

Northeast Air Monitoring Project (MoE-Phase 2)

Final Report

for

Recipient Agreement HS-2013-01-01

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BC Ministry of Environment
Report to the BC Oil and Gas Research and Innovation Society (BC OGRIS)

1. Executive Summary

During Phase 2 (2014-2016) of the Northeast BC Air Quality Monitoring Project, air pollutant data in the Peace Region were monitored using three portable stations and a core station in Fort St. John. A public outreach group and a technical advisory committee were also created to provide recommendations and guidance for the project. A report characterizing air quality throughout the Peace Region was developed, based on air quality data for the period 1998 through to 2013. Looking ahead to the possible need for ongoing ambient air quality monitoring in Northeast BC, a set of governance options were developed and considered by the Project Steering Committee.

2. Background to project

The Northeast BC Air Quality Monitoring Project was announced on June 6, 2012 as a partnership between the BC government, the BC Oil and Gas Commission (OGC), the Canadian Association of Petroleum Producers (CAPP) and Spectra Energy. The goal of the project is to address public concerns about possible air quality issues related to oil and gas development in the Peace region. The specific objectives were to engage the community, monitor air pollution concentrations, develop an understanding of air quality throughout the Peace region and identify options for a long term monitoring network.

The Northeast BC Air Quality Monitoring Project has three phases. In Phase 1 (2012-March 2014), three fully equipped, automated air quality monitoring stations were transported to the Peace region. These were installed at the Doig River Cultural Centre, the Farmington Town Hall and in Tomslake and were operational in late 2013 and early 2014. Phase 1 also began the engagement of the local community with the creation of an Advisory Group.



Figure 1. Three portable air monitoring stations

3. Methodology of Phase 2

3.1. Measuring air quality in Northeast BC

3.1.1. Air quality monitoring operated by MoE

Ministry of Environment continued the operation of the three portable continuous air monitoring stations at Doig River, Farmington and Tomslake measuring sulphur dioxide (SO₂), total reduced sulphur (TRS) and some basic meteorological parameters.

During Phase 2, Ministry of Environment also installed a core air monitoring station in Fort St. John which measures nitrogen dioxide (NO₂), sulphur dioxide, ozone (O₃), and particulate matter (PM_{2.5} and PM₁₀). This station produces an Air Quality Health Index result.

3.1.2. OGC mobile air monitoring

The BC Oil and Gas Commission also monitors air quality in the Peace region and other areas of BC that may be affected by oil and gas activity. It operates two mobile monitoring stations. One is the Commission Air Monitoring Environmental Laboratory (CAMEL), a full air quality monitoring trailer (Figure 2) that measures meteorological parameters and the concentrations of a wide range of pollutants including PM_{2.5}, PM₁₀, ozone, carbon monoxide, nitrogen oxides (NO_x), sulphur dioxide, total reduced sulphur, hydrocarbons, BTEX (benzene, toluene, ethyl-benzene, xylene) and light scattering. This air quality laboratory can be deployed to study community air quality where there is **not a**



Figure 2. OGC Commission Air Monitoring Environmental Laboratory (CAMEL)



Figure 3. OGC Roaming Air Monitor (RAM)

fixed monitoring station. To date CAMEL has been deployed in Taylor, Fort St. John, Dawson Creek, Tumbler Ridge, Chetwynd and Buick Creek.

The second monitoring station is the smaller Roaming Air Monitor (RAM) (Figure 3) van unit. It is primarily designed as a quick response unit for emergencies. However, it can also be used for other ambient monitoring deployments when it is not in emergency service.

3.1.3. Community initiated monitoring

Elms monitors are small, low-cost electro-chemical devices that continuously measure ambient pollutant concentrations including nitrogen oxides, ozone, particulate matter and volatile organic compounds. The Peace Environment and Safety Trustees Society (PESTS) currently operates thirteen of these monitors these monitors in the Peace region.

