# Report on Initial Network Design - NE BC Air Quality Network

BC Ministry of Environment
Report to the SCEK Fund, BC Oil and Gas Commission
January 31, 2014

## Contents

# Introduction

Demand for air quality information in NE BC is rising due to public concern about real or perceived threats to human health and/or the environment from oil and gas activity. To help meet this demand, Phase 1 of the North East Air Monitoring Project was announced in June 2012 as a partnership initiative between the provincial government, the Oil and Gas Commission and the oil and gas industry operating in NE BC. Phase 1 included the addition of new monitoring sites to the existing network of eight sites where instruments have been measuring hourly concentrations of H2S, TRS, PM10 and/or SO2 in NE BC since the 1990s. An existing network of passive monitors operated by industry continues to measure air pollutant concentrations.

Funding for Phase 1 was provided by the Science and Community Environmental Knowledge (SCEK) Fund.

Air monitoring data from this network is available to the public at the following website: http://www.bcairquality.ca/.

# Objectives

The objective of the initial network design was to identify the most suitable locations for the three new monitoring trailers that will best augment the existing monitoring network and improve our understanding of the impacts of oil and gas activity on air quality. These three trailers may be moved to new locations after a year of operation if no significant impacts on air quality from oil and gas activity are found and/or if there is a need for the trailers to be used elsewhere in the south Peace.

Originally only two new monitoring sites south of the Peace River were planned, as described in the press release of June 6, 2012 (Appendix 1). A third site was added north of the Peace River after subsequent discussions between the BC Ministry of Environment (MoE) and CAPP, OGC, the BC Ministry of Agriculture and the Northern Health Authority.

# The Network Planning Team – Phase 1

A network planning team of experts helped MoE identify the locations of three new sites, the pollutants to be measured and the type of communications and monitoring equipment to be used. The team also assisted in the negotiating of land use agreements with property owners, site preparation and monitor installation, calibration and testing. The team was comprised of personnel from MoE, CAPP, the Ministry of Health's Human Health Risk Assessment (HHRA) project (including David Chadder at RWDI and Bart Koppe of Intrinsik), Environment Canada (including Dr. Jeff Brook), industry (e.g. April Hauk, Spectra Energy), environmental monitoring companies, technicians and legal professionals. In addition, an Interim Air Monitoring Working Group (subsequently renamed the Advisory Group) made up of stakeholders from the south Peace area provided useful input into the process. The Terms of Reference of the Advisory Group is in Appendix 2.

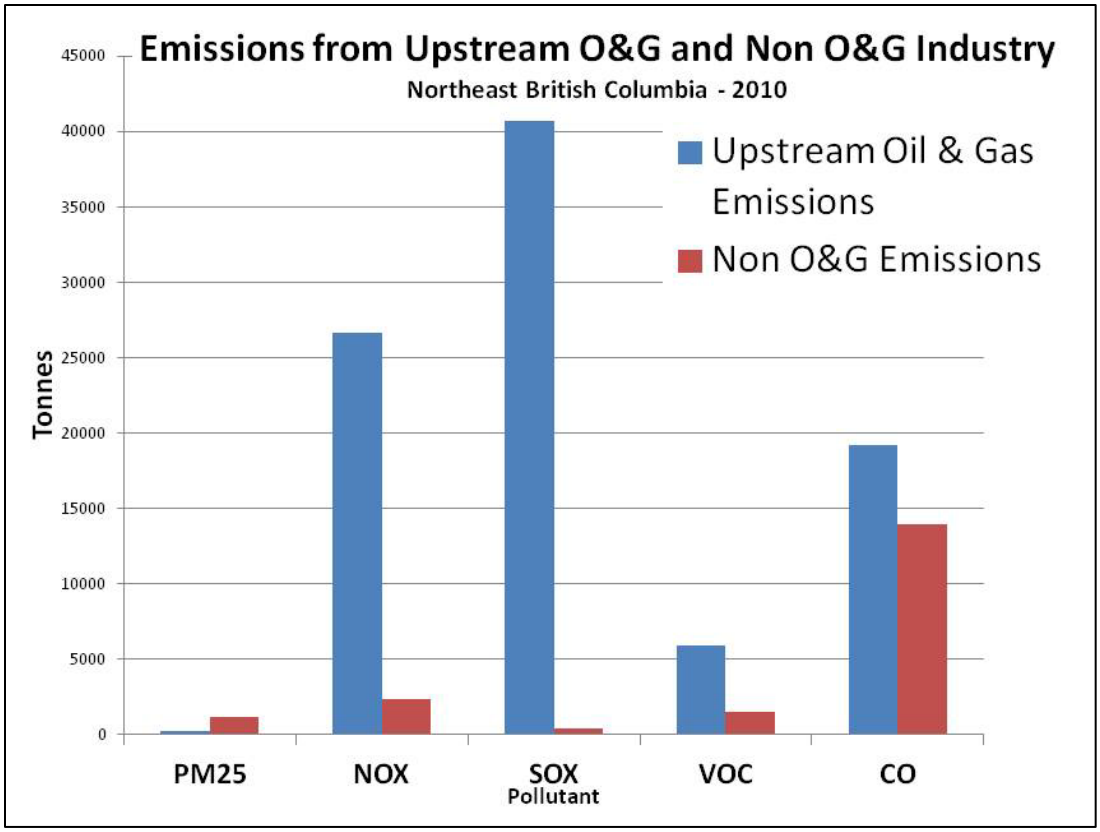


**Figure 1 Annual emissions from industry in NE BC. The upstream oil and gas industry is the dominant source of NOx, SOx and VOCs (Environment Canada 2013).**

## Oil and Gas Industry Emissions in NE BC

According to emissions data reported through the National Pollutant Release Inventory, the upstream oil and gas industry is the dominant emitter of NOx (nitrogen oxides), SOx (sulphur oxides) and VOCs (volatile organic compounds) in NE BC (Figure 1). Emissions of these pollutants from non-oil and gas industries, including fossil-fuel electric power generation, sawmills (except shingle & shake mills), bituminous coal mining, waferboard mills, and mechanical pulp mills in Taylor, Fort Nelson, Chetwynd, Fort St. John, Dawson Creek and Tumbler Ridge, are much lower.

