



Canada Energy
Regulator

Régie de l'énergie
du Canada

Suite 210, 517 Tenth Avenue SW
Calgary, Alberta
T2R 0A8

Final Audit Report

Trans Mountain Pipeline ULC
Topic: Control Room Management
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Executive Summary

The Canada Energy Regulator (**CER**) expects pipelines and associated facilities within the Government of Canada's jurisdiction to be constructed, operated, and abandoned in a safe and secure manner that protects people, property, and the environment. To this end, the CER conducts a variety of compliance oversight activities, such as audits.

Section 103 of the *Canadian Energy Regulator Act* (S.C. 2019, c.28, s.10) (**CER Act**) authorizes inspection officers to conduct audits of regulated companies. The purpose of these audits is to assess compliance with the CER Act and its associated Regulations.

The purpose of operational audits is to ensure that regulated companies have established and implemented both a management system and its associated programs, as specified in the *Canadian Energy Regulator Onshore Pipeline Regulations* (SOR/99-294) (**OPR**).

The CER conducted an audit of Trans Mountain Pipeline ULC (**Trans Mountain or TMPU or the company**) between 13 September 2023 and 8 November 2023. The topic of the audit was Control Room Management.

One objective of this audit was to **verify that the company has developed and implemented a pipeline control system and leak detection system in accordance with the requirements of the OPR and the Canadian Standards Association Standard Z662:2023, Oil and gas pipeline systems (CSA Z662:23). Another objective was to verify that the control room operation and maintenance processes are effectively integrated within the company's management system.**

The scope of the audit included the personnel, processes and activities used to operate and control the liquid pipeline control system and leak detection system. The scope applied to normal and abnormal operating conditions, including emergency shut down in place at the time of the audit and looking back for up to six months to verify that they were compliant with relevant sections of the OPR and CSA Z662.

The CER conducted the audit using the 21 audit protocols attached in Appendix 1 of this report, which are focused on control room management. The CER assessed whether Trans Mountain's documentation, processes and activities complied with legal and other requirements under the CER's authority.

Of the 21 regulatory requirements that were assessed, Trans Mountain demonstrated that it met the expected outcomes for all of them. Note that all findings are specific to the information assessed at the time of the audit as related to the audit scope.

The Final Audit Report will be made public on the CER website.

Table of Contents

Executive Summary	2
1.0 Background	5
1.1 Introduction	5
1.2 Description of Audit Topic	5
1.3 Company Overview	5
2.0 Objectives and Scope.....	7
3.0 Methodology.....	8
4.0 Summary of Findings.....	8
5.0 Discussion	14
6.0 Next Steps.....	15
7.0 Conclusion	15
Appendix 1: Audit Assessment.....	16
AP-01 Policy and Commitment Statements	16
AP-02 Hazard Identification	18
AP-03 Risk Assessment	20
AP-04 Controls	23
AP-05 Goals, Targets and Objectives.....	26
AP-06 Organizational Structure, Roles, and Responsibilities	28
AP-07 Operational Control.....	31
AP-08 Operating and Maintenance Manuals	34
AP-09 Pipeline Control System – Leak Detection System	37
AP-10 Pipeline Control System – Data Recording System	40
AP-11 Investigation of Incidents, Near Misses and Non-Compliances	42
AP-12 Emergency Procedures Manual.....	45
AP-13 Analysis of Leak Alarms.....	48
AP-14 Safe Shutdown of Pipeline in an Emergency	50
AP-15 Defining Competency and Training Requirements	53
AP-16 Verifying Competency and Training	56
AP-17 Annual Training Program Report	58
AP-18 Control Room Audits.....	60
AP-19 Audits of Leak Detection System	62
AP-20 Annual Management Review	64

AP-21 Pipeline Control System.....67
Appendix 2: Terms and Abbreviations.....70

List of Tables and Figures

Table 1. Audit Scope.....8
Table 2. Summary of Findings9

1.0 Background

1.1 Introduction

The CER expects pipelines and associated facilities within the Government of Canada's jurisdiction to be constructed, operated, and abandoned in a safe and secure manner that protects people, property, and the environment. Section 103 of the CER Act authorizes inspection officers to conduct audits of regulated companies. The purpose of these audits is to assess compliance with the CER Act and its associated Regulations. The purpose of operational audits is to ensure that regulated companies have established and implemented both a management system and its associated programs, as specified in the OPR.

The CER conducted an audit of Trans Mountain between 13 September 2023 and 8 November 2023. The topic of the audit was Control Room Management.

1.2 Description of Audit Topic

For CER-regulated entities that operate pipeline control rooms, the OPR requires them to develop and implement a pipeline control system and a leak detection system as part of their management system. A carefully designed and well-implemented management system reflects a company's commitment to continual improvement in safety and environmental protection throughout the full lifecycle of its facilities. It also supports a culture of safety and is fundamental to keeping people safe and protecting the environment. The control systems and leak detection systems must also meet the requirements of CSA Z662:23 and reflect the level of complexity of the pipeline, the pipeline operation, and the products transported.

For the purposes of this audit, the CER's expectations include, but are not limited to the company having established and implemented:

- an effective organizational structure, competency and training requirements, and training programs and processes to identify and communicate roles, responsibilities, and authorities, and to verify the competency of workers;
- control room operation and maintenance manuals designed to ensure that the pipeline is operated safely, efficiently, and in a manner that protects people and the environment;
- a process for the internal reporting, analysis, and investigation of hazards, potential hazards, incidents, and near-misses reported through the control centre, and for taking corrective and preventive measures, including measures to manage imminent threats; and
- quality assurance measures, including audits and inspections, to ensure that the pipeline control system is being effectively operated and maintained and that personnel are carrying out their duties in accordance with company requirements in a competent manner.

1.3 Company Overview

Trans Mountain is a Canadian corporation with its head office in Calgary, Alberta. It is the holder of the CER certificates for the existing pipeline and the Trans Mountain Expansion Project (**TMEP**), currently under construction. Trans Mountain's CER-regulated assets include approximately 1156 kilometres (**kms**) of operating pipeline. Trans Mountain Line 1 pipeline includes 1147.28 kms of pipe on its mainline and 8.75 kms of pipe that runs from Suma Station to the border with the United States of America (**USA**). The existing pipeline commenced operations in 1953 and transports a range of crude oil and refined / semi-refined petroleum products from western Canada to refineries and terminals in British Columbia and Washington State. Crude oil is also shipped to offshore markets in Asia and to the USA west coast via the Westridge Marine Terminal in Burnaby, British Columbia. Trans Mountain is unique among major pipelines out of the Western Canadian Sedimentary Basin in that it ships the full spectrum of oils (from refined petroleum products to heavy

crude oil) in a single line. The existing system has an operating capacity of 47,690 m³ /day (300,000 bbl/day) using 23 active pump stations. Trans Mountain currently has 62 legacy tanks in service in Canada.

The expansion project will increase the system capacity to 141,500 m³ /day (890,000 bbl/day). The new pipeline will carry heavier oils with the capability for transporting light crude oils. The TMEP involves the twinning of the existing pipeline with approximately 987 kms of new buried pipeline and the reactivation of approximately 193 kms of existing pipeline. Along with the installation of new pipeline, changes are being made to existing facilities including additional pump stations, terminal upgrades, and the construction of new facility infrastructure. The mechanical completion of the project, filling of the line and set-to work is planned to occur in 2024.

Trans Mountain has developed and implemented an Integrated Safety and Loss Management System (**ISLMS**) that applies to all activities involved in the design, construction, operation, and abandonment of TMPU's pipeline systems. During this audit, CER Auditors did not evaluate the entirety of the ISLMS as it was beyond the scope for this focused audit. Instead, the auditors evaluated whether TMPU met the requirements of section 37 of the OPR for a pipeline control system and that the operation and maintenance of the control system was effectively integrated into the company's ISLMS.

Section 37 of the OPR states:

A company shall develop and implement a pipeline control system that:

- (a) Comprises the facilities and procedures used to control and monitor the operation of the pipeline;
- (b) Records historical pipeline data, messages, and alarms for recall; and
- (c) Includes a leak detection system that, for oil pipelines, meets the requirements of CSA Z662 and reflects the level of complexity of the pipeline, the pipeline operation and the products transported.

The map below depicts the company's CER-regulated assets.



2.0 Objectives and Scope

One objective of this audit was to verify that the company has developed and implemented a pipeline control system and leak detection system in accordance with the requirements of the OPR and CSA Z662:23. Another objective was to verify that the control room operation and maintenance processes are effectively integrated within the company's management system.

The table below outlines the scope selected for this audit which included the personnel, processes and activities used to operate and control the liquid pipeline control system and leak detection system. The scope applied to normal and abnormal operating conditions, including emergency shut down, as in place at the time of the audit and looking back for up to six months to verify that they were compliant with the relevant sections of the OPR and CSA Z662.

Table 1. Audit Scope

Audit Scope	Details
Audit Topic	Control Room Management
Lifecycle Phases	<input type="checkbox"/> Construction <input checked="" type="checkbox"/> Operations <input type="checkbox"/> Abandonment
Section 55 Programs	<input type="checkbox"/> Emergency Management <input checked="" type="checkbox"/> Integrity Management <input type="checkbox"/> Safety Management <input type="checkbox"/> Security Management <input type="checkbox"/> Environmental Protection <input type="checkbox"/> Damage Prevention
Time Frame	Up to six (6) months prior to the start of the audit.

3.0 Methodology

To evaluate Trans Mountain’s compliance with the regulatory requirements listed in Appendix 1, the CER auditors reviewed over 350 of TMPU’s documents and records, visited the liquid pipeline main control centre (**MCC**) and backup control centre (**BCC**) and conducted 23 interviews with company personnel. The list of documents reviewed, records sampled, and the list of interviewees are retained on file with the CER.

An audit notification letter was sent to the company on 28 August 2023 advising the company of the CER’s plans to conduct an operational audit. The lead auditor provided the audit protocol and initial information request to the company on 30 August 2023 and followed up on 13 September 2023 with a meeting with the company staff to discuss the plans and schedule for the audit. Document review began on 17 October 2023 and interviews were conducted between 30 October 2023 and 3 November 2023, which included tours of the MCC and the BCC.

On 8 November 2023, the CER audit team provided Trans Mountain with a closeout meeting in which the preliminary audit findings were presented.

4.0 Summary of Findings

The lead auditor assigned a finding to each audit protocol, which can be either:

- No issues identified: This means that no non-compliances were identified during the audit, based on the information provided by the company, and reviewed by the auditor within the context of the audit scope; or
- Non-compliant: This means that the company has not demonstrated that it has met the legal requirements. A corrective and preventive action (**CAPA**) plan shall be developed and implemented to resolve the deficiency.

All findings are specific to the information assessed at the time of the audit, as related to the audit scope.

The table below summarizes the finding results. See [Appendix 1: Audit Assessment](#) for more detailed information. Of the 21 protocol items that were assessed in Appendix 1, the CER auditors found all 21 met the expected outcomes.

Table 2. Summary of Findings

Audit Protocol (AP) Number	Regulation	Regulatory Reference	Topic	Finding Status	Finding Summary
AP-01	OPR	6.3(1)	Policy and Commitment Statements	No issues identified	Trans Mountain demonstrated that it has policies and goals at the corporate level that meet the requirements of sub-section 6.3(1) of the OPR.
AP-02	OPR	6.5(1)(d)	Hazard Identification	No issues identified	Trans Mountain demonstrated that it has a process for identifying hazards and potential hazards associated with control room operations and that it maintains an up-to-date list of those hazards which is used as part of its risk evaluation and control process.
AP-03	OPR	6.5(1)(e)	Risk Assessment	No issues identified	Trans Mountain demonstrated that it has a process for evaluating risks associated with hazards and potential hazards associated with control room operations including risks related to normal and abnormal operating conditions.
AP-04	OPR	6.5(1)(f)	Controls	No issues identified	Trans Mountain demonstrated that it has a process for developing and implementing controls to prevent, manage, and mitigate the identified hazards, potential hazards and risks associated with control room operations and for communicating those controls to anyone who is exposed to the risks.

Audit Protocol (AP) Number	Regulation	Regulatory Reference	Topic	Finding Status	Finding Summary
AP-05	OPR	6.5(1)(a)	Goals, Targets and Objectives	No issues identified	Trans Mountain demonstrated that it has a process for setting objectives and targets within its Control Centre Management Program and Computational Pipeline Monitoring Management Program designed to achieve its corporate goals and for ensuring their annual review.
AP-06	OPR	6.4	Organizational Structure, Roles, and Responsibilities	No issues identified	Trans Mountain demonstrated that it has a documented organizational structure that enables it to meet the requirements of the management system and meet its obligations under the OPR; determine and communicate the roles, responsibilities and authority of the officers and employees at all levels of the company; and that it conducts an annual documented evaluation of need of the human resources needed for the Control Centre and the Simulations and Control Group.
AP-07	OPR	6.5(1)(q)	Operational Control	No issues identified	Trans Mountain demonstrated that it has a number of procedures and standards that it uses to coordinate and control the operational activities of Control Centre Operators and field personnel so that each person is aware of the activities of others and has the information that will enable them to perform their duties in a manner that is safe, ensures the safety and security of the pipeline and protects the environment.

Audit Protocol (AP) Number	Regulation	Regulatory Reference	Topic	Finding Status	Finding Summary
AP-08	OPR	27	Operating & Maintenance Manuals	No issues identified	Trans Mountain demonstrated that processes to develop, regularly review, and update as required, operation and maintenance manuals specific to the control room processes are established and implemented.
AP-09	OPR	37(c)	Pipeline Control System – Leak Detection System	No issues identified	Trans Mountain demonstrated that it has developed and implemented a pipeline control system that includes two leak detection systems that, for oil pipelines, meet the requirements of CSA Z662.
AP-10	OPR	37(b)	Pipeline Control System – Data Recording System	No issues identified	Trans Mountain demonstrated that it has developed and implemented a pipeline control system that records historical pipeline operation data, messages, and alarms for recall for the Supervisory Control and Data Acquisition (SCADA) and the leak detection systems.
AP-11	OPR	6.5(1)(r)	Investigation of Incidents, Near Misses, and Non-compliances	No issues identified	Trans Mountain demonstrated that it has established and implemented a process for the internal reporting of hazards, potential hazards, incidents, and near-misses and taking corrective and preventive actions, including the steps to manage imminent hazards. The control room has a specialized operational incident reporting process that integrates with the ISLMS incident management process.

Audit Protocol (AP) Number	Regulation	Regulatory Reference	Topic	Finding Status	Finding Summary
AP-12	OPR	32(1.1)	Emergency Procedures Manual	No issues identified	Trans Mountain demonstrated that it has developed emergency procedure manuals and control room emergency procedures, reviews them regularly and updates as required. The company also has processes in place to train and evaluate control room operators on emergency and abnormal operating conditions response.
AP-13	CSA Z662:23	E.4.2.1	Analysis of Leak Alarms	No issues identified	Trans Mountain demonstrated that analysis of leak alarms is conducted to determine the cause, and false alarms are not discounted or declared invalid without analysis.
AP-14	CSA Z662:23	E.5.2.1	Safe Shut Down of Pipeline in an Emergency	No issues identified	Trans Mountain demonstrated that the control room has emergency procedures for the safe control or shutdown of the pipeline system; and safety procedures for personnel at emergency sites are available and specific procedures are used by the control centre when working with the field operations staff.
AP-15	OPR	6.5(1)(j)	Defining Competency and Training Requirements	No issues identified	Trans Mountain demonstrated that it has a process for developing competency requirements and training programs that provide employees and other persons working with or on behalf of the company with the training that will enable them to perform their duties.

