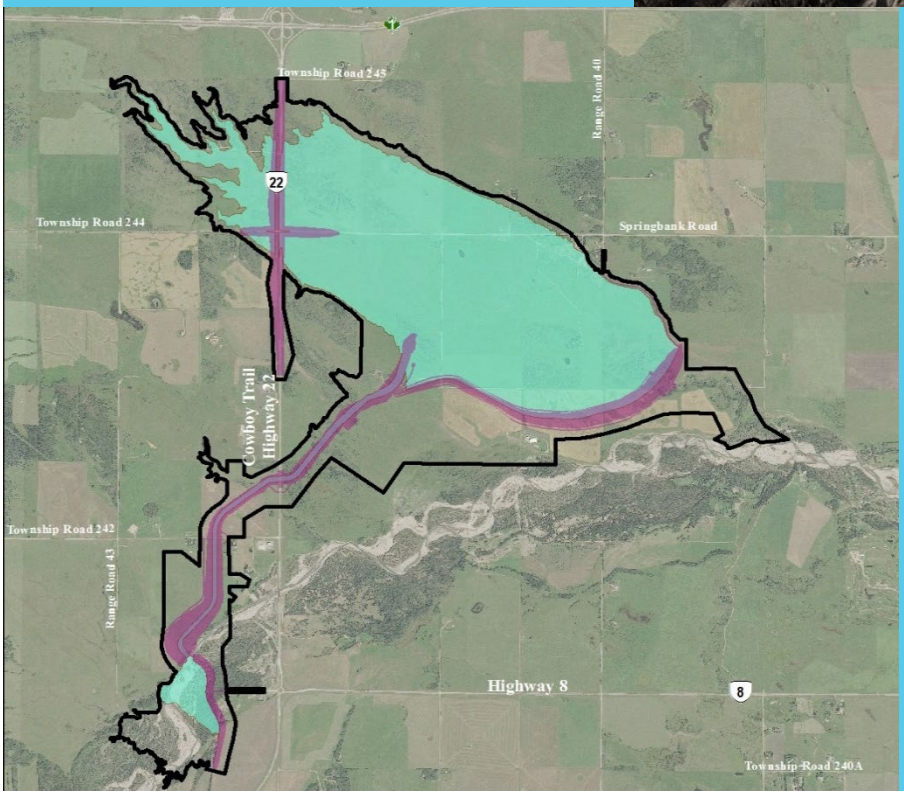
Springbank Off-stream Reservoir Project

Environmental Monitoring Report



Air Quality Management Plan

January 2022

Alberta

SPRINGBANK OFF-STREAM RESERVOIR PROJECT
Air Quality Management Plan

Prepared for:
Alberta Transportation

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January 2022

Table of Contents

LIST OF TABLES

LIST OF FIGURES

Abbreviations

AEP	Alberta Environment and Parks
AMD	Air Monitoring Directive
AQMP	Air Quality Management Plan
CAAQS	Canadian Ambient Air Quality Standards
CAC	criteria air contaminant
CCME	Canadian Council of Ministers of the Environment
CEAA	Canadian Environmental Assessment Agency
EIA	environmental impact assessment
ECCC	Environment and Climate Change Canada
ECO	Environmental Construction Operations
IAAC	Impact Assessment Agency of Canada
LAA	local assessment area
NRCB	Natural Resources Conservation Board
PAH	polycyclic aromatic hydrocarbon
PDA	Project development area
PM	particulate matter
$PM_{2.5}$	fine particles with an aerodynamic diameter of 2.5 µm or less
TLRU	traditional land and resource use
TSP	total suspended particulate
TUS	traditional use study
VOC	volatile organic compound
WISSA	Western Interprovincial Scientific Studies Association

1.0 INTRODUCTION

The Air Quality Management Plan (AQMP) has been developed for construction and operation of the Springbank Off-stream Reservoir Project (the Project). Project construction and operations are expected to affect key aspects of the quality of the air. The AQMP describes mitigation and monitoring for several criteria air contaminants (CAC) identified as being of potential concern or importance to the Project. These are a sub-set of the substances of interest listed in the Alberta Environment and Parks (AEP) terms of reference (AESRD, 2015) and Impact Assessment Agency of Canada (IAAC) and Natural Resources Conservation Board (NRCB) guidelines (IAAC, 2021c). This AQMP is current as of January 2022, and is subject to change.

1.1 GOALS AND OBJECTIVES

This AQMP has the following goals and objectives:

- Summarize relevant approval decisions and conditions from the IAAC and NRCB for the construction and operational phases of the Project.
- Define the Project phases and the types of activities that may result in changes to ambient air quality.
- Defines the roles and responsibilities for implementation and management of the AQMP during the Project phases.
- Provide an understanding of the current baseline ambient air quality conditions.
- Provide mitigation measures that will be applied to limit the changes to the baseline ambient air quality from Project activities.
- Provide the types and scope of the ambient air quality monitoring that will occur during the different phases of the Project.
- Provide the Adaptive Management Framework and how it will be applied to manage the effects on ambient air quality from the Project.

2.0 REGULATIONS, APPROVALS AND GUIDELINES

The Project was subject to approval under various provincial and federal regulations. Specific regulatory conditions for the AQMP have been, and will continue to be, reviewed in accordance with the terms and conditions of approvals or licenses issued for the Project.

This AQMP meets the IAAC and NRCB Decision conditions for the Project. Table 2.1 summarizes the approval conditions as defined by IAAC and NRCB as they relate to the AQMP according to the phase of the Project. The AQMP was prepared using the information submitted from the Environmental Impact Assessment (EIA), information requests from AEP, NRCB, and the IAAC, as well as supporting documents submitted to the NRCB hearing.

Table 2.1 Summary of Approval Conditions for Air Quality

Timing	Reference	Activity
Pre-construction, Construction	IAAC Condition 6.1	The Proponent shall ensure that all vehicles required for construction of the Designated Project meet or exceed emission standards applicable at time of introduction, and are operated, inspected, and maintained in accordance with any applicable engine instructions provided by the manufacturer to meet the emissions standards.
Pre-construction, Construction	IAAC Condition 6.2	The Proponent shall develop, prior to construction, and implement, during construction, a no-idling policy for all vehicles within the project development area. The Proponent shall require that all persons abide by this policy, unless not technically feasible or not feasible for health or safety reasons. The Proponent shall submit the policy to the Agency prior to construction.
All Phases	IACC Condition 6.3	The Proponent shall develop, prior to construction and in consultation with relevant authorities, and implement during all phases of the Designated Project, measures to maintain baseline air quality and prevent exceedance of the Canadian Council of Ministers of the Environment' Canadian Ambient Air Quality Standards.
All Phases	IAAC Condition 6.4	The Proponent shall develop, prior to construction and in consultation with Environment and Climate Change Canada and Health Canada, and implement during all phases of the Designated Project, a follow-up program to verify the accuracy of the environmental assessment and determine the effectiveness of mitigation measures as it pertains to adverse changes to air quality attributed to the Designated Project. As part of the follow-up program, the Proponent shall: • 6.4.1 - identify, in consultation with the parties involved in the development of the follow-up program, the locations for the monitoring referred to in conditions 6.4.2 and 6.4.3, including a minimum of one location within the community of Springbank;

Table 2.1 Summary of Approval Conditions for Air Quality

Timing	Reference	Activity
All Phases (cont'd)	*See above*	• 6.4.2 - monitor nitrogen dioxide continuously during construction; • 6.4.3 – monitor total suspended particulate (TSP), coarse particulate matter (PM_{10}) and fine particulate matter ($PM_{2.5}$) continuously during construction, flood operation, post-flood operation and for 16 months after post-flood operation. Monitoring of total suspended particulate and fine particulate matter shall be done at one location between the permanent access road and the diversion channel excavation work, one location at the dam construction site, one location at any borrow source site used and at the parking areas, and shall include: – 6.4.3.1 – visual observation during construction; and – 6.4.3.2 – monitoring, other than through visual observation, during construction, flood operation and post-flood operation. • 6.4.4 – monitor meteorological factors, including wind speed, wind direction and temperature during construction, flood operation, post-flood operation and for 16 months after post flood operation; • 6.4.5 – take into account during construction the Canadian Council of Ministers of the Environment' Canadian Ambient Air Quality Standards management levels for nitrogen dioxide and fine particulate matter ($PM_{2.5}$) and Air Zone Management Framework when determining if modified or additional mitigation measures are required based on the results of monitoring conducted in accordance with conditions 6.4.2 and 6.4.3; • 6.4.6 – use the Alberta Ambient Air Quality Objectives during operations to determine if modified or additional mitigation measures are required based on the results of monitoring conducted in accordance with condition 6.4.3.
Construction Post-Flood	IAAC Condition 6.5	The Proponent shall provide Indigenous groups with the results of the follow-up program referred to in condition 6.4 in plain language at a minimum twice annually, at a time determined in consultation with Indigenous groups.
All Phases	IAAC Condition 7.5	The Proponent shall implement, during all phases of the Project, measures to mitigate fugitive dust emissions attributable to the Designated Project. As part of the measures, the Proponent shall: • Establish speed limits on Designated Project roads during all phases of the Designated Project and require that all persons abide by these speed limits; and • Apply dust suppressant on the Designated Project permanent access roads and parking areas during all phases of the Designated Project. The Proponent shall select, in consultation with relevant authorities, dust suppressants with the least potential effects on human health and the environment.

Table 2.1 Summary of Approval Conditions for Air Quality

Timing	Reference	Activity
All Phases	IAAC Condition 7.10	Develop, prior to construction and in consultation with Indigenous groups and relevant authorities, a follow-up program to verify the accuracy of the environmental assessment and to determine the effectiveness of all measures to mitigate fugitive dust emissions attributable to the Designated Project. The Proponent shall implement the follow-up program during all phases of the Designated Project.
All Phases	IAAC Environmental Assessment Report Section 6.14	• Prior to construction, the Proponent will finalize an Air Quality Management Plan in consultation with Environment and Climate Change Canada and Health Canada. The plan will include mitigation targets (i.e., trigger levels) for all project phases that are informed by pre-project baseline concentrations, including the air zone management levels. The plan will also develop a wind speed metric where construction activities are to be suspended. • Throughout construction, flood, and post flood operations, applicable measured pollutant concentrations will be evaluated as per the Air Quality Management Plan against the mitigation targets as outlined in the Air Quality Management Plan to trigger investigation and reporting. • If exceedances in mitigation targets determined to be caused by the Project are noted, additional mitigations to reduce air emissions will be implemented. These include the suspension of construction activity, increased watering of access roads or the spraying of surfactants during the construction phase, and the spraying of surfactants during the post-flood phase.
All Phases	NRCB Condition (Section 15.5 and Appendix A (8) of the decision report)	The Operator shall, in addition to air monitoring commitments, and to the satisfaction of Alberta Environment and Parks, conduct continuous monitoring of $PM_{2.5}$ and total suspended particulate levels and meteorological conditions for a minimum 16-month period post-flood at the proposed Calaway Park air monitoring station during the period when the Park is open to the public, and at the Springbank community air monitoring station. All monitoring stations must be capable of sending automatic alerts to the Operator when air concentrations exceed designated alert levels so that any exceedance events, if confirmed to be attributable to Project activities, can be mitigated in a timely manner.
All Phases	NRCB Condition (Section 19.7 and Appendix A (10) of the decision report)	The Board acknowledges that interveners at the hearing expressed a keen interest in monitoring of environmental effects and the need for public access to those results. The Board agrees it is important that environmental effects are being monitored and reported in a transparent manner. To that end, the Board requires as a condition of approval that, subject to privacy protection requirements, the Operator shall make Project monitoring results accessible to the public for: • aquatic ecology

Table 2.1 Summary of Approval Conditions for Air Quality

Timing	Reference	Activity
All Phases (cont'd)	*See above*	• hydrology and sediment transport • surface water quality • groundwater quality and quantity • vegetation • terrain and soils • wildlife and biodiversity • air quality

2.1 RESPONSIBILITIES AND REPORTING REQUIREMENTS

2.1.1 Construction and Dry Operations

The AQMP describes required mitigation to minimize emissions (Section 6.0), air quality and meteorological monitoring (Section 7.0) and adaptive management (Section 8.0). Alberta Transportation will be responsible for implementing the AQMP during the construction phase and for a period of three years post-construction during the dry operations phase of the Project. After that period, AEP will implement the AQMP during dry, flood and post-flood operations.

In compliance with the IAAC approval conditions 6.5 and 7.11, Alberta Transportation will prepare and submit a report summarizing in plain language the current state of the Project, mitigation actions applied during the period, and the monitoring results. These reports will be submitted to the local Indigenous groups at a minimum of twice per year at periods requested by the groups during construction.

In compliance with IAAC approval condition 2.11, Alberta Transportation and AEP will prepare an annual report summarizing the monitoring results, which will be provided to IAAC and the First Nation Land Use Committee by October 31 of the reporting year to which the annual report applies. IAAC has defined the reporting year as July 1 of the calendar year to June 30 of the subsequent calendar year (IAAC definition 1.32). The annual report, including a plain language executive summary in both official languages, will be made publicly available to Indigenous groups and public stakeholders no later than October 31 following the reporting year to which the annual report applies (IAAC approval condition 2.13). Indigenous groups, the First Nation Land Use Advisory Committee and the Agency will be notified of the annual reports within 48 hours of their publication (IAAC approval condition 2.14). The annual reports will be available for 15 years following their publication (IAAC approval condition 2.14).

