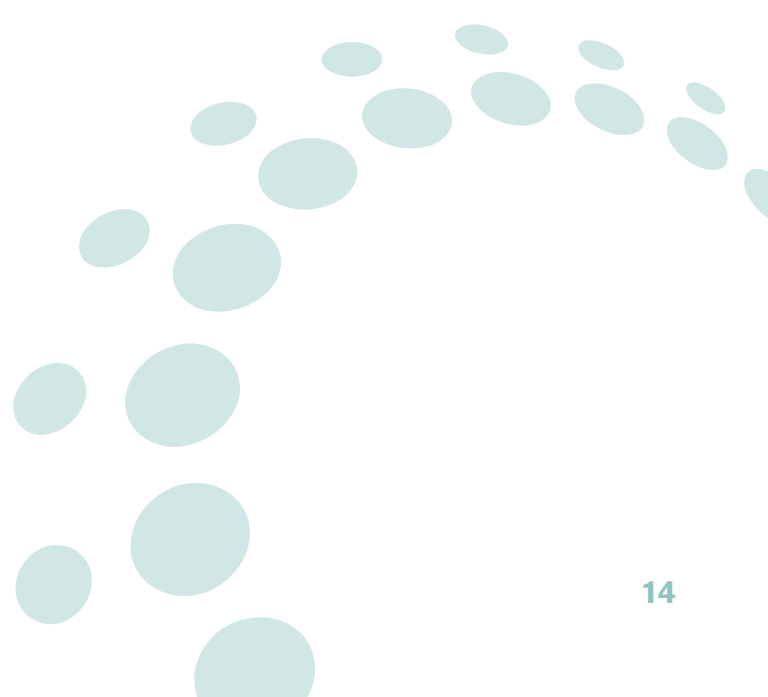
- Underground Miner Committee (Committee)
- Training participants
- Trainers

The scope of this evaluation is focused on the Curriculum and Toolkit and does not explore other activities of CTEM.

The evaluation aligns with the vision of ensuring the long-term usability of the Curriculum and Toolkit through a shared and reasonable understanding of sustainability, including roles of stakeholders and partners, the objectives and goals.

Key activities include Committee meetings, online resources (including the Toolkit), training resources, training support, online Curriculum, securing training sites (mine sites), raising program awareness, securing endorsement(s), ensuring alignment with MiHR's National Occupational Standard (NOS) for Underground Miner and continual review and revision of the Curriculum.

Specific indicators have been developed for each key outcome and will be operationalized through the use of specific measurement tools, including the interviews and surveys and website key performance indicators (KPIs). Indicators are a "specific, observable, and measurable characteristic or change that represents the achievement of an outcome". It is critical the indicators relate directly to the outcome they are approximating in order to provide meaningful information.



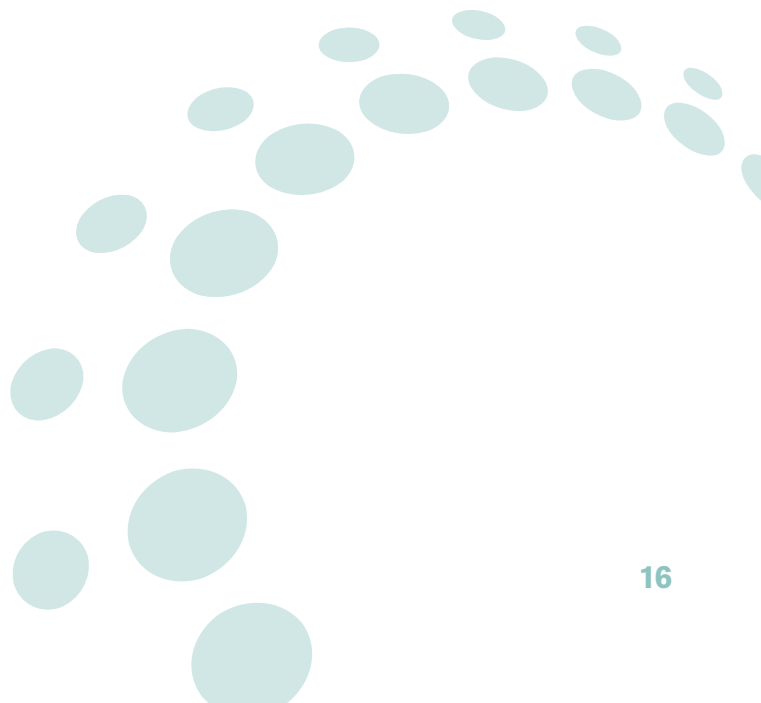
4.2 Logic model

Activities identified in the following logic model were created by the UM-SME Committee to support the three pillars presented in this document – training and information sharing, industry acceptance and funding. Through the specific activities in the logic model, it is anticipated that changes in attitudes, knowledge or behaviour (outcomes) will be achieved. These outcomes will be measured through the identified indicators and reported on to determine the success of the sustainability plan.