3.2. Advisory Groups

Phase 2 of the Northeast BC Air Quality Monitoring Project built on previous work by separating the Phase 1 Advisory Group into a Technical Advisory Group (TAG) and the Public Outreach Group (POG). The TAG and the POG held an initial joint meeting on November 2014 at the OGC offices in Fort St. John to outline the goals and objective of the project and get advice from the two groups on the direction of the project. Terms of Reference were subsequently developed for each group, the essence of which was to provide the Ministry of Environment with the essential outside advice needed to develop this multi-faceted project.

3.2.1. Technical Advisory Group

The central purpose of the TAG was to provide expert advice to the Project Steering Committee, through the Project Manager, on the technical aspects of the design and operation of the ambient air quality monitoring network in the northeast region of British Columbia.

Over the course of its tenure, the TAG:

- Identified knowledge gaps that limit the robustness and regional representation of the current ambient monitoring network.
- Reviewed a report prepared by government staff characterizing air quality in Northeast BC based on current knowledge. This report was used to guide air monitoring network design options.
- Evaluated and provided advice on additional monitoring needs and options in Northeast BC.
- Provided suitable options for network design (monitoring locations, appropriate parameters and monitoring technologies).
- Drafted an initial monitoring plan that provided overall direction for subsequent implementation and ongoing operation of the monitoring network
- Served as a technical information resource that fulfilled the information needs of the overall project, including providing reliable technical information to the Public Outreach Group.

Membership of the Technical Advisory Group includes oil and gas industry experts, university academics in BC, Alberta and Ontario, BC government agencies, Health Canada, Treaty 8 representatives and the BC Oil and Gas Commission.

3.2.2. Public Outreach Group

The Public Outreach Group was assembled to provide advice to the Project Steering Committee on public communications during Phase 2 including:

- Dissemination of data and information in a manner that meets the needs of the public, which may include ambient air quality measurements and source discharge quantities for air pollutants (Canadian Ambient Air Quality Standards and air toxics);
- Tools, platforms and pathways for the dissemination of data and information;
- Frequency of communications; and
- Effectiveness of any implemented communication tools and initiatives.

Membership of the POG includes CAPP, the Northern Health Authority, BC Ministry of Health, Peace Environment & Safety Trustees Society, BC Oil and Gas Commission, Ministry of Natural Gas Development, MoE, NE Oil & Gas Health Advisory Committee, Spectra Energy, Northern Lights College, and the South Peace River Stockmen's Association.

3.3. Long-term management and funding options

Three design options were considered for the development of governance scenarios for the funding and operation of the Northeast BC Air Quality Monitoring Network. The Enhanced and Expanded cases would reflect an increasing level of concern regarding human or environmental risk and exposure based on air quality data.

- Base Case:** Government operated network including private sector monitoring data
- Enhanced Case:** Co-funded by government and industry
- Expanded Case:** Airshed monitoring entity co-funded by industry, government, local governments and others

4. Data and Results

4.1. Phase 1 - 2 Monitoring Sites

Ambient hourly total reduced sulphur (TRS) and sulphur dioxide (SO₂) concentrations were collected in Phase 2 from January 2014 until late 2015 and early 2016 at the three portable monitoring locations: Doig River Cultural Centre, Farmington Community Hall and Tomslake 197 Rd East.

BC hourly ambient air quality objectives for total reduced sulphur (TRS) are 5 ppb and for sulphur dioxide (SO₂) are 75 ppb. Table 1 shows that the ambient hourly concentrations of SO₂ were well below the BC air quality objectives during Phase 2, and that the objectives for TRS were only exceeded for two hours at Tomslake during all of 2014 and 2015. TRS hourly objectives are based on odour detection, not health impacts.

Table 1. Concentrations of SO₂ and TRS measured during Phase 2 at the three portable air quality monitors. BC hourly ambient air quality objectives for total reduced sulphur (TRS) are 5 ppb and for sulphur dioxide (SO₂) are 75 ppb. The only exceedances of objectives was for TRS for 2 hours at Tomslake. These events were most likely associated with nearby oil and gas activity.