The ambient air quality results will be compared to the baseline conditions used in the EIA which are summarized in Section 5.1. This report would provide an evaluation of the accuracy of the EIA and to determine the effectiveness of all measures to mitigate fugitive dust emissions attributable to the Project. This report will provide updates to the air quality monitoring program including:

- Changes to the ambient monitoring network
- Modifications to the mitigation program
- Changes to the Project that would potentially affect ambient air quality
- Non-Project related air quality or meteorological events (e.g., forest fires) that may influence the ambient air quality measured by the monitoring network

During construction Alberta Transportation committed that the monitoring stations will be continuously monitored during construction with alerts being sent to the Operator.

A monthly summary report will be prepared during construction summarizing the state of the Project, mitigation actions applied during the month, and the monitoring results. To achieve the goal of adaptive management and sharing data with interested stakeholders, these reports will be provided to Alberta Transportation and the Community Liaison. These reports and monitoring data can be made available upon request through the Community Liaison.

As monitoring is not required during dry operations, reporting is not required.

2.1.2 Flood and Post-Flood Operations

AEP will be responsible for implementing the AQMP during both flood and the 16-month period of post-flood operation phases of the Project (IAAC approval condition 6.4.3).

In compliance with the IAAC approval conditions, AEP will prepare and submit a report summarizing in plain language the current state of the Project, mitigation actions applied during the period, and the monitoring results. These reports will be required to be submitted to the local Indigenous groups at a minimum of twice per year at periods requested by the groups during flood and the 16-month period of post-flood operations. The reporting would be specific to the year during the flooding and the subsequent 16-month post flood period. No reporting is required during dry operation during non-flood years.

During flood and the 16-month period of post-flood operations, the NRCB conditions require that the monitoring stations will be continuously monitored during post-flood operations with alerts being sent to the Operator.

A monthly summary report will be prepared during flood and the 16-month period of post-flood operations summarizing the state of the Project, mitigation actions applied during the month, and the monitoring results. These reports will be provided to the Operator and Community Liaison. These reports and monitoring data can be made available upon request through the Community Liaison.

In compliance with the IAAC conditions, AEP will prepare an annual report summarizing the results of the air quality monitoring program, the effectiveness of mitigation, summary of events where NO_2, $PM_{2.5}$, or TSP concentrations were measured above AAAQO&G, and if the NO_2 and $PM_{2.5}$ CAAQS were achieved. The ambient air quality results will be compared to the baseline conditions used in the EIA which are summarized in Section 5.1. This report would provide an evaluation of the accuracy of the environmental assessment and to determine the effectiveness of all measures to mitigate fugitive dust emissions attributable to the Project. This report will provide any updates to the air quality monitoring program including:

- Changes to the ambient monitoring network
- Modifications to the mitigation program
- Changes to the Project that would potentially affect ambient air quality
- Non-Project related air quality or meteorological events (e.g., forest fires) that may influence the ambient air quality measured by the monitoring network

This annual report would only be prepared in the year where flooding occurs and the Project is engaged, and the subsequent 16-month post-flood period. Annual reporting would not be required during dry operations during non-flood years. These reports will be provided to the Operator and Community Liaison. These reports and monitoring data can be made available upon request through the Community Liaison.

2.2 AMBIENT AIR QUALITY OBJECTIVES, GUIDELINES, AND STANDARDS

2.2.1 Alberta Ambient Air Quality Objectives and Guidelines

AEP provides the Alberta Ambient Air Quality Objectives and Guidelines [AAAQO&G (AEP, 2019)] to assess and manage the air quality in Alberta. The objectives are used to evaluate the emissions from industrial facilities to ensure compliance and to protect human health. The guidelines are mainly used as a planning tool for management of air quality in the airshed, general performance of industrial facilities, and assessment of local concerns from stakeholders. Table 2.2 summarizes the applicable AAAQO&G of the substances that would be emitted from the Project.

Table 2.2 Summary of Current Alberta Ambient Air Quality Objectives and Guidelines for the Substance of Interest

Substance	Averaging Period	Concentration [1]	
		(µg/m)³ [2,3]	(ppbv)[4]
Nitrogen Dioxide (NO_2)	1-hour	300	159
	Annual	45	24
Fine Particulate Matter ($PM_{2.5}$)	1-hour [5]	80	—
	24-hour	29	—
Total Suspended Particulate Matter (TSP)	24-hour	100	—
	Annual [6]	60	—

NOTES:
1. Alberta Ambient Air Quality Objectives and Guidelines Summary (AEP, 2019)
2. µg/m³ is the mass of the substance in micrograms per cubic meter of air
3. Standard conditions of 25°C and 101.325 kPa are used to convert from µg/m³ to ppbv
4. ppbv is the volume of the substance (parts) per billion volumes of air
5. Guideline values are used for planning, management, general performance indicators, and to assess local concerns but not for regulatory enforcement.
6. Based on annual geometric mean

AEP has released draft objectives for NO_2 for public comment on September 22 to November 22 (AEP, 2021c). It could be expected that these objectives could be effective during the construction and future phases of the Project. AEP is updating the NO_2 objectives to align with the Canadian Air Quality Standards (CAAQS; (CCME, 2021)) and other provincial jurisdictions. Table 2.3 summarizes the proposed (draft) NO_2 objective. At the time that AEP formally revised the AAAQO for NO_2, the AQMP will also adopt the updated AAAQO.

Table 2.3 Draft Alberta Ambient Air Quality Objectives for Nitrogen Dioxide

Substance	Averaging Period	Concentration [1]	
		(µg/m)³ [2,3]	(ppbv)[4]
Nitrogen Dioxide (NO_2)	1-hour	150	80
	Annual	32	17
	Annual [5]	23	12

NOTES:
1. Draft Alberta Ambient Air Quality Objectives for Nitrogen Dioxide (AEP, 2021c)
2. µg/m³ is the mass of the substance in micrograms per cubic meter of air
3. Standard conditions of 25°C and 101.325 kPa are used to convert from µg/m³ to ppbv
4. ppbv is the volume of the substance (parts) per billion volumes of air
5. Effective January 1, 2025

2.2.2 Canadian Ambient Air Quality Standards

The Canadian Council of Ministers of the Environment (CCME), Environment and Climate Change Canada (ECCC), and Health Canada have developed the Canadian Ambient Air Quality Standards [CAAQS; (CCME, 2021)] as part of the Air Quality Management System (AQMS). Table 2.4 shows the current and 2025 CAAQS.

Table 2.4 Summary of Current Canadian Ambient Air Quality Standards for the Substance of Interest

Substance	Averaging Period	Concentration [1]			
		(µg/m)³ [2,3]		(ppbv)[4]	
		2020	2025	2020	2025
Nitrogen Dioxide (NO_2)	1-hour [5]	113	79	60	42
	Annual [6]	32	23	17.0	12.0
Fine Particulate Matter ($PM_{2.5}$)	24-hour [7]	27	— [8]	—	—
	Annual [9]	8.8	— [8]	—	—

NOTES:

1. Canadian Ambient Air Quality Standards (CCME, 2021) for 2020 and 2025
2. µg/m³ is the mass of the substance in micrograms per cubic meter of air
3. Standard conditions of 25°C and 101.325 kPa are used to convert from µg/m³ to ppbv
4. ppbv is the volume of the substance (parts) per billion volumes of air
5. The 3-year average of the annual 98th percentile of the daily maximum 1-hour average concentration (CCME, 2020)
6. The average over a single calendar year (CCME, 2020)
7. The 3-year average of the annual 98th percentile of the daily 24-hour average concentrations (CCME, 2012)
8. Currently under review by the CCME
9. The 3-year average of the annual average of the daily 24-hour average concentrations (CCME, 2012)

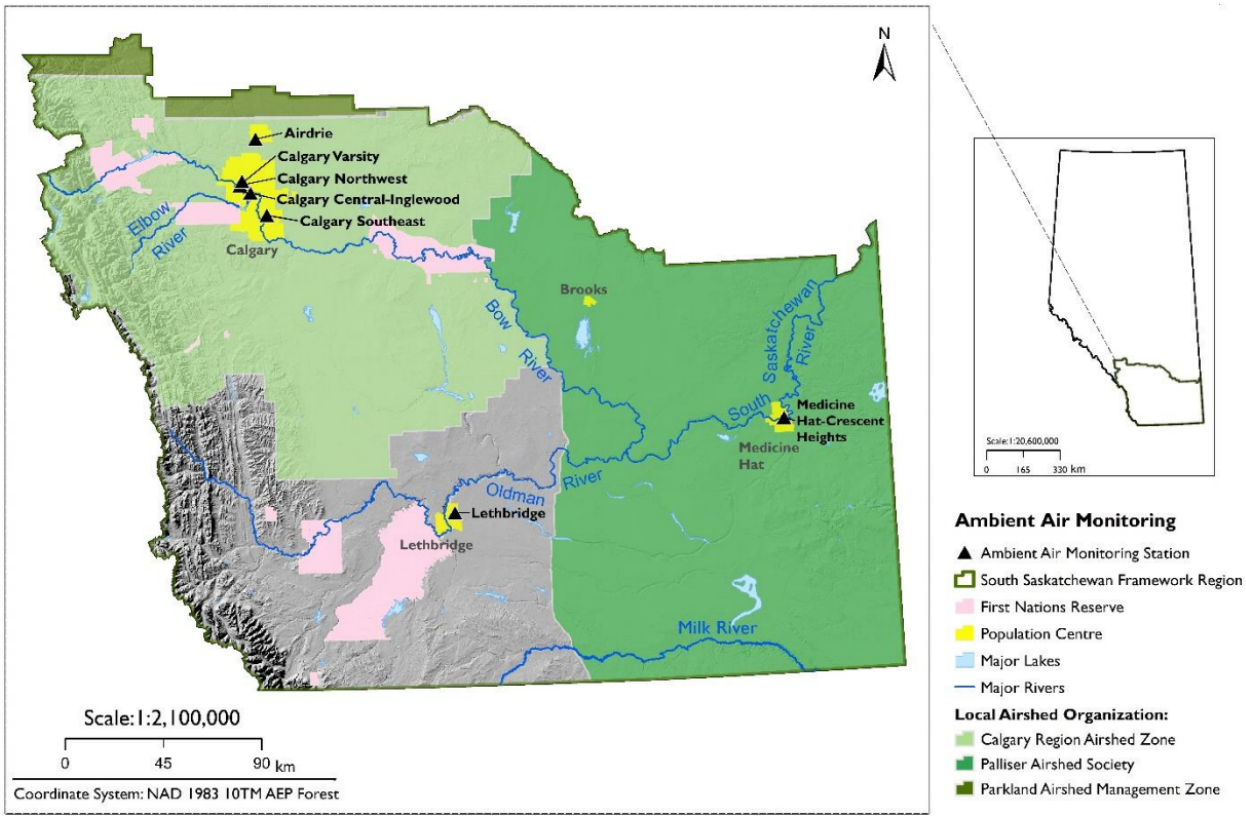
The CCME released the $PM_{2.5}$ CAAQS in 2012 with standards for 2015 and 2020 with a commitment to periodically review an update the CAAQS based on stakeholder engagement. As such, Table 2.4 does not have $PM_{2.5}$ CAAQS past 2020 as they are currently under review. The $PM_{2.5}$ 2020 CAAQS would be applied until updated CAAQS were released by the CCME.

The NO_2 CAAQS were released in 2020 so have standards that are effective for 2020. These would be used until 2025 when those standards would then be used. Similar to the $PM_{2.5}$ CAAQS, the NO_2 CAAQS would be periodically reviewed. If the CCME updates the NO_2 CAAQS during the Project, then the updated standard would be used to evaluate regional ambient air quality.

The Project falls in the South Saskatchewan Region air zone as shown in Figure 2.1. Regional air quality is managed by AEP through the Alberta Land Use Framework (AESRD, 2014), the CCME Guidance Document on Air Zone Management (CCME, 2019) and CCME Achievement Guidance for each pollutant (CCME, 2012; 2020). The CAAQS are used to assign a regional management level (Table 2.5) based on the Guidance Document on Air Zone Management (CCME, 2019).

The most recent assessment results from the 2016 to 2018 monitoring period assigned the region as an orange management level for $PM_{2.5}$ (AEP, 2021b). As the NO_2 CAAQS were established in 2017 and came into force in 2020; therefore, the NO_2 management levels were not determined for this reporting period.