Audit Protocol (AP) Number	Regulation	Regulatory Reference	Topic	Finding Status	Finding Summary
AP-16	OPR	6.5(1)(k)	Verifying Competency and Training	No issues identified	Trans Mountain demonstrated that it has a process for verifying that employees and other persons working with or on behalf of the company are trained and competent and for supervising them to ensure that they perform their duties in a manner that is safe, ensures the security of the pipeline and protects the environment.
AP-17	OPR	56(b)	Annual Training Program Report	No issues identified	Trans Mountain demonstrated that it regularly provides senior management and the Accountable Officer (AO) with a report on the training program developed under section 46 that compares the actual training received by employees to the planned training.
AP-18	OPR	55	Control Room Audits	No issues identified	Trans Mountain demonstrated that control room audits of their processes, as required by OPR sections 53 and 55, are being conducted every three years; deficiencies are noted; and corrective or preventative actions were taken and completed.
AP-19	CSA Z662:23	E.9	Audits of Leak Detection System	No issues identified	Trans Mountain demonstrated that the leak detection systems are reviewed and audited periodically to determine whether they are in accordance with the provisions of CSA Z662 Annex E. Audits, gap assessments and weekly reviews of the leak detection systems are conducted and corrective action plans address findings.

Audit Protocol (AP) Number	Regulation	Regulatory Reference	Topic	Finding Status	Finding Summary
AP-20	OPR	6.5(1)(x)	Annual Management Review	No issues identified	Trans Mountain demonstrated that it has a process for conducting an annual management review of the management system and the two programs associated with the operation and control of the pipeline and for ensuring continual improvement.
AP-21	OPR	37(a)	Pipeline Control System	No issues identified	Trans Mountain demonstrated that it has a pipeline control system and procedures used to control and monitor the operation of the pipeline. Processes address design, maintenance, and operation. Procedures have been developed and used to manage SCADA issues through the Management of Change (MOC) process, manage alarms and monitor statistics, commission facilities and transfer to backup servers or facilities.

5.0 Discussion

Control Room Management is an important component of operations that helps regulated companies ensure the safety of people, property, and the environment. Control rooms monitor a variety of parameters across the pipelines such as flow rates, pressure, and temperature readings, and are often the first line of defence in locating and responding to abnormalities. Auditing Control Room Management practices is a proactive method to identify what is working well and what needs improvement.

Overall, Trans Mountain Pipeline ULC performed very well in this audit. The company demonstrated that it met the expected outcomes of the 21 audit protocol items listed in Appendix 1. The auditors found the control room to be well organized, managed, and controlled. The control room processes are well laid out, documented, and managed in accordance with the requirements of the corporate management system. The management team has incorporated principles related to human organizational factors such as fatigue management and addressed ergonomic concerns designed to assist controllers in carrying out their shifts competently and effectively, sometimes under stressful conditions. The auditors found that control room esprit de corps was high, and all the control room staff were well versed in control room procedures including the correct actions to take when operational incidents occur. It was noted that the company is in the process of cross training its controllers so that each controller has the skillsets to step in and operate and control a second

control station if called upon to do so. This will allow the company greater flexibility in managing the control room under a variety of scenarios while preserving the safe operation of the pipeline.

6.0 Next Steps

The next steps of the audit process are as follows:

- The CER will issue the Final Audit Report to Trans Mountain;
- The company will have 7 calendar days to review and provide the CER with any final requests for redactions;
- The CER will then issue the Final Audit Report and post it on the CER's external website in both official languages; and
- The CER will issue an audit closeout letter to Trans Mountain.

7.0 Conclusion

In conclusion, all 21 audit protocols that were evaluated during the course of this audit through document and record review, site visit, tours and interviews met the expected outcomes. No further actions are required by Trans Mountain aside from reviewing the Final Audit Report and advising the CER of any requests for redactions prior to posting the Final Audit Report on the CER's external website.

Appendix 1: Audit Assessment

AP-01 Policy and Commitment Statements

Finding status	No issues identified
Regulation	OPR
Regulatory reference	6.3(1)
Regulatory requirement	The company shall establish documented policies and goals to ensure that the purposes referred to in paragraphs 6(a) to (c) are achieved and its obligations under these Regulations are met. The policies and goals shall include: (b) goals for the prevention of ruptures, liquid and gas releases, fatalities, and injuries and for the response to incidents and emergency situations.
Expected outcome	The expected outcome is as follows: <ul style="list-style-type: none">• The company can demonstrate that it has established documented policies and goals for the prevention of ruptures, liquid and gas releases, fatalities, and injuries and for the response to incidents and emergency situations.
Relevant information provided by the company	<p>The list of documents and records that the CER reviewed related to this assessment are kept on file with the CER.</p> <p>The following interviews are related to this finding:</p> <ul style="list-style-type: none">• Director, Compliance and Enterprise Risk• Manager, Compliance• Manager, Control Centre• Manager, Simulation and Controls• Supervisor, Control Centre• Team Lead Hazard and Risk Management Compliance• For a complete list of TMPU staff that were present during the interview, the CER holds a list in its file directory associated with this audit.
Finding summary	Trans Mountain demonstrated that it has policies and goals at the corporate level that meet the requirements of sub-section 6.3(1) of the OPR.

Detailed Assessment

Trans Mountain's ISLMS is comprised of seventeen management programs which include the six programs required by the OPR (i.e., Safety Management Program, Environmental Protection Program, Security Management Program, Damage Prevention Program, Emergency Management Program, and Integrity Management Program). The ISLMS programs also include a Control Centre Management Program and a Computational Pipeline Monitoring Management Program.

The Control Centre Management Program manages the centralized monitoring and control of the pipeline systems and associated infrastructure. The Computational Pipeline Monitoring Management Program manages the systems and resources used for leak detection through computational

pipeline monitoring for all pipeline systems. The two governing documents for these programs are the Control Room Management Plan (**CRM Plan**) and the Computational Pipeline Monitoring Management Plan (**CPM Plan**), the contents of which will be discussed throughout this audit report. Together the two programs fulfil the requirements of section 37 of the OPR for a pipeline control system that comprises the facilities and procedures to:

- Control and monitor the operation of the pipeline;
- Record historical data, messages, and alarms; and
- Detect Leaks

For a detailed list of requirements of section 37 of the OPR, please refer to the regulation.

The ISLMS has a policy, corporate goals, and a commitment statement, signed by the Accountable Officer (**AO**). Within the ISLMS, there is a requirement for each program to have goals, objectives and targets that are aligned with the corporate goals. There is also a requirement for each program to include a commitment statement, signed by the program owner, which commits to meeting the corporate goals.

The ISLMS policy statement states that Trans Mountain is committed to the goal of conducting its business in a safe, environmentally responsible manner by minimizing the risks that could result from its activities. It further states that to meet this commitment, Trans Mountain will:

- Meet all applicable legal requirements;
- Ensure that all activities are carried out by appropriately qualified personnel;
- Ensure that adequate resources are available;
- Ensure effective communications and engagement with Indigenous Communities and company stakeholders (both internal and external;)
- Establish, monitor, and communicate goals, objectives and targets that support continual improvement; and
- Maintain the necessary programs and systems which are effectively implemented and appropriately monitored to ensure the desired outcomes are achieved.

Within its policy, it also provides an immunity statement for good faith internal reporting by employees and contractors of hazards, potential hazards, incidents, and near-misses. This meets the requirements of paragraph 6.3(1)(a) of the OPR.

The commitment statement, signed by the AO, states that the management team of Trans Mountain recognizes the importance of the ISLMS with respect to meeting its stated commitments.

There are 14 stated goals within the ISLMS document. The ones that are applicable to the regulatory requirement being evaluated in this protocol item are:

- Goal 1 – Prevent injuries, illnesses, and fatalities.
- Goal 2 – Prevent the unplanned release of hazardous substances, prevent fires, explosions, and other incidents.
- Goal 4 – Prepare and respond effectively to incidents, and emergencies including coordination with emergency response organizations in communities where we operate.
- Goal 5 – Ensure incidents and near misses are reported, investigations are conducted, and lessons learned are effectively communicated.

As such, the company has demonstrated that it has established documented policies and goals for the prevention of ruptures, liquid and gas releases, fatalities, and injuries and for the response to incidents and emergency situations.

In summary, Trans Mountain demonstrated that it has policies and goals at the corporate level that meet the requirements of sub-section 6.3(1) of the OPR.

AP-02 Hazard Identification

Finding status	No issues identified
Regulation	OPR
Regulatory reference	6.5(1)(d)
Regulatory requirement	A company shall, as part of its management system and the programs referred to in section 55, establish and maintain an inventory of the identified hazards and potential hazards.
Expected outcome	<p>The expected outcomes are as follows:</p> <ul style="list-style-type: none"> • The company has a compliant inventory that is established and maintained. • The inventory includes hazards and potential hazards associated within the company scope of operations and activities through the lifecycle of the pipelines. • Hazards and potential hazards are identified for the control room. • The inventory has been maintained, it is current, and is up to date including changes made to company operations and activities. • The inventory is being used as part of the risk evaluation and controls processes.
Relevant information provided by the company	<p>The list of documents and records that the CER reviewed related to this assessment are kept on file with the CER.</p> <p>The following interviews are related to this finding:</p> <ul style="list-style-type: none"> • Manager, Compliance • Manager, Control Centre • Manager, Simulation and Controls • Supervisor, Control Centre • Team Lead Hazard and Risk Management Compliance • For a complete list of TMPU staff that were present during the interview, the CER holds a list in its file directory associated with this audit.
Finding summary	Trans Mountain demonstrated that it has a process for identifying hazards and potential hazards associated with control room operations and that it maintains an up-to-date list of those hazards which is used as part of its risk evaluation and control process.

Detailed Assessment

Trans Mountain has several corporate processes as part of its ISLMS which are in line with the requirements for the various process requirements of subsection 6.5(1) of the OPR. The company requires that each of the program areas have processes and procedures that meet the requirements of the corporate processes. Section 8.0 of the ISLMS deals with Hazard and Risk Management and lists five documents that the various program areas are required to follow, which include:

- Hazard and Risk Management Standard
- Hazard Identification and Reporting Procedure

- Operations Risk Management Procedure
- Hazard and Risk Guidelines
- Contingency Plans for Abnormal Events Standard

The Hazard and Risk Management Standard establishes the requirements to identify, analyze, evaluate, respond to, and report on hazards and risks encountered at Trans Mountain. The procedure states that Enablon is the software and database to be used for incident and hazard management. The process to follow to report hazards is detailed in the Hazard Identification and Reporting Procedure. The standard also establishes the process for:

- establishing and maintaining a Unified Hazard List (**UHL**);
- the identification and reporting of hazards and potential hazards;
- managing the associated risks; and
- developing and implementing control measures.

The UHL is a centralized inventory which contains all the hazards and potential hazards identified by the ISLMS management programs. Within the standard, Trans Mountain differentiates between the identification and treatment of hazards, potential hazards, and imminent hazards. The UHL makes up part of Trans Mountain's Unified Hazard and Risk Register (**UHRR**).

Trans Mountain provided the CER auditors with its Control Room Management Plan and its Computational Pipeline Monitoring Management Plan. The CRM Plan lays out the management system program requirements that includes the policies, processes, standards, procedures and other documents and activities used by Trans Mountain to effectively manage its control centre.

Likewise, the CPM Plan is the governing management system document that ensures the effective management of the computational pipeline monitoring systems.

Both the CRM Plan and the CPM Plan have a Section 4.0 - Hazard and Risk Management which directs that hazards and risks are to be identified and managed in accordance with the ISLMS Hazard and Risk Management Standard and associated procedures.

Together the Hazard and Risk Management Standard and associated procedures detail how the Compliance Department gathers information to be included in the UHL and the UHRR.

Trans Mountain provided the CER auditors with copies of its 2021 and 2022 UHRR. The CER audit team noted that within the UHRR, hazards and risks associated with the control room, such as an overpressure event, or operator error are listed along with the risk ranking and associated risk treatment.

In summary, Trans Mountain demonstrated that it has a process for identifying hazards and potential hazards associated with control room operations and that it maintains an up-to-date list of those hazards which is used as part of its risk evaluation and control process.

AP-03 Risk Assessment

Finding status	No issues identified
Regulation	OPR
Regulatory reference	6.5(1)(e)
Regulatory requirement	A company shall, as part of its management system and the programs referred to in section 55, establish and implement a process for evaluating the risks associated with the identified hazards and potential hazards, including the risks related to normal and abnormal operating conditions.
Expected outcome	<p>The expected outcomes are as follows:</p> <ul style="list-style-type: none"> • The company has a compliant process for evaluating and managing risks that is established and implemented. • The method(s) for risk evaluation confirm that the risks associated with the identified hazards (related to normal and abnormal operating conditions) are based on referenced regulatory standards and are appropriate for the nature, scope, scale, and complexity of the company's operations, activities, and are connected to the purposes and intended outcomes of the section 55 programs. • Risks are evaluated for all hazards and potential hazards and includes normal and abnormal conditions. • Risk levels are monitored on a periodic basis and as needed and re-evaluated for changing circumstances. • Risks are managed using defined method(s) appropriate to the section 55 programs. • Risk tolerance/acceptance criteria is determined for all hazards and potential hazards.
Relevant information provided by the company	<p>The list of documents and records that the CER reviewed related to this assessment are kept on file with the CER.</p> <p>The following interviews are related to this finding:</p> <ul style="list-style-type: none"> • Manager, Compliance • Manager, Control Centre • Manager, Simulation and Controls • Supervisor, Control Centre • Team Lead Hazard and Risk Management Compliance • For a complete list of TMPU staff that were present during the interview, the CER holds a list in its file directory associated with this audit.
Finding summary	Trans Mountain demonstrated that it has a process for evaluating risks associated with hazards and potential hazards associated with control room operations including risks related to normal and abnormal operating conditions.

Detailed Assessment

Trans Mountain demonstrated that it has a process for identifying hazards and potential hazards associated with control room operations and that it maintains a list of those hazards in its UHL, which is used as part of its risk evaluation and control process.

Section 8.0 of the ISLMS deals with Hazard and Risk Management and lists five documents that the various program areas are required to follow, which include:

- Hazard and Risk Management Standard
- Hazard Identification and Reporting Procedure
- Operations Risk Management Procedure
- Hazard and Risk Guidelines
- Contingency Plans for Abnormal Events Standard

The company requires each program area to have processes and procedures that meet the requirements of the corporate processes.

The Hazard and Risk Management Standard establishes the requirements to identify, analyze, evaluate, respond to, and report on hazards and risks encountered at Trans Mountain. The standard stipulates that Enablon is the software and database to be used for incident and hazard management. The process to follow to report hazards is detailed in the Hazard Identification and Reporting Procedure. The standard also establishes the process for establishing and maintaining the UHL, the identification and reporting of hazards and potential hazards, managing the associated risks, as well as developing and implementing control measures. The UHL is a centralized inventory which contains all the hazards and potential hazards identified by the ISLMS Management Programs. Within the standard, Trans Mountain differentiates between the identification and treatment of hazards, potential hazards, and imminent hazards. The UHL makes up part of the Unified Hazard and Risk Register.