Activities and Inputs	Outputs	Short-term Outcomes	Medium-term Outcomes	Long-term Outcomes	Indicators	Data Source
Local training and access						
<ul style="list-style-type: none"> Cost of training Mine site Trainer 	<ul style="list-style-type: none"> Number of individuals trained Location of home/ training Hours trained 	<ul style="list-style-type: none"> Potential workers access local training Industry utilizes trusted Curriculum Transferrable skills assessed 	<ul style="list-style-type: none"> Potential workers gain knowledge and skills for entry-level positions Industry has trained workers 	<ul style="list-style-type: none"> Local people are trained to work in a local mine Mine accesses local, trained workers 	<ul style="list-style-type: none"> Number of trainees from local community vs. outside of the community Number of individuals using transferable skills online monitoring 	<ul style="list-style-type: none"> Survey of Trainers Training Participant Survey
Recruitment						
<ul style="list-style-type: none"> Promotion of training Promotion of transferable skills Curriculum taught by SMEs 	<ul style="list-style-type: none"> Website statistics Type of training method* Number/role of industry experts 	<ul style="list-style-type: none"> Stakeholders are aware of training 	<ul style="list-style-type: none"> Training is easy to access 	<ul style="list-style-type: none"> Reduced time to hire trained workers Trained workers meet market demand 	<ul style="list-style-type: none"> Days from job posting to hire Average number of vacant jobs across the industry 	<ul style="list-style-type: none"> Underground Miner Labour Market Survey
Industry standard						
<ul style="list-style-type: none"> Aligns with MiHR NOS for Underground Miner Provincial endorsement WorkSafeBC endorsement Sector information sharing 	<ul style="list-style-type: none"> Alignment with MiHR NOS Number/type of information sharing events (post-secondary/ industry) Multiple delivery implementation 	<ul style="list-style-type: none"> Industry is aware of alignment and endorsements Training is aligned with the NOS for Underground Miner 	<ul style="list-style-type: none"> Training is accepted by industry 	<ul style="list-style-type: none"> Training is used and adapted across provincial jurisdictions 	<ul style="list-style-type: none"> Industry representatives indicate high level of trust for the Curriculum Endorsements Number of regions in B.C. training using the Curriculum 	<ul style="list-style-type: none"> Underground Miner Committee Survey

* The 'type of training method' output will allow for a better understanding of flexibility in training delivery (i.e. how much simulator versus direct equipment training, how much training provided by site experts versus training provided by post-secondary training experts).

Activities and Inputs	Outputs	Short-term Outcomes	Medium-term Outcomes	Long-term Outcomes	Indicators	Data Source
Job-ready skills						
<ul style="list-style-type: none"> Cost of training Mine site Trainer 	<ul style="list-style-type: none"> Number of trained workers Number of workers employed 	<ul style="list-style-type: none"> Miner is aware of skills needed Training is affordable 	<ul style="list-style-type: none"> Miner has knowledge and skills for entry level position 	<ul style="list-style-type: none"> Miner is employed in local mine Miner progresses their career path through the Canadian Mining Certification Program (CMCP) 	<ul style="list-style-type: none"> Reducing number of on-the-job training hours Number of workers advancing through CMCP 	<ul style="list-style-type: none"> Training Participant Survey Underground Miner Labour Market Survey
Honoring transferrable skills						
<ul style="list-style-type: none"> Promotion Accessibility Usage 	<ul style="list-style-type: none"> Number of Toolkits accessed online Number of Toolkit resources disseminated Number of / location of employers using the Curriculum 	<ul style="list-style-type: none"> Toolkit is aligned with MiHR NOS for Underground Miner 	<ul style="list-style-type: none"> Industry human resources professionals incorporate Toolkit into the onboarding process Mine sites use Toolkit to re-evaluate progression of employee skills 	<ul style="list-style-type: none"> Miner progresses their career path through the Canadian Mining Certification Program (CMCP) 	<ul style="list-style-type: none"> Number of people registering transferable skills in MiHR's online portal Number of people advancing through CMCP 	<ul style="list-style-type: none"> Underground Miner Labour Market Survey



4.3 Measurement tools

Measurement tools support assessing and enhancing the Curriculum and Toolkit. Indicators for success have been put forward in the logic chart (provided in the previous section). The measurement tools discussed below are designed to gather both quantitative and qualitative feedback from trainers, participants, industry, partners and industry associations. It is anticipated that questions for surveys and interviews will be developed in the implementation phase and be applied in future training experiences. Six measurement tools are recommended to collect a mix of quantitative and qualitative data.