Figure 2.1 South Saskatchewan Region Air Zone



SOURCE: (AEP, 2020)

Table 2.5 CAAQS Management Levels

Air Quality Management Levels [1]	NO_2 (ppbv)				$PM_{2.5}$ (µg/m³)	
	1-hour		Annual		24-hour	Annual
	2020	2025	2020	2025	2020	2020
Red	> 60	> 42	> 17.0	>12.0	> 27	> 8.8
Orange	32 - 60	32 - 42	7.1 - 17.0	7.1 - 12.0	20 - 27	6.5 - 8.8
Yellow	21 -31		2.1 - 7.0		11 - 19	4.1 - 6.4
Green	≤ 20		≤ 2.0		≤ 10	≤ 4.0

NOTES:

1. Canadian Ambient Air Quality Standards (CAAQS) Management Levels (CCME, 2021) for 2020 and 2025. Note that the $PM_{2.5}$ CAAQS beyond 2020 are currently under review
2. Red Management Level – Reduce pollutant levels below the CAAQS through Advanced Air Management Actions
3. Orange Management Level – Improve air quality through Active Air Management and Prevent exceedance of the CAAQS
4. Yellow Management Level – Improve air quality using Early and Ongoing Actions for Continuous Improvement
5. Green Management Level – Maintain good air quality through Proactive Air Management Measures to Keep Clean Areas Clean

2.2.3 South Saskatchewan Region Air Zone Triggers and Limits

In the Air Quality Management Framework for the South Saskatchewan Region Air Zone (AESRD, 2014), AEP set trigger limits at one-third and two-thirds of the AAAQO for NO_2 which would be re-evaluated once the CAAQS were released. The evaluation of the $PM_{2.5}$ concentrations would follow the CAAQS Management Levels. Table 2.6 summarizes the NO_2 limits and triggers.

Based on the latest annual monitoring reporting (AEP, 2020) for the area most of the region is in Level 1 with exception to the monitoring completed in Calgary which was Level 2 on an annual average basis. 2018 was the first time that the Calgary Central monitoring station registered NO_2 annual concentrations above the Level 3 trigger. Peak concentrations in the region were at Level 1 with the stations in Calgary and Airdrie above the Level 2 trigger.

Table 2.6 South Saskatchewan Region Air Zone NO_2 Air Quality Management Triggers

Level	Annual Average NO_2 Concentrations [1] (ppmv)	99th Percentile Annual Hourly NO_2 Concentrations [2] (ppmv)
1 [3]	< 8	< 35
2 [4]	8 to 16	35 to 69
3 [5]	16 to 24	69 to 104
4 [6]	≥ 24	≥ 104

NOTES:

1. Annual average of the 1-hour average of the NO_2 concentrations collected over one year (AESRD, 2014)
2. 99th Percentile 1-hour average of the NO_2 concentrations collected over one year (AESRD, 2014)
3. Level 1 – Ambient air quality well be low air quality limits, or peak (99th Percentile) concentrations are below the 1-hour average AAAQO – Maintain ambient air quality through standard regulatory and non-regulatory approaches
4. Level 2 – Ambient air quality is below limits, or peak concentrations below the 1-hour AAAQO – Improve knowledge, understanding, and plan for managing air quality
5. Level 3 – Ambient air quality is approaching limits, or peak concentrations may be approaching 1-hour AAAQO – Proactive maintain air quality below annual limits and reduce the probability that the regional NO_2 concentrations are above the 1-hour AAAQO
6. Level 4 – Ambient air quality is above the limits, or peak 1-hour average concentrations are likely above the AAAQO – Improve ambient air quality to below the limit and reduce the probability of NO_2 concentrations are above the AAAQO

2.3 ALBERTA AIR MONITORING DIRECTIVE

In 2016, AEP released an updated Air Monitoring Directive [AMD (AEP, 2021a)] that replaces the previous 1989 AMD and the 2006 amendments. The AMD sets out the requirements for the monitoring and reporting of ambient air quality for the province. The AMD consists of the following chapters:

- Chapter 1: Introduction, also referred to as the AMD Introduction;
- Chapter 2: Ambient Monitoring Program Planning – Repealed December 2019
- Chapter 3: Ambient Monitoring Site Selection, Siting Criteria and Sampling System Requirements, also referred to as the Site Selection Chapter;
- Chapter 4: Monitoring Requirements and Equipment Technical Specifications, also referred to as the Monitoring Chapter;
- Chapter 5: Quality System, also referred to as the Quality System Chapter;

- Chapter 6: Ambient Data Quality, also referred to as the Data Quality Chapter;
- Chapter 7: Calibration, also referred to as the Calibration Chapter;
- Chapter 8: Ambient Audit, also referred to as the Audit Chapter; and
- Chapter 9: Reporting, also referred to as the Reporting Chapter.

The AMD is typically applied to facilities with *Environmental Protection and Enhancement Act* (EPEA) Approvals, air sheds, or as otherwise specified in the AMD. Since the Project does not have an EPEA Approval, is not an air shed, and is not specified in the AMD; then AMD would not be directly enforceable on the Operator of the Project. Alberta Transportation and AEP propose to adhere to the AMD requirements as a best practice.

3.0 INDIGENOUS AND PUBLIC STAKEHOLDER FEEDBACK

Since completion of the EIA, additional feedback on air quality was received from Indigenous groups, stakeholders and the public, and through supplemental regulatory information requests and the Project hearing. The input was captured in the AQMP. As the AQMP could be changed throughout the course of the Project through the Adaptive Management framework, the future versions of the AQMP would incorporate feedback from stakeholders on an ongoing basis.

Alberta Transportation developed a draft AQMP which outlined key mitigations and monitoring commitments during construction and dry operations and was shared with Piikani Nation, Ermineskin Cree Nation, Foothills Ojibway Society, Ktunaxa Nation Council, Métis Nation of Alberta Region 3, Montana First Nation, Samson Cree Nation, Blood Tribe/Kainai, Siksika Nation, Stoney Nakoda Nations, and Louis Bull Tribe on July 22, 2020 for review and feedback. This draft AQMP was also shared Tsuut'ina Nation on July 23, 2020. Alberta Transportation also offered funding to Indigenous groups to provide written feedback and offered multiple opportunities to provide oral feedback, including group meetings in the fall of September 2020 and individual meetings to discuss. The AQMP has been finalized to incorporate regulatory approval decisions and conditions from the NRCB and IAAC (IAAC, 2021a; NRCB, 2021) and has taken into account any feedback received from Indigenous groups. This updated AQMP will be shared with regulators, Indigenous communities, and other stakeholders.

4.0 PROJECT DESCRIPTION

The Project consists of the construction and operation of an off-stream reservoir to divert and retain a portion of Elbow River flows during a flood. The diverted water will be released back into Elbow River in a controlled manner after the flows in Elbow River decrease sufficiently to accommodate the release of water from the reservoir. The reservoir will not hold a permanent pool of water.

4.1 PROJECT COMPONENTS

The primary Project components are:

- diversion structure on the main channel and floodplain of Elbow River
- diversion channel to transport partially diverted floodwater into the off-stream reservoir
- dam to temporarily retain the diverted floodwater in the reservoir
- low-level outlet in the dam to return retained water through the existing unnamed creek and back to the river when AEP Operations determines conditions are appropriate

4.2 PROJECT PHASES

4.2.1 Construction

The Project is scheduled to be able to accommodate a 1:100-year flood after two years of construction and be able to accommodate a design flood after three years of construction. Elements of Project construction may be continuous (24 hours per day), weather conditions permitting.

4.2.2 Dry Operations

Dry operations refers to post-construction and Project operation between floods. During dry operation, the diversion inlet gates are closed, and the service spillway gates are open. The low-level outlet structure will remain open to carry the flow of the unnamed creek over which the dam will be built. The outlet gate system and its operation will be checked according to a routine maintenance schedule to be developed by AEP Operations.

The associated access roads, emergency spillway and reservoir will be inspected at the same time and repaired. The maintenance schedule will also include inspections of the diversion structure and the river channel upstream of it, the maintenance building, the floodplain berm, and the auxiliary spillway. Repairs and debris management will be completed, as necessary.

4.2.3 Flood Operations

AEP Operations will be in communication with the City of Calgary Glenmore Dam operators in advance of and during the flood season each year. The need for flood operations will be determined through this communication, which will be informed by forecasted and measured flows on Elbow River at the diversion structure and upstream. AEP Operations staff, in communication with the City of Calgary Glenmore Dam operators, will decide when to open the diversion gates to commence partial diversion of flood water into the off-stream reservoir.

4.2.4 Post-Flood Operations

During post-flood operations, the diversion inlet gates are closed, and the service spillway gates are open (lowered to the riverbed). The gates of the low-level outlet structure will be opened to allow the floodwater retained in the reservoir to drain through the structure into the unnamed creek and then into Elbow River. The structure gates at the base of the reservoir will remain open after the reservoir has drained.

5.0 AIR QUALITY OVERVIEW

The following provide a summary of baseline air quality conditions and potential Project effects. See the Volume 3A, Section 3 of the EIA for further detail. That section of the EIA provides baseline conditions for four aspects of the existing atmospheric environment: climate and meteorology, existing ambient air quality (including odour), existing light, and greenhouse gas emissions.

5.1 BASELINE CONDITIONS

Multiple information sources were used to characterize baseline conditions for air quality (also called background air quality) for six CACs, dustfall, eight volatile organic compounds (VOC), two polycyclic aromatic hydrocarbon species (PAH), and four metals. Details regarding the selected sites for background data from these information sources are provided in Volume 4, Appendix E of the EIA.

Due to proximity of farms and ranch yards and nearby roads, a particulate matter (PM) monitoring program was conducted for $PM_{2.5}$, TSP, and dustfall. This 10-week monitoring program was conducted during dry summer months to coincide with the worst-case conditions for PM generation from activities that are common for a rural farm location. These measurements were combined with published ambient air quality data from regional air quality monitoring stations with longer records. For this assessment, some ambient air quality data were obtained from several stations in the National Air Pollution Surveillance (NAPS) ambient air quality monitoring network. Other data were obtained from the Western Interprovincial Scientific Studies Association (WISSA) monitoring program, or from scientific literature.

Baseline concentrations for the substances of interest are shown in Table 5.1. The identification of the monitoring stations and information sources for these baseline measurements are provided in Volume 4, Appendix E, Attachment 3D of the EIA.

Table 5.1 Baseline Air Quality

Substance	Averaging Period	Background Concentrations (µg/m³)	AAAQO/AAAQG (µg/m³)	Comparison of Background to AAAQO/AAAQG (%)
CAC Gas				
NO_2	1-hour	9.59	300	3.2
	Annual	3.77	45	8.4
SO_2	1-hour	5.24	450	1.2
	24-hour	4.95	125	4.0
	30 day	3.08	30	10.3
	Annual	2.49	20	12.5
CO	1-hour	344	15,000	2.3
	8-hour	344	6,000	5.7
Particulate				
$PM_{2.5}$	1-hour	11.0	80	13.8
	24-hour	11.0	29	37.9
	Annual	3.50	-	-
TSP	24-hour	51.0	100	51.0
	Annual	16.2	60	27.0
Dustfall	30-day	17.7	53	33.4
VOC				
Acetaldehyde	1-hour	3.38	90	3.8
Acrolein	1-hour	0.29	4.5	6.4
	24-hour	0.048	0.40	12.0
Benzene	1-hour	0.81	30	2.7
	Annual	0.32	3	10.7
Ethyl Benzene	1-hour	0.19	2,000	0.01
Formaldehyde	1-hour	9.9	65	15
Toluene	1-hour	1.0	1,880	0.053
	24-hour	1.0	400	0.25
Xylenes	1-hour	0.22	2,300	0.010
	24-hour	0.22	700	0.031
Styrene	1-hour	0.011	215	0.0051

Table 5.1 Baseline Air Quality

Substance	Averaging Period	Background Concentrations (µg/m³)	AAAQO/AAAQG (µg/m³)	Comparison of Background to AAAQO/AAAQG (%)
PAH				
Benzo(a)pyrene	Annual	0.000022	0.0003	7.3
Naphthalene	Annual	0.052	3	1.7
Metal				
Arsenic	1-hour	0.00050	0.1	0.50
	Annual	0.00016	0.01	1.60
Chromium	1-hour	0.00060	1	0.060
Manganese	1-hour	0.0045	2	0.23
	Annual	0.002	0.2	1.0
Nickel	1-hour	0.00036	6	0.0060
	Annual	0.00017	0.05	0.34

NOTES:
See EIA, Volume 4, Appendix E, Attachment 3D for details regarding the selection of the indicated background values.
- No data available

5.2 METEOROLOGICAL CONDITIONS

Understanding the historical meteorological conditions is important for the mitigation of dust from the Project and when mitigation measures are more likely going to be required. Historical meteorology is also used for siting of ambient air quality monitoring equipment to ensure that it is placed in areas where downwind effects are more likely to occur.

This section provides information of the historical meteorological conditions observed near the Project at the Springbank Airport.

5.2.1 Wind Direction and Speed

Meteorological data for the last five-year period (2016-2020) was obtained for the Springbank Airport from ECCC (ECCC, 2021a). Figure 5.1 shows the wind rose for the complete five-years of meteorological measurements. The winds blow primarily from the northwest (15.3%), north northwest (12.3%), and north (11.9%) over the period. Figure 5.2 shows the seasonal trend of the wind directions which shows that the winds tend to follow the same pattern with the winds from the northwest to be predominate.