	Doig River Cultural Centre		Farmington Community Hall		Tomslake 197 Rd East	
	TRS ppb	SO ₂ ppb	TRS ppb	SO ₂ ppb	TRS ppb	SO ₂ ppb
Maximum hourly concentrations	1.6	5.2	3.1	10.5	7.6	16.9
Average hourly concentrations	0.1	0.1	0.2	0.4	0.4	0.4
98th percentile of hourly concentration	0.4	0.7	0.6	1.5	0.9	1.4

Monitoring data collected from these three portable monitors at Farmington, Tomslake and Doig River in 2014-15 are available through the [BC Air Data Archive](#) in the section for the Omineca-Peace region.

4.2. Public Outreach

The Public Outreach Group began its work by creating a Public Outreach Strategy to prioritize and guide its recommendations and activities.

A significant public outreach product of Phase 2 was the creation of four media articles on the Northeast BC Air Quality Monitoring Network authored by Dr. Judi Krzyzanowski. These articles were published weekly in the *Alaska Highway News* during June and July 2015. They are available online at <http://www.bcairquality.ca/readings/northeast.html>.

The POG also developed five Fact Sheets to complement the media articles. They are available at <http://www.bcairquality.ca/readings/northeast/index.html>. These are also being distributed by mail to community organizations, First Nation communities, the Cattleman’s Association, the Grain Producer’s Association, the Peace River Regional District and the school districts. The Fact Sheets titles are:

1. The Northeast Air Quality Monitoring Project
2. BC Air Quality Objectives
3. Air Quality in the Peace region
4. Air Quality Monitors
5. Emission Sources and Regulations

Beyond the POG, in April 2016, the MoE Northeast Air Monitoring Coordinator, a MoE meteorologist and OGC’s Airshed Specialist presented air quality information to the Chetwynd town council to enhance

that community’s understanding that while industry operates near their community, their air quality is relatively good.

4.3. Technical Advisory Group

A significant outcome that relied on TAG advice was the report [Air Quality Characterization of the Peace region of Northeast BC](#), published in late 2015. This 53-page report provides a description of the ambient air quality in the Peace region of BC. The report is based on up to 15 years of monitored data (1998-2013) as well as atmospheric dispersion computer modelling provided by the Human Health Risk Assessment, a project led by the BC Ministry of Health. The report compares ambient air quality throughout the Peace Region to 2013 BC air quality objectives and provides detailed assessments of the concentrations of various pollutants and summaries of air quality in key Peace communities.

A key Phase 2 objective of the TAG was to provide advice on the locations of this Phase 3 monitoring along with the types of monitoring to be used at these sites. Since SO₂ concentrations in Phase 2 were all well below the BC health-based objectives and that the odour-based objectives for TRS were only exceeded for 2 hours during the two-year period, the Project Steering Committee, on the advice of the TAG, decided to move the three stations to new locations to continue the monitoring program.

4.4. Phase 2 - 3 Monitoring Sites

The TAG used a weighting process to rank the answers to six questions concerning technical and community criteria at fourteen prospective monitoring sites and to provide recommendations. Based on this process and the TAG recommendations (described in the July 28, 2015 report *Refining the Northeast Ambient Air Monitoring Network: Rationale and Recommendations*), the communities where the monitors will be located and the pollutants that will be monitored in Phase 3 are in Table 2.

Table 2. Recommended Phase 3 site locations and monitored pollutants for the three portable monitoring stations, based on Technical Advisory Committee advice

Community	Pollutants to be monitored in Phase 3
Taylor	Nitrogen oxides , ozone, PM _{2.5} (fine particulate matter), sulphur dioxide, total reduced sulphur, volatile organic compounds (VOC)
Blueberry River	Nitrogen oxides, ozone, sulphur dioxide, total reduced sulphur, volatile organic compounds
Rolla	Nitrogen oxides, ozone, sulphur dioxide, total reduced sulphur, volatile organic compounds

Figure 4 shows the former (in grey) and new (in blue) locations of the three portable air monitoring stations. Ambient air monitoring stations operated by industry under permit by MoE are shown in purple.

