TECHNICAL REPORT

Screening Level Health Risk Assessment of the Historical Mining Tour of Cobalt, Ontario

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Executive Summary

A screening-level health risk assessment (SLHRA) was conducted to evaluate potential health risks to visitors acutely exposed to inorganic contaminants in soil at historical mining tour sites (Nipissing High Grade Mill, NHGM; Nipissing Low Grade Mill, NLGM; McKinley-Darragh Mill, MKD; and Buffalo Low Grade Mill, BLG) located in Cobalt, Ontario. While SLHRAs are generally used to indicate the absence of potential health problems, in the present study the SLHRA approach was used: (1) to qualify the likelihood of potential health risks, and (2) to support the development of risk management strategies without resorting to a comprehensive and resource-intensive site-specific health risk assessment. Since soil concentrations of several contaminants were substantially higher than current soil guidelines, the SLHRA was conducted using the contaminant presenting the greatest potential for acute health effects. Arsenic (As) was selected as a marker contaminant since it presented with the greatest magnitude of exceedance of soil guideline at most sampling locations. Three acute toxicity reference values (TRVs) were derived for As using available toxicological data in animals and acute poisoning data in humans in order to assess potential acute health effects to the general population and for pregnant women (based on reports of embryo-fetal effects of As). Central tendency (CT) and reasonable maximum exposure (RME) scenarios were developed for receptors of various age groups and pregnant women. Hazard Indexes (HI = receptor exposure / permissible limit) were then computed for various ranges of As soil concentrations.

Results obtained indicated that potential acute health effects to As (and possibly other contaminants) are likely to occur at most of the historical mining sites and sampling locations examined. For the RME and CT scenarios, HIs of 1-10 were associated with As soil concentrations of 235–2349 ppm and 1050–10,499 ppm, respectively, based on available sampling at the sites. The frequency of HIs at each former mining site is summarized in the following table which indicates the magnitude of HI exceedance and also provides an indication of the spatial extent of contamination:

Frequencies of HIs for the Toddler at each Former Mining Site

HI	Surface Soil Arsenic Concentrations	Frequencies of HIs (out of total number of sample locations)			
		NHGM	NLGM	MKD	BLG
CT Scenario					
< 1	< 1050 ppm	2/48	3/9	1/6	0/2
1 to < 10	1050 to < 10,499 ppm	18/48	5/9	5/6	2/2
≥ 10	≥ 10,500 ppm	28/48	1/9	0/6	0/2
RME Scenario					
< 1	< 235 ppm	0/48	1/9	0/6	0/2
1 to < 10	235 to < 2349 ppm	7/48	3/9	1/6	1/2
≥ 10	≥ 2350 ppm	41/48	5/9	5/6	1/2

HI < 1 indicates that no adverse health effects are expected, while HIs of 1-10 indicate that adverse health effects are possible although they may not necessarily occur. HI >10 presumes a higher probability that adverse effects may occur. At most sampling locations, total As soil concentrations were substantially greater than 1000 ppm. The toddler (7 months to 4 years of age) was identified as the most sensitive receptor. Incidental ingestion of contaminated soil was the most relevant exposure route/pathway.

Although uncertainties are generally associated with screening approaches, integration of additional parameters in the current study provides a reasonable degree of confidence that acute health effects could be experienced by visitors of the Cobalt historical mining tour sites, thus lending support to the development of risk management strategies without the need for conducting a comprehensive human health risk assessment.