Figure 5.1 Joint Frequency Distribution Plot (Wind Rose) from the Springbank Airport Climate Station – 2016 to 2020 (43,848 hours; (ECCC, 2021a))

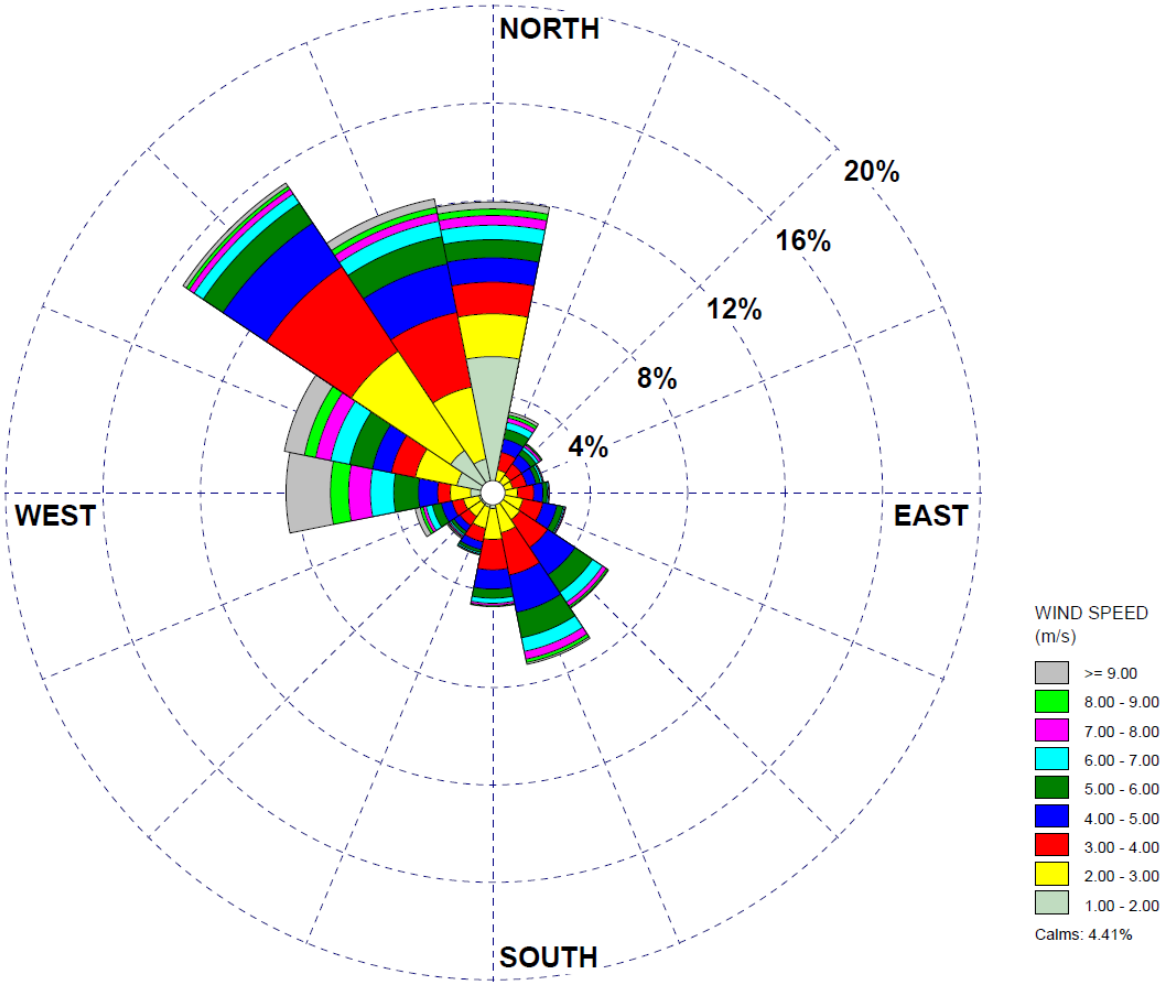
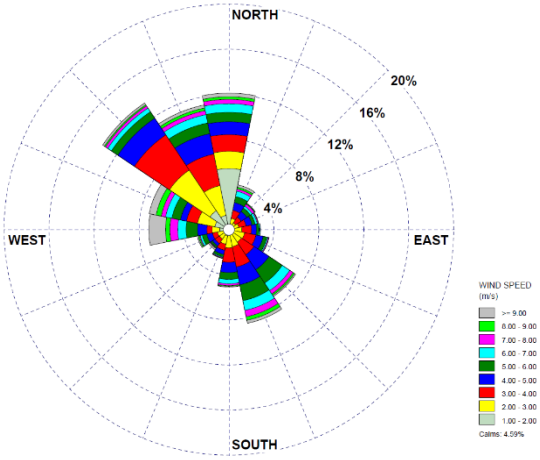
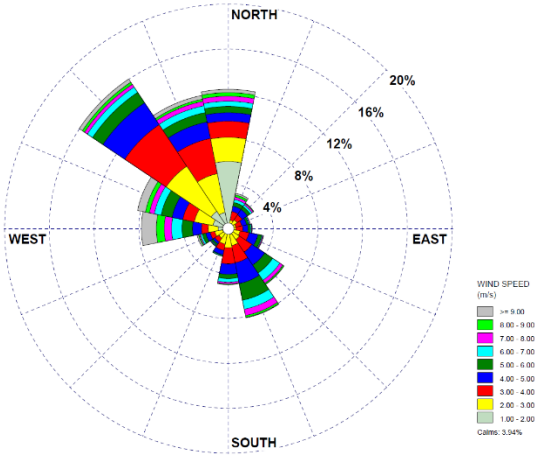


Figure 5.2 Joint Frequency Distribution Plot (Wind Rose) from the Springbank Airport Climate Station – 2016 to 2020 (43,848 hours) for the Spring, Summer, Fall, and Winter (ECCC, 2021a)

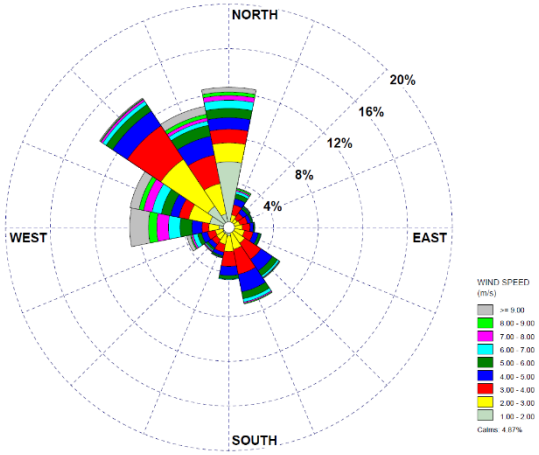


Spring (March, April, May)

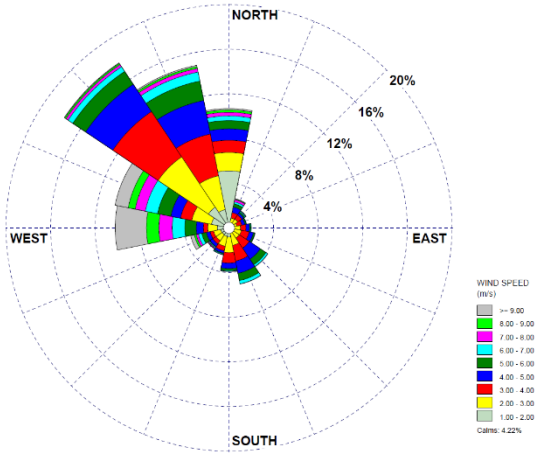


Summer (June, July, August)

Figure 5.2 Joint Frequency Distribution Plot (Wind Rose) from the Springbank Airport Climate Station – 2016 to 2020 (43,848 hours) for the Spring, Summer, Fall, and Winter (ECCC, 2021a) (cont'd)



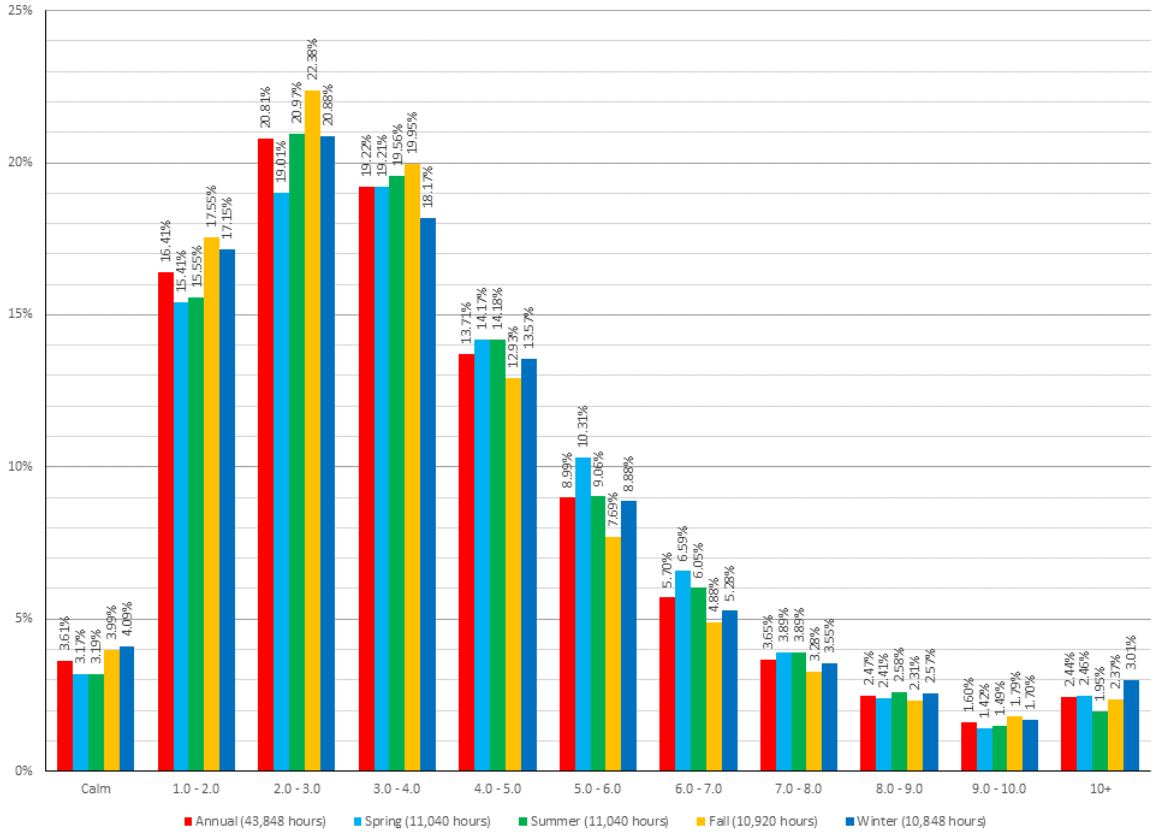
Fall (September, October, November)



Winter (January, February, December)

Figure 5.3 shows the distribution of the wind speeds measured at the Springbank Airport. Most of the winds tend to be within 1 m/s to 5 m/s (70.6%) with winds considered as calm (less than 0.5 m/s) occurring 4.41% of the time. There is some variance from season to season, but the overall trend is the same.

Figure 5.3 Histogram of the Wind Speeds Measured at the Springbank Airport Climate Station – 2016 to 2020 (43,848 hours; (ECCC, 2021a))



5.2.2 Temperature

Based on the 2016 – 2020 data from the Springbank Airport (ECCC, 2021a) the average temperatures range from -9.4°C in February to 15.4°C in July (Figure 5.4) with extremes measured at -37.6°C in January to 34.8°C in August. Figure 5.5 shows the temperatures from the 30-year record (1981 – 2010) at the Springbank Airport (ECCC, 2021b) which shows a similar trend with the daily average temperatures ranging from -8.2°C in January to 14.8°C in July. The lowest average daily minimum temperature is -14.5°C with the average daily maximum is 22.2°C. With the lowest temperature recorded as -42.8°C (January 25, 1997) and the highest temperature recorded as 33.8°C (July 13, 2002).

Table 5.2 shows the probabilities when the spring and fall temperatures transition to being primarily 0°C or lower. The table also indicates the probability for the number of frost-free days with the highest probability being 108 days.