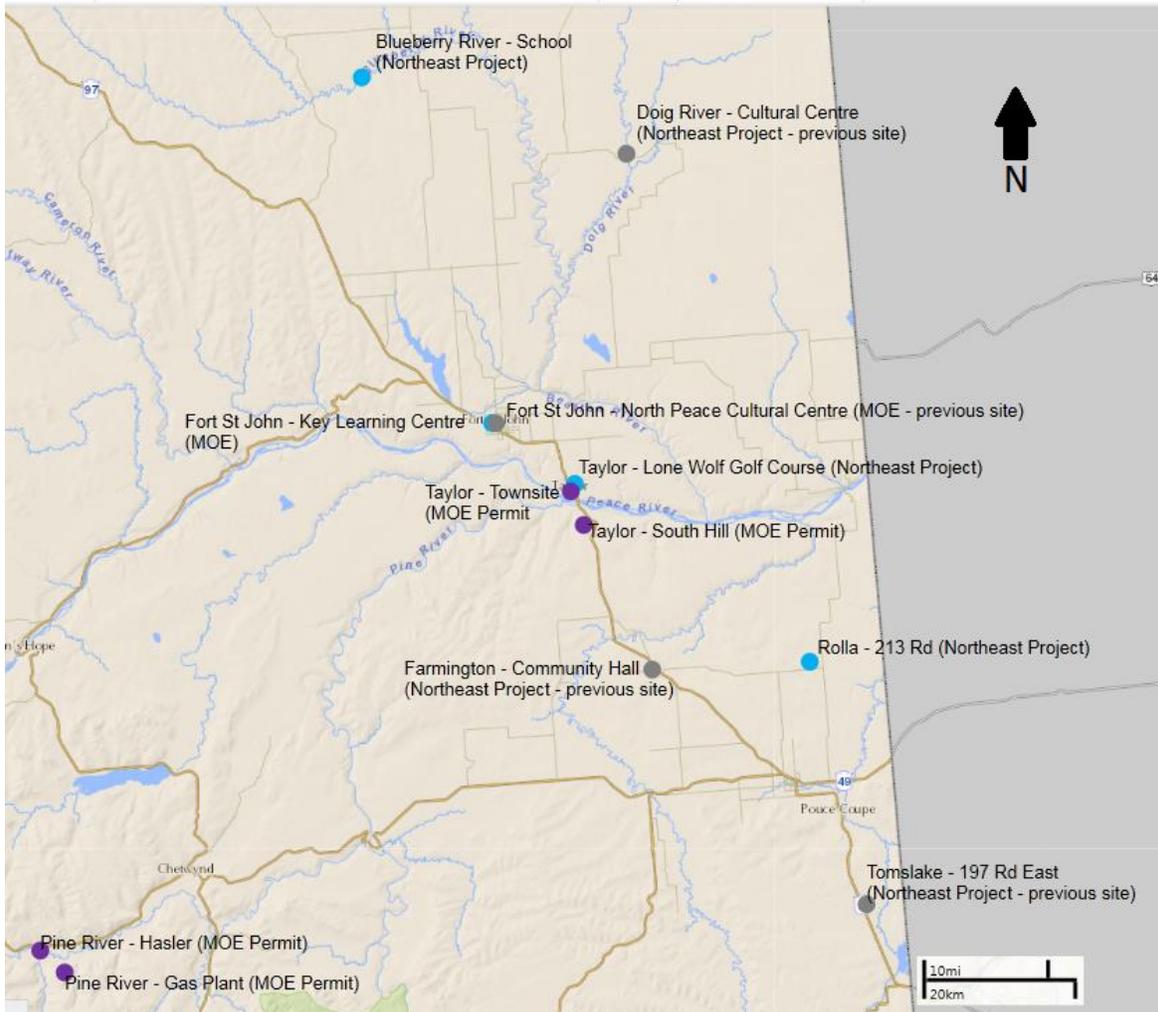


Figure 4. Continuous air quality monitor locations, past and present. Taylor Lone Wolf, Rolla, and Blueberry River (in blue) are the new locations for Phase 3 monitoring. Photos of all three MoE portable air quality stations are to the left of the map.