Measurement Tool	Description
Survey of Trainers	An online survey of Trainers completed immediately following the completion of a training session (e.g. Module 1 etc.). The survey will have open- and closed-ended questions regarding the Curriculum (and recommendations for improvement), demographics of training participants and logistics of the training itself including barriers, success factors and lessons learned.
Training Participant Survey	An online survey of training participants completed immediately following the completion of the training session (e.g. Module 1 etc.). The survey will have mostly closed-ended questions (to support ease of completion and ease of data analysis) regarding the method of training, the Curriculum, skills and knowledge gained as well as employability and career outlook. The survey will also explore if the training is working well from the participants' perspective.
Training Participant Interviews	A 30-minute telephone interview with three to five training participants to explore in-depth the topics found on the survey including effectiveness of the training methods, the Curriculum, suggestions for improvement, what the participant liked best about the training and career outlook. This should be done at the end of the first two cohorts at each mine site and then once a year or after an update to the training. It can be delivered by the industry provider, a representative of the Underground Miner Committee or an industry association (ie. CTEM or MiHR).
Underground Miner Labour Market Survey	An annual survey, conducted in partnership with MiHR to examine supply and demand. This would be a good opportunity to assess awareness and acceptance of the Curriculum.
Underground Miner Committee Survey	A brief online and/or paper survey of Committee members disseminated once or twice each year. The survey will have open- and closed-ended questions regarding the Curriculum (and recommendations for improvement), their understanding of training barriers, success factors and lessons learned as well as alignment with standards, endorsements and sector information sharing.
Underground Miner Committee Interviews	A 30-minute telephone interview with three to five Committee members to explore the barriers, success factors and lessons learned of the Curriculum and training methods.

A one-hour facilitated session with the Committee is also recommended to support ongoing project learning and improvements/adaptation. Example facilitation questions include:

- What from the evaluation data was unexpected?
- What is working, and why? What is not working, and why?
- How should the strategy/approach be adapted?

4.4 Measurement work plan

The following measurement work plan is presented inclusive of timelines and responsibilities to ensure the evaluation activities are conducted:

Measurement Tool	Timing	Responsibility
1. Survey of Trainers	Immediately upon completion of training session (e.g. Module 1 etc.)	CTEM
2. Underground Miner Labour Market Survey	Bi-annually	CTEM, in partnership with MiHR
3. Underground Miner Committee Survey	Semi-annually	CTEM
4. Underground Miner Committee Interviews	Annually (Two months prior to year-end reporting)	CTEM
5. Training Participant Survey	Immediately upon completion of training session (e.g. Module 1 etc.)	CTEM / Trainer(s)
6. Training Participant Interviews	Immediately upon completion of training session (e.g. Module 1 etc.)	CTEM / Trainer(s)
7. Underground Miner Committee facilitated session*	Annually	CTEM

**This is not a measurement tool, but rather an annual review process utilizing data collected from the other six tools.*

5. Closing

In response to the need for provincial curriculum for the underground miner occupation, the UM-SME Committee developed the Underground Miner Curriculum and Toolkit. To ensure sustainability of these deliverables, CTEM, along with the UM-SME Committee, provided input into the development of this Final Report, inclusive of a Strategic Plan, Implementation Framework and Evaluation Framework.

Three pillars were identified to sustain this work: (1) training and information sharing, (2) industry acceptance, and (3) funding. They are supported by the following objectives:

- The Underground Miner Curriculum and Toolkit is customizable.
- The Underground Miner Curriculum and Toolkit is accepted and trusted as the industry standard.
- The Underground Miner Curriculum and Toolkit have sustainable funding which allows for long-term planning.

Specific goals were developed and operationalized through actions, timelines and clear responsibilities and the effectiveness will be measured through the evaluation framework.

To ensure ongoing project improvement and organizational learning, it is recommended that 'evaluation' be added as a standing item to the Committee agenda. It is also recommended that a strategic learning session be facilitated annually to create the space for where evaluation results to be formally reviewed.

Moving forward, this provincial Curriculum will be implemented and evaluated. As the business case is built to demonstrate the benefits of the Curriculum for industry, post-secondary training providers and communities, CTEM and the Committee will seek additional revenue streams (i.e. student loans, provincial grants, federal grants, industry loans) for the ongoing implementation of the Curriculum.