The UHRR lists all the identified hazards and potential hazards, their contributing causes, their associated risks, risk assessment results and corresponding controls. The term 'unified' refers to the fact that Trans Mountain maintains a central database of all hazards and risks identified by all its program areas. As such, all hazards associated with Control Centre operations are maintained within the UHL and risk managed through the UHRR.

The Operations Risk Management Procedure describes the process for managing risks and the steps required to develop and maintain program risk registers which contribute to the Operations Risk Register and the Operations Risk Report. According to the Standard, operational risk is a potential exposure to an undesirable event and is a measure of the likelihood of the events occurrence and the severity of the consequences. It then breaks the risks into the categories of Inherent Risk, Residual Risk and Top Residual Risks.

- Inherent risk is the risk that exists without any controls in place, aside from those already built into the organization.
- Residual risk is the level of risk that remains after additional controls are considered and implemented.
- Top Residual Risk is a risk that requires the ongoing attention of management due to the higher probability and/or consequence that an event could adversely affect the achievement of business objectives.

Within the procedure, there are three main components of the risk assessment process:

- Identify Risks: Produce a list of operations risks. Identify new risks and update the list of previously identified risks.
- Analyze Risks: Rank operations risks based on likelihood and consequence. This includes the consideration of inherent risk and the effectiveness of existing additional controls.
- Evaluate Risks: Set risks priorities and determine whether risk treatment is required. Identify and assess the value of potential additional controls to allow for informed response decisions by management.

In the Analyze Risks step, Trans Mountain uses a five-by-five risk matrix, which is a tool used to assess and analyze the consequence of a risk in a consistent manner. Within the standardized risk matrix tool, the risk assessor must assess the likelihood and consequence of an event based on standardized definitions. There are five levels of likelihood, which are: Extremely Unlikely, Unlikely, Rare, Occasional; and Expected. There are also five levels of consequence ranging from: Minor; Moderate, Major, Critical; and Extreme.

Using standardized descriptions for each likelihood and each consequence, the risk assessor can determine where the risk falls within the matrix of possibilities. Based on the results of the risk assessment, the risk assessor then can move to the next stage of the process, which is to select appropriate controls to manage the risk.

Trans Mountain provided the CER auditors with its CRM Plan and its CPM Plan and within each there is a Section 4.0 - Hazard and Risk Management that directs that the Control Centre and Computational Pipeline Monitoring Management Programs are to identify and manage hazards and risks in accordance with the ISLMS Hazard and Risk Management Standard and associated procedures.

Trans Mountain provided the CER auditors with copies of its 2021 and 2022 UHRR. The CER audit team noted that within the UHRR, hazards and risks associated with the control room are listed along with the risk ranking and associated risk treatment.

In summary, Trans Mountain demonstrated that it has a process for evaluating risks associated with hazards and potential hazards associated with control room operations including risks related to normal and abnormal operating conditions.

AP-04 Controls

Finding status	No issues identified
Regulation	OPR
Regulatory reference	6.5(1)(f)
Regulatory requirement	A company shall, as part of its management system and the programs referred to in section 55, establish and implement a process for developing and implementing controls to prevent, manage and mitigate the identified hazards, potential hazards and risks and for communicating those controls to anyone who is exposed to the risks.
Expected outcome	<p>The expected outcomes are as follows:</p> <ul style="list-style-type: none"> • The company has a compliant process for developing and implementing controls. • The method(s) for developing controls are appropriate for the nature, scope, scale, and complexity of the company's operations and activities and section 55 programs. • Controls are developed and implemented. • Controls are adequate to prevent, manage and mitigate the identified hazards and risks. • Controls monitored on a periodic basis and as needed and re-evaluated for changing circumstances. • Controls are communicated to those exposed to the risks.
Relevant information provided by the company	<p>The list of documents and records that the CER reviewed related to this assessment are kept on file with the CER.</p> <p>The following interviews are related to this finding:</p> <ul style="list-style-type: none"> • Manager, Compliance • Manager, Control Centre • Manager, Simulation and Controls • Supervisor, Control Centre • Team Lead Hazard and Risk Management Compliance • For a complete list of TMPU staff that were present during the interview, the CER holds a list in its file directory associated with this audit.
Finding summary	Trans Mountain demonstrated that it has a process for developing and implementing controls to prevent, manage and mitigate the identified hazards, potential hazards, and risks associated with control room operations and for communicating those controls to anyone who is exposed to the risks.

Detailed Assessment

As discussed previously, Trans Mountain demonstrated that it has a process for identifying hazards and potential hazards associated with control room operations and that it maintains a list of those hazards which is used as part of its risk evaluation and control process.

Section 8.0 of the ISLMS deals with Hazard and Risk Management and lists five documents that the various program areas are required to follow, which include:

- Hazard and Risk Management Standard
- Hazard Identification and Reporting Procedure
- Operations Risk Management Procedure
- Hazard and Risk Guidelines
- Contingency Plans for Abnormal Events Standard

The company requires that each of the program areas have processes and procedures that meet the requirements of the corporate processes.

As detailed in AP-03, Trans Mountain utilizes its Hazard and Risk Management Standard to identify, analyze, evaluate, respond to, and report on hazards and risks encountered at Trans Mountain. The UHL is a centralized inventory which contains all the hazards and potential hazards identified by the ISLMS management programs and makes up part of the UHRR. The UHRR lists all the identified hazards and potential hazards, their contributing causes, their associated risks, risk assessment results and corresponding controls.

Also, as previously described, Trans Mountain uses its Operations Risk Management Procedure to manage identify, analyze, and evaluate risks using its five-by-five risk matrix to evaluate the likelihood and consequence of an event. Using standardized descriptions for each likelihood and each consequence, the risk assessor can determine where the risk falls within the matrix of possibilities. Based on the results of the risk assessment, the risk assessor then can move to the next stage of the process, which is to select appropriate controls to manage the risk.

Trans Mountain provided the CER auditors with its CRM Plan and its CPM Plan and within each there is a Section 4.0 - Hazard and Risk Management that directs that the Control Centre and the Computational Pipeline Monitoring Management Programs are to identify and manage hazards and risks in accordance with the ISLMS Hazard and Risk Management Standard and associated procedures.

Trans Mountain provided the CER auditors with copies of its 2021 and 2022 UHRR. The CER audit team noted that hazards and risks associated with the control room are listed, the corresponding risks are evaluated using the risk matrix tool, and then controls are assigned.

Controls can vary from:

- Elimination: Physically remove the hazard.
- Substitution: Replace the hazard.
- Engineering controls: Isolate people from the hazard.
- Administrative controls: Change the way people work.
- Personal Protective Equipment (**PPE**): Protect the worker with PPE.

Throughout the audit, the audit team observed and reviewed several controls that Trans Mountain has in place, such as:

- ISLMS and standardized processes and procedures
- CRM and CPM Plans
- Control Centre Operating Procedures
- Control Centre Emergency Procedures
- Contingency Plans
- Use of MCC and BCC

- Use of Backup Communications Systems
- Use of Backup Servers
- Fatigue Management
- Standardized Shift Handover Procedure
- Annual Human Resources Evaluation
- Annual Management Review Process

In summary, Trans Mountain demonstrated that it has a process for developing and implementing controls to prevent, manage and mitigate the identified hazards, potential hazards, and risks associated with control room operations and for communicating those controls to anyone who is exposed to the risks.

AP-05 Goals, Targets and Objectives

Finding status	No issues identified
Regulation	OPR
Regulatory reference	6.5(1)(a)
Regulatory requirement	A company shall, as part of its management system and the programs referred to in section 55, establish and implement a process for setting the objectives and specific targets that are required to achieve the goals established under subsection 6.3(1) and for ensuring their annual review.
Expected outcome	<p>The expected outcomes are as follows:</p> <ul style="list-style-type: none"> • The company has a compliant process that is established and implemented. • The company can demonstrate that it has established and implemented a process for setting the objectives and specific targets to achieve the company's goals for the prevention of ruptures, liquid and gas releases, fatalities, and injuries and for the response to incidents and emergency situations applicable to the company's control room operations. • The company has set objectives and targets that are required to achieve the goals established under subsection 6.3(1). • All objectives are relevant to the company's management system when considering the scope of the process and their application to section 55 programs. • An annual review of the objectives and targets is performed by the company. • The review determines if the objectives were achieved or if corrective or preventive actions are needed.
Relevant information provided by the company	<p>The list of documents and records that the CER reviewed related to this assessment are kept on file with the CER.</p> <p>The following interviews are related to this finding:</p> <ul style="list-style-type: none"> • Director, Compliance and Enterprise Risk • Manager, Compliance • Manager, Control Centre • Manager, Simulation and Controls • Supervisor, Control Centre • Team Lead Hazard and Risk Management Compliance • For a complete list of TMPU staff that were present during the interview, the CER holds a list in its file directory associated with this audit.
Finding summary	Trans Mountain demonstrated that it has a process for setting objectives and targets within its Control Centre and its Computational Pipeline Monitoring management programs designed to achieve its corporate goals and for ensuring their annual review.

Detailed Assessment

The ISLMS has a policy, corporate goals and a commitment statement signed by the AO. The ISLMS requires each program to have goals, objectives, and targets (**GOTs**) that are aligned with the corporate goals. It also requires each program to have a commitment statement signed by the program owner that commits to meeting the program and corporate goals.

Trans Mountain advised the CER that all programs under the ISLMS are subject to the requirements of its Goals Objectives and Targets Standard. The purpose of this standard is to serve as the framework for the setting, review and maintenance of GOTs and performance measures.

TMPU uses its Quality Assurance Management Plan which outlines the quality assurance (**QA**) activities that are to be taken to ensure that the programs are aligning with the GOTs Standard.

The Continual Improvement Standard establishes the framework for the annual review of the performance of the programs under the ISLMS and any CAPAs. Annual program plans are to include the development of GOTs.

The Goals Objectives and Targets Standard requires each program to:

- Develop a program commitment statement;
- Establish program GOTs to support the achievement of commitments;
- Measure the performance of objectives through performance measures with specific measurable targets;
- Communicate GOTs to program staff, senior management, and other stakeholders; and
- Review performance annually.

Within the ISLMS, two of the 17 program areas that are within the scope of this audit are the Control Centre Management Program and the Computational Pipeline Monitoring Management Program. Trans Mountain provided the CER auditors with its GOTs for 2022 and 2023 for both programs,

Trans Mountain showed the CER auditors a spreadsheet that it uses to keep track of the various program GOTs and demonstrated how they are aligned with the corporate goals.

Each year, as part of its management review process, each program owner is required to review and comment on the results of the performance indicators used to monitor the program's success in achieving its GOTs. Whenever a target or objective is not achieved, the program owner must provide an explanation as to why it was not achieved and a justification for altering the objective or setting a new objective. Also, each program is required to set new targets and objectives for the coming year and set key performance indicators (**KPIs**) to monitor its progress towards achieving them.

TMPU provided the CER auditors with its 2021 and 2022 management review records which clearly showed that the Control Centre Management Program and the Computational Pipeline Monitoring Management Program reviewed their success in achieving their KPIs, targets and objectives from the previous year and set new ones for the coming year.

In summary, Trans Mountain demonstrated that it has a process for setting objectives and targets within its Control Centre Management Program and Computational Pipeline Monitoring Management Program designed to achieve its corporate goals and for ensuring their annual review.

AP-06 Organizational Structure, Roles, and Responsibilities

Finding status	No issues identified
Regulation	OPR
Regulatory reference	6.4
Regulatory requirement	The company must have a documented organizational structure that enables it to (a) meet the requirements of the management system and meet its obligations under these Regulations; (b) determine and communicate the roles, responsibilities and authority of the officers and employees at all levels of the company; and (c) demonstrate, based on an annual documented evaluation of need, that the human resources allocated to establishing, implementing and maintaining the management system are sufficient to meet the requirements of the management system and to meet the company's obligations under these Regulations.
Expected outcome	<p>It is expected that the company can demonstrate that:</p> <ul style="list-style-type: none"> • It has a documented organizational structure for its control room, operations staff, SCADA support staff and other support staff. • The documented organizational structure matches the way the control room is organized and staffed. • It has determined and communicated the roles, responsibilities and authorities for control room management and operation to all control room staff and those who interact with them. • It has a documented process that it uses to communicate roles, responsibilities, and authorities to control room staff and others that need to know. For example, training notes. • It conducts an annual documented evaluation of need of the human resources required to operate and maintain its pipeline control system and leak detection system.
Relevant information provided by the company	<p>The list of documents and records that the CER reviewed related to this assessment are kept on file with the CER.</p> <p>The following interviews are related to this finding:</p> <ul style="list-style-type: none"> • Director, Compliance and Enterprise Risk • Manager, Compliance • Manager, Control Centre • Manager, Simulation and Controls • Supervisor, Control Centre • Team Lead Hazard and Risk Management Compliance • For a complete list of TMPU staff that were present during the interview, the CER holds a list in its file directory associated with this audit.

Finding summary

Trans Mountain demonstrated that it has a documented organizational structure that enables it to meet the requirements of the management system and meet its obligations under these Regulations; determine and communicate the roles, responsibilities and authority of the officers and employees at all levels of the company; and that it conducts an annual documented evaluation of the human resources needed for the Control Centre and the Simulations and Control Group.

Detailed Assessment

Within Trans Mountain's ISLMS, two of the commitments made in the Safety and Loss Management Policy Statement are that Trans Mountain will ensure all activities are carried out by appropriately qualified personnel and ensure that adequate resources are available.

Section 3.0 of the ISLMS describes Trans Mountain's organization and the responsibilities of key personnel. The Vice President (**VP**) of Engineering reports directly to the CEO/AO and is accountable for the direct oversight of the Control Centre Management Program and the Computational Pipeline Monitoring Management Program. Trans Mountain provided the CER auditors with a copy of its organizational structure showing the link between the CEO/AO and the program owners for the Control Centre Management Program and the Computational Pipeline Monitoring Management Program. Further down the organizational chart, it shows the link between the VP Engineering and the Managers for the Control Centre and the Simulations and Control Group. From there, there is a direct link from the Managers to the control centre staff.

Section 11.1 of the ISLMS states that programs are responsible for the development of a program organizational structure that includes the roles and responsibilities of key individuals or groups to ensure effective management of the program. Also, the program is responsible for the ISLMS process for conducting an annual human resources sufficiency evaluation to ensure the program has the adequate resources in place for the year ahead.

Within the CRM Plan and the CPM Plan, there are organizational structures with roles and responsibilities for the Control Centre and for the Simulations and Controls Group. Each of these plans makes use of the ISLMS Role Development and Communication Procedure to establish roles and responsibilities and authorities for the control room and support personnel.

Section 2.4 of the Role Development and Communications Procedure requires that annually, the Human Resources (**HR**) Department is to have all Trans Mountain personnel review, acknowledge and update their job descriptions. Also, there is a requirement for each program to conduct an annual evaluation of need using the ISLMS Human Resources Evaluation Procedure. All departments are required to conduct the annual evaluation of need as part of the annual program planning process.