Figure 5.4 Box-Whisker Plot of the Hourly Average Temperatures Measured at the Springbank Airport Climate Station – 2016 to 2020 (43,848 hours; (ECCC, 2021a))

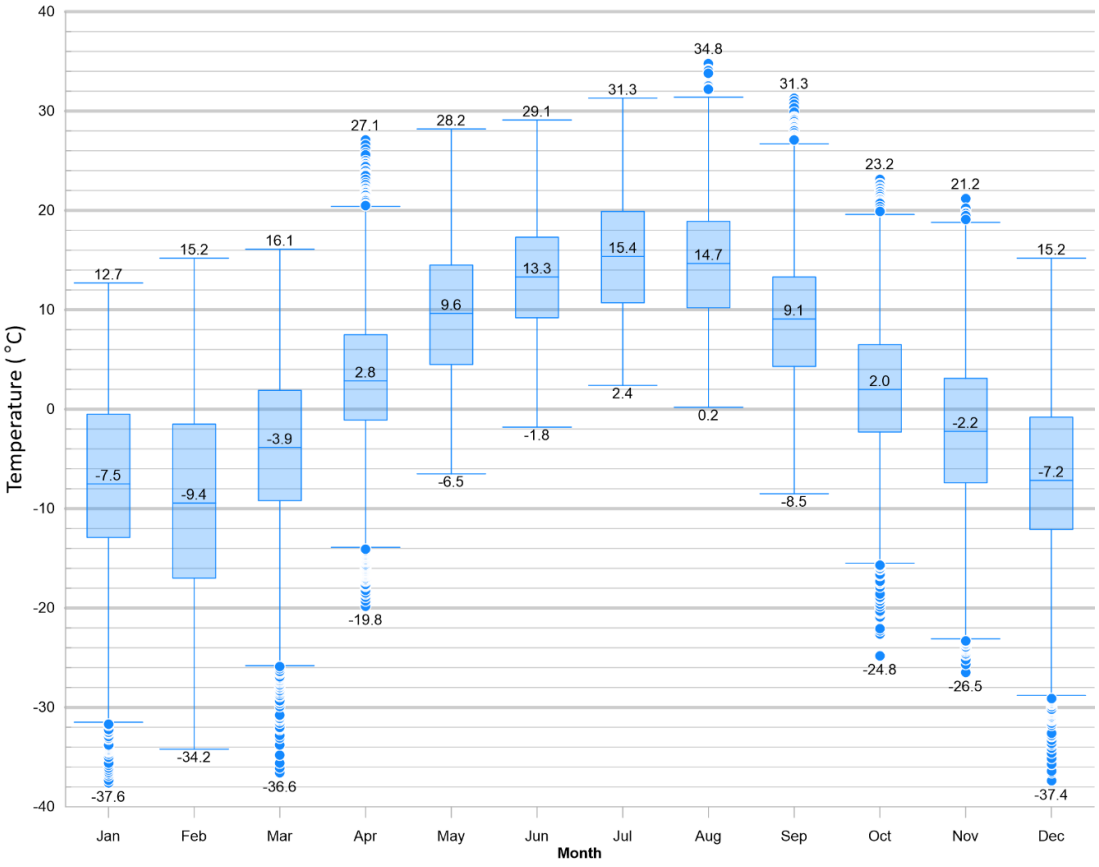


Figure 5.5 Plot of the Daily Temperatures Measured at the Springbank Airport Climate Station – 1981 to 2010 (ECCC, 2021b)

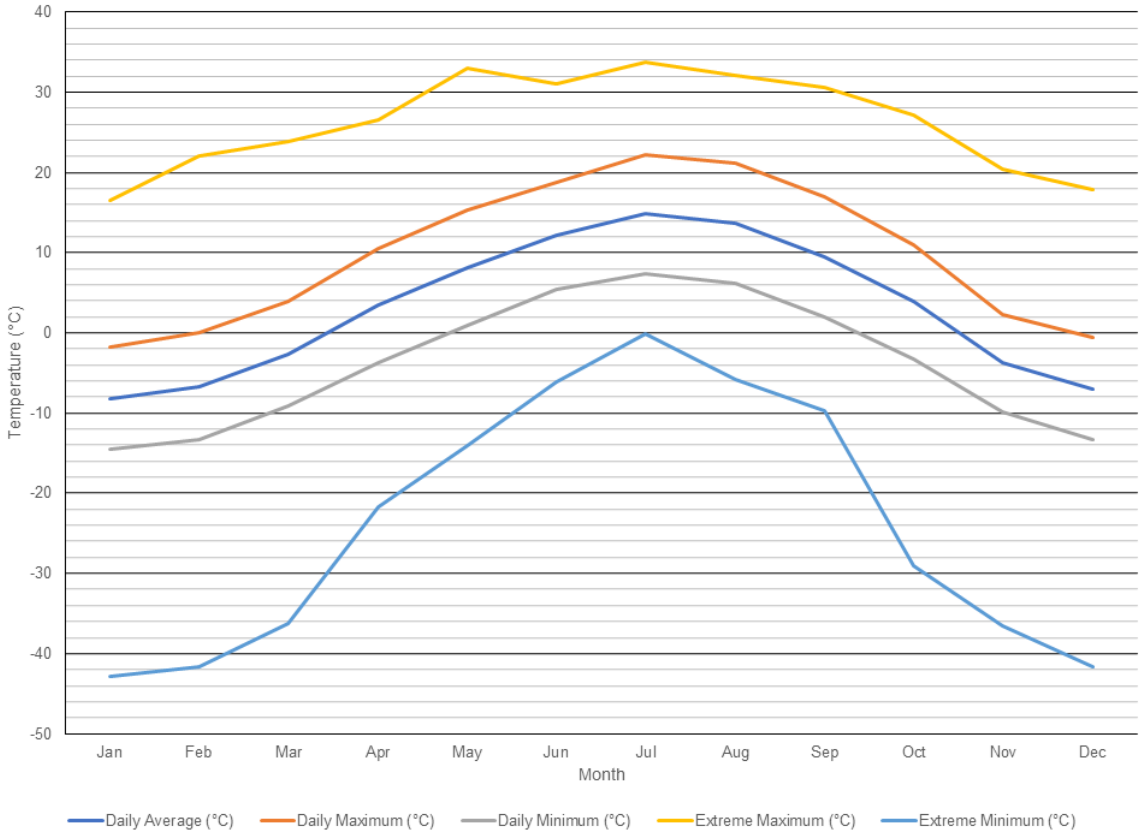


Table 5.2 1981 to 2010 Canadian Climate Normals Station Data (Frost-Free)

Probability of last temperature in spring of 0 °C or lower on or after indicated dates	10%	25%	33%	50%	66%	75%	90%
Date (Month-Day)	Jun-26	Jun-17	Jun-08	Jun-07	Jun-01	May-29	May-25
Probability of first temperature in fall of 0 °C or lower on or before indicated dates	10%	25%	33%	50%	66%	75%	90%
Date (Month-Day)	Jul-26	Aug-13	Aug-17	Aug-28	Sep-03	Sep-06	Sep-12
Probability of frost-free period equal to or less than indicated period (Days)	10%	25%	33%	50%	66%	75%	90%
Days	41	67	69	77	82	88	108
NOTES: Data from Environment and Climate Change Canada Canadian Climate Normals 1981-2010 Station Data for the Springbank Airport Climate Station (ECCC, 2021b)							

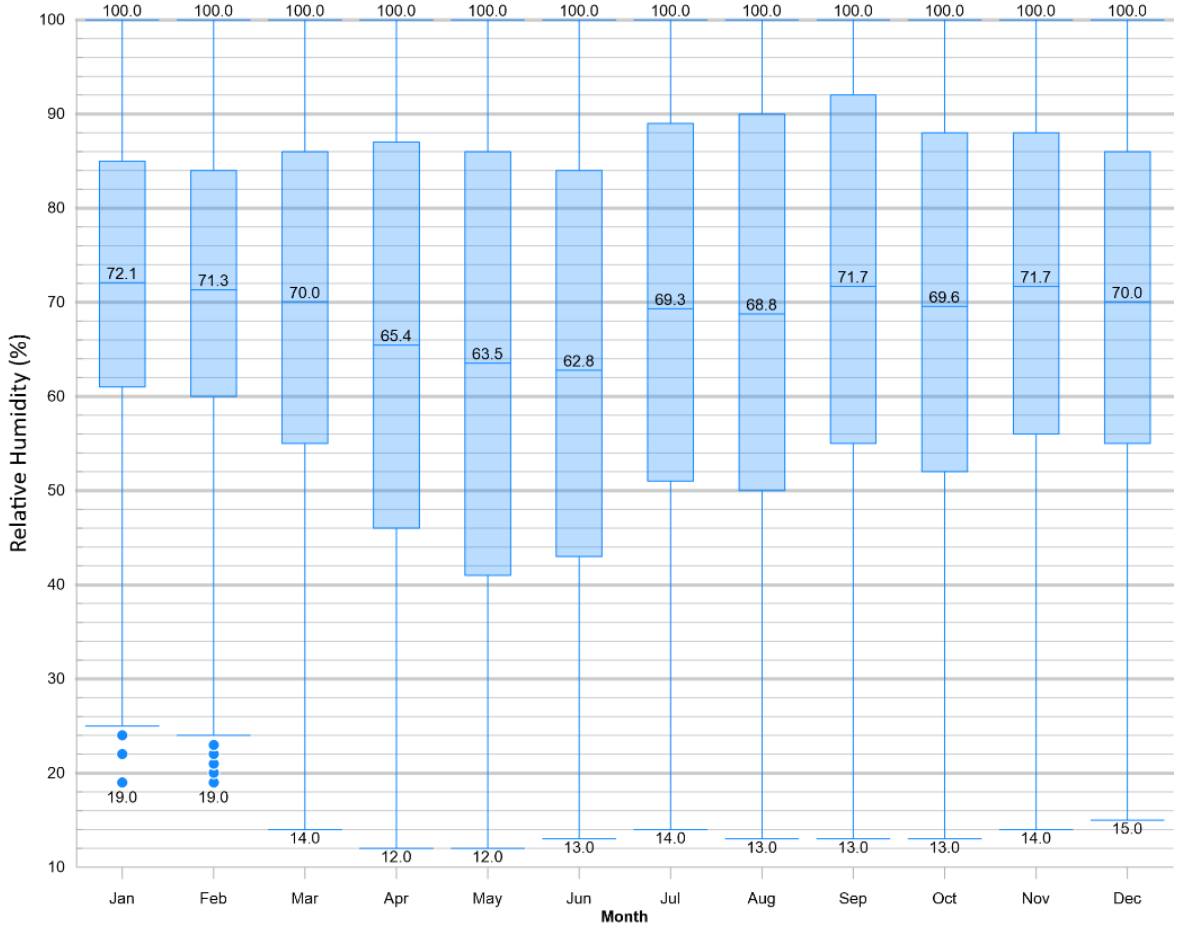
5.2.3 Relative Humidity

Figure 5.6 shows the hourly average relative humidity measured at the Springbank Airport for the last five years (ECCC, 2021a). The average relative humidity ranged from 62.8% in June to 71.7% in September and November. On the extremes the relative humidity can be 100% at the highest and 12.0% at the lowest. Table 5.3 shows the average 30-year relative humidity measured at the Springbank Airport (ECCC, 2021b) in the morning (06:00) and mid-afternoon (15:00). The morning relative humidity ranges from 69.2% to 87.9% and the mid-afternoon relative humidity ranges from 43.3% to 60.4%.

Table 5.3 Average Relative Humidity Measured at the Springbank Airport

Average Relative Humidity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
06:00 Local Standard Time (%)	69.2	70.3	71.3	75.1	78.5	83.1	85.6	87.9	83.8	75.1	72.4	69.7
15:00 Local Standard Time (%)	58.6	56	50.3	43.3	45.7	50.8	48.2	49.2	47.8	46.5	57.1	60.4
NOTES: Data from Environment and Climate Change Canada Canadian Climate Normals 1981-2010 Station Data for the Springbank Airport Climate Station (ECCC, 2021b)												

Figure 5.6 Box-Whisker Plot of the Hourly Average Relative Humidity Measured at the Springbank Airport Climate Station – 2016 to 2020 (43,848 hours; (ECCC, 2021a))



5.2.4 Precipitation

The precipitation recorded at the Springbank Airport over the last five years did not contain enough valid readings to statistically analyze. Figure 5.7 to Figure 5.9 show the daily average rainfall, snowfall, and total precipitation measured at the Springbank Airport during 1981-2010 (ECCC, 2021b). This shows that the highest amount of rain occurs in June, snow occurs in March, and total precipitation is in June. The lowest month of total precipitation is December.

Figure 5.10 shows the average and median snow depth measured at the Springbank Airport and the average snow depth measured at the month end. The snow tends to start accumulating in late October and has substantially melted by April. There have been periods of high amounts of snow accumulation with the highest depth measured at 60 cm on January 2, 1998.

