TECHNICAL MEMORANDUM

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TO Graham Veale
BC Ministry of Environment

CC Derek Holmes (BURNCO)

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BURNCO AGGREGATE PROJECT: RESPONSE TO INFORMATION REQUEST MOE-051

1.0 INTRODUCTION

BURNCO Rock Products Ltd (BURNCO) and 0819042 B.C. Ltd. propose to develop the BURNCO Aggregate Project (the Project), which will include a sand and gravel pit, processing facility and marine barge load-out facility.

This memorandum provides a response to Information Request #MOE-051 from the Ministry of Environment during the working group review of BURNCO's Environmental Assessment Application under the BC Environmental Assessment Act. Information request #MOE -0515 is reiterated as follows:

> *"Section 2.1.3.2 Data Processing: The limited data sets (2 TSP samples and 1 Dustfall sample) are insufficient to determine, with any confidence, representative background metals concentrations and deposition rates. Also sampling occurred in November when particulate concentrations and any associated metals are likely to be low. Note also, earlier comment re. the validity of the frozen dustfall sample."*

Concerns regarding background dustfall readings were addressed in the Proponent's response to IR #MOE-050.

This memorandum focuses on establishing background metal concentrations using the site specific monitoring and in addition, data from the National Air Pollutant Surveillance (NAPS) network. Updated background metal concentration data were provided to the human health discipline team. The updated background metal concentrations plus project offsite concentrations were compared to human health air quality criteria for short-term and long-term inhalation. Comment is provided on how the use of the updated metals background affects the results of the human health inhalation risk assessment.

This memorandum references the following appendices of the EAC Application/EIS:

- Appendix 5.7-D: Air Quality and Meteorology Baseline Report (Golder 2015)
- Appendix 9.1-B: Air Screening (Golder 2016)

2.0 UPDATED BACKGROUND METAL CONCENTRATION

Background metal concentrations were measured, scaled and provided to the human health discipline to support their risk assessment. Background metal concentrations were measured onsite over two 24 hour sampling periods in November 2013 and scaled to 1 hour, 24 hour and annual averaging periods.

An updated method was developed to estimate 1 hour, 24 hour and annual metal concentrations in response to IR #MOE-051. The alternative method uses both the site specific data and available NAPS data for 2013, 2014, and 2015 to establish background metal concentrations.

Two NAPS stations within the Greater Vancouver area measure ambient metal concentrations:

- Rumble Street station (Station ID 100119), located 54 km southeast of the Project in the City of Burnaby (Burnaby)
- Eton and Madison Avenue station (Station ID 100137), located 46 km southeast of the Project in Burnaby

Given the proximity of the Eton and Madison Avenue NAPS station to industrial areas, data is expected to be influenced by local industrial sources and was therefore not considered when establishing Project background metal concentrations. Therefore, Rumble Street station was used to establish background metal concentrations. The Rumble Street station is located in an area influenced by anthropogenic emission sources (urban and industrial/commercial), therefore establishing background metal concentrations for the Project using this station is expected to result in higher ambient concentrations than those at the BURNCO Project location.

Table 1 summarizes the monitoring station location and monitoring frequency.

Table 1: Background Metal Concentration Monitoring Station

Monitoring Station	UTM Zone 10		Parameter	Frequency of Monitoring Data
	Easting (m)	Northing (m)		
Rumble Street	501,051	5,451,387	Metals	24-hour measurements every 3 days

UTM = Universal Transverse Mercator.

Background metal concentrations were established using data from the 2013, 2014 and 2015 calendar years. Three years of data were used to establish background concentrations since none of the 2013, 2014, and 2015 calendar years met the BC Modelling Guidelines percent completeness recommendations (BC MOE 2015).

Metals measured at the Rumble Street station were extracted from the particulate samples using dispersive X-ray fluorescence (EDXRF) and acid inductively-coupled plasma mass spectrometry (ICPMS). To establish the background concentration for individual metal species, the 98th percentile metal concentration from 2013 to 2015 from each extraction technique (dataset) was established, then the higher concentration from the two dataset was used..