TMPU provided the CER auditors with its 2023 HR evaluation records for the Control Centre and for the Simulations and Control Group.

Also, as part of Trans Mountain's annual management review process, the Compliance Department provides the senior executive team and the AO with an assessment of the adequacy and effectiveness of its management system.

In summary, Trans Mountain demonstrated that it has a documented organizational structure that enables it to meet the requirements of the management system and meet its obligations under these Regulations; determine and communicate the roles, responsibilities and authority of the officers and

employees at all levels of the company; and that it conducts an annual documented evaluation of the human resources needed for the Control Centre and the Simulations and Control Group.

AP-07 Operational Control

Finding status	No issues identified
Regulation	OPR
Regulatory reference	6.5(1)(q)
Regulatory requirement	A company shall, as part of its management system and the programs referred to in section 55, establish and implement a process for coordinating and controlling the operational activities of employees and other people working with or on behalf of the company so that each person is aware of the activities of others and has the information that will enable them to perform their duties in a manner that is safe, ensures the safety and security of the pipeline and protects the environment.
Expected outcome	<p>It is expected that the company is able to demonstrate that it has established and implemented a process for coordinating and controlling the operational activities of control room staff and other people working with or on behalf of the company so that each person is aware of the activities of others and has the information that will enable them to perform their duties in a manner that is safe, ensures the security of the pipeline and protects the environment. It is expected that:</p> <ul style="list-style-type: none"> • The company has a compliant process that is established and implemented to supervise and ensure the operations of the control room are correct. • The methods for coordinating and controlling operational activities are defined. • Employees and other people working with or on behalf of the company are aware of the activities of others. • Employees' operational activities are planned, coordinated, controlled, and managed. • People working for or on behalf of the company: <ul style="list-style-type: none"> ▪ are pre-qualified for their assigned duties to ensure safety, the security of the pipeline and to protect the environment. ▪ are assigned work plans that have been reviewed by the company and are assessed for the interoperation with the work to be performed by other people working on behalf of the company. ▪ have adequate oversight performed by company representatives for their assigned tasks to ensure safety, security of the pipeline and the protection of the environment.
Relevant information provided by the company	<p>The list of documents and records that the CER reviewed related to this assessment are kept on file with the CER.</p> <p>The following interviews are related to this finding:</p> <ul style="list-style-type: none"> • Director, Compliance and Enterprise Risk • Manager, Compliance • Manager, Control Centre • Manager, Simulation and Controls • Supervisor, Control Centre • For a complete list of TMPU staff that were present during the interview, the CER holds a list in its file directory associated with this audit.

Finding summary

Trans Mountain demonstrated that it has a number of procedures and standards that it uses to coordinate and control the operational activities of CCOs and field personnel so that each person is aware of the activities of others and has the information that will enable them to perform their duties in a manner that is safe, ensures the safety and security of the pipeline and protects the environment.

Detailed Assessment

According to section 2.3 of the ISLMS, the Operations and Maintenance Management Program is responsible to develop and maintain proactive measures and controls for effective field operations and maintenance. The Trans Mountain Scheduling Group provides operations and maintenance personnel, including control centre personnel with daily schedules for the transfer of commodities through the pipeline. These schedules dictate what is to be transferred, where, when, and how much.

For maintenance activities, Control Centre Operators (**CCOs**) are kept in the loop on what is happening along the pipeline using job plans. CCOs are invited to review and comment on job plans that impact their operations. For example, whenever a pigging operation is to be carried out, design engineering job plans must be reviewed by all parties involved. In this way, if a job plan is going to require additional personnel in the control room, the control centre management team will be aware and be able to prepare.

Within the CRM Plan, the company has a procedure for reporting and managing operational incidents. The Operational Incident Reporting (**OIR**) Procedure deals with abnormal operating conditions (**AOCs**) encountered by the CCOs and considers contributing factors such as CCO Error, CCO Fatigue, and Control Centre Procedures. Each OIR, where the probable contributing cause is attributable to the control centre, is reviewed with the intent of preventing repeat occurrences. Recommendations stemming from these reviews are then forwarded to the group or department responsible for implementing any changes, which will then follow the MOC process.

Section 11.1 of the ISLMS (Requirements of Programs) requires that each program apply ISLMS processes for the supervision of personnel to ensure that their duties are performed in a manner which ensures safety and security of Trans Mountain's assets and protection of the environment. This section references section 10.1.4 of the ISLMS which requires TMPU personnel to adhere to the requirements of Trans Mountain's Standard for Supervising Personnel, including contractors.

The documented procedures used to coordinate and control the operational activities of its workers in the control centre and in the field are contained within its CRM Plan and its CPM Plan. The CRM Plan is the governing document for pipeline operations within the control room and the CPM Plan is the governing document for the Simulations and Control Group.

One of the procedural documents used within the control centre is the shift handover procedure which details how an on-shift CCO is to brief and hand over responsibilities to an oncoming CCO. This shift handover procedure covers normal operations, and mid-shift handover for a CCO break of longer than 15 minutes. During the on-site portion of the audit, the CER auditors witnessed a shift handover for Line 1.

The control centre makes use of Trans Mountain's corporate MOC process to communicate changes to its operations and maintenance personnel. For example, whenever a SCADA alarm is taken off scan for an extended period, an MOC is required to communicate this change to everyone who needs to know. MOCs are used to communicate:

- Changes to an operating pipeline or facility
- Changes to controls
- Changes to products
- Changes to the management system or programs
- Changes to operating limits and protective device settings
- Changes to control centre standards, procedures, or other documents
- Changes to Environmental Health and Safety and Security programs, standards, and procedures
- And others

Control centre personnel are to be included in planning and design meetings prior to the implementation of changes that affect the control centre. In addition, notifications are sent to all CCOs affected by changes. Whenever a new procedure is issued or an existing one is modified or deleted, a notification is sent to all CCOs. The CCOs must then make themselves familiar with the change and then sign and date a form to indicate that they have read and understood the change.

Planning, execution and evaluation of inspection, measurement, and monitoring activities are carried out in accordance with the Inspection, Measurement and Monitoring Standard, and as mentioned above, job plans are used to communicate maintenance and repair activities to the CCOs.

Throughout each shift, the CCOs are in contact with other operators in the control centre and with field personnel during transfer operations through communication links that have backups. Throughout each shift, the CCOs maintain an electronic log of events that occur during the shift. They then use this log to transfer important information to the next CCO during a shift handover.

When field personnel enter a facility, they are required to contact the control centre upon arrival and again upon departure. If a field person fails to call in, the CCO is required to contact them. If a field person is required to enter a facility during an emergency or abnormal event, they are required to fill out a hazard identification form prior to entering. If a field person encounters an incident, they are required to report it to the control centre. In the field, if there is a requirement to lockout and tagout a piece of equipment, or to bring it back into operation, this information is relayed to the control centre so that CCOs are always aware of the operational status of equipment in the field.

In summary, Trans Mountain demonstrated that it has several procedures and standards that it uses to coordinate and control the operational activities of CCOs and field personnel so that each person is aware of the activities of others and has the information that will enable them to perform their duties in a manner that is safe, ensures the safety and security of the pipeline and protects the environment.

AP-08 Operating and Maintenance Manuals

Finding status	No issues identified
Regulation	OPR
Regulatory reference	27
Regulatory requirement	A company shall develop, regularly review, and update as required, operation and maintenance manuals that provide information and procedures to promote safety, environmental protection, and efficiency in the operation of the pipeline and shall submit them to the Regulator when required to do so.
Expected outcome	<p>It is expected that the company can demonstrate that:</p> <ul style="list-style-type: none"> • It has developed, regularly reviews and updates as required, control room operations and maintenance manuals that provide information and procedures to promote safety, environmental protection, and efficiency in the operation of the pipeline. • The manuals include procedures for shift handover communications; fatigue management; alarm management; and procedures to handle Operation Beyond Design Limits (OBDL) incidents and leak alarms. • If shift handover communications, fatigue management, alarm management and procedures are not in the Operation and Maintenance Manuals, the company is able to provide the documents and procedures, where they are located. • The manuals have been established and implemented for a minimum of three months. • The manuals are reviewed regularly and updated as required.
Relevant information provided by the company	<p>The list of documents and records that the CER reviewed related to this assessment are kept on file with the CER.</p> <p>The following interviews are related to this finding:</p> <ul style="list-style-type: none"> • Supervisor, Procedures and Training • Manager, Control Centre • Supervisor, Control Centre • Senior Regulatory Advisor • For a complete list of Trans Mountain staff that were present during the interview, the CER holds a list in its file directory associated with this audit.
Finding summary	Trans Mountain demonstrated that processes to develop, regularly review, and update as required, operation and maintenance manuals specific to the control room processes are established and implemented.

Detailed Assessment

The ISLMS identifies document and record management as one of the common management system elements that is applied to all Trans Mountain programs. The Controlled Document Standard is the overarching process for the company. Within this standard, sections describe document governance, lifecycle, and implementation.

The Control Centre Procedures Standard describes the specific document management requirements for the control centre. It addresses how the need for procedures is determined, the development and revision of procedures, what types of procedures are utilized and how procedures are used. In addition, it describes the process to maintain electronic and hardcopy versions. A designated supervisor is responsible for managing this process. In the control centre, this responsibility is fulfilled by the Supervisor, Procedures and Training.

Procedures are maintained in two formats, electronic and hardcopy. The primary method used by the CCOs is electronic. Procedures are easily accessed through the company's SharePoint site, which only allows users to access the most recent approved documents. Hardcopy procedures are controlled by the Supervisor, Procedures and Training, who prepares three copies:

- primary control centre desk copy,
- secondary control centre desk copy that is located at the backup control centre, and
- the master copy held by the supervisor.

Hardcopies of procedures are immediately updated when a document change occurs. Only signed copies are deemed authorized to be used by the CCOs. For a substantial document revision, the supervisor initially reviews document changes with the on-duty CCOs. At shift handover, CCOs follow up with the incoming CCO to ensure timely awareness and this process continues until all applicable CCOs have been notified. This process requires each CCO to sign off on a review form. A sign off form example was provided for a revision to the Control Centre Common Procedures (C20120) dated 2023-02-07. For non-substantial procedure changes, an electronic notification is sent to the CCOs; the audit team reviewed an example dated 2023-07-12.

Control room procedures are reviewed once per year, at intervals not to exceed 15 months. The formalized review of the procedures is conducted by CCOs, who are assigned to specific procedures and considered subject matter experts (**SME**). The process also allows for others to submit revisions or suggest changes at any time. The supervisor considers the SME edits and triggers the document change process. There are a few types of changes that may occur:

- Editorial changes that include changes to hyperlinks;
- Spelling or grammar changes, which are considered minor; and
- Substantial changes that include the creation of a new document, when a task step is performed differently, or if the content is significantly altered. Substantial changes to documents are evaluated and approved through the MOC process.

Trans Mountain provided the table of contents (**TOC**) for the control room procedures. These TOCs showed the procedure collections that are aligned to general and facility responsibilities and include:

- Common Procedures
- Pipeline Procedures
- Leak detection
- Trans Mountain System
- Edmonton Terminal 1
- Edmonton Terminal 2
- Sumas and Puget Sound
- Burnaby and Westridge Marine Terminals

The audit team reviewed a subset of these collections and confirmed the reviews were being conducted once per year, not to exceed 15 months. A revision record list was provided and showed the revision/edition, date of last change, comments and who updated the documents.

It was noted by the CER auditors during interviews that some documents displayed the incorrect dates in the revision blocks. Trans Mountain staff indicated that this was a known problem that they have self-identified and are working to resolve. In addition, the audit team noted how the dates were displayed on the title and subsequent pages may be ambiguous to the reader, and that the revision histories were inconsistently shown in the procedures. These are areas that Trans Mountain could improve upon. Nevertheless, the company did demonstrate to the audit team that they are reviewing and updating (as required) documents on an annual basis.

Procedures reviewed by the audit team included, but not limited to:

- Shift Handover and Start of Shift
- Fatigue Self-Assessment
- High Pressure Alarm
- SCADA Alarms
- Control Centre Site Change
- Fire Alarm – Control Centre
- Loss of Communications to One or More Facilities
- Job Plan Responsibilities
- SPS Leak Alarm Investigation
- ATMOS Leak Alarm Investigation

Interviews were conducted with the control room manager, supervisors and CCOs who described the document management process and control room procedures. CCOs stated that procedures in electronic format are primarily used and easily retrievable. They described their responsibilities for the annual document review, shift handover, and response to alarms. Fatigue management was discussed and CCOs confirmed they are trained and aware of fatigue mitigation countermeasures.

The audit team observed an evening shift change on 31 October 2023 at 17:30 hours. An outgoing CCO updated the incoming CCO on the status of pipeline operations, reviewed operational plans, and stepped through the SCADA and leak detection displays. A shift change log is created by the outgoing CCO and signed off by both, before the incoming CCO takes control. This signed hardcopy record is retained by the control room. Once a shift handover has been completed, the incoming CCO conducts a review of the system to ensure adequate awareness of the system operations. Shift handover records were reviewed by the audit team for the Sumas/Puget Sound night to day shift on 30 October 2023, and the Edmonton Terminal 1 day to night shift for 31 October 2023.

In summary, Trans Mountain demonstrated that it has developed, regularly reviews, and updates as required, operation and maintenance manuals and procedures specific for the control centre.

AP-09 Pipeline Control System – Leak Detection System

Finding status	No issues identified
Regulation	OPR
Regulatory reference	37(c)
Regulatory requirement	A company shall develop and implement a pipeline control system that includes a leak detection system that, for oil pipelines, meets the requirements of CSA Z662 and reflects the level of complexity of the pipeline, the pipeline operation and the products transported.
Expected outcome	It is expected that the company can demonstrate that: <ul style="list-style-type: none"> • It has developed and implemented a pipeline control system that includes a leak detection system that, for oil pipelines, meets the requirements of CSA Z662:23. • The company can explain and demonstrate the operation of its leak detection system.
Relevant information provided by the company	The list of documents and records that the CER reviewed related to this assessment are kept on file with the CER. The following interviews are related to this finding: <ul style="list-style-type: none"> • Manager, Simulation and Controls • Manager, Control Centre • Supervisor, Control Centre • Manager, SCADA • Supervisor, Control Systems • For a complete list of Trans Mountain Staff that were present during the interview, the CER holds a list in its file directory associated with this audit.
Finding summary	Trans Mountain demonstrated that it has developed and implemented a pipeline control system that includes two leak detection systems that, for oil pipelines, meet the requirements of CSA Z662.

Detailed Assessment

Trans Mountain demonstrated that they have a leak detection system and a CPM Plan that addresses the requirements of CSA Z662:23 Annex E. The CPM Plan addresses the regulations and states that the company will comply with CSA Z662:23 sections 10.3.3 and Annex E. The audit team observed Trans Mountain's legal registry database, Conformii application, which showed CSA Z622:23 was reviewed by the Simulation and Controls Group to ensure compliance to the recent version change.

Trans Mountain has implemented two leak detection systems on the Trans Mountain line 1 pipeline and will utilize this approach for Trans Mountain line 2 when it enters service. The systems are supplied by different vendors and are managed and monitored as independent systems. The first system, Synergi Pipeline Simulator (**SPS**), developed by Det Norske Veritas (**DNV**), is a leak detection real time transient model simulator. The second is the ATMOS Pipe (**ATMOS**), developed by ATMOS international, and is a statistical volume balance system.