Figure 5.7 Histogram of the Daily Rainfall Measured at the Springbank Airport Climate Station – 1981 to 2010 (ECCC, 2021b)

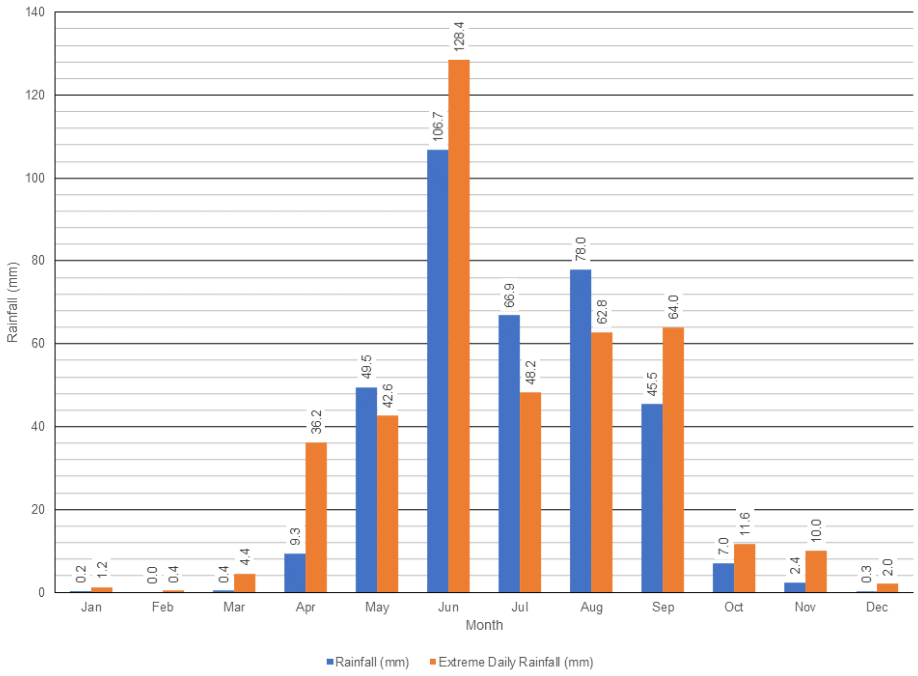


Figure 5.8 Histogram of the Daily Snowfall Measured at the Springbank Airport Climate Station – 1981 to 2010 (ECCC, 2021b)

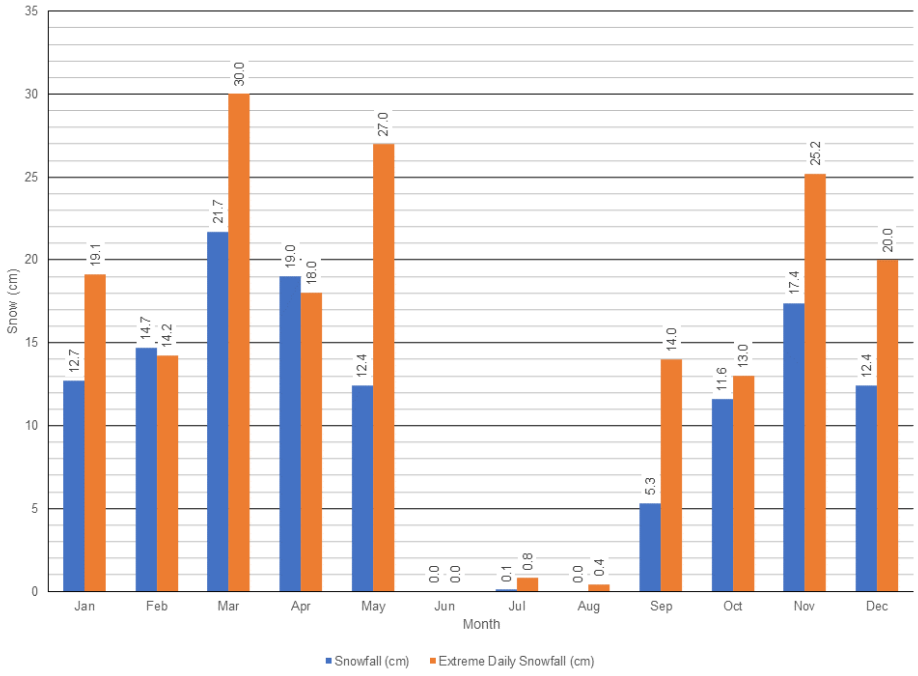


Figure 5.9 Histogram of the Daily Precipitation Measured at the Springbank Airport Climate Station – 1981 to 2010 (ECCC, 2021b)

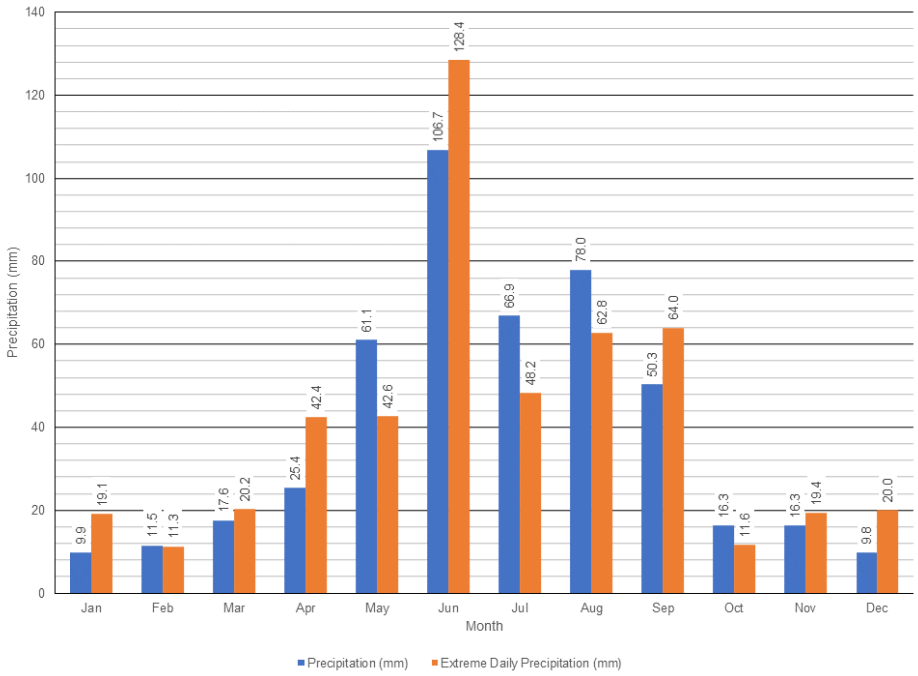
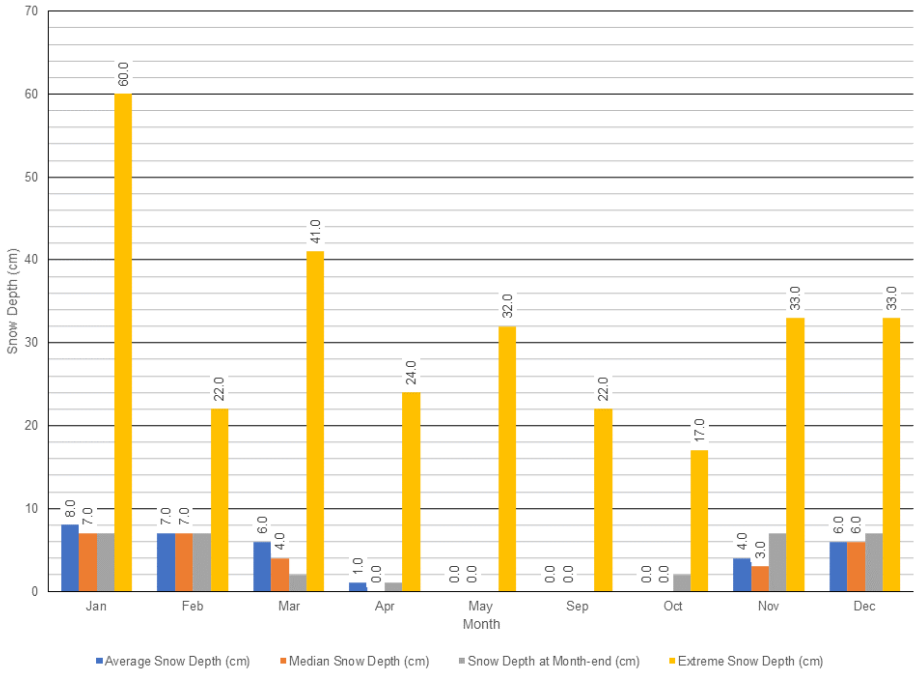


Figure 5.10 Histogram of the Daily Snow Depth Measured at the Springbank Airport Climate Station – 1981 to 2010 (ECCC, 2021b)



5.3 POTENTIAL PROJECT EFFECTS

The Project phases that have interactions with air quality are construction, dry operations, and post-flood operations.

5.3.1 Construction

The components and activities that may interact with air quality during construction are:

- clearing
- channel excavation
- water diversion construction
- dam and berm construction
- low-level outlet works construction
- road construction
- bridge construction
- borrow extraction
- reclamation

Atmospheric emissions during construction result from construction vehicle exhausts and from fugitive dust associated with construction activities. The magnitude of these emissions is directly related to the intensity of construction activity. The off-stream dam and berm construction, and the raising of Highway 22 (road construction) involve movement of the earthen material and, hence, these two activities are associated with the largest emissions during the construction phase. Smaller emissions are associated with other activities such as clearing, channel excavation, water diversion construction, low-level outlet construction, and bridge construction.

Activities associated with laydown areas and reclamation are very minor sources of emissions. Laydown areas are designated areas for the receipt and storage of Project equipment and materials required for construction. These laydown areas would be prepared prior to the main construction activity period. Construction reclamation activities include reclaiming the laydown areas, temporary construction roads, and the borrow pit. These reclamation activities would occur after the main construction activity period. Since these activities do not overlap with the main construction period and, because they are also very small compared to other activities, they are not included explicitly in the assessment. In addition, emissions associated with on-highway vehicles transporting equipment and materials to the Project site are not included in the assessment since the associated emissions occur off site.

The ambient air quality assessment in the EIA and Alberta Transportation's response to Round 1 CEAA Package 3 IR3-35 addresses three cases:

- Base Case defined by existing emissions in the local assessment area (LAA – 20 km x 20 km area centered on the Project),
- Project Case that considers only Project emissions, and
- Application Case that considers the combined effects of the Base Case and the Project Case.

Background contributions (from emission sources outside the LAA) are considered for the Base Case and the Application Case. The Project Case provides an explicit indication of the Project's contribution.

The conclusion with respect to change in air quality is that the main sources of air emissions due to the construction are vehicle exhaust and fugitive PM. Because these emissions result from ground-based sources, the greatest air quality changes due to these emissions occur inside and near the PDA, decreasing to Base Case levels with increasing distance from the PDA.

The main finding is that predicted NO_2, TSP and $PM_{2.5}$ concentrations are greater than the regulatory criteria outside the PDA. In the Base Case, the highest predicted concentrations for all time averaging intervals occur on and near highways. This is consistent with motor vehicles being the highest emitter of both oxides of nitrogen and fugitive emissions of PM. In the Project Case, the highest concentrations occur along the PDA boundary in proximity to the busiest haul roads. For the Application Case, the highest concentrations occur along the PDA boundary in proximity to the busiest haul roads and along highways.

The highest predicted concentrations in the Project Case and Application Case all occur within a few hundred metres of the PDA. As such, they occur within or very near to the "exclusion zone" of modelled haul roads where predicted concentrations might not be valid because they are within the horizontal dimension of the volume sources (Volume 3A, Section 3.4.5.2 of the EIA). These high predicted concentrations should be considered conservative.

The air quality assessment uses emission algorithms developed by the United States Environmental Protection Agency (US EPA) to estimate fugitive dust emissions. There is substantial uncertainty associated with estimating fugitive dust emissions, which results in uncertainties in the associated ambient TSP and $PM_{2.5}$ concentration and dustfall deposition predictions. The assessment indicates a need for ambient monitoring during construction to confirm if the adopted dust control mitigation is adequate.

5.3.2 Dry Operations

During dry operations, associated activities would be limited to periodic inspections and routine maintenance. There are few interactions of the dry operations with air quality. These are discussed briefly in Volume 3A, Section 3.3.2 of the EIA.

5.3.3 Flood Operations

There are no interactions of associated with the Project flood operations with air quality.

5.3.4 Post-Flood Operations

During release of impounded water from the off-stream reservoir back into Elbow River, sediment deposited into the off-stream reservoir will be exposed to the air and dried. During high winds, the surface of the dried sediment could be exposed to wind erosion. This interaction could lead to fugitive dust emissions and impacts on air quality under some meteorological conditions.

The effects of post-flood operations on air quality are examined in detail in Volume 4, Appendix E of the EIA and Appendix I of the reply to submissions of Alberta Transportation to the Interveners and hearing participants entitled "*Post-Flood Operations Sediment Emission Estimates and Dispersion Model Predictions*" (Stantec, 2021). The Appendix I submission included updated post-flood model predictions, senility analyses, and updated health risk estimates and was submitted prior to the NRCB Hearing.

The ambient air quality assessments addressed three cases:

- Base Case, defined by existing emissions in the LAA;
- Project Case that considers only Project emissions from a 1:100-year flood and a design flood (approximately 1:200 year); and the
- Application Case which is the combined effects of the Base Case and the two Project Case scenarios.

Background contributions (from emission sources outside the LAA) are considered for the Base Case and the Application Case. The Project Case provides an explicit indication of the Project's contribution.

The conclusion of the air quality assessments were that Project post-flood operations emissions originate at ground level as the flood waters evaporate and the sediment deposits dry out. The greatest effects on ambient air quality emissions occur within or directly outside the PDA and decreases to Base Case levels with increasing distance from the PDA.

For both scenarios, predicted TSP concentrations for the Base, Project, and Application Cases are greater than the regulatory criteria outside the PDA; however predicted $PM_{2.5}$ concentrations are less than the regulatory criteria outside the PDA. For TSP, the highest predicted concentrations associated with the Project are found on and near the east PDA boundary.

The potential source of fugitive dust during post-flood operations is wind erosion of deposited sediments in the reservoir after they dry out, and when strong wind conditions occur. Quantification of fugitive dust predictions is challenging and there is considerable uncertainty with emission estimates and dispersion model predictions. In support of the public hearing, additional modelling was undertaken to evaluate the sensitivity of model predictions to variations in sediment properties. The sensitivity analysis demonstrated that predicted concentrations are sensitive to assumptions about both sediment texture and sediment area.