## Geographical Scope

As outlined in the June 6, 2012 press release (Appendix 1), the south Peace area was chosen as the area of interest where the three new monitors were to be installed since much of the new oil and gas activity is occurring in the Montney field. This area is approximately bounded by 55$^{o}$N and 57$^{o}$N, the Alberta border and 122$^{o}$W, encompassing Fort St. John, Dawson Creek, Pouce Coupe, Chetwynd and Hudson's Hope (Figure 2). Two monitors were slated to be installed south of the Peace River, and one to the north. The eastern section of the south Peace area was the focus for these new monitors as oil and gas activity is greatest there.

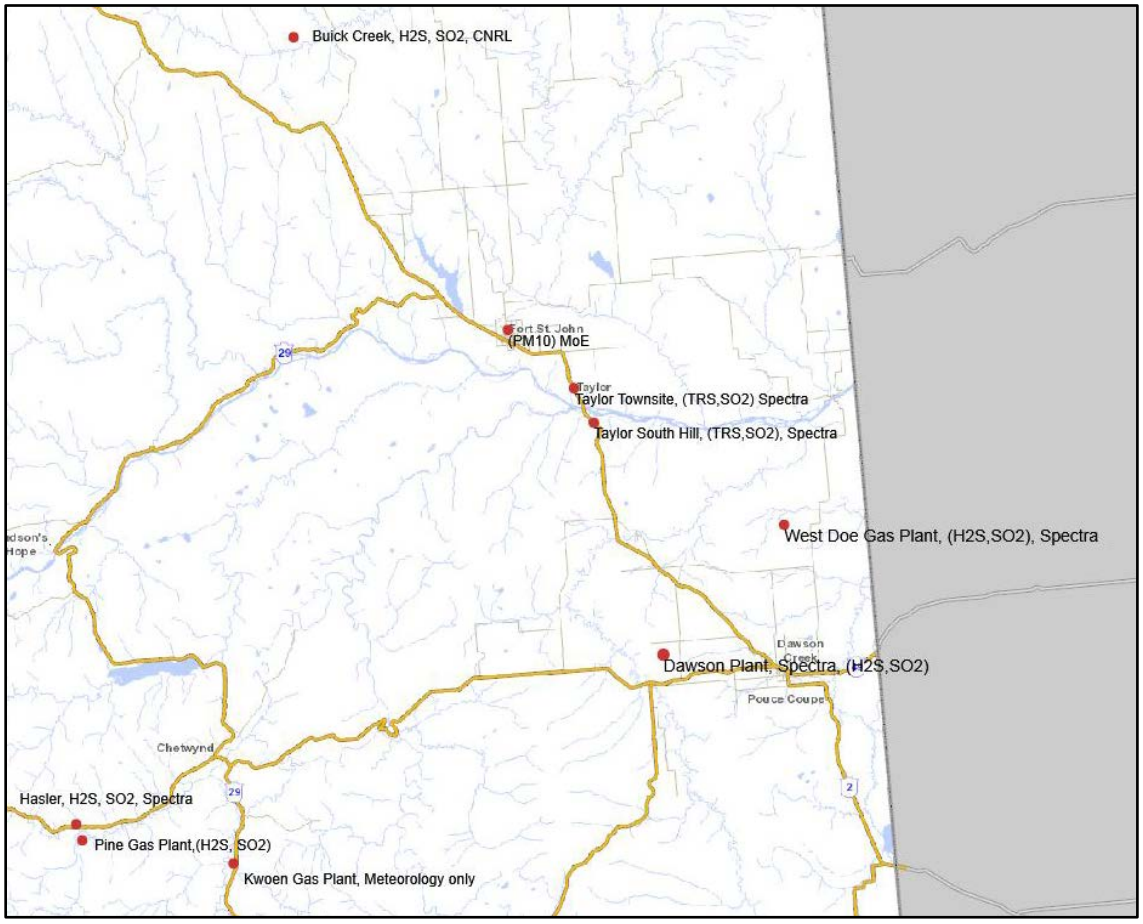


**Figure 2 Hourly monitoring sites in the NE B.C. Air Quality Monitoring Network as of November, 2013. Pollutant concentrations measured by this network appear in real time on the website BCAirQuality.ca. The exceptions are Buick Creek, West Doe Gas Plant and Dawson Plant that are operated by industry. Historical data from 1992-2013 are also available to the public.**

## Approach to Siting Air Quality Monitors

Identification of new monitoring sites was based on generally accepted scientific principles. Throughout North America , air quality monitoring sites are usually located in urban or suburban locations since total human exposure to pollutants is greater in communities with higher population densities (Committee on Air Quality Management in the United States 2004). Therefore, since much of NE BC is rural and sparsely populated, additional approaches were required. Three systematic approaches have been suggested by the EPA for identifying where monitoring should occur (U.S. EPA, 2013):

1. Use existing (or new) ambient air quality data to identify locations where monitors could fill in information gaps
2. Locate monitors near sources of higher emissions, as determined by emission inventories.
3. Use dispersion modelling to estimate how emissions could spread and transform with time.

Additional considerations include topographic features and meteorology since pollutants can be trapped in river valleys or natural depressions where wind speeds are generally lower and strong surface-based atmospheric inversions are intensified, particularly in winter. Demographic factors were also considered, particularly population density and land use patterns, since they provided insight into the degree of human exposure to pollutants (Stern, 1968). Monitoring gaps also were considered when developing the monitoring plan, particularly areas with no air quality data in proximity to emission sources or populated areas.

The following sections outline how these approaches were, and will continue to be, used to identify new candidate monitor locations.

## Ambient Air Quality Data Analysis Based on Fixed Site Monitors

Air quality analysis informed the siting of the new monitors by identifying areas that historically had elevated concentrations but currently have no monitors, represent air quality data gaps and/or have experienced population increases. In December 2013, the NE BC air quality network was comprised of eight hourly and about seventeen passive fixed air quality monitoring sites. These were near Fort St. John, Dawson Creek and Chetwynd (Figure 2 and Table 1). Some continuous monitoring sites have been operating in NE BC for nineteen years, measuring hourly ambient concentrations of sulphur dioxide (SO2), hydrogen sulphide (H2S), total reduced sulphur (TRS) and/or particulate matter less than 10 microns in diameter (PM10). The BCAirQuality.ca website provides current air quality data, basic data analysis and up to two months of time series graphs for most stations in Table 1. Data from all stations on BCAirQuality.ca are quality controlled and archived in databases accessible to the public.