For metals, the NAPS stations measured data over a 24-hour period and data measurements were non-continuous (every three days); to convert the data to 1-hour and annual periods the time correction method outlined in *Air Dispersion Modelling Guideline for Ontario* Section 4.4 (Ontario MoE 2009) was used. To establish the background concentration for all averaging periods for metal compounds the 98th percentile value for 24-hour

averaging from 2013 to 2015 was utilized and the method provided by Ontario MoE (2009) was used convert the 24-hour 98th percentile value to 1-hour and annual averaging periods.

The background concentrations (1-hour, 24-hour and annual) established using NAPS data were compared to the background metal concentrations used in the human health risk assessment within the Environmental Assessment Application (Golder 2015). Instances when NAPS data resulted in more conservative (higher) metal concentrations were identified, these concentrations are summarized in Table 2.

Table 2: NAPS Background Metal Concentrations Greater than Metal Concentrations Used in the Environmental Assessment Application

Contaminant	Background Concentration (µg/m³)		
	1-hour	24-hour	Annual
Aluminum (Al)	1.653	0.679	0.130
Antimony (Sb)	0.037	0.015	0.003
Barium (Ba)	0.083	0.034	0.006
Cadmium (Cd)	0.015	—	—
Copper (Cu)	0.032	—	—
Iron (Fe)	0.847	0.348	—
Manganese (Mn)	0.031	0.013	—
Strontium (Sr)	0.0145	—	—

Note: "—" averaging periods where NAPS background concentrations are less than those previously supplied.

µg/m³ = microgram per cubic meter.

The updated, more conservative (higher), metal background concentrations (Table 2) were provided to the human health team to update the human health air quality risk assessment.

3.0 HUMAN HEALTH AIR QUALITY RISK ASSESSMENT

3.1 Risk Assessment Approach

3.1.1 Short-Term Inhalation

As part of the short-term human health inhalation risk assessment screening process, updated 1-hour and 24-hour predicted concentrations of metals expected to be emitted by the Proposed Project were compared to selected 1-hour and 24-hour health-based air quality criteria, respectively. The 1-hour and 24-hour health-based air quality criteria were obtained from the following agencies:

- British Columbia Ministry of Environment (BC MoE)
- Canadian Council of Ministers of the Environment (CCME)
- Agency for Toxic Substances and Disease Registry (ATSDR)
- United States Environmental Protection Agency (US EPA) National Ambient Air Quality Standards (NAAQS)
- World Health Organization (WHO)

The lowest health-based air quality criteria with supporting information was generally selected for use in the screening process. Consideration was also given to relevant test species (i.e., human data versus animal data), study endpoint, quality and date of the study.

Where a health-based screening air quality criteria was not available from the agencies listed above, available health-based air quality criteria from the following agencies were used:

- Ontario Ministry of the Environment (OMOE)
- California Environmental Protection Agency Office of Environmental Health Hazard Assessment (Cal OEHHA)
- Texas Commission on Environmental Quality (TCEQ)

Priority was given to health-based air quality criteria that had supporting documentation. The COPCs were identified as those substances in the Application Case (i.e., background concentration plus Project emissions) that exceeded the acute inhalation criteria and also exhibited a 10% or greater increase above the background concentration (referred to as the Base Case) at any location evaluated in the acute inhalation assessment.

Comparison to regulatory criteria values was considered to represent a conservative evaluation of the potential for the predicted concentrations to elicit adverse effects. Comparison to 10% above Base Case concentrations was considered to represent a conservative evaluation of whether a measureable Proposed Project-related impact on environmental quality was likely to occur. Given temporal variability, variability in sampling and laboratory methods, and the uncertainty inherent in estimates from air quality models, a predicted increase of less than 10% above Base Case concentrations was considered unlikely to reflect a meaningful Proposed Project-related change in environmental quality.

The background (i.e., Base Case) and predicted 1-hour and 24-hour air concentrations for the Application Case and results of the screening process are provided in Tables 1 (1-hour) and 2 (24-hour).

