

REPORT

AIR QUALITY ASSESSMENT OF AIR EMISSIONS ASSOCIATED WITH ASPHALT PLANT OPERATIONS IN THE SPY HILL AREA OF NORTHWEST CALGARY

ALBERTA TRANSPORTATION

Prepared by

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Executive Summary

Sand and gravel operations are being conducted by the BLV Group in the Spy Hill area of Northwest Calgary near sub-divisions of Rocky Ridge and Royal Oak. These operations occasionally entail asphalt manufacturing. This report presents the results of an air quality analyses of emissions associated with operations of an asphalt plant located within the BLV Group's sand and gravel excavation area.

The analyses were based on the results of a survey which resulted in measurements of asphalt plant stack emissions relating to a wide range of air pollutants. These included sulphur dioxide (SO₂), carbon monoxide (CO) particulates, oxides of nitrogen (NO_x), benzene, toluene, and xylene. The survey was based on three tests conducted by Protocol2 Air Sciences Inc. on 04, 05 September 2008.

Maximum ground-level concentrations for each of the emitted pollutants were estimated using a plume dispersion model developed by the United States Environmental Protection Agency (U.S. EPA). The model, recommended by Alberta Environment, is universally known, widely accepted and well documented. It was applied with five years of meteorological data collected at the Calgary International Airport. Results of the model calculations were compared to ambient air quality criteria established by regulatory agencies in Alberta, and Texas. The criteria provide adequate protection against adverse effects on soil, water, vegetation, materials, animals, visibility, personal comfort, and wellbeing.

The assessment showed that all predicted ground-level pollutant concentrations were well below maximum objective values established by the regulatory agencies. This means that their emissions should not have any adverse environmental effects.



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1.0 INTRODUCTION

Sand and gravel operations are being conducted by Alberta Infrastructure and Transportation in the Spy Hill area of Northwest Calgary near the sub-divisions of Rocky Ridge and Royal Oak. The gravel pit area is known as the Stoney Trail Aggregate Resource (STAR). The department has contracted with the BLV group for the overall management of the STAR pit, and also allows its paving contractors access to the pit to access aggregates and to produce asphalt concrete pavement. This report presents results of an air quality analysis of emissions associated with the operations of an asphalt plant within the STAR pit area. The asphalt plant tested is owned and operated by South Rock Ltd. They were contracted for the paving of provincial highway projects by Alberta Transportation and Utilities. Specifically, the plant is being used to produce asphalt concrete pavement, for the paving of the northwest portion of Stoney Trail in Calgary.

The asphalt plant is a source of a variety of air emissions including particulate matter (PM), oxides of nitrogen (NO_x), nitrogen dioxide (NO₂), carbon monoxide (CO), sulphur dioxide (SO₂) and volatile organic compounds (VOCs). The VOCs comprise a range of different gases, including benzene, and xylene.

This report presents a quantitative assessment of:

- particulate emissions from the asphalt plant as they relate to Alberta's Code of Practice for asphalt plants and
- maximum ground-level concentrations of air emissions as they relate to regulatory objectives

This report assesses potential air quality impacts associated with emissions from the stack which services the Plant. The evaluation procedure involved measurement of stack emissions, and subsequent estimations of their ground-level impacts through the use of a plume dispersion model. Estimated maximum ground-level concentrations of the emitted pollutants were then compared to regulatory guidelines to determine their acceptability.

The purpose of the assessment was to determine if the asphalt stack emissions might result in objectionable impacts to local residents with respect to odours or health effects.

2.0 EMISSION STANDARDS/AMBIENT AIR QUALITY OBJECTIVES

This assessment of air quality impact associated with asphalt plant emissions has relied upon standards, objectives, guidelines, and criteria formulated and accepted by regulatory agencies.

Alberta has emission requirements for asphalt paving plants as they relate to particulates. British Columbia has emission standards for asphalt plants relating to VOCs and CO.



Maximum ground-level concentrations of criteria pollutants (e.g., SO₂, NO₂, CO, and PM_{2.5}) are governed by provincial (Alberta Environment (AENV 2006)) and federal objectives (Health Canada 2005). There are substances other than criteria pollutants such as specific VOCs which are also potentially toxic.