Communications to remote instruments are managed primarily through a T1 line and supported by auto fail backup communications that includes satellite and cellular. There are three redundant SPS/ATMOS servers at two data centres that maintain continuity of operations. CPM communications polling is approximately every 5 seconds through a dedicated leak detection open platform communications server. CPM calculation windows range from 3 minutes to 2 hours. Both systems can replay events for training purposes.

In addition, Trans Mountain has installed an external fibre optic leak detection system on Trans Mountain Line 2 that extends approximately 1100 kms. This new leak detection technology is supplied by Hifi Engineering Inc. and detects leaks with acoustic, temperature and strain sensing. The Trans Mountain Simulation and Controls Manager indicated that this system is designed to detect leaks and can also identify right-of-way encroachments or other anomalies on the pipeline.

The CPM Instrumentation Standard describes the processes for CPM instrument installation, data quality, calibration, maintenance, and point-to-point checks. The leak detection instruments are recorded on the piping and instrumentation diagrams which are used to configure the SCADA system displays. A list of critical instruments is available in the Trans Mountain Engineering Records Management System. In addition, engineering data includes pipeline lengths, diameters, elevation profiles, fluid properties and instrumentation accuracy/repeatability. Initial installation or replacement of CPM instruments requires a point-to-point check to ensure values are displayed correctly in the SCADA system.

Critical instruments are calibrated by field operations technicians in accordance with manufacturer's standards. In addition, the standard states that critical instruments are to be located where they cannot be isolated during normal pipeline operations. CPM instruments are calibrated on an annual basis, except for the custody flow meters which are proved monthly. Calibrations, whether planned or due to an issue, require a work order to be created. This work order is assigned to a field operations technician who works with the control room to calibrate and verify operation.

Leak detection testing is described in the CPM Leak Detection Testing Standard. Testing methods include fluid withdrawal tests (**FWT**), and data simulation. Fluid withdrawal requires a coordinated plan with field operations and an example was provided, titled: Sumas Border Trap Facility Puget Sound Fluid Withdrawal Test Job Plan, dated 2022-01-28. This test was conducted successfully on 2022-02-09 and evaluated the SPS and ATMOS CPM systems. The report, Puget Sound Pipeline System Border Trap Fluid Withdrawal Test, dated 2022-02-09, summarized the results stating: "Both CPM systems successfully alarmed the leak faster than the expected detection time and the CCO diagnosed the leak alarm within the prescribed 10-minute rule. Additionally, the test benchmarked the accuracy of leak location and leak size estimates and confirmed leak detection sensitivity of the 2 CPM systems." In addition to the annual FWT, data simulation testing is conducted annually on both CPM systems. The Manager of Simulation and Controls described the automated tests. For SPS, a configured sensitivity test is conducted at multiple locations along the pipeline on all leak detection models, and on the ATMOS all leak detection segments are verified.

Issues related to the CPM systems are identified by the CCO. Notification to the Simulation and Controls team is done verbally or by email. This information is logged in the ServiceNow application and worked through to resolution. If a change is required that involves a change to the CPM configuration or displays, the CPM Change Management Standard is used to ensure adequate corrective measures, review, and approval prior to implementation. Examples of leak detection MOCs were provided to the audit team and included CHG0035963 – ATMOS SIM (ver0.6): Correction to drain fill module, CHG0035842 – SPS PSPL (v2.1): Disabling Step Doubling and CHG0033586 – HPSU (v6.4), OI (v0.7): Roll out of SUST OI displays and SUST model changes.

The health of the leak detection systems is continuously monitored through the SCADA system by the control room, Simulation Specialists, and the SCADA support team. The Simulation and Controls team reviews the CPM system health weekly. The review includes the SPS models performance, DNGVL backup, ATMOS leak detection and SIM performance, ATMOS data backup, ClearSCADA (GeoSCADA), CPM alarm report and the external leak detection pilot. CPM Weekly Review 01-06-2022 and CPM Weekly Review 08-30-2023 were provided as examples of weekly checks that were conducted. This information and other CPM performance measures are included in the annual GOTs process.

MOCs for leak detection systems that are technical changes and have no impact to operations are managed through the ServiceNow issue process. If a change has an operational impact, the corrective actions are managed by the on-call Simulations Specialist and approved by the Control Centre Manager. This change is formalized using the CPM Change Management Standard process and notification to the control centre staff is immediate. The Simulations and Controls group manages the MOC for software source control changes to configuration files and utilizes GIT, which is a software source code management system.

The 2023 GOTs Computational Pipeline Monitoring Program list displayed the objective, performance measure, target, program component, program goal and link to the Trans Mountain's ISLMS goals. Continuous improvement is based on the GOTs and part of the ISLMS continuous improvement cycle. CPM testing for accuracy and sensitivity, review of reliability and robustness, and the requirement for a fluid withdrawal and function testing were defined objectives. It was noted in the interviews, system thresholds consider speed and number of alarms. Application of thresholds and sensitivities are set to the best values possible.

The Simulation and Controls team supports the control room 24x7. A designated on-call Simulation Specialist responds to issues affecting the leak detection systems as and when a leak alarm occurs. Training for this role includes peer-to-peer training, corporate and vendor training. CCOs have specific training requirements and qualifications for identifying, analysing, and responding to leak detection system alarms. Through interviews and observation, CCOs were able to demonstrate their understanding of the leak detection systems and applicable procedures. The audit team observed roles and competency system job descriptions which identify the roles, responsibilities, and education requirements for positions within Trans Mountain that include the CCO. Refer to AP 15, 16 and 17 for additional information regarding the Trans Mountain competency and training processes.

In summary, Trans Mountain demonstrated that it has developed and implemented a pipeline control system that includes two independent leak detection systems that, for oil pipelines, meet the requirements of CSA Z662.

AP-10 Pipeline Control System – Data Recording System

Finding status	No issues identified
Regulation	OPR
Regulatory reference	37(b)
Regulatory requirement	A company shall develop and implement a pipeline control system that (b) records historical pipeline operation data, messages, and alarms for recall.
Expected outcome	<p>It is expected that the company can demonstrate that it has developed and implemented a pipeline control system that records historical pipeline operation data, messages, and alarms for recall. It is further expected that:</p> <ul style="list-style-type: none"> • The company can explain and demonstrate the operation of the data, messaging, and alarm recording system. • The company can produce a printout of alarms and incidents including OBDL and leak incidents. • The company can demonstrate that the list of OBDL and leak incidents matches the CER list of reported incidents. • The company can provide justification for any non-reported OBDL incidents and leak incidents.
Relevant information provided by the company	<p>The list of documents and records that the CER reviewed related to this assessment are kept on file with the CER.</p> <p>The following interviews are related to this finding:</p> <ul style="list-style-type: none"> • Manager, Control Centre • Supervisor, Control Centre • Manager, Simulation and Controls • Manager, SCADA • Supervisor, Control Systems • For a complete list of Trans Mountain staff that were present during the interview, the CER holds a list in its file directory associated with this audit.
Finding summary	Trans Mountain demonstrated that it has developed and implemented a pipeline control system that records historical pipeline operation data, messages, and alarms for recall for the SCADA and the leak detection systems.

Detailed Assessment

Trans Mountain demonstrated that they have developed and implemented a pipeline control system that records historical pipeline operation data, messages, and alarms for recall. The company provided data extractions from the SCADA system and the audit team observed the SCADA system during site visits on 30 October 2023 and 31 October 2023.

SCADA data extractions included:

- ATMOS Leak Detected alarms last 6 months Oct 4 rev1.xlsx
- SCADA_24hr_events_Oct6_2024_1.xlsx
- sps_leak_detected_6months_Oct4 rev1.xlsx

Observations during on-site visits to the control room included SCADA alarm and events, trending capabilities and event logging. The CCOs explained their process to review the pipeline system during the first hour of operation and the steps they take to review the various SCADA and leak detection displays.

The audit team confirmed that Trans Mountain had no OBDL incidents in the previous six months.

Historical retention and archiving of records are described in the SCADA System General Documentation. Sections which explain historical data values, alarms and events, historical configuration, and historical archiving. The SCADA Manager stated that SCADA historical information is retained for seven years. For the leak detection systems, the Simulation and Controls Manager stated that records are retained for the lifetime of the pipeline. The Trans Mountain record retention schedule was observed and showed leak detection records are maintained for 17 years after the abandonment or sale of a pipeline.

In summary, Trans Mountain demonstrated that it has developed and implemented a pipeline control system that records historical pipeline operation data, messages, and alarms for recall for the SCADA and the leak detection systems

AP-11 Investigation of Incidents, Near Misses and Non-Compliances

Finding status	No issues identified
Regulation	OPR
Regulatory reference	6.5(1)(r)
Regulatory requirement	A company shall, as part of its management system and the programs referred to in section 55, establish and implement a process for the internal reporting of hazards, potential hazards, incidents, and near-misses and taking corrective and preventive actions, including the steps to manage imminent hazards.
Expected outcome	<p>It is expected that the company can demonstrate that it has established and implemented a process for the internal reporting of hazards, potential hazards, incidents, and near-misses related to the operation of the pipeline and for taking corrective and preventive actions, including the steps to manage imminent hazards. It is expected that:</p> <ul style="list-style-type: none"> • The company has a compliant process that is established and implemented. • The company has defined its methods for internal reporting of hazards, potential hazards, incidents, and near-misses. • Hazards and potential hazards are being reported as required by the company's process. • Incidents and near-misses are being reported as required by the company's process. • The company has defined how it will manage imminent hazards. • The company is performing incident and near-miss investigations. • The company's investigation methodologies are consistent and appropriate for the scope and scale of the actual and potential consequences of the incidents or near misses to be investigated. • The company has defined the methods for taking corrective and preventive actions. • The company can demonstrate through records that all corrective and preventive actions can be tracked to closure.

Relevant information provided by the company	<p>The list of documents and records that the CER reviewed related to this assessment are kept on file with the CER.</p> <p>The following interviews are related to this finding:</p> <ul style="list-style-type: none"> • Director, Compliance and Enterprise Risk • Manager, Control Centre • Supervisor, Control Centre • Manager, Simulation and Controls • Manager, Compliance • Control Centre Operators • For a complete list of Trans Mountain staff that were present during the interview, the CER holds a list in its file directory associated with this audit.
Finding summary	<p>Trans Mountain demonstrated that it has established and implemented a process for the internal reporting of hazards, potential hazards, incidents, and near-misses and taking corrective and preventive actions, including the steps to manage imminent hazards.</p>

Detailed Assessment

The ISLMS identifies incidents and near miss reporting and investigation as an element of Trans Mountain’s management system. References supporting the process include:

- Incident Reporting and Investigation Procedure
- Incident Notification and Initial Entry Procedure
- Incident Investigation and Corrective Actions Procedure
- Incident Severity Matrix

Steps to report a hazard that is observed is documented in the Hazard Identification and Reporting Procedure and includes determining if the hazard is imminent. Trans Mountain has defined imminent hazards as "a hazard that requires immediate controls to prevent an undesirable event." The Authority and Obligation to Report section states: "If the hazard or hazardous situation, in their best judgement, is likely to result in an immediate or potentially immediate release event, damage to property, or presents danger to the public or employees, the worker shall notify the Control Centre Immediately."

The CRM Plan describes how incidents and near misses are reported and investigated. Overarching ISLMS general processes are referenced that include the Incident Reporting and Investigation Standard, Incident Management Procedure, Incident Investigation and Corrective Actions Procedure, and the Analysis of Incidents and Trend Communication Procedure. There are two processes that are used specifically by the control room. The OIR supplements the ISLMS reporting process. This allows the CCOs to report hazards, potential hazards, incidents, near misses and opportunities for improvement through a form that is submitted to the control room supervisor. The OIR Reviews and Action Plans procedure describes the steps taken to review the information and report, if necessary, into the Trans Mountain incident reporting system. Information is entered into the Enablon application which tracks the progress from initial report to corrective action plans and approval. Action plans can be assigned to other Trans Mountain departments or can be transferred when the investigation committee determines a root cause is required. The CCO may be a contributing cause in operating incidents and a review of incidents is conducted to identify potential causes including human error, fatigue or inadequate procedures. Corrective actions are implemented by utilizing the Trans Mountain management of change process.

The SCADA support team, and the Simulation and Controls team, who are responsible for maintaining the leak detection systems, use the ISLMS incident management processes for incidents related to their respective systems.

The audit team reviewed examples of incident reports and verified that they were tracked to closure.

Records reviewed by the audit team included:

- OIR - Kingsvale reported 2023-07-12.
- OIR - Edmonton Terminal reported 2023-05-27.
- Incident Report - Black Pines reported 2023-06-29.
- Hazard ID – Burnaby Terminal reported 2022-07-20.
- Near Miss – Bear Incident CN/TMX Access Road 2023-06-23

Interviews conducted with CCOs, and control room management confirmed the OIR procedures are integrated with the ISLMS incident management process. The control room supervisors review the OIRs at the quarterly safety meetings with the CCOs to ensure learnings are shared.

In summary, Trans Mountain demonstrated that it has established and implemented a process for the internal reporting of hazards, potential hazards, incidents, and near-misses and taking corrective and preventive actions, including the steps to manage imminent hazards. The control room has a specialized operational incident reporting process that integrates with the ISLMS incident management process.

AP-12 Emergency Procedures Manual

Finding status	No issues identified
Regulation	OPR
Regulatory reference	32.(1.1)
Regulatory requirement	The company shall develop an emergency procedures manual, review it regularly and update it as required.
Expected outcome	It is expected that the company can demonstrate that: <ul style="list-style-type: none"> • It has developed, regularly reviews, and updates as required an emergency procedures manual to respond to control room specific emergencies (i.e., bomb threat). • It tests the emergency procedures to ensure workers are familiar with them.
Relevant information provided by the company	The list of documents and records that the CER reviewed related to this assessment are kept on file with the CER. The following interviews are related to this finding: <ul style="list-style-type: none"> • Manager, Control Centre • Supervisor, Control Centre • Manager, Simulation and Controls • Manager, Emergency Management • Control Centre Operators • For a complete list of Trans Mountain staff that were present during the interview, the CER holds a list in its file directory associated with this audit.
Finding summary	Trans Mountain demonstrated it has developed emergency procedure manuals and control room emergency procedures, reviews them regularly and updates them as required. The company also has processes in place to train and evaluate control room operators on emergency and abnormal operating conditions response.

Detailed Assessment

Trans Mountain provided the CER auditors with three emergency response plans (**ERP**) for their assets. These plans were revised in April 2023 and included:

- Emergency Response Plan Terminals
- Emergency Response Plan Trans Mountain Pipeline
- Emergency Response Plan Westridge Marine Terminal

The Trans Mountain Pipeline ERPs describe the control centre monitoring and response processes. Responsibilities for the control room include, but not limited to:

- Shut down affected line segment if there is an indication of a leak.
- Isolate the segment.

- Depressurize the line.
- Start internal and external notifications.
- Mobilize additional personnel as required.