3.1.2 Long-Term Inhalation

As part of the long-term human health inhalation risk assessment screening process, updated concentrations of metals expected to be emitted by the Proposed Project were compared to selected air quality screening standards or guidelines derived for the protection of chronic inhalation to human health. The chronic health-based air quality criteria were preferentially obtained from the following agencies:

- BC MoE
- CCME
- ATSDR
- US EPA Residential Air Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites
- US EPA National Ambient Air Quality Standards (NAAQS)
- WHO

The lowest health-based air quality criterion with supporting information was generally selected for use in the screening process. Consideration was also given to relevant species (i.e., human data versus animal data), study endpoint, quality and date of the study.

Where a health-based air quality criterion was not available from the agencies listed above, the lowest available health-based air quality criteria with supporting information, from the following agencies, were used:

- OMOE
- Cal OEHHA
- TCEQ

Risk levels for which the air quality screening criteria were derived were standardized to risk levels considered acceptable by the BC MoE and Health Canada (BC MoE 2008; Health Canada 2010). For non-carcinogens, this involved adjusting to an HQ of 1.0, and for carcinogens this involved adjusting to a risk level of 1×10^{-5} (i.e., 1 in 100,000).

COPCs were identified as those substances in the Application Case that both exceeded the chronic inhalation criterion and exhibited a 10% or greater increase above the background concentration (referred to as the Base Case) at any location.

Comparison to regulatory criteria was considered to represent a conservative evaluation of the potential for the predicted concentrations to elicit adverse effects. Comparison to 10% above Base Case concentrations was considered to represent a conservative evaluation of whether a measureable Proposed Project-related impact on environmental quality was likely to occur. Given temporal variability, variability in sampling and laboratory methods, and the uncertainty inherent in estimates from air quality models, any predicted increase of less than 10% above Base Case concentrations was considered unlikely to reflect a meaningful Proposed Project-related change in environmental quality.

The predicted background (i.e., Base Case) and Application Case annual air concentrations and results of the screening process are provided in Table 3.

3.2 Summary of Chemicals of Potential Concern Identified for the Human Health Risk Assessment

3.2.1 Short-Term Inhalation Risk Assessment

1-Hour Inhalation Risk Assessment

The predicted 1-hour air concentrations for metals at the selected receptor locations compared to air quality criteria are presented in Table 1. Based on the screening process, aluminum and iron were identified as COPCs for the acute inhalation assessment which is consistent with the results of the previous inhalation risk assessment (Golder 2016).

24-Hour Inhalation Risk Assessment

The predicted 24-hour air concentrations for metals at the selected receptor locations compared to air quality criteria are presented in Table 2. Based on the screening process, iron and manganese were identified as COPCs which is consistent with the results of the previous inhalation risk assessment (Golder 2016).

3.2.2 Long-Term Inhalation Risk Assessment

The predicted annual air concentrations for metals at the selected receptor locations compared to air quality criteria are presented in Table 3. Based on the screening process, no COPCs were identified for the long-term (chronic) inhalation risk assessment which is consistent with the results of the previous inhalation risk assessment (Golder 2016).

4.0 SUMMARY

Background metal concentrations for the 1 hour, 24 hour and annual averaging periods were calculated using data from Rumble Street's NAPS monitoring station from 2013 to 2015. Background metal concentrations established using NAPS data were compared to background metal concentrations used within the human health risk assessment within the Environmental Assessment Application; eight metals had more conservative (higher) background concentrations. These updated, higher background concentrations for the eight metals were provided to the human health discipline for inclusion in the human health inhalation risk assessment.

The updated background metal concentrations for the 1 hour, 24 hour and annual averaging periods were compared to short-term and long-term human health inhalation air quality criteria. Based on the screening process, aluminum (1-hour averaging period), iron (1-hour and 24-hour averaging period) and manganese (24-hour averaging period) were identified as COPCs for the short-term (acute) inhalation risk assessment, and no COPCs were identified for the long-term (chronic) inhalation risk assessment. The identification of these COPCs is consistent with the results of the inhalation risk assessment submitted in the Environmental Assessment application (Golder 2016). In conclusion, the use of the updated (higher) background concentrations does not change the results of the human health risk assessment submitted as part of the Environmental Assessment application for the BURNCO project.

5.0 CLOSURE

We trust that this response meets the current information requirements. Please contact the undersigned with questions or comments.

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