Given the low recurrence of the floods that can result in substantial sediment deposition, the proposed mitigation measures of revegetation and application of a tackifier, Alberta Transportation's commitment to monitor and adaptively manage and enhance dust control efforts as required to minimize wind erosion risk, it is expected that fugitive dust emissions would not have significant adverse effects on ambient air quality or human health.

6.0 MITIGATION

Alberta Transportation will implement mitigation measures prior to the initiation of any ground disturbance activities. Mitigation will be continued during construction and post-flood operations.

6.1 CONSTRUCTION

Mitigation measures will be implemented to manage and reduce emissions during construction. Some of these mitigation measures will be applied, as needed, during the operating phases as the Project. The following mitigation options will be planned for the management of combustion emissions (i.e., construction vehicles) during the construction phase:

- To accommodate construction activities that may result in traffic line-ups, public traffic flows on Highway 22 will be always maintained, which may include short periods of time when flow is reduced to one-way traffic. Idling will be limited to the extent possible.
  - The current speed limit on Highway 22 is 100 km/h between Highway 1 and Highway 8, but this will be reduced to 60 km/h on a segment of Highway 22 along the bridge construction area for raising of Highway 22 this will increase the travel time along Highway 22 will be from approximately 3 minutes to 6 minutes.
  - One-way traffic flows on Highway 22 and Springbank Road, to accommodate construction activities, that may result in traffic line-ups and idling will be limited to the extent possible.
- The discharge of atmospheric contaminants from construction operations will be in accordance with regulatory requirements.
- Project construction vehicles will meet or will be lower than the emission standards applicable at time of introduction, and are operated, inspected and maintained in accordance with any applicable engine instructions provided by the manufacturer to meet the emissions standards.
- Engines and exhaust systems will be properly maintained. Equipment, including construction equipment, that shows excessive emissions of exhaust gases will not be operated until corrective repairs or adjustments are made.
- The concentration of sulphur in diesel fuel will not exceed 15 mg/kg.
- Develop a no-idling policy for all vehicles within the Project development area. All persons working on the Project abide by this policy, unless not technically feasible or not feasible for health or safety reasons.

- Construction vehicle idling times will be reduced to the extent possible to reduce emissions, as a best management practice.
- Cold starts will be limited to the extent possible to reduce emissions, as a best management practice.

The following mitigation measures are planned for the management of fugitive dust emissions during the construction phase:

- Establish speed limits on designated Project roads to limit fugitive dust emissions and all persons using these roads must abide by these speed limits.
- Dust generating construction activities will be suspended during periods of excessive winds when dust suppression measures are not working adequately.
- During dry periods, water will be applied to haul roads and/or disturbed areas to mitigate dust emissions. The application of water will be limited to non-freezing temperatures to prevent icing that can present a safety hazard. Watering is most effective immediately after application, and repeated watering several times a day may be required, depending on surface and meteorological conditions.
- Apply dust suppressant on the Project permanent access roads and parking areas as required. Only dust suppressants with the least potential effects on human health and the environment will be used.
- Chemical dust suppressants will be applied to haul roads as an alternative option to watering. While chemical dust suppressants can be more effective at controlling fugitive dust than watering, they are also more expensive. Therefore, chemical dust suppression will be applied on an as-needed basis during high wind conditions or if PM concentrations are in exceedance of the AAAQO and if an increase of watering is determined ineffective or unfeasible at the time. These suppressants, if required, will be applied, as per the manufacturer's recommendations, to preclude unintended environmental effects.
- If trackout and carryout of soils occurs, road cleaning will be conducted by manually picking up and sweeping material or by using rotary or vacuum street cleaning vehicles.
- Disturbed surfaces will be revegetated promptly following construction to prevent wind erosion and to control dust.
- Surfaces of temporary soil and overburden stockpiles will be stabilized during extended periods between usage, by means of vegetating or covering the exposed surfaces.
- Silt fences and other erosion control methods such as mulching and application of tackifiers will be used to prevent soil loss from soil stockpiles due to wind erosion.

6.2 DRY OPERATIONS

During dry operations, associated activities would be limited to periodic inspections and routine maintenance. There are few interactions of the Project dry operations with air quality, meaning mitigation measures are likely not necessary.

6.3 FLOOD OPERATIONS

There are no interactions of the Project flood operations with air quality; mitigation measures are not necessary.

6.4 POST-FLOOD OPERATIONS

A primary mitigation for dust emissions from wind erosion in the off-stream reservoir would be the re-establishment of vegetation cover (e.g., native grasses) after reservoir drainage. Natural revegetation success in the short term, however, is not assured, given initial high moisture contents and reduced energy input in the autumn. In the long term, it is assumed that revegetation would effectively eliminate the potential for windblown emissions when the vegetation is fully developed.

In the short term, when natural revegetation could be ineffective, a tackifier would be applied where required. Tackifiers are a sprayable erosion control product that bonds with the soil surface and creates a porous and absorbent erosion resistant blanket that can last for up to 12 months. This would be triggered based on a combination of ambient monitoring, observations, revegetation monitoring, and public complaints.

Depending upon the state of revegetation and environmental conditions, reapplication of the chemical stabilizer at defined periods may be necessary to maintain high control efficiency. The dilution ratio, chemical application rate and time between reapplications of a chemical stabilizer can be adjusted to achieve and maintain high levels of fugitive dust control. Frequent reapplication of a chemical stabilizer can maintain a control efficiency of 90%, even over a three-month summer period, with one initial application and one reapplication of typical latex based chemical stabilizers.

7.0 MONITORING

Monitoring will be implemented to maintain the quality of the air and, by extension, protect potentially sensitive receptors (e.g., human, wildlife, vegetation, soils, or waterbodies). Monitoring will be used to assess the effectiveness of mitigation measures. The air quality monitoring program is designed to meet the requirements in the IAAC and NRCB decision documents (IAAC, 2021a; NRCB, 2021) and to provide information on effectiveness of Project mitigation measures. Monitoring will be conducted according to the AEP Air Monitoring Directive (AMD; (AEP, 2021a)). The rationale for monitoring and the parameters to be measured are described below.

7.1 CONSTRUCTION

7.1.1 Particulate Monitoring Near the Project

While $PM_{2.5}$ is the substance of concern with respect to human health, PM_{10} and TSP can be valuable accompaniments. $PM_{2.5}$ is mostly fine (less or equal to 2.5 microns in aerodynamic diameter) and is mostly a by-product of combustion processes (e.g., biomass smoke, motor vehicle exhaust, etc.). PM_{10} is more associated with fugitive dust and is composed of coarse material (less than or equal to 10 microns in aerodynamic diameter) and is largely crustal in origin (e.g., pulverized rock, silts, clays). TSP includes all particle sizes equal to or less than 100 microns in aerodynamic diameter which would be made up of larger particle sizes (i.e., very fine sands, coarse silts, pollen, etc.) that tend to settle quickly unless suspended by high wind speeds.

The ratios of $PM_{2.5}/PM_{10}$, $PM_{2.5}$/TSP, and PM_{10}/TSP are good diagnostic indicators of whether the source of $PM_{2.5}$ is fugitive dust or combustion-related (e.g., internal combustion exhaust, forest fire smoke). A low $PM_{2.5}/PM_{10}$ ratio (e.g., less than approximately 0.3) indicates more dust than combustion byproduct, and a high ratio (e.g., more than approximately 0.8) indicates more combustion byproducts than dust. Fugitive dust settles quickly and, thus, its effects are often localized. $PM_{2.5}$ settles slowly and can be transported greater distances. TSP is also a good indicator of nuisance dust effects, including soiling and visibility impairment. Measuring TSP, PM_{10}, and $PM_{2.5}$ allows the determination of whether construction is indeed the source of $PM_{2.5}$ and, if so, that mitigation is targeting the appropriate activity.

For the Application Case (construction), the highest concentrations of $PM_{2.5}$ occur along the PDA boundary in proximity to the busiest haul roads and along highways. Air quality monitoring for $PM_{2.5}$, PM_{10}, and TSP at these locations will facilitate the timely application of additional mitigation measures for fugitive dust should excessive particulate matter levels be measured. Monitoring at these locations will also verify effectiveness of mitigation and confirm predictions from the EIA. Haul roads and areas of major earthworks will also be subject to daily visual inspections of active areas (diversion structure, diversion channel, dam, low level outlet).

Alberta Transportation commits to measuring TSP, PM_{10}, and $PM_{2.5}$ at three monitoring locations:

- Between the permanent access road and the diversion channel excavation work (Station 1)
- At the dam construction site (Station 2)
- At any borrow source site used and at the parking areas (Station 3)

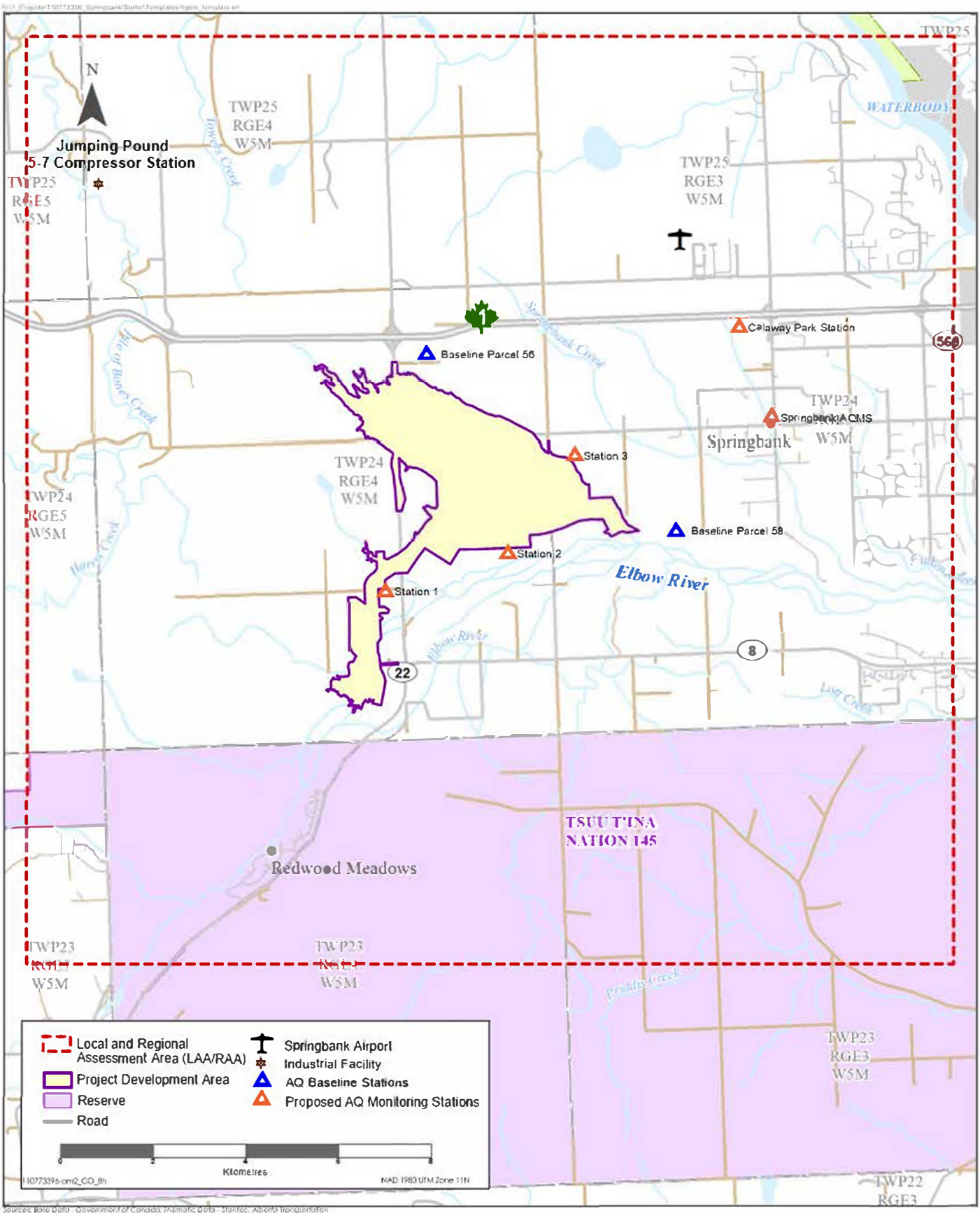
Figure 7.1 shows the preliminary locations of these three sites in relation to the Project and surrounding areas. Specific locations will be determined based on:

- Year-round access to the sites for deployment, monthly calibration and maintenance, and other site visits as needed
- Access to reliable electrical power that will be relatively uninterrupted during construction
- Site security
- Siting guidelines from Chapter 3 of the AMD (AEP, 2016)

Each of the sites would be equipped with environmental beta-attenuation mass monitors (EBAM) or equivalent that meets the requirements of Chapter 4 of the AMD (AEP, 2017). As EBAM stations can only monitor one particulate size fraction three individual instruments will be required for each site. One of the instruments would be equipped with meteorological sensors to measure wind speed, wind direction, temperature, and relative humidity at instrument height (approximately 2 m above ground surface). The stations will be equipped with equipment to collect the monitoring data and transmit it via the local cellular phone network to a datacenter for long-term storage. The monitors will be deployed, operated, and maintained as per manufacture recommendations.