Notification of a potential incident can come from the public who contact the Trans Mountain emergency line, field operations notification to the control centre, or be detected in the SCADA system as an annunciation of an alarm. Field operations staff are dispatched to the location to confirm. Upon confirmation, the control room or field operations will invoke the Trans Mountain Alert System (**TAS**), mobilize the Incident Command System (**ICS**), and respond and manage the event. Leak alarms that are generated by SCADA are reviewed by the CCO who has 10 minutes to determine if the event is false; otherwise, the pipeline is shut down and a thorough investigation is performed. Additional information regarding the analysis of leak alarms can be found in AP-13.

The control room has specific procedures that address emergencies and abnormal operating conditions. Trans Mountain has defined:

- Abnormal Operation Condition as a condition or event indicating a malfunction of a component or deviation from normal operations that may: exceed design limits, or result in a hazard to people, property, or the environment.
- Emergency Condition as a condition or event that could imminently be hazardous to persons, property, or the environment. Examples were listed and include, but not limited to, unintended valve closure, operation of a safety device, fire or explosion, release of hazardous liquid, natural disaster, or security threat (i.e., bomb threat).

Control room response procedures for emergencies and AOCs are shown in a flowchart. Analysis, decision, and response steps are displayed in a logical format. In addition, these procedures identify references to supporting procedures for specific events.

Trans Mountain provided emergency procedures used by the control room. These addressed fire alarms, communications or SCADA network failure, loss of utility power, and control centre site change. In addition, the Primary Control Centre Site Security Plan is a site-specific plan designed to assist staff at the control room. This applies to physical security at the facility and includes a section on bomb threats. A bomb threat phone card template was provided as an example of what CCOs would use for a threat call.

The Emergency Management Exercise Standard describes the emergency exercise process and methods employed by Trans Mountain for all operational staff. This includes the following exercises: spill deployment, fire equipment, unannounced fire deployment, table-top, full-scale/worst-case, notifications, and wildfire equipment and response. The Emergency Reporting Procedure describes how the company shares information regarding emergency exercises, incident emergency response and other relative industry events. The report is shared internally with all employees and contractors and may be shared with external parties who participated in the exercise.

All employees receive the ICS 100 training as a mandated requirement. The CCO is tested on emergency response procedures every three years and must requalify to maintain active status. This includes, but not limited to, Recognize and Respond to Emergencies and AOCs – Common and Pipeline, and Station Emergency Shutdown. The control room also conducts tabletop emergency exercises every quarter and annual operating conditions performance checks to ensure CCOs are prepared and ready to respond. Additional information regarding control room training is available in AP 15, 16 and 17.

Review period for the ERPs is annually or if revisions are identified after a release or exercise, and if changes in operating conditions substantially affect the implementation of the plans. The control

room procedures are reviewed once per year, at intervals not to exceed 15 months as cited in the Control Centre Procedures Standard. Access to all emergency management procedures and ICS forms is readily available on the Employee Toolkit internal SharePoint site and backed up in hardcopies.

Interviews conducted with control room management and CCOs demonstrated their understanding of their roles and responsibilities, response requirements, and training and qualifications.

In summary, Trans Mountain demonstrated that it has developed emergency procedure manuals and control room emergency procedures, reviews them regularly and updates them as required. The company also has processes in place to train and evaluate control room operators on emergency and abnormal operating conditions response.

AP-13 Analysis of Leak Alarms

Finding status	No issues identified
Regulation	CSA Z662:23
Regulatory reference	Clause E.4.2.1
Regulatory requirement	Analysis of leak alarms shall be conducted to determine the cause of the alarm. The leak alarm shall not be discounted and declared invalid without such analysis. All alarms shall be assumed to have a cause. Methods to determine the cause of the leak alarm shall be documented in a leak alarm analysis procedure.
Expected outcome	It is expected that the company can demonstrate that: <ul style="list-style-type: none"> • It analyses all leak alarms to determine the cause and has developed methods to determine the cause. • It has procedures and records that demonstrate how leak alarms are handled within the control room. • It has developed and follows methods to determine the cause of leak alarms. • It has records that demonstrate that it analyses all leak alarms. • It does not discount any alarms or declare alarms false without investigating their cause.
Relevant information provided by the company	The list of documents and records that the CER reviewed related to this assessment are kept on file with the CER. The following interviews are related to this finding: <ul style="list-style-type: none"> • Manager, Control Centre • Supervisor, Control Centre • Manager, Simulation and Controls • Control Centre Operators • For a complete list of Trans Mountain staff that were present during the interview, the CER holds a list in its file directory associated with this audit.
Finding summary	Trans Mountain demonstrated that analysis of leak alarms is conducted to determine the cause, and false alarms are not discounted or declared invalid without analysis.

Detailed Assessment

Trans Mountain demonstrated that analysis of leak alarms is conducted to determine the cause of the alarm and leak alarms are not discounted and declared invalid without analysis. The company provided the SPS and ATMOS leak alarm investigation procedures that are used by the CCOs to analyse and respond to a leak alarm. The CPM Plan describes the responsibilities of the Simulation and Controls team, who support the control room, when a leak alarm occurs.

The SPS and ATMOS Pipe leak alarm investigation procedures describe potential leak indicators, examples of operational changes that may cause a leak alarm, the Ten-Minute Rule for analysis, how to manage multiple alarms and the CPM leak analysis reporting requirements.

The two CPM systems are considered independent and monitored and responded to separately. A leak alarm is non-latching and displayed as a high priority magenta colour in the SCADA system leak detection displays. The Simulation and Controls (**S&C**) team maintains the CPM systems and have developed and implemented special diagnostic SCADA displays to help the CCO step through the leak alarm analysis. Additional information regarding the leak detection systems is available in AP-09.

CCOs are trained to determine if the leak alarm is a suspected leak or a false alarm. Both leak alarm investigation procedures use a flowchart that steps a CCO through analysis, decisions, and response. Upon leak alarm annunciation, the CCO is allowed 10 minutes to perform the evaluation, and if a suspected leak is determined within this period a safety shutdown is performed. If the CCO is unable to determine whether the leak alarm is valid, a discretionary shutdown of the affected operation is enacted. Both scenarios trigger a field operations response and investigation by the S&C team, who maintain the leak detection systems. If a suspected leak has been identified the TAS immediately contacts all Trans Mountain corporate emergency response staff.

During the analysis period, the CCO creates a CPM leak analysis report for each event, and this is filed in the CPM Logbook. An alarm event may be multiple alarms in the same general location and at the same general time. An E-Log is also created that captures the alarm analysis, the shutdown, and reasons for the shutdown. If the event is deemed false, then operation will continue with heightened awareness and the event is investigated by the S&C team and a corrective action is determined, as required.

A review of the CPM system health and effectiveness process is described in the Computations Pipeline Monitoring Plan. This is conducted on a weekly basis and includes:

- Review of previous incidents or false alarms
- Analysis of the health of the CPM systems
- Search for any instruments that have been disabled from the CPM system
- Review of occasions where the leak detection system was inoperative
- Review of operations under normal and abnormal conditions

If a false alarm performance review determines a significant degradation of performance, an investigation will be triggered to determine the cause.

The audit team reviewed and observed records identified in the procedures during interviews. These include a CPM Leak Analysis Report on the ATMOS CPM dated 2023-10-09, CPM Weekly Review dated 2023-08-23 and a False Leak Alarm Investigation List for the period 2022-07-10 to 2023-09-28. The audit team observed a ServiceNow ticket (INC0067114) that showed the changes implemented due to a SPS CPM false alarm issue at the Sumas facility. Interviews conducted with CCOs verified the leak alarm investigation processes.

In summary, Trans Mountain demonstrated that analysis of leak alarms is conducted to determine the cause of the alarm. Leak alarm investigation procedures step the CCO through a 10-minute analysis period and state response actions for actual or false alarms. The company provided evidence that all false alarms are reviewed on a weekly basis to determine if corrective actions are required to prevent future false alarms.

AP-14 Safe Shutdown of Pipeline in an Emergency

Finding status	No issues identified
Regulation	CSA Z662:23
Regulatory reference	Clause 10.5.2.1
Regulatory requirement	Operating companies shall establish emergency procedures that include: (a) procedures for the safe control or shutdown of the pipeline system, or parts thereof, in the event of a pipeline emergency; and (b) safety procedures for personnel at emergency sites.
Expected outcome	It is expected that the company can demonstrate that: <ul style="list-style-type: none"> • It has established emergency procedures for the safe control or shutdown of the pipeline system in the event of an emergency. • It has established safety procedures for personnel at emergency sites. • It trains and tests control room personnel on the emergency shutdown procedures. • There is someone on each shift who has the authority to shut down the pipeline.
Relevant information provided by the company	The list of documents and records that the CER reviewed related to this assessment are kept on file with the CER. The following interviews are related to this finding: <ul style="list-style-type: none"> • Manager, Control Centre • Supervisor, Control Centre • Manager, Simulation and Controls • Control Centre Operators • For a complete list of Trans Mountain staff that were present during the interview, the CER holds a list in its file directory associated with this audit.
Finding summary	Trans Mountain demonstrated that the control centre has emergency procedures for the safe control or shutdown of the pipeline system; and safety procedures for personnel at emergency sites are available and specific procedures are used by the control centre when working with the field operations staff.

Detailed Assessment

Trans Mountain provided the CER auditors with asset-specific emergency response plans and control room procedures for responding to emergencies and AOCs. Refer to AP-12 for detailed information. In addition, the leak detection alarm investigation procedures detailed the analysis and response to leak alarms which trigger either a safety or discretionary shutdown. Refer to AP-13 for detailed information.

The CRM Plan describes the responsibilities of the CCOs during emergencies and AOCs. Trans Mountain procedures state: “The CCO has the authority and responsibility to shutdown operations during an emergency, abnormal operating condition, or as a precaution when, in his/her judgement,

further operation is unsafe. The CCO shall not be faulted for shutting down under these circumstances.”

Control room pipeline procedures describe how the CCO responds to emergency and abnormal operating conditions that may warrant a safe control or shutdown of the pipeline. These include:

- Fire at Pump Station
- Fire on Right-of-Way
- Pipeline Shutdown
- Station Shutdown
- High Pressure Alarm – Pipeline
- High Upstream Line Pressure Protection System
- Unexpected Mainline Block Valve Closure.

It was noted by the audit team that the CCO’s authority to shutdown the pipeline was clearly stated in each procedure.

The Pipeline Shutdown procedure describes the criteria for determining the type of shutdown required for specific scenarios. This includes safety, discretionary, maintenance, and operational shutdowns. The pipeline shutdown procedure steps the CCO through analysis, decisions, and response.

Training on emergency and abnormal operating conditions response is described in the Control Centre Training Standard. CCOs complete courses and are required to pass an operator qualification process before they can operate the control centre console independently. CCOs receive general training to recognize and respond to emergencies and AOCs, and specific training for the console they will be operating. General training was shown in the Control Centre Training Matrix and examples were courses C20205.1 and C20205.2. Refer to AP 15, 16 and 17 for additional details regarding the competency and training processes.

Trans Mountain qualifies CCOs on two consoles to ensure there is adequate coverage when a CCO takes a break or is unavailable. CCOs are available to cover shifts if an absence occurs. Fatigue management processes that include monitoring hours of work are reviewed prior to selecting the replacement CCO. Under special conditions a CCO that exceeds fatigue guidelines may be required to work, however, they must use additional fatigue countermeasures throughout the shift. A deviation record is created and approved by the supervisor. Supervisors support the CCO but are not qualified to respond to emergencies or AOCs. It was noted, that qualifying the supervisor for this purpose would ensure adequate coverage during a unique staffing absence.

Interviews conducted with CCOs confirmed the safe control and shutdown of pipelines process and that they had the authority to shut down the pipeline, as cited in the procedures. The interviewees stated that during an emergency or AOC event the on shift CCOs and supervisor work together to analyse and respond to events.

Trans Mountain provided documents that addressed the requirements for safety procedures for personnel at emergency sites. These were Emergency and AOC – General Response, Fire Alarm, Communications and SCADA Network Failure, Loss of Utility Power, Control Centre Site Change, and Contacting Emergency Services. The Working alone, After Hours Call-out, and Safety Line System are control centre procedures that are used when working with the field operations staff.

The Emergency Response Plan - Trans Mountain describes responder health and safety that includes sections on safety guidelines, initial health and safety plan, and the health and safety plan. The audit team observed the Trans Mountain emergency management program's Emergency Toolkit SharePoint site and noted the plans, supporting procedures and links to ICS reporting forms. An initial site health and safety plan for an incident that occurred on 11 July 2023 was provided as an example of the information collected when the first responder arrives at the event site. Site information that was documented included location, incident commander, hazards, atmospheric monitoring, control measures, and PPE requirements.

In summary, Trans Mountain demonstrated that the control room has emergency procedures for the safe control or shutdown of the pipeline system; and safety procedures for personnel at emergency sites are available and specific procedures are used by the control centre when working with the field operations staff.

AP-15 Defining Competency and Training Requirements

Finding status	No issues identified
Regulation	OPR
Regulatory reference	6.5(1)(j)
Regulatory requirement	A company shall, as part of its management system and the protection programs referred to in section 55, establish and implement a process for developing competency requirements and training programs that provide employees and other persons working with or on behalf of the company with the training that will enable them to perform their duties in a manner that is safe, ensures the safety and security of the pipeline and protects the environment.
Expected outcome	<p>It is expected that the company can demonstrate that it has established competency criteria and training programs for pipeline controllers. It is expected that:</p> <ul style="list-style-type: none"> • The company has a compliant process for developing competency requirements and training programs. • The company has defined what competencies are required. • Training programs are traceable and trackable to the defined competency requirements and effective at achieving the desired competencies. • Persons working with or on behalf of the company are provided with adequate training to operate and maintain the pipeline control system. • Employees and those working on behalf of the company are competent to carry out their assigned work.
Relevant information provided by the company	<p>The list of documents and records that the CER reviewed related to this assessment are kept on file with the CER.</p> <p>The following interviews are related to this finding:</p> <ul style="list-style-type: none"> • Director, Compliance and Enterprise Risk • Manager, Compliance • Manager, Control Centre • Manager, Simulation and Controls • Team Lead, Training • Supervisor, Procedures and Training • Supervisor, Control Centre • For a complete list of TMPU staff that were present during the interview, the CER holds a list in its file directory associated with this audit.
Finding summary	Trans Mountain demonstrated that it has a process for developing competency requirements and training programs that provide employees and other persons working with or on behalf of the company with the training that will enable them to perform their duties.

Detailed Assessment

One of the programs within the ISLMS is the Training Management Program, the purpose of which is to administer and monitor competency and training assurance activities of employees and contractors. The program applies to all personnel and interacts with all programs under the umbrella of the ISLMS.

Trans Mountain provided the CER auditors with its Training Management Plan which is the governing document for the Training Management Program. Within the plan, Trans Mountain laid out the policies and requirements to ensure that its employees are appropriately trained and qualified to perform their assigned tasks. The plan is designed to align with and meet the goals of the ISLMS.

Section 3.2.2 of the Training Management Plan refers to the requirement for each department requiring training specific to their area of expertise to have a training standard. Section 11.2.2 of the plan deals with skills matrices and competencies. Trans Mountain demonstrated that skills matrices have been developed to organize the training for all employees. The company organizes competencies into appropriate sections and where applicable, reflect the skills progression required to advance to higher levels of the organization.