**Table 1 NE BC Air Quality Monitoring Network – November 2013**

| Site | Operator | Type | Pollutants measured | Reported on BCAirQuality website in 2013 |
|---|---|---|---|---|
| Buick Creek | CNRL | Hourly | H2S, SO2 | No |
| Dawson Plant | Spectra | Hourly | H2S, SO2 | No |
| Fort St. John | MoE | Hourly | PM10 | Yes |
| Hasler | Spectra | Hourly | H2S, SO2 | Yes |
| Kwoen Gas Plant | Spectra | Hourly | Meteorology only | Yes |
| Pine Gas Plant | Spectra | Hourly | H2S, SO2 | Yes |
| Taylor South Hill | Spectra | Hourly | TRS, SO2 | Yes |
| Taylor Townsite | Spectra | Hourly | TRS, SO2 | Yes |
| West Doe Gas Plant | Spectra | Hourly | H2S, SO2 | No |

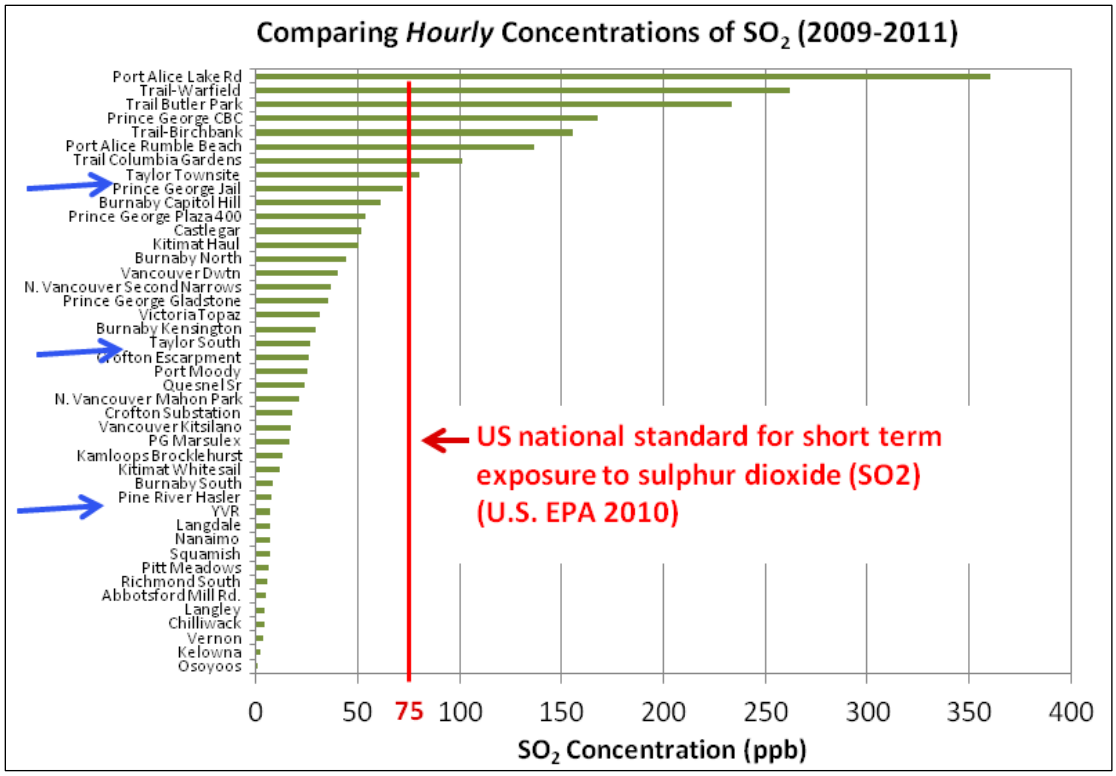


**Figure 3 Extreme values of hourly concentrations of SO2 at 43 BC monitoring sites. Blue arrows indicate the Taylor, Taylor South and Pine River Hasler monitoring results. Data is the 99th percentile of one-hour maximum concentration, averaged over three consecutive years.**

Air quality analysis focused on the eastern section of the study area where recent gas exploration and other activity has been occurring. SO2 concentrations at the two monitors in the Taylor area were analyzed based on the SO2 hourly 99th percentile over the period 2009-2011(Figure 3). SO2 concentrations at Taylor Townsite slightly exceeding the US National standard for short term exposure to SO2 (the vertical red line in Figure 3: 75 parts per billion[1]) in the period and were the 8th highest average concentration of SO2 of all BC monitoring sites. Taylor South and Pine River Hasler were well within the EPA standard, experiencing the 20th and 31st highest average concentrations respectively.

Average annual SO2 concentrations have fallen at the two Taylor monitoring sites since 2010, while concentrations at the Pine River Hasler site have remained very low since monitoring began in 2000 (Figure 4). Dispersion modelling in 1996 predicted that ambient concentrations of SO2 in the area around the gas plant would be highest along the hills south of the Peace River, but subsequent monitoring there did not support this. Further analysis suggested that concentrations would likely be highest to the east of Taylor (BC MoE 2013).

[1] The SO2 hourly standard for BC was developed in the 1970s and is much less stringent than the current United States EPA standard. The BC standard is in the process of being updated.