As needed, security fencing will be installed around the monitoring stations and secured to prevent being blown over in the event of wind gusts. The individual monitors will be also secured to the ground surface as per manufacture recommendations.

If reliable power is not available at the site, these EBAM stations can be operated on solar and wind power with battery backup. This option would only be used, if reliable power is unavailable and the monitoring site cannot be relocated.



Baseline and Proposed AQ Monitoring Stations

Stantec

SPRINGBANK OFF-STREAM RESERVOIR PROJECT

Figure 7.1

The monitoring stations will be programmed either at the site or at the datacenter to send out alerts to the Project Operator and other required individuals when:

- The particulate matter measurements are above trigger limits
  - 2/3 of the 1-hour average $PM_{2.5}$ AAAQG – 53 µg/m^3
  - 2/3 of the 24-hour average $PM_{2.5}$ CAAQS – 18 µg/m^3
  - 2/3 of the 24-hour average TSP AAAQO – 66 µg/m^3
  - Use the TSP trigger for PM_{10} since there is no AAAQO&G or CAAQS for PM_{10}
- The particulate matter measurements are above:
  - 1-hour average $PM_{2.5}$ AAAQG – 80 µg/m^3
  - 24-hour average $PM_{2.5}$ CAAQS – 27 µg/m^3
  - 24-hour average TSP AAAQO – 100 µg/m^3
  - Use the TSP trigger for PM_{10} since there is no AAAQO&G or CAAQS for PM_{10}
- The monitor is not transmitting data
- The monitor registers a fault or other malfunction and requires maintenance
- Other alarms as determined during the Project (i.e., wind thresholds, relative humidity thresholds, etc.)

If the $PM_{2.5}$, PM_{10}, or TSP concentrations are higher than the proposed trigger limits this would provide an initial warning to the operator that mitigation of fugitive dust maybe required. These warnings would be investigated to determine possible causes of elevated particulate matter concentrations and if they are associated with the Project activities. If they are then the Operator can determine the appropriate mitigation measures that should be applied and where they would be most effectively applied to lower the particulate emissions.

If measured TSP or $PM_{2.5}$ concentrations are above the AAAQO&G, a sequence of specific actions will be triggered. The first step is to determine whether measurement error exists (i.e., confirm that the measurements are valid). If exceedances of the AAAQO&G are verified, then Alberta Transportation will investigate to determine possible causes of elevated particulate matter concentrations and determine the appropriate adaptive mitigation. Recent construction activities will be reviewed to determine which activities may have contributed to measured TSP, PM_{10}, and $PM_{2.5}$ concentrations.

If the ambient monitoring program indicates that the ground-level $PM_{2.5}$ and TSP concentrations are greater than the AAAQO&G and that they are associated with the Project, additional mitigation to reduce dust emissions will be implemented. This mitigation may include increased watering of access roads, the spraying of surfactants, stabilizing soil stockpiles, silt fencing or the suspension of construction activity at the site. Water will be applied to haul roads and disturbed

areas for mitigating dust emissions. Watering could be repeated several times a day during dry periods with periods of excessive winds when dust suppression measures may not work adequately.

These trigger limits would align with the application of the South Saskatchewan Regional Air Zone Triggers and Limits (AESRD, 2014). These trigger limits should be periodically reviewed to ensure that they protect human health from particulate emission from the Project and allows the development of the Project without significant delays.

The stations may be relocated during the Project to accommodate construction requirements, changes to the Project, consultation with stakeholders or regulators, or based on observations made in the field during construction or Project operations. These locations should be periodically reviewed to ensure that they are correctly placed to protect human health and inform dust control efforts. Additional monitoring stations maybe added to the program as needed.

7.1.2 $PM_{2.5}$ and NO_2 Monitoring to Evaluate Public and Community Exposure

An air quality monitoring station (AQMS) will be in the community of Springbank around the intersection of Springbank Road and Range Road 33. This AQMS will be primarily used to monitor the regional air quality for the parameters of $PM_{2.5}$ and NO_2 to evaluate public and community exposure relative to both the AAAQO and the CAAQS at a monitoring location representative of area residences and nearby communities in the Project area.

Both NO_2 and $PM_{2.5}$ are substances of concern with respect to human health. Measuring both allows for adequate monitoring of Project effects where people live. Meteorological measurements (e.g., wind speed, wind direction, temperature, relative humidity) are a necessary accompaniment. In conjunction with the concentration of NO_2 and $PM_{2.5}$, meteorology can indicate a source region and, with other information, a probable cause of an air quality event.

The most suitable platform for NO_2 and $PM_{2.5}$ monitoring is a fully enclosed heated trailer deployed to a fixed location for the duration of construction. The meteorological instruments would be affixed on a 10 m tower. Power from the grid will be a requirement to run instruments, and provide adequate heating and cooling required for the sensors to operate. The trailer will also house the calibration equipment to ensure accurate measurements from the sensors.

Onboard data logging capability and cellular modem for real-time telemetry is required. These data will be logged locally, and remotely on a server. This system will be capable of sending automatic alerts to staff when air concentrations exceed designated alert levels. These alerts can come in the form of emails or SMS text messages and notify staff that action is required. These automatic alerts can be customized for any desired trigger level and location.

Measured pollutant concentrations will be evaluated against the AAAQO&G to trigger investigation, potential adaptive mitigation, and reporting. Measured pollutant concentrations will also be compared to the CAAQS to evaluate potential effects on air quality. Similar triggers can be used for the AQMS where two-thirds of the AAAQO&G would serve as a warning level of a potential air quality event and concentrations above the AAAQO&G would require investigation to determine the potential cause of elevated concentration measurement, adaptive management, and reporting.

Similar actions as described in the Section 7.1.1 would be taken if measured concentrations are higher than the trigger limits or the AAAQO&G.

7.1.3 Calaway Park Particulate Monitoring

During construction, a station will be located near Calaway Park (near Highway 1 and Range Road 33) likely either near the southern or western edges of the park, away from the major roadways and potential sources of particulate matter (i.e., vehicles, combustion sources, unpaved roads, etc.). This station would deploy an EBAM monitor for the measurement of $PM_{2.5}$ while the park is in operation and open to the public (May – October). The location of this monitor will be finalized in consultation with the Calaway Park management team.

The EBAM station would be setup like the ones located near the Project. Power will be obtained from Calaway Park. When the Park is not in operation the EBAM station would be removed after the park is closed to the public for the season and setup prior to the opening of the park to the public.

The EBAM station would be similarly equipped with meteorological equipment for measuring wind speed, wind direction, temperature, and relative humidity at on the of the stations. Both stations would be able to the transmit the data in a similar fashion as the other stations located near the Project. Similar trigger limits and actions would be taken as per the EBAM stations located near the Project.

7.1.4 Reporting

The Project is not required to submit monthly or annual reports to AEP as detailed in Chapter 9 of the AMD (AEP, 2021a). However, the IAAC and NRCB Decision documents (IAAC, 2021a; NRCB, 2021) do provide some guidance on what reporting is required for this Project. Alberta Transportation has also committed to periodic reporting during the regulatory process. The following summarizes these reports.

7.1.4.1 Daily Reports

During construction, records of dust control measures implemented on site will be maintained on daily basis and air quality results will be provided to Alberta Transportation within 12 hours of each work shift. The report may also contain:

- If the measured NO_2, $PM_{2.5}$, PM_{10}, or TSP concentrations are above the AAAQO&G or trigger levels during the day these will be investigated and documented to determine the cause of the event.
- Abnomalies in the ambient air quality monitoring or meteorological data.
- Other potential non-Project related NO_2, $PM_{2.5}$, PM_{10}, or TSP emissions occurring within the region that could be contributing to higher than expected measured concentrations, such as wildfire smoke, long-range transport of pollutants, or emissions from other nearby sources such as agricultural activities.
- Changes, maintenance, calibration, or other activities related to the ambient air quality monitoring network.

7.1.4.2 Monthly Reports

A summary report of the ambient air monitoring results, mitigation measures implemented, calibrations and maintenance completed on the monitoring network, changes to the monitoring network, or other relevant information will be provided to Alberta Transportation and the Contractor at the beginning of each month during construction.

7.1.4.3 Plain Language Bi-Annual Report

A non-technical summary of the monitoring program will be provided to Indigenous Groups that provides information on the status of Project construction, air quality monitoring program, mitigation actions taken over the six-month period, and any other information related to the Project that is requested by the groups. The delivery schedule of these reports will be determined based on consultation with the Indigenous groups that desire these reports. For example, the reporting could be completed for the period from July 1 to December 31, and January 1 to June 30 which would align with the IAAC annual reporting condition.

These reports will also be provided to the Alberta Transportation and can be made available to public stakeholders upon request.

7.1.4.4 Annual Reporting

An annual summary report will be prepared for each year of active construction. This report will summarize the current state of the Project, ambient air quality data, changes to the monitoring network, and summaries of mitigation actions taken and investigations into air quality events during the year.

Measured concentrations of $PM_{2.5}$ and NO_2 at the Springbank AQMS will be analyzed to determine trends in pollutant concentration relative to the CAAQS. If measured NO_2 or $PM_{2.5}$ concentrations trends are approaching the CAAQS, Alberta Transportation will investigate to determine possible causes of elevated NO_2 or $PM_{2.5}$ concentrations and determine the appropriate adaptive mitigation as necessary.

Any potential non-project related NO_2, $PM_{2.5}$, PM_{10}, and TSP emissions identified during the daily reports (Section 7.1.4.1) will be identified in the annual report. These events will be evaluated and accounted for as per the achievement guidance documents for the CAAQS (CCME, 2012; 2020) for NO_2 and $PM_{2.5}$. Annual averaging of these emissions for comparison to the AAAQO&G will follow similar guidance.

7.1.4.5 Investigative Reporting

A summary report will be prepared each time the ambient air quality network detects an air quality event that requires investigation. This will document the conditions leading up to the event, any mitigation actions taken to reduce the effects on ambient air quality, determination of the source of the emissions causing the event where possible, and any other relevant information. The summary report will be prepared at the conclusion of the investigation and be provided to the Community Liaison and will be included as part of the annual reports.

7.2 POST-FLOOD OPERATIONS

7.2.1 Particulate Monitoring

The Application Case (post-flood operations) has the highest concentrations of TSP and $PM_{2.5}$ associated with windblown silt occurring on and near the east PDA boundary. If a flood occurs that results in substantial deposition of sediment within the reservoir, once water is released and sediment begins to dry, ambient monitoring will be deployed to monitor potential effects associated with windblown sediment.

Monitoring for $PM_{2.5}$, PM_{10}, and TSP at or near the same three locations near the Project that were used during construction would be deployed as soon as reasonably possible after a flood event. These locations can be changed based on changing land use, observations made during construction, observed evidence of areas of sediment with elevated erosion risk, or previous flooding events. These monitoring stations would be operated until 16-months after the flood event.

Additionally, EBAM monitors to measure $PM_{2.5}$ and TSP will be deployed to the same location of the Springbank AQMS. When Calaway Park is in operation, EBAM stations will be deployed to that site during the 16-month period.

The EBAM monitoring will follow the same procedures as used in construction. This would include preparing any of the monthly, bi-annual, annual, and investigative reports.

As the post-flood monitoring program is the responsibility of AEP, they would be responsible for the deployment of the monitoring stations, operations, maintenance, and reporting during the monitoring period.

8.0 ADAPTIVE MANAGEMENT

Applying adaptive management in the context of the AQMP involves a review of the effectiveness of the program to maintain the quality of the air and, by extension, protect potentially sensitive receptors (e.g., human, wildlife, vegetation, soils, or waterbodies). Adaptation involves changing assumptions plus management and mitigations in response to new or different information obtained through monitoring.

Assumptions about the effects of various construction and other activities on air quality will be tested, as will be a series of actions based on triggers designed to achieve a desired outcome. Monitoring data will be reviewed to determine if management actions, mitigations, and trigger levels are appropriate. A minimum of one year of data is required to account for seasonal changes in prevailing wind direction and dispersion meteorology.

Alberta Transportation will update this AQMP during construction to keep it current. During dry and flood operations, the AQMP will be the responsibility of AEP Operations. A scheduled review will be undertaken at least annually. The ambient monitoring and visual inspection programs will also be reviewed if it is determined the current methods are not effective in indicating or predicting the occurrences of air quality events. This AQMP will be updated to reflect any improvements that are identified.

During the construction period, the monitoring data will be periodically reviewed to determine if there are specific environmental conditions (e.g., wind speed, wind direction, relative humidity, etc.) which resulted in concentrations of particulate matter above the trigger thresholds or observed dust events. These conditions will be used to define thresholds going forward at which to modify construction activities, pre-emptively adopt more stringent dust controls, or stop construction activity entirely while the meteorological conditions are present over several hours or days.

Should any deficiencies be found during the scheduled reviews, an updated AQMP will be issued, and outdated copies will be collected for archive.

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