COMMUNITY-BASED RISK ASSESSMENT

INTEGRATION REPORT

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Executive Summary

An extensive Community Based Risk Assessment (CBRA) has been carried out to determine the potential risk associated with elevated levels of nickel, copper, cobalt and arsenic (the chemicals of concerns, CoCs) in soil to human health, agricultural crops and the natural environment within the City of Port Colborne. This Integration Report concludes the CBRA (Phase 1) and provides guidance on how the findings of the CBRA (including possible remediation {Phase II}) will be applied on a site by site basis. A site refers to land that has a title, has clear boundaries and has an owner. Sites include properties used for city residences, rural residences, farming, having woodlots, and being undeveloped land and/or combinations of these typical uses. The CBRA derived safe soil concentrations for the CoCs for a worst case land use and the most sensitive receptor. The CBRA is, therefore, applicable to all sites within Port Colborne and site-specific information from each site will be used in applying the CBRA findings.

The CBRA serves two important purposes. First, it can be used to help identify whether any remediation or preventive measures should be taken by Vale Inco to address its responsibilities (including its potential liability under Ontario's environmental laws concerning remedial/preventive measures orders) and, if so, what those measures should be. Second, the CBRA can be used by property owners to facilitate any sale, development, financing or other valuation of their property. For example, together with site-specific information, the CBRA can be used to facilitate municipal development approvals or the obtaining of a Record of Site Condition under *O. Reg. 153/04*. Together with site-specific information, the CBRA can also be used to satisfy prospective purchasers or persons undertaking a valuation of a property that there are no concerns with the environmental condition of that property that would affect its use or value.

Human Health

Results of the Human Health Risk Assessment (HHRA) have determined that there exist no health risks from the CoCs for humans of any age living or working in Port Colborne, regardless of land use and/or soil type considerations. The intervention number (the maximum

safe level for a CoC) derived by the HHRA includes the protection of small children, which are the most sensitive human receptors. Based on the intervention numbers and the known soil CoC levels, no soil remediation is necessary to protect human health because no soils routinely used by humans are above the Port Colborne-specific "safe" CoC limits derived in the HHRA.

Agricultural Crops

Studies on crops included greenhouse studies and field trials that established Predicted No-Effects Concentrations (PNECs) for each soil type that are protective of a representative sensitive crop, oats. Nickel toxicity to sensitive crops, such as oats, is the most severe outcome of any of the CoCs and nickel content in soils is very well correlated with the contents of other CoCs. Accordingly, nickel concentration in soil is the parameter that influences decision-making on farmland remediation. In view of these conditions, Ni PNECs for oats will be used to determine whether farm soils in Port Colborne need remediation in Phase II. It should be noted that, since the Ni PNEC (oats) is lower than the Ni PNEC (earthworms), use of the Ni PNEC (oats) will also be protective of earthworms in farming fields.

Because sampling of soils across farmland has been limited, more intensive selective sampling will be done in order to accurately know what portions of certain farm sites are above the PNEC (oats). The program for farm sampling will be carried out for those farm sites that have any portion of land exceeding the 95% lower confidence level (LCL) of $PNEC_{Ni}$ (oats), as obtained using currently available computer-modeled nickel soil concentrations. The sampling criterion for soils greater than 95% LCL of PNEC (oats) was selected to make sure that no farm site close to having PNEC levels would fail to be sampled. The sampling of each site will be carried out on a grid pattern with a 30 meter spacing, which will be able to determine contours of nickel concentrations with adequate precision for making decisions about remediation for each farm property.

Residential Vegetable Gardens

According to the findings for agricultural crops, there may be some effect on certain vegetables grown on residential sites. These effects concern the growth and yield of vegetables; there are negligible risks to humans from eating home-grown vegetables. In order to protect

home-grown vegetables, remediation of existing gardens (as Vale Inco is notified by property owners of such) will be carried out based on their garden soils being in excess of the PNEC (oats) for till soil. Since residential soil sampling in some areas may not be sufficient, existing vegetable garden sampling will be carried out. Vegetable gardens that are moved or expanded, or gardens that are established at some future time (upon notification to Vale Inco by property owners) will be sampled and remediated under the same criteria as is set forth herein for existing vegetable gardens.

Natural Environment

The technical risk assessment on a wide variety of Valued Ecosystem Components (VECs) determined that earthworms in woodlots in close proximity to the Vale Inco refinery may be impacted by nickel in soil and Ni PNECs (earthworms) were derived for woodlot soils. Woodlot remediation will be considered for a woodlot exceeding the relevant Ni PNEC (earthworm). Due to limited existing sampling, a woodlot sampling campaign will be conducted based on whether the woodlot is within a 2.5 km distance from the former Vale Inco stack in the north-east quadrant

Remediation Options

Removal and replacement of soil in agricultural settings and woodlots is not a practical remediation option. In the former setting, excessive topsoil would be lost; in the latter setting, excessive damage to vegetation would occur. The most practical and effective remediation for these lands is to make soil amendments to reduce CoC bioavailability. Chemical agents most commonly used for this kind of treatment contain carbonate or phosphate. An alternative to reduction of bioavailability is to use nickel hyper-accumulating plants that thrive on extracting nickel from soil into their biomass, which can be harvested and processed for nickel recovery.

For residential vegetable gardens, either removal/replacement or soil amendment are viable remediation options.

Remediation Actions And Certification

Detailed decision-making flowcharts are presented in the report. These flowcharts will assist landowners in understanding whether their site will be included in Phase II. The flowcharts detail decision-making steps for dealing with impacts to agricultural soils, residential vegetable gardens and woodlots. Remedial actions for a specific property will be agreed upon by the property owner and Vale Inco with the Ministry of the Environment playing an advisory role. After carrying out the remediation action for a site, verification of remediation will be done and a suitable certification of the remediation will be given to the property owner.