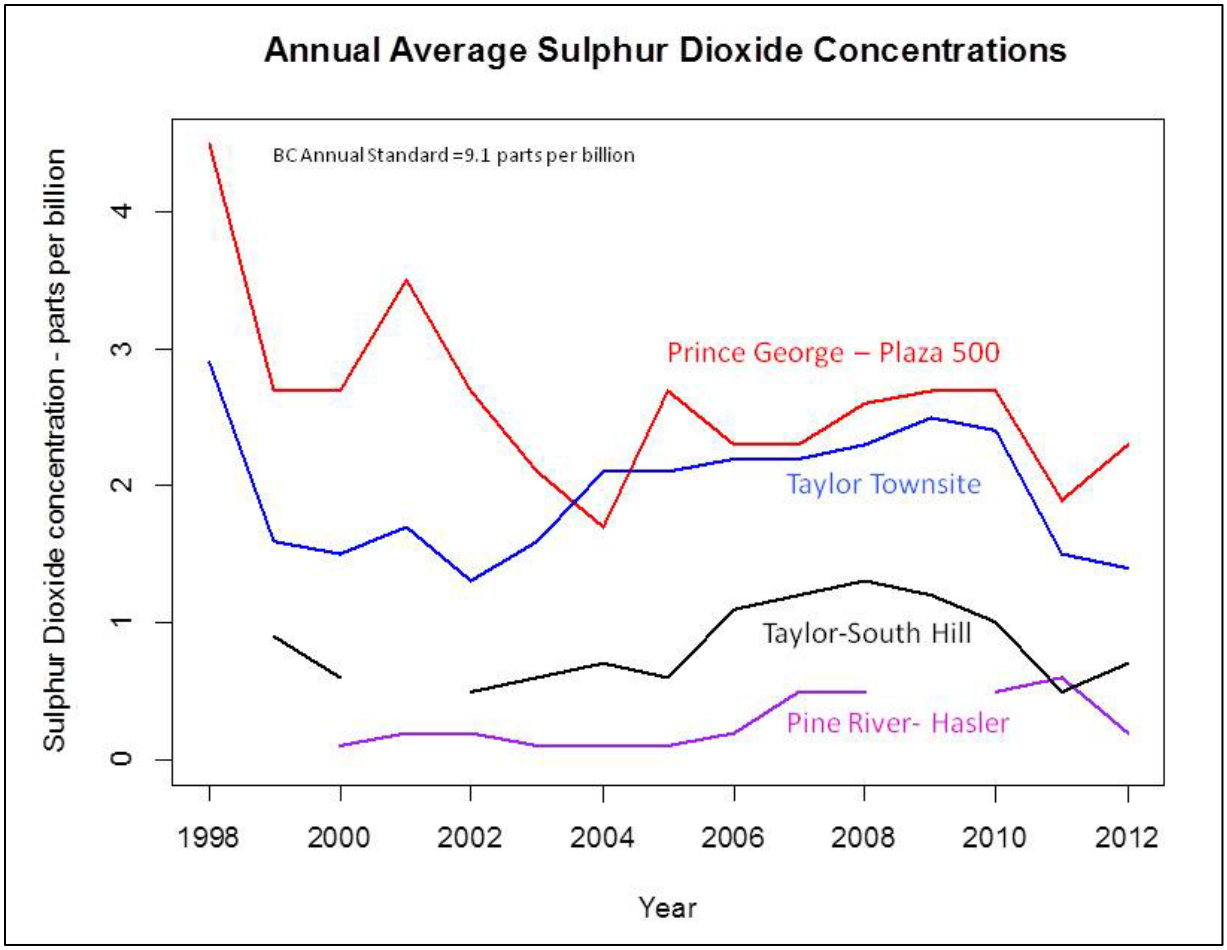


**Figure 4 Annual average SO2 ambient concentrations for three sites in NE BC and for Prince George. Concentrations have fallen rapidly since 2010 at Taylor Townsite (near the gas plant) and Taylor South Hill.**

## Ambient Air Quality Data Analysis Based on Mobile Monitors

Additional hourly ambient air quality data was obtained in 2010 and 2011 using the BC MoE mobile air monitoring laboratory (MAML) in the south Peace. The MAML offers a flexible and cost-effective way to monitor air quality in communities that do not have fixed air monitoring stations. The MAML measured hourly concentrations of SO2, TRS, NO2, CO, ozone and particulate matter for approximately 25 days each in 2010 in the communities of Tomslake, Groundbirch, Rolla, Farmington and, in 2011, Kelly Lake where no data previously existed. Concentrations of TRS and SO2 were all below one-hour BC objectives[2]. Table 2 gives maximum one hour concentrations of both pollutants and shows that TRS approached these objectives (7 µg/m3 ) during the monitoring period (BC MoE 2011a and 2011b).

[2] Level A one hour objectives in BC are concentrations that should not be exceeded. They are 7 µg/m3 (micrograms per cubic metre) for TRS and 450 µg/m3 for SO2.

**Table 2 Maximum one hour concentrations of TRS (total reduced sulfur) and SO2 (sulphur dioxide) measured at MAML sites in 2010 and 2011. All sites remained below objectives. Level A objectives in British Columbia are 7 µg/m3 for TRS and 450 µg/m3 for SO2. TRS was highest at Groundbirch; SO2 was highest at Kelly Lake. TRS is measured as H2S.**

| MAML site | TRS (µg/m3) | SO2 (µg/m3) |
|---|---|---|
| Farmington (2010) | 2.1 | 6.1 |
| Groundbirch (2010) | 5.5 | 9.5 |
| Kelly Lake (2011) | 1.2 | 15.8 |
| Rolla (2010) | 1.5 | 6.1 |
| Tomslake (2010) | 3.2 | 6.9 |

Ambient air quality data obtained by industry includes both hourly and passive monitors in the south Peace. Despite a number of attempts, MoE has been not yet been successful in obtaining significant amounts of ambient air quality data from industry to aid in the identification of future monitoring sites. MoE has therefore entered into a contract with the University of Northern British Columbia to find and acquire these data. The results of the contract will be available in March, 2014.