Trans Mountain provided the audit team with its Control Centre Training Standard which serves as the interface between the control centre training program, the ISLMS and other programs under the ISLMS. The standard describes the specific requirements for implementing training programs for CCOs. It integrates the requirements of the company's policies, the Training Management Plan, the Occupational Qualification Program, and various government regulations and applies to all CCOs and supervisors.

The standard stipulates that the control centre shall have a Supervisor, Control Centre Procedures and Training to serve as the administrator for occupational qualifications in the control centre and to serve as the designated training administrator. The standard provides definitions, roles, and responsibilities, and defines the requirements for control centre skills matrix and training and career progression. The standard defines the requirements for individual training profiles and training plans, training and evaluations, qualification requirements and requalification requirements.

Requirements for contractors are laid out in the Contractor Competency Assurance Procedure. Contractors are contracted based on qualifications stipulated in contract documents, which are based on the occupational qualifications (**OQs**) for similar positions within the company and verified by the contracting staff. Then all work performed by contractors is performed under the guidance of Trans Mountain personnel. The Manager of the control centre advised the CER auditors that contracted staff have not recently been utilized in the control centre. However, the CER auditors were advised that if a contractor was to be brought into the control centre to perform the functions of a CCO, they would be required to undertake the same training as a new hire.

All new employees are put through a corporate training program to teach them common corporate training requirements such as training on the ISLMS, general safety, environmental awareness, and security awareness. Once a new CCO trainee has completed the corporate training, they are required to complete a comprehensive training process to learn how to operate one of the control centre desks. They are paired with a qualified CCO and required to complete a long list of training procedures which are signed off by the CCO and supervisor upon successful demonstration of the necessary skills and knowledge. This process typically takes anywhere from 5 to 6 months. The CCO is then subjected to a scored evaluation process under the control of the Supervisor, Control Centre Procedures and Training. Once a trainee successfully completes their on-job-training and the final evaluation process, they are assigned to a team of CCOs.

Trans Mountain advised the CER auditors that it is in the process of cross training its operators so that each operator will be qualified to operate and control the assets of two consoles. Doing so will provide the company with greater flexibility within its workforce to account for issues such as illness, or vacation.

Trans Mountain has a Learning Management System (**LMS**) which is a software based automated system that keeps track of all training. Training requirements from the skills matrices get entered into the LMS for tracking purposes. The LMS keeps track of training courses for each worker and when they are due for completion. As the due date approaches, the LMS sends out a notification to the employee and their supervisor. Trans Mountain provided the CER auditors with examples of these notifications and an example of an individual training plan for one of its CCOs, showing the training that is to be completed and when it is due.

In summary, Trans Mountain demonstrated that it has a process for developing competency requirements and training programs that provide employees and other persons working with or on behalf of the company with the training that will enable them to perform their duties.

AP-16 Verifying Competency and Training

Finding status	No issues identified
Regulation	OPR
Regulatory reference	6.5(1)(k)
Regulatory requirement	A company shall, as part of its management system and the programs referred to in section 55, establish and implement a process for verifying that employees and other persons working with or on behalf of the company are trained and competent and for supervising them to ensure that they perform their duties in a manner that is safe, ensures the security of the pipeline and protects the environment.
Expected outcome	<p>It is expected that the company can demonstrate that it has established and implemented a process for verifying that control room personnel are trained and competent and for supervising them to ensure they perform their duties in a manner that is safe, ensures the security of the pipeline and protects the environment. It is expected that:</p> <ul style="list-style-type: none"> • The company has a compliant process for verifying employees and other persons working with or on behalf of the company are trained and competent. • Records are maintained demonstrating employees and other persons working on behalf of the company are trained and competent as applicable to the Integrity Management Program and specifically, the control room. • The company has a compliant process for supervising employees and other persons working on behalf of the company. • Supervision of employees and other persons is adequate to ensure they perform their duties in a manner that is safe, ensures the security of the pipeline and protects the environment.
Relevant information provided by the company	<p>The list of documents and records that the CER reviewed related to this assessment are kept on file with the CER.</p> <p>The following interviews are related to this finding:</p> <ul style="list-style-type: none"> • Director, Compliance and Enterprise Risk • Manager, Compliance • Manager, Control Centre • Manager, Simulation and Controls • Team Lead, Training • Supervisor, Procedures and Training • Supervisor, Control Centre • For a complete list of TMPU staff that were present during the interview, the CER holds a list in its file directory associated with this audit.
Finding summary	Trans Mountain demonstrated that it has a process for verifying that employees and other persons working with or on behalf of the company are trained and competent and for supervising them to ensure that they perform their duties in a manner that is safe, ensures the security of the pipeline and protects the environment.

Detailed Assessment

As previously described, all control centre employees are put through a corporate and job-specific training program before being assigned to a team of CCOs. Once their training is completed, there is a requirement for each CCO to requalify for their assigned duties and responsibilities every three years. Also, each year, each shift supervisor is required to conduct several performance evaluations of the CCOs to assess their ongoing ability to carry out the CCO procedures correctly.

Once every two years, Trans Mountain performs a liquid takeaway test to test the leak detection systems and the CCOs' ability to recognize and respond to a perceived leak. These tests can be either announced or unannounced and require a lot of engineering, planning and coordination to carry out. In these tests, the commodity in the pipeline is drawn away from the pipeline and put into temporary storage so that, from the perspective of the leak detection system and the controller, the situation resembles a leak. However, these tests are always arranged so that the on-shift supervisor is aware of the test and will stop the CCO before they shut down the pipeline.

Also, the control centre performs quarterly failovers from the MCC to the BCC to test the ability of the CCOs to successfully transfer from one control centre to the backup. These failovers are arranged to enable all shifts to have a chance to conduct the failover.

Quarterly, during periods of reduced activities, such as during a weekend shift, the shift supervisors will use the opportunity to carry out tabletop exercises to run the on-shift CCO team through an emergency scenario and the correct procedures to follow. Minutes and learnings from these exercises are recorded and disseminated.

Also, on an annual basis, each supervisor is required to carry out a number of operational assessments of the CCOs to assess their knowledge and skills in implementing the procedures associated with the desk that they control. These are typically carried out during periods of reduced activity, such as a weekend shift and follow the control centre's procedure for Conducting a Performance Observation and utilizing the CCO Performance Observation Checklist. Trans Mountain provided the CER auditors with a record of a completed checklist.

Changes to the control centre operations and procedures are managed using the corporate MOC process. Whenever there is a change in a procedure, each CCO is required to sign off that they have read and understood the change.

Within the corporate management system, there is a requirement for each program to follow the company's Standard for Supervising Personnel. Both the CRM Plan and the CPM Plan meet this requirement. In each plan, Section 11.0 deals with the requirement for the two programs to define competency and training requirements and verify ongoing competency and skills. As previously discussed, Trans Mountain demonstrated to the CER auditors that they have identified competency and training requirements and the company has a process to verify the ongoing competency of its staff and for supervising them.

In summary, Trans Mountain demonstrated that it has a process for verifying that employees and other persons working with or on behalf of the company are trained and competent and for supervising them to ensure that they perform their duties in a manner that is safe, ensures the security of the pipeline and protects the environment.

AP-17 Annual Training Program Report

Finding status	No issues identified
Regulation	OPR
Regulatory reference	56(b)
Regulatory requirement	A company shall, in addition to complying with the record retention requirements set out in the CSA standards referred to in section 4, retain an annual report on the training program developed under section 46 that compares the actual training received by employees to the planned training.
Expected outcome	It is expected that the company can demonstrate that: <ul style="list-style-type: none"> It prepares an annual report that compares the actual training received by employees and other staff working on behalf of the company in the control room to the planned training.
Relevant information provided by the company	The list of documents and records that the CER reviewed related to this assessment are kept on file with the CER. The following interviews are related to this finding: <ul style="list-style-type: none"> Director, Compliance and Enterprise Risk Manager, Compliance Manager, Control Centre Manager, Simulation and Controls Team Lead, Training Supervisor, Procedures and Training Supervisor, Control Centre For a complete list of TMPU staff that were present during the interview, the CER holds a list in its file directory associated with this audit.
Finding summary	Trans Mountain demonstrated that it regularly provides senior management and the AO with a report on the training program developed under section 46 that compares the actual training received by employees to the planned training.

Detailed Assessment

The CER auditors required Trans Mountain to demonstrate that, at least annually, it ensures that the AO is made aware of the status of training conducted in the control centre and that the training program meets the requirements of section 46 of the OPR. Section 46 requires (amongst other things) that the training program instruct employees on:

- a) The safety regulations and procedures applicable to the day-to-day operation of the pipeline;
- b) The security processes, procedures and measures applicable to the day-to-day operation of the pipeline;
- c) Responsible environmental practices and procedures in the day-to-day operation of the pipeline;
- d) The procedures for the proper operation of the equipment that the employee could reasonably be expected to use; and

- e) The emergency procedures set out in the manual developed under section 32 and the procedures for the operation of all emergency equipment that the employee could reasonably be expected to use.

Section 32 of the OPR requires that a company have an Emergency Management Program.

For a detailed understanding of the requirements of sections 32 and 46 of the OPR, please refer to the regulations.

Trans Mountain identifies all the competency and training requirements for every employee and enters them into the company's LMS. TMPU provided the CER auditors with examples of the training lists for several employees showing all the courses they are required to complete and those that have been completed on time. The LMS advises each employee and their supervisor of upcoming training requirements. If a course is not completed on time, the system requires that the training be completed as soon as is practicable.

Trans Mountain puts all new employees through a corporate training process in which topics such as safety, security, and environmental protection are covered. In addition, each new control centre employee is put through a multi-month training process to learn the operating procedures for the equipment they will be required to operate, including emergency procedures.

Each month, a training report is prepared for each member of the Executive Team broken down by Director showing which employees have completed training and what training is overdue. Trans Mountain showed the CER auditors the training report for the control centre. The status of training is also part of the annual management review process. Trans Mountain provided the CER auditors with evidence that this is being done.

In summary, Trans Mountain demonstrated that it regularly provides senior management and the AO with a report on the training program developed under section 46 that compares the actual training received by employees to the planned training.

AP-18 Control Room Audits

Finding status	No issues identified
Regulation	OPR
Regulatory reference	55
Regulatory requirement	A company shall conduct audits with a maximum interval of three years of the following programs (1)(b) the integrity management program referred to in section 40, including the pipeline control system referred to in section 37; and (2) The documents prepared following the audit shall include (a) any deficiencies noted; and (b) any corrective action taken or planned to be taken.
Expected outcome	It is expected that the company can demonstrate that: <ul style="list-style-type: none"> • It conducts audits of the pipeline control system with a maximum interval of three years. • The audit reports note any deficiencies and any corrective actions taken or planned to be taken.
Relevant information provided by the company	The list of documents and records that the CER reviewed related to this assessment are kept on file with the CER. The following interviews are related to this finding: <ul style="list-style-type: none"> • Manager, Control Centre • Manager, Supervisor • Manager, Simulation and Control • Director, Compliance and Enterprise Risk • Manager, Compliance • Compliance Auditor • For a complete list of Trans Mountain staff that were present during the interview, the CER holds a list in its file directory associated with this audit.
Finding summary	Trans Mountain demonstrated that control room audits of their processes, as required by the OPR, are being conducted every three years; deficiencies are noted; and corrective actions were taken and completed.

Detailed Assessment

Trans Mountain provided the CER auditors with four audit reports associated with the control room that showed audits are being conducted every three years and that the scope included audits of the OPR and CSA Z662. The reports submitted were:

- 2020 FIMP & Control System Audit Report
- 2023 Integrity & Pipeline Control Audit Report
- 2019 CSA-Z662-15 EY Audit Report Final
- 2022 CSA-Z662-19 Audit Report Final

Trans Mountain's ISLMS identifies compliance audits as a management system element that is required to meet OPR sections 53 and 55. The Compliance Audit Standard is the overarching

process for conducting audits on Trans Mountain's programs and processes. This standard defines the responsibilities, the audit team, development and management of the audit plan, the execution of the audits that includes the development of CAPAs, and auditor competence.

The audit team reviewed the recent audit report, 2022 CSA Z662:19 Audit Report Final, which evaluated Trans Mountain's compliance to CSA Z662:19. The control room and the leak detection systems were included in the evaluation and five non-compliances were identified, specific to CSA Z662:19 Annex E: Sales quality liquid hydrocarbon pipeline leak detection. The company submitted the 2022 Z662:19 Audit Findings Including CAPAs – Leak Detection document and the audit team observed the completed CAPAs during interviews. CSA Z662:19 Full Protocol was provided to the audit team for review. It was noted, that within this audit the control room was not clearly defined in the scope and that protocol should be reviewed thoroughly to ensure all applicable clauses are identified for control room processes.

The 2023 Integrity and Pipeline Control Room Report described the audit process and evaluation of Trans Mountain's programs and management system compliance to OPR and American Code of Federal Regulations Part 195. The audit team reviewed the report and the 2023 Integrity & Pipeline Control Audit CAPA's. The Control Room Management Program and applicable processes were evaluated against OPR sections and there were no findings identified.

In summary, Trans Mountain demonstrated that control room audits of their processes, as required by OPR sections 53 and 55, are being conducted every three years; deficiencies are noted; and corrective or preventative actions were taken and completed.

AP-19 Audits of Leak Detection System

Finding status	No issues identified
Regulation	CSA Z662:23
Regulatory reference	Clause E.9
Regulatory requirement	<p>The leak detection system shall be reviewed and audited periodically to determine whether it is in accordance with the provisions of this Annex. Where discrepancies are identified, appropriate revisions shall be made. The methods, responsibilities, and results of the reviews and audits shall be documented. Such reviews and audits should include</p> <ul style="list-style-type: none"> a) Scope and objectives; b) Review/audit frequency and timing; c) Responsibilities for managing and performing the audit; d) Previous incidents or false alarms; e) Occasions where the leak detection system was inoperative; f) Previous reviews, internal audits and external audits; g) Reviewer/auditor independence; h) Reviewer/auditor competency; i) Reviewer/auditor procedures; and j) Operations under normal and special conditions.
Expected outcome	<p>The company can demonstrate that:</p> <ul style="list-style-type: none"> • It conducts reviews and audits of the leak detection system periodically. • Its evaluations have determined the root cause of incidents and recommended corrective and preventive actions. • Corrective and preventive actions stemming from the audits and evaluations have been (or are being) implemented.
Relevant information provided by the company	<p>The list of documents and records that the CER reviewed related to this assessment are kept on file with the CER.</p> <p>The following interviews are related to this finding:</p> <ul style="list-style-type: none"> • Manager, Simulation and Control • Manager, Control Centre • Supervisor, Control Centre • Director, Compliance and Enterprise Risk • Manager, Compliance • Compliance Auditor • For a complete list of Trans Mountain staff that were present during the interview, the CER holds a list in its file directory associated with this audit.
Finding summary	<p>Trans Mountain demonstrated that the leak detection systems are reviewed and audited periodically to determine whether they are in accordance with the provisions of CSA Z662 Annex E. Audits, gap assessments and weekly reviews of the leak detection systems are conducted and corrective action plans address findings.</p>

Detailed Assessment

Trans Mountain demonstrated that the leak detection systems are reviewed and audited periodically to determine whether they are in accordance with the provisions of CSA Z662 Annex E and corrective actions were implemented to address discrepancies. Trans Mountain's ISLMS identifies compliance audits as a management system element. Cited in the Compliance Audit Standard, Trans Mountain's audit scope includes the Onshore Pipeline Regulations, and CSA Z662, which is to be conducted at a maximum three-year interval.