Alberta Ambient Air Quality Objectives (AAAQO) exist for 45 toxic emissions (AENV 2008, Internet site). Other regulatory limits, such as the Texas Commission on Environmental Quality Environmental (TCEQ) Effects Screening Levels (ESL), are also available for the assessment of a wide range of toxic pollutants (TCEQ 2003, Internet Site) and are often used to complement the AENV AAAQO.

2.1 Emission Standards

The Code of Practice for Asphalt Paving Plants for Alberta (ANEV 2007) requires that concentrations of particulates in the stack effluent not exceed 0.2 grams per kg of effluent (0.2g/kg). There are no other quantitative requirements for air emissions.

British Columbia Ministry of the Environment (1997) has emission standards for VOCs and CO for asphalt paving plants of 0.0.06 and 0.5g/m³ of effluent respectively. The effluent is calculated as being at 16 % O₂, at 20°C and 760 mm Hg.

2.2 Ambient Air Quality Objectives for Criteria Air Pollutants

Table 1 describes the recommended objectives, and their general intent, for criteria pollutants used by Environment Canada for the categories desirable, acceptable, and tolerable (Furmanczyk 1994). The desirable objectives are the most stringent. Table 2 shows the current AAAQO (AENV 2008) for SO₂, NO₂, and CO and the comparable National Ambient Air Quality Objectives (NAAQO). Most of the provincial objectives correspond to the national desirable category.

Table 1: National Ambient Air Quality Objectives

Objective Description	
Maximum desirable (most stringent)	Long-term goal for air quality. Provides a basis for anti-degradation policy for unpolluted parts of the country and for continuing development of control technology.
Maximum acceptable	Provides adequate protection against adverse effects on soil, water, vegetation, materials, animals, visibility, personal comfort, and wellbeing.
Maximum tolerable (least stringent)	Indicates that appropriate abatement strategies are required without delay to avoid further deterioration to air quality to protect the health of the general population.



Table 2: National and Alberta Ambient Air Quality Objectives for CO, NO₂, and SO₂

Pollutant	AAAQO ($\mu\text{g m}^{-3}$)	NAAQO ($\mu\text{g m}^{-3}$)	
		Desirable Objective	Acceptable Objective
Carbon Monoxide			
1-hour Maximum	15,000	15,000	34,600
8-hour Maximum	6,000	6,000	12,700
Nitrogen Dioxide			
1-hour Maximum	400	–	400
24-hour Maximum	200	–	200
Annual Maximum	60	60	100
Sulphur Dioxide			
1-hour Maximum	450	450	900
24-hour Maximum	150	150	300
Annual Maximum	30	30	60

NOTES:

- ¹ Concentrations given in $\mu\text{g m}^{-3}$ at 25°C, 101 kPa, dry basis.
 - ² AAAQO = Alberta Ambient Air Quality Objective.
 - ³ NAAQO = National Ambient Air Quality Objective.
- Not Available

Canada's long-term air quality management goal for fine particulate matter (PM_{2.5}) is to minimize the risks of this pollutant to human health and the environment. A Canadian Wide Standard (CWS) has been established for PM_{2.5} (Health Canada 2005). It represents a balance between the desire to achieve the best health and environmental protection possible in the relative near term, and the feasibility and costs of reducing pollutant emissions that contribute to elevated levels of particulate matter (PM) in the ambient air. As a basic requirement, jurisdictions will report on CWS achievement for population centers over 100,000. CWS achievement will be based on community-oriented monitoring sites (e.g., sites located where people live, work, and play) rather than at the expected maximum impact point for specific emission sources. The CWS for PM_{2.5} is presented in Table 3. It has recently been accepted as an AAAQO.

Table 3: Canada-Wide Standard and AAAQO for PM_{2.5}

Parameter	Canada-wide Standard (CWS)/AAAQO
PM _{2.5}	30 $\mu\text{g}/\text{m}^3$ averaged over a 24-hour period. Achievement will be based on the 98 th percentile ambient measurement annually, averaged over 3 consecutive years.