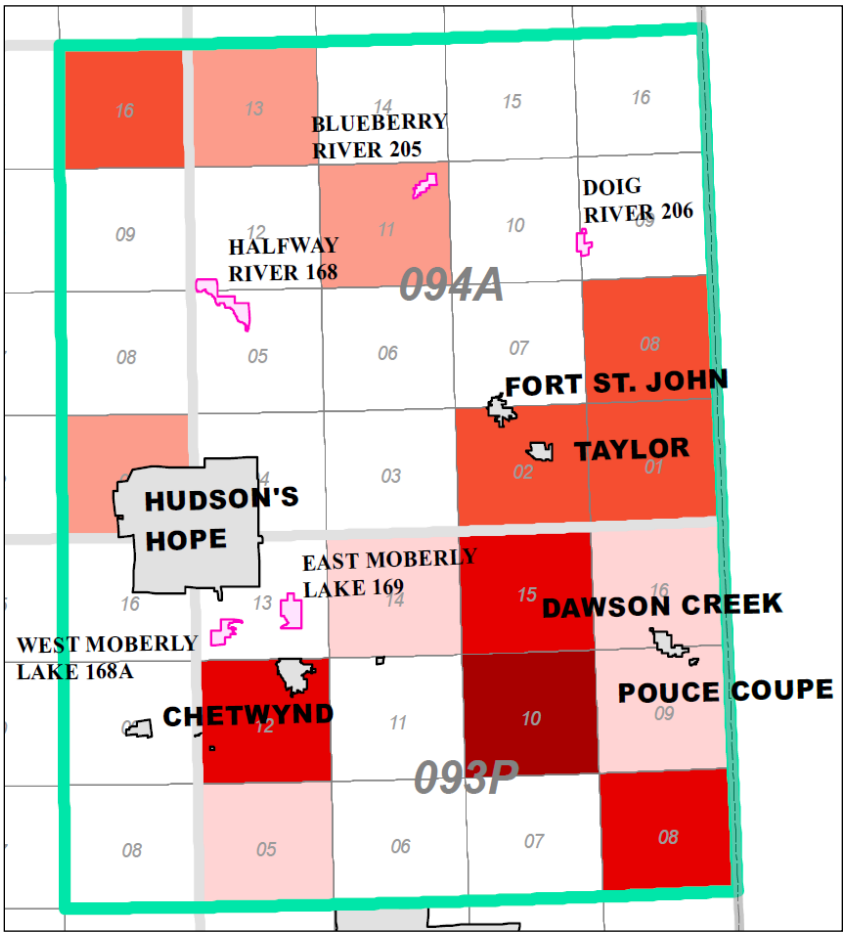


**Figure 5 Gridded emission inventory for NO2 in the south Peace. Darker grid squares indicate areas of higher emission rates. For example, the highest emission rate (1.6358 - 2.7161 tonnes/km$^2$ of NO2 per annum ) is indicated by grid square #10 (the darkest square) to the southwest of Dawson Creek. Information courtesy of BC Ministry of Health**

## Emissions Inventory

A gridded emission inventory prepared by the BC Ministry of Health's team working on the HHRA project was used to estimate pollutant emissions and the density of facilities from the oil and gas sector in the south Peace. Figure 5 is an example of one of these gridded maps. Tables 3 and 4 summarize the pollutant emission rates and the density of oil and gas facilities estimated from these maps.

Appendix 3 provides a full list of the pollutants, facilities and other information provided by the HHRA to MoE.

**Table 3 Rate of emissions of three pollutants related to the oil and gas industry based on the HHRA gridded emission inventory. Information from HHRA**

| Pollutant | Moderate emission rate | High emission rate |
|---|---|---|
| NO2 | Fort St. John and northeast of Fort St. John; Dawson Creek and South of Dawson Creek; Chetwynd | Southwest of Dawson Creek |
| SO2 | Taylor, West of Dawson Creek | Chetwynd |
| VOC | West of Dawson Creek; Taylor; Fort St. John | Chetwynd |

**Table 4 Density of batteries, gas plants and other oil and gas facilities based on gridded emission inventory. Information from HHRA.**

| Facilities | Moderate density | High density |
|---|---|---|
| Batteries | Fort St. John; | North, NW and East of Fort St. John ; Doig River; Blueberry; |
| Gas Plants | South of Dawson Creek; | Fort St. John; Taylor and east; West of Dawson Creek and Pouce Coupe |
| Sour gas Pipelines | Taylor; South of Dawson Creek, South and West of Ft. St. John | Fort St. John; Taylor and northwest to Blueberry; Dawson Creek, Doig |
| All Facilities | Taylor | Fort St. John |

## Modeling Dispersion of Air Pollutants

Predictive air pollutant dispersion modelling will be part of the Ministry of HHRA in 2014, the results of which will be made available to MoE for selected emission scenarios to identify the pollutants that may be of high enough concentration to be of potential concern to human health in NE BC. Estimates of exposure will be calculated for people of different ages and different health status in the study area. These modelling results will help identify areas that potentially may have high concentrations in the future and therefore could be candidate locations for future monitoring sites.

## Topography, Meteorology and Demographics

During stable atmospheric conditions, the lack of significant topographical barriers to wind flow in the prairie landscape of NE BC results in higher horizontal dispersion, and therefore lower concentrations, of pollutants compared to valley landscapes that can trap air pollutants near the surface. Therefore, river

valleys or significant depressions were priority considerations for monitoring sites. Also, a higher level of human exposure to pollutants would occur more frequently in more densely populated areas

Other criteria considered included the distance to existing air quality monitors, the interest of the local community in hosting and protecting a monitor, vehicle access to the site for monitor maintenance and availability of power and other utilities.

## Stakeholder Input to Siting Monitors

An Advisory Group (initially called an Interim Air Monitoring Working Group) was involved to provide additional input into possible site locations. Stakeholders included representatives of the Peace River Regional District, the oil and gas industry, the Cattlemen's Association, the BC Grain Producers Association and the Treaty 8 Tribal Association. The Advisory Group met five times between December 2012 and June 2013. This included a face to face meeting of the Advisory Group in Fort St. John on March 26, 2013. The key advice from stakeholders was to consider locating new monitoring in:

a) The most populated areas
b) Areas with the highest possible concentrations
c) Areas of relatively high long term population exposure