The company provided the CER auditors with a recent CSA Z662 audit that was conducted in 2022 by an external company. Review of the 2022 CSA-Z662-19 Audit Report Final confirmed that Annex E: Sales quality liquid hydrocarbon pipeline leak detection, in its entirety, was evaluated. The company submitted the 2022 Z662-19 Audit Findings Including CAPA(s) – Leak Detection document where five non-compliances were identified. This was reviewed by the audit team who observed the completed CAPAs during interviews. In addition, the Trans Mountain Simulation and Controls team commissioned a gap assessment of this annex that was completed in 2022. The audit team reviewed one finding during interviews and noted that this CAPA was completed.

The CPM Plan aligns to the ISLMS compliance assurance activities and requirements of Annex E. The plan requires leak detection system (**LDS**) audits and reviews to ensure performance and health of the LDS and that the system is functioning properly. Deficiencies identified in previous reviews, internal audits, and external audits result in CAPAs. The reviews are conducted by the leak detection systems (Simulation & Controls) support group on a weekly basis and includes previous incidents or false alarms, analysis of the health of the LDS, occasions where the LDS was inoperative, and operations under normal and special conditions. Additional information that describes Trans Mountain's leak detection systems is available in AP-09.

CPM Weekly Reviews for 6 January 2022, 23 August 2023 and 30 August 2023 were provided and reviewed by the audit team. In addition, there were several incident and change request tickets submitted that demonstrated this process is being performed. The review of the leak detection systems being inoperative is documented in section 1 (DNV GL SPS Models Performance) and 3 (ATMOS Leak Detection and Simulation Performance) within the weekly review checklist.

In summary, Trans Mountain demonstrated that the leak detection systems are reviewed and audited periodically to determine whether they are in accordance with the provisions of CSA Z662 Annex E. Two evaluations were conducted in 2022 by external companies that included an audit and gap assessment. The company performs a weekly performance and health review to ensure adequate leak detection system.

AP-20 Annual Management Review

Finding status	No issues identified
Regulation	OPR
Regulatory reference	6.5(1)(x)
Regulatory requirement	A company shall, as part of its management system and the programs referred to in section 55, establish and implement a process for conducting an annual management review of the management system and each program referred to in section 55 and for ensuring continual improvement in meeting the company's obligations under these Regulations.
Expected outcome	<p>It is expected that the company can demonstrate that it has a process for conducting an annual management review of its control room operations and for ensuring continual improvement in meeting the company's obligations under the OPR Regulations. It is expected that:</p> <ul style="list-style-type: none"> • The company has a compliant process that is established and implemented. • The company's methods for conducting the management review are defined. • The company has defined methods for reviewing the management system and each section 55 program. • The company has maintained records to demonstrate the achievement of meeting obligations the OPR Regulations is continually improved. • The company has identified, developed, and implemented corrective actions as part of its continual improvement.
Relevant information provided by the company	<p>The list of documents and records that the CER reviewed related to this assessment are kept on file with the CER.</p> <p>The following interviews are related to this finding:</p> <ul style="list-style-type: none"> • Director, Compliance and Enterprise Risk • Manager, Compliance • Manager, Control Centre • Manager, Simulation and Controls • For a complete list of TMPU staff that were present during the interview, the CER holds a list in its file directory associated with this audit.
Finding summary	Trans Mountain demonstrated that it has a process for conducting an annual management review of the management system and the two programs associated with the operation and control of the pipeline and for ensuring continual improvement.

Detailed Assessment

Section 18.0 of the ISLMS stipulates that the requirements for the Quality Assurance Management Review meeting and the Quality Assurance Annual Report are detailed in the Management Review Procedure. Trans Mountain provided the CER auditors with copies of these documents.

Trans Mountain also provided the CER with its Goals Objectives and Targets Standard which requires each program owner to:

- Develop a program commitment statement;
- Establish program GOTs to support the achievement of commitments;
- Measure the performance of objectives through performance measures with specific measurable targets;
- Communicate GOTs to program staff, senior management, and other stakeholders; and
- Review performance annually.

Within the ISLMS, two of the 16 program areas that are within the scope of this audit are the Control Centre Management Program and the Computational Pipeline Monitoring Management Program. Trans Mountain provided the CER auditors with the GOTs for 2022 and 2023 for both programs,

Trans Mountain also showed the CER auditors a spreadsheet that it uses to keep track of the various program GOTs and demonstrated how they are aligned with the corporate goals.

Section 18.0 of the ISLMS states that the purpose of the annual management review meeting is to conduct an executive level review of the performance of the ISLMS and programs in meeting their obligations including (but not limited to);

- The achievement of GOTs;
- The results of the Annual Human Resources Evaluation and any deficiencies;
- The status of any CAPAs;
- Trends in hazards and incidents;
- The results of operational risk assessments;
- The results of incident investigations, including any lessons learned and any resulting CAPAs;
- Results of internal or regulator audits and assessments;
- A summary of decisions, actions and commitments undertaken to continually improve the ISLMS;
- The results of the Safety and Loss Management dashboard for the prior year and proposed changes to performance measures and targets for the following year.

In addition to the annual management review, program owners are required to participate in additional meetings throughout the year to keep the executive team and the AO apprised of the performance of their programs.

The Management Review Procedure details the procedural steps and roles and responsibilities for the annual management review process, which is to result in the preparation of an annual report.

The annual report is a formal document prepared by the Compliance Department, which outlines the performance of the ISLMS and management programs in meeting obligations for the previous year. It is to be prepared for, and signed by, the AO.

Trans Mountain provided the CER with the agenda for the 2022 Annual Management Review Meeting. They also provided the 2022 Human Resources Evaluation Plan for the Control Centre and the Computational Pipeline Monitoring Group.

Annually, the Compliance Department sends around a template to each program owner detailing the information that is to be put into their management review and evaluation of their performance for the previous year and plans and adjustments for the upcoming year. Each program owner is required to review and comment on the results of the performance indicators used to monitor the

program's success in achieving its GOTs. Whenever a target or objective is not achieved, the program owner must provide an explanation as to why it was not achieved and a justification for altering the objective or setting a new objective. Also, each program is required to set new targets and objectives for the coming year and set KPIs to monitor progress towards achieving them.

The Compliance Department then takes the results from all the program areas and assembles them into a single presentation which is delivered to the executive team and the accountable officer during the annual management review meeting. Trans Mountain provided the CER with a copy of the presentation slide deck that was used for the 2022 annual management review meeting.

The annual management review meeting leads to the generation of the Quality Assurance Annual Report, which is signed by the AO. TMPU provided the CER auditors with its 2021 and 2022 management review records which clearly showed that the Control Centre Management Program and the Computational Pipeline Monitoring Management Program reviewed their success in achieving their KPIs, targets and objectives from the previous year and set new ones for the coming year. Overall, the management review process serves to provide the senior executive team and the AO with a good overview of the adequacy and effectiveness of the management system and the human resources required to implement it. The CER auditors noted that these two annual reports met the requirements of subsection 6.6(1) of the OPR for the company to generate an annual report.

In summary, Trans Mountain demonstrated that it has a process for conducting an annual management review of the management system and the two programs associated with the operation and control of the pipeline and for ensuring continual improvement.

AP-21 Pipeline Control System

Finding status	No issues identified
Regulation	OPR
Regulatory reference	37(a)
Regulatory requirement	A company shall develop and implement a pipeline control system that (a) comprises the facilities and procedures used to control and monitor the operation of the pipeline.
Expected outcome	<p>It is expected that the company can demonstrate that it has developed and implemented a pipeline control system for its pipelines that meets the requirements of CSA Z662. It is further expected that:</p> <ul style="list-style-type: none"> • The company can explain how the pipeline control system is used to control and monitor the operation of its pipelines. • The company provides documentation that explains the pipeline control system design, maintenance, and operation. • The company provides documentation and records that explain how alarms setpoints and control limits are determined, and changes are managed and monitored. • The company provides documentation and records that explain how malfunctioning, inhibited, and stale data and alarms are analyzed, and managed. • The company can provide documentation and records that explain the backup pipeline control system and when is used. • The company can provide documentation and records that explain the pipeline system commissioning.
Relevant information provided by the company	<p>The list of documents and records that the CER reviewed related to this assessment are kept on file with the CER.</p> <p>The following interviews are related to this finding:</p> <ul style="list-style-type: none"> • Manager, SCADA • Supervisor, Controls Systems • Manager, Simulation and Controls • Manager, Control Centre • Supervisor, Control Centre • For a complete list of Trans Mountain staff that were present during the interview, the CER holds a list in its file directory associated with this audit.
Finding summary	Trans Mountain demonstrated that they have a pipeline control system and procedures used to control and monitor the operation of the pipeline. Processes address design, maintenance, and operation. Procedures have been developed and used to manage SCADA issues through the MOC process, manage alarms and monitor statistics, commission facilities and transfer to backup servers or facilities.

Detailed Assessment

Trans Mountain demonstrated that they have a developed and implemented pipeline control system that includes pipeline and terminal facilities and procedures used to control and monitor. The company submitted documents that describe the SCADA system, and procedures that explain how the SCADA system is maintained and used for pipeline operations. This included the SCADA General Documentation that described infrastructure and components, and maintenance and configuration. The SCADA Manager confirmed that the processes used to manage the SCADA system are integrated with Trans Mountain's ISLMS.

The audit team received a tour of the primary and backup control rooms. The two facilities are within a few minutes of each other, and operations can be transferred to either should an event occur that impacts the communications, power, or access to the centre. In addition, the audit team observed a shift change and noted the CCOs interacting with the displays, trending analogue values, and reviewing the event and alarm screens.

Trans Mountain uses the Geo SCADA, formerly named ClearSCADA, for all pipeline and terminal monitoring and control. SCADA and facility control systems architecture diagrams were submitted to the audit team. The system has triple server redundancy at two data centres. This ensures continuous operations should a technical issue affect a server or a data centre communications link. Primary communication with the remote facilities is through landlines and backups are either radio or cellular communications. Power is maintained with a backup generator at the control centre facility. All critical computers operate on a dedicated uninterruptible power supply. The control centre has five active consoles, one spare used by planning and engineering, and one spare console that will be used for the future Trans Mountain Line 2 operation. Observation of the backup control centre confirmed the same number of consoles and similar SCADA display setup.

CCOs are trained to transfer operations to the backup control centre. SCADA switching to a secondary or tertiary server is done automatically. The SCADA Site Failover and Disaster Recovery documents describe the SCADA redundancy, disaster backup, operational switching and backup system testing and operation.

SCADA software monitors the health status of the servers, including the leak detection servers, and announce an alarm if a problem is detected. If the server becomes inoperable, the system transfers to an available redundant server.

The Operating Limits and Protective Device Settings Manual lists the operating limits and protective device settings for Trans Mountain facilities, which are determined by the engineering team. Analogue alarm setpoints are configured within the remote facility programmable logic controllers and the control room will receive an alarm status if the analogue setpoint is exceeded.

Changes to the SCADA system follow the Trans Mountain Management of Change Standard. Issues related to the SCADA system are identified by the CCO who notifies the supervisor. Depending on the issue, the supervisor may follow up with field operations for facility related issues, or the SCADA support team. Problems may include data quality, communications, inaccurate display, or incorrect database configuration. The issue is documented, reviewed by SCADA support and if required, changes are implemented to resolve the issue. The audit team observed a SCADA modification change, CHG0036068 dated 16 October 2023, during the interviews. Significant changes to SCADA are reviewed at the shift handover to ensure CCO awareness.

The SCADA Alarm Management Standard describes the alarm philosophy which includes alarm rationalization, criteria, safety-related alarm identification, detailed design, classification, presentation, and implementation. Continuous monitoring of alarms and potential SCADA issues is

conducted by the CCO 24x7, and as part of a performance monitoring process a monthly alarm review is conducted. The monthly alarm review dated 26 July 2023 was observed by the audit team who noted the review included a review of safety-related alarms, alarm system performance, and alarm statistics. In addition, the review includes reviews of safety-related tags that have been disabled, put out of service, have generated alarms or have been forced to manual values. Safety alarm review committee meeting minutes dated May 2023 showed the issues, responsibilities, details, and status. A safety alarm settings validation is conducted once per calendar year, at intervals not to exceed 15 months. These are checked using the Point-to-Point Verification Procedure, which confirms that SCADA displays accurately display the remote monitoring values and the control room can control a facility.

Commissioning of Sustaining Capital Projects describes the role of the SCADA Specialist. This includes verifying that the SCADA database and graphical interfaces are consistent with the remote facility configuration, that commands sent from the SCADA system to the facility have the desired control effect, that status information is properly received and displayed, and that alarms are appropriately functioning. The control room participates in all applicable phases of the pre-startup safety review and work with the engineered plan author during flooding, wet commissioning, and startup. Acceptance by the control room supervisor is required to complete the pre-startup safety review and formalizes the turnover to operations. Commissioning records, SCADA analog commissioning Blackpool L2 and SCADA digital commissioning Blackpool L2, were reviewed by the audit team.

In summary, Trans Mountain demonstrated that they have a pipeline control system for the pipeline and terminal facilities. Procedures used to control and monitor the operation of the pipeline and processes that address design, maintenance, and operation are available. Procedures have been developed and used to manage SCADA issues through the MOC process, manage alarms and monitor their statistics, commission facilities and transfer to backup servers or facilities.

Appendix 2: Terms and Abbreviations

For a set of general definitions applicable to all operational audits, please see Appendix I of the CER Management System Requirements and CER Management System Audit Guide found on www.cer-rec.gc.ca.

Term or Abbreviation	Definition
AO	Accountable Officer
AOC	Abnormal Operating Condition
AP	Audit Protocol
bbl	Barrel
BCC	Backup Control Centre
CAPA	Corrective and Preventive Action
CCO	Control Centre Operator
CER	Canada Energy Regulator
CER Act	<i>Canadian Energy Regulator Act</i>
CPM	Computational Pipeline Monitoring
CRM	Control Room Management
CSA	Canadian Standards Association
CSA Z662:23	<i>Canadian Standards Association Standard Z662:2023 – Oil and gas pipeline systems</i>
EHS	Environment, Health and Safety
HR	Human Resources
ICS	Incident Command System
ISLMS	Integrated Safety and Loss Management System
kms	kilometres
KPI	Key Performance Indicator
LDS	Leak Detection System

LMS	Learning Management System
m3	Cubic Metres
MCC	Main Control Centre
MOC	Management of Change
OBDL	Operation Beyond Design Limits
OIR	Operational Incident Report
OPR	<i>Canadian Energy Regulator Onshore Pipeline Regulations</i>
S&C	Simulation and Controls
SCADA	Supervisory Control and Data Acquisition
The company	Trans Mountain Pipeline ULC
TAS	Trans Mountain Alert System
TMEP	Trans Mountain Expansion Project
TMPU	Trans Mountain Pipeline ULC
TOC	Table of Contents
Trans Mountain	Trans Mountain Pipeline ULC
UHL	Unified Hazard List
UHRR	Unified Hazard and Risk Register
USA	United States of America