Equipment purchased and installed during Phase 2 of the project is summarized in Table 3. VOC monitoring recommended by the TAG (in Taylor and Blueberry River) could not be addressed within the available budget. Depending on available resources, it may be possible to address VOC monitoring at one location by loaning MOE equipment for a limited period of time. In this case, Taylor would be prioritized over Blueberry River to maintain consistency with the priority rankings recommended by the TAG.

Table 3. Equipment purchased and installed at three new portable air monitoring station locations

Site	Parameter	Make	Model	Serial #	Date Installed
Rolla – 213 Rd	NO _x	Teledyne	T200	2403	2015-12-18
	O ₃	Teledyne	T400	2190	2016-03-08
	Datalogger	Envivas	Ultimate	282267	2015-12-18
Taylor – Lone Wolf Golf Course	NO _x	Teledyne	T200	2401	2016-01-27
	O ₃	Teledyne	T400	2189	2016-01-28
	PM _{2.5}	Thermo	SHARP 5030i	CM15501001	2016-03-11
	Datalogger	Envivas	Ultimate	282106	2016-01-27
Blueberry River - School	NO _x	Teledyne	T200	2402	In progress
	O ₃	Teledyne	T400	2375	In progress
Calibration Equipment	Gas Calibrator	Teledyne	T750	96	NA
	Zero Air System	Teledyne	751H	115	NA

Data from the Rolla and Taylor sites are currently available at www.bcairquality.ca. The Blueberry River station is currently being installed and is expected to be operational by June 30, 2016.

4.5. Long-term management and funding

Based on an assessment of the data collected through Phases 1 and 2, the Air in NE BC is relatively clean. Concentrations of ozone, NO_x, SO₂ and TRS are relatively low based on records from existing monitors and in the communities where the three moveable monitors were located in Phase 1. In light of the air quality evidence, the project steering committee agreed that the Base Case scenario should be implemented at this time.

5. Conclusions

Significant progress was made in Phase 2 of the Northeast BC Air Quality Monitoring Project in providing science-based information and engaging the local community on air quality in the region. A Public Outreach Group and Technical Advisory Group provided valuable advice and direction on both public engagement and the types and location of monitoring needed in the Peace to address public concerns about oil and gas development.

Portable monitoring showed that TRS and SO₂ concentrations in the area of Tomslake, Farmington and Doig River were very low compared to BC Air Quality Objectives. The three portable monitoring stations have had new sensors added to measure nitrogen dioxide, ozone and particulate matter, and are being moved to new locations at Rolla, the Taylor Lone Wolf Golf Course, and Blueberry River to continue to

increase our knowledge of air quality in Northeast BC. VOC monitoring will also be addressed at Taylor as resources allow.

6. Recommendations for Phase 3

Our collective understanding of the quality of ambient air in the Northeast region of BC has grown considerably as a result of monitoring implemented in Phases 1 and 2 of the project. However, with the distributed pattern of industrial activity and small rural node communities throughout the region, important knowledge gaps still exist.

Relocating the three portable monitors to new locations for a minimum of one year, as described in Section 4 of this report, for Phase 3, is an effort to continue to fill those gaps.

Still, there are several other communities for which air monitoring has not been conducted. Therefore, as a more mobile unit, operation of the OGC CAMEL is recommended for inclusion in Phase 3 as it offers additional coverage in the air monitoring network for short to medium term durations.