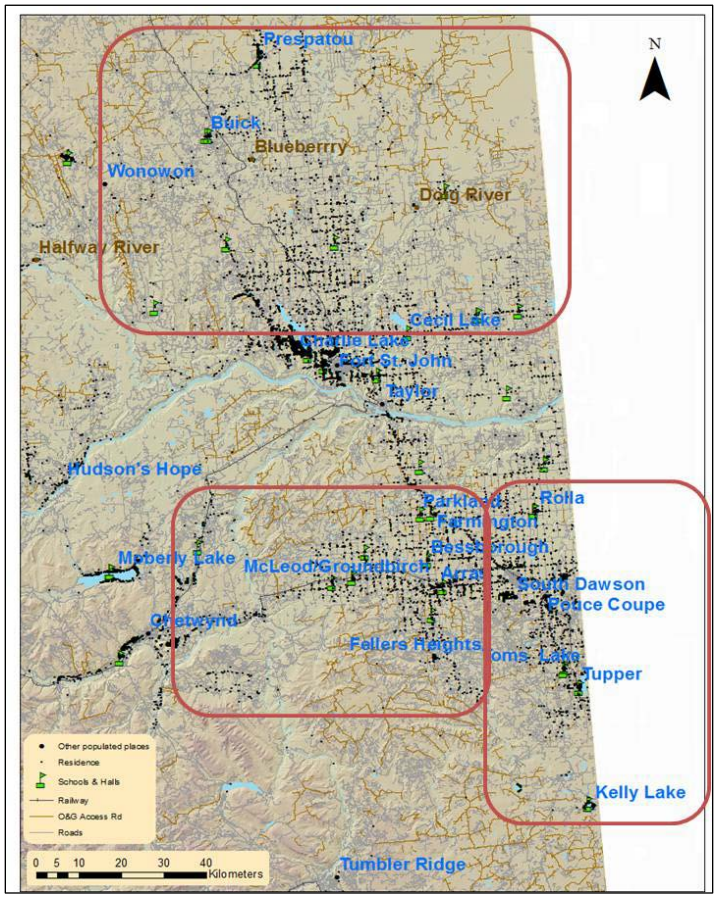


**Figure 6 Three broad regions were investigated for suitable monitoring sites: North, Southwest and Southeast. Dots on the map indicate residences and other population places that were used as an estimate of population density.**

## Survey of candidate monitor sites

MoE identified three general regions (northern, southwest and southeast regions) in the south Peace to identify new sites based on the above considerations (Figure 6). Two MoE staff (Gail Millar and Chris Marsh) visited a number of locations in these areas during the week of April 22, 2013 to assess their suitability for monitoring locations (Millar 2013).

### Northern Region

Sites considered in the northern region were Blueberry River First nation, Doig First Nation, Buick and Cecil Lake.

- Blueberry River First Nation: The community has a relatively large population (456), is close to high densities of batteries and sour gas pipelines and is in a broad river valley where pollutants could concentrate in stagnant conditions. However, a meteorological tower and a continuous air quality monitor measuring H2S (but not SO2) is already operating at the east end of the community and so was dropped from the list of candidate stations. However, additional effort will be made to acquire historical air quality and meteorological data from CNRL, the monitor operator.
- Doig River First Nation: The community has a population of 280 and is located in a flat-bottomed valley that could concentrate pollutants under clear and stagnant conditions. Discussions with local residents indicated odours are most frequent during the winter under such conditions (Millar 2013). An ideal site was identified near the Doig River First Nation Cultural Centre in a flat area within the community in the valley bottom.
- Buick: This is a small community to the west of Blueberry, in a flat area above the surrounding river valleys so there will be a reduced chance of measuring elevated concentrations, even during stagnant conditions. Density of oil and gas activity around the community is lower than around Doig or Blueberry.
- Cecil Lake: This community has a population of 500, but a low population density. Significant oil and gas activity occurs in the area but the topography is very flat, so the threat of pooling of pollutants in a community in a valley location is low (Figure 7). A community hall could serve as a monitoring site.

**Figure 7 Cecil Lake Community Hall. The area is sparsely populated and in a flat, level landscape.**

Of the four sites visited in the north, the Doig River First Nation site in a flat-bottomed valley was identified as the most ideal. Potential emission sources within 5 km of the Doig River site include 5 batteries, 1 battery/compressor site, 2 compressor stations, 1 gathering point, 5 test facilities and 36 well sites (Millar G, Taylor, Weick 2013). The Doig River First Nation also expressed a strong interest in having a monitor in their community. Anecdotal evidence of TRS odours has raised concerns among residents of the community concerning exposure to all types of contaminants from oil and gas activities on or near their land and hunting grounds (Millar G, personal communication 2014).

## Southwest Region

In the southwest region, the team visited potential sites in the vicinity of McLeod School/ Groundbirch, Arras and Farmington/Parkland.

- McLeod School: This is located on in a flat area on highway 97 about 30 km east of Chetwynd with a sparse population and no air quality monitor in the vicinity. There is a high density of facilities to the west. This site was not considered as there was a concern about siting monitors at schools.
- Arras: This is a more heavily treed community on highway 97 east of McLeod School with a low density population. It is relatively distant from oil and gas activity.
- Farmington/Parkland: This is a sparsely populated area with gas plants and a number of facilities with 1% to 5% H2S to the east and south of the Parkland Community Hall (Figure 8). This is a flat, level area and therefore less prone to pooling of pollutants. However, it is relatively close to a gas plant.

**Figure 8 Rural area around Parkland Community Hall in Farmington**

Of the three potential sites, the Parkland Community Hall was selected as the best candidate for the southwest region. The Farmington Community Association was interested in having a monitor on the property. Within 5 km of the Hall there is a battery, 2 compressor and central dehydrator stations, 3 gas sales meters, 23 test facilities, 42 waste disposal facilities and 41 well sites (Millar G, Taylor, Weick 2013).

### Southeast Region

Sites visited in the southeast region included Rolla, South Dawson, Pouce Coupe, Tomslake, Tupper and Kelly Lake. Fewer population centres in the southeast region made this a more challenging area to locate monitors.

- Rolla: Significant industrial facilities surround Rolla. While potential monitoring sites exist in the community, Spectra Energy already operates a continuous monitor 10 km to the north.
- South Dawson: Potential monitoring sites exist to the southwest of Pouce Coupe but the density of industrial facilities is relatively low.
- Tomslake: The MoE mobile laboratory was previously stationed for a short time near the Tomslake community hall, though the site was not the most favourable. A new site 2 km to the north of the community hall was found to be more suitable.

The site near Tomslake was chosen as the most suitable of the three for Phase 1 monitoring.

## Siting of the Three New Monitors

Based on the work outlined above, three sites were selected for monitoring of H2S / TRS and SO2. Table 5 summarizes these sites along with a summary of the rationale for deciding on these locations.

**Table 5 Parkland Community Hall, Tomslake and Doig River Cultural Centre are the three sites selected for expansion of the NE BC monitoring network**

| Site | Lat/long | Monitored values | Rationale for monitor site |
|---|---|---|---|
| **Parkland Community Hall** | 55.91330N 120.53146W | TRS, SO2, Wind, Temperature, RH | No known existing ambient monitors currently in area. Moderate emissions in area of SO2, NO2 and VOCs. 29 test facilities and other industrial activity plus numerous well sites within 5 km. Battery in vicinity. Dense sour gas pipelines and moderate density of gas plants in vicinity. Willing host. Small rural population. |
| **Tomslake** | 55.59015N 120.08583W | TRS, SO2, Wind, Temperature, RH | No known existing ambient monitors currently in area. Moderate SO2 emissions to the south. Dense sour gas pipelines and moderately dense gas plants to south. Compressor stations, 98 test facilities, 93 waste disposal facilities and 150 well sites within 5 km. Small rural population. |
| **Doig River Cultural Centre** | 56.57808N 120.49748W | TRS, SO2, Wind, Temperature, RH | No known existing ambient monitoring currently in the area. Willing First Nation community, population 280. Narrow, shallow river valley that could concentrate pollutants in community under stable, stagnant conditions. Moderate battery density in area, with 14 facilities plus numerous well sites within 5 km. High density of sour gas pipelines. |

**Figure 9 The three new ambient air quality stations installed in northeast BC. From left to right, Doig River station, Farmington station and Tomslake station. Each monitoring station was installed by the BC Ministry of Environment in December 2013 and January 2014 and contains instruments that measure concentrations of sulphur dioxide and total reduced sulfur. Both of these pollutants are associated with oil and gas development. Attached to each station is a ten metre high tower equipped with instruments measuring meteorological parameters including temperature, wind speed and direction.**

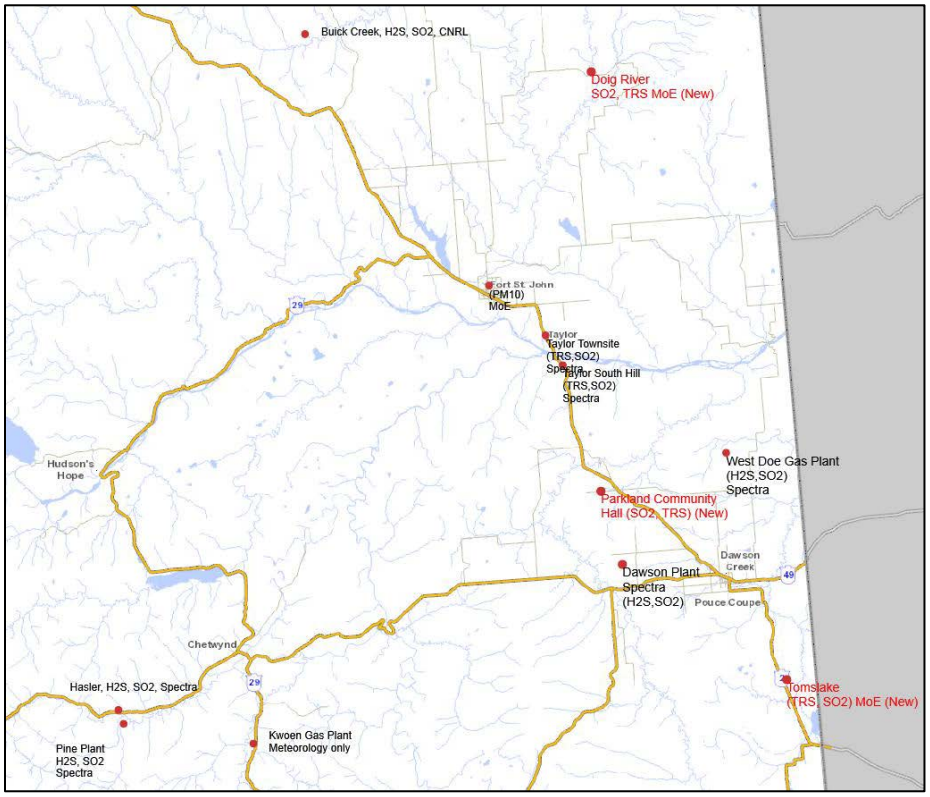


**Figure 10 Air quality monitoring network including the three new stations (in red): Doig River, Farmington (at the Parkland Community Hall) and Tomslake**

Figure 10 shows the present configuration of the NE BC monitoring site, including the three new monitoring sites in red. These three sites were installed in December 2013 and will operate for at least one year when they may be moved to other sites in NE BC, if appropriate.

## References


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# Glossary

| | |
|---|---|
| **AQHI** | Air Quality Health Index |
| **AQMS** | Air Quality Management System |
| **BC OGC** | BC Oil and Gas Commission |
| **CAAQS** | Canadian Ambient Air Quality Standards |
| **HHRA** | Human Health Risk Assessment |
| **MAML** | Mobile Air Monitoring Laboratory |
| **MoE** | BC Ministry of Environment |
| **MoH** | BC Ministry of Health |
| **NEOGHAC** | NE Oil and Gas Health Advisory Committee |
| **NO2** | Nitrogen dioxide |
| **NOx** | Nitrogen oxides |
| **NPRI** | National Pollutant Release Inventory. This is Canada's legislated, publicly-accessible inventory of pollutant releases |
| **PM10** | Particulate matter, up to 10 microns (millionths of a metre) in diameter |
| **PM2.5** | Particulate matter, up to 2.5 microns (millionths of a metre) in diameter |
| **SO2** | sulphur dioxide |
| **SOx** | Sulphur oxides |

# Appendix 1 News Release

For Immediate Release Ministry of Environment
2012ENV0035-000810
June 6, 2012

## New air monitoring program responds to residents' concerns

DAWSON CREEK — The Province and partners from the oil and gas industry are embarking on a three-year air monitoring and community engagement program in the Northeast, Environment Minister Terry Lake announced today.

Following on the heels of phase one of the oil and gas health assessment, the air monitoring program is in response to growth in the oil and gas industry and concerns from residents over its potential impact on air quality.

Funding for the first year is more than $550,000 with contributions from government, the BC Oil and Gas Commission and members of the Canadian Association of Petroleum Producers. To date, the following companies will be involved in the program: ARC Resources Ltd., ConocoPhillips Canada, Canadian Natural Resources Limited, Devon Energy Corporation, Encana, Imperial Oil Limited, Penn West, Progress Energy, Shell Canada, Spectra Energy, Suncor Energy and Talisman Energy Inc.

During the first year of the program, actions will focus on:

- Starting monitoring immediately at two priority rural locations in the South Peace. This will draw from the experience of Alberta's Sentinel Monitoring and the work of Alberta's Peace AirShed Zone Association (PAZA).
- Funding a co-ordinator to establish a locally based air-monitoring working group to review air quality data currently collected in the Northeast and determine the scope, plan and design of the broader network requirements.
- Making air quality data easily accessible to the public to help citizens make daily decisions about air quality and their health requirements.

Initial monitoring will focus on hydrogen sulphide (H2S), sulphur dioxide (SO2) and volatile organic compounds (VOCs) traditionally associated with oil and gas development. In larger communities, where a wide variety of emission sources are seen, there will be a more broad-based monitoring suite of criteria for air contaminants such as PM2.5 (particulate matter), Ozone, oxides of nitrogen (NOx) and SO2.

Beyond the initial year, the geographic scope and characteristics of the monitoring network will be determined by the emissions inventory and the local air monitoring working group.

# Appendix 2 Advisory Group Terms of Reference

## NORTHEAST REGION AIR QUALITY MONITORING PROJECT

## February 2013

### 1) SCOPE

The Advisory Group (hereafter referred to as the "Group") will provide advice to British Columbia's Provincial Government in Phase 1 of the development of a monitoring network in the northeast region of British Columbia. The initial purpose of the monitoring network is to collect ambient air quality data in response to concerns expressed about the potential influence of ongoing oil and gas sector operations on air quality in the region. It is expected that the ambient air quality data collected through this initiative may be used to facilitate future studies however it is outside of the expertise of this group to provide interpretation of data in regards to human health or environmental effects.

### 2) TERM OF SERVICE

The Group will be constituted through Phase 1 of the project, ending in May 2013.

### 3) MEMBER RESPONSIBILITIES

- Speak on their own behalf or from the perspective of his/her respective organization or community.
- Actively participate in Group meetings and support discussion, knowledge sharing and direction setting.
- Work collaboratively towards the goals/objectives of the Group.
- Participate in transparent decision making in support of identified priorities, resolving issues when necessary and encourage other members to share their insights.
- Act as a liaison between the Group and his/her own member organization, and advise the Group of strategic input from his/her organization's executive if and when appropriate.

### 4) GOVERNMENT RESPONSIBILITIES

Representatives of government agencies will be *ex-officio* members of the Group. They will participate in discussions, provide expertise, data and other support required by the Group to fulfill its mandate but do not have voting privileges.

### 5) FUNCTIONS

- The Group will provide advice and information relevant to the:

- geographical scope of the project;
- criteria for the siting of monitors;
- pollutants to be monitored; and
- sharing information with the public.

## 6) MEMBERSHIP

The membership of the Group will be as follows:

| | |
|---|---|
| • Peace River Regional District | 4 members |
| • Industry Representatives | 3 members |
| • NE Health Advisory Committee | 2 members |
| • Peace River Regional Cattlemen's Association | 1 member |
| • BC Grain Producers Association | 1 member |
| • Treaty 8 Tribal Association | 1 member |
| • Citizen Representative | 2 member |

Once the initial membership is established, other representatives may be appointed as required.

**Participating Government Agencies:**

- Ministry of Environment
- Ministry of Energy and Mines
- Oil and Gas Commission
- Ministry of Agriculture
- Ministry of Health
- Northern Health Authority

## 7) FACILITATOR

- A representative from the BC MOE will facilitate meetings.

## 8) MEETINGS

- The Ministry of Environment will convene meetings and conference calls.
- It is anticipated that most meetings will be by teleconference.
- Attendance at meetings is restricted to Committee members, Government Representatives, their appointed alternates, and invited guests.

## 9) GOVERNANCE

- Decisions will be made by consensus.
- Recommendations will be submitted to the Assistant Deputy Ministers of the participating Ministries, the Chief Operating Officer of the Oil and Gas Commission,

and the Regional Director of Public Health of the Northern Health Authority for consideration and response.

## 10) RESOURCES AND BUDGET

- The Ministry of Environment will arrange meeting space and provide food/beverages for the Group meetings as required. Travel, meals and accommodation to in-person meetings will be the responsibility of the members' employers if applicable. On request, the Provincial Government will reimburse members for travel and other out of pocket expenses related to their participation in the Group

## 11) SECRETARIAT

- The Ministry of Environment will provide secretarial and facilitator services including the drafting and dissemination of meeting minutes and other materials.

## 12) REVIEW OF THE TERMS OF REFERENCE

- The Terms of Reference will be reviewed and revised or confirmed by the Group as necessary.

# Appendix 3 Table of Emission Inventory and Facility Information provided by HHRA

## Facilities and Emission Inventory Information provided in GIS form

Gas Pipelines - Sweet
Gas Pipelines - Sour
Other Pipelines - Sweet
Other Pipelines - Sour
Batteries (Operating)
Gas Plants (Operating)
Other Facilities
Wells - Bottom Hole
Wells - Surface Hole
Density: PM 10 Emissions
Density: PM 2.5 Emissions
Density: NO2 Emissions
Density: SO2 Emissions
Density: CO Emissions
Density: VOCs Emissions
Density: Pipeline - Sweet
Density: Pipeline - Sour
Density: Wells - Surface Hole
Density: Wells - Bottom Hole
Density: Batteries
Density: Gas Plants
Density: Facilities (All)
Density: Population
Urban/Indian Lands
Proposed Studies Area
Legends