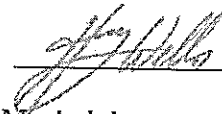


The Final
Public Liaison Committee Report
on the
Port Colborne
Community Based Risk Assessment

July 8, 2010

Prepared by: Harry Wells Chairman



Vivian Moskalyk

Rosemari Poission

Table of Contents

ACKNOWLEDGEMENTS	3
NOTE	3
INTRODUCTION.....	4
BACKGROUND	4
MOE 2000 SURVEY.....	5
NRPHD LEAD SCREENING STUDY	5
TRANS CANADA PROPERTY SSRA	6
CLASS ACTION LAWSUIT.....	6
LEAD NOT A COC.....	6
STANTEC ACQUIRES BEAK AND JACQUES WHITFORD	6
ECOLOGICAL RISK ASSESSMENT (ERA).....	7
HUMAN HEALTH RISK ASSESSMENT (HHRA).....	7
INTEGRATION REPORT	8
CBRA HEALTH MONITORING STUDY (CHAP).....	8
PUBLIC LIAISON COMMITTEE (PLC).....	9
PLC MEETINGS.....	10
INDEPENDENT CONSULTANT.....	11
TECHNICAL SUBCOMMITTEE (TSC)	11
OPEN HOUSE MEETINGS.....	12
INDEPENDENT CONSULTANT'S CONCLUSIONS.....	13
CROPS STUDY	13
NATURAL ENVIRONMENT STUDY	13
HUMAN HEALTH RISK ASSESSMENT.....	13
CHEMICALS OF CONCERN (COC).....	14
INTEGRATION REPORT	14
CHAP STUDY.....	14
SUCCESSFUL ASPECTS.....	14
LESS SUCCESSFUL ASPECTS.....	15
CONCLUSIONS	17
THE CBRA PROCESS	17
THE TERMS OF REFERENCE.....	18
THE TECHNICAL SCOPE OF WORK (TSOW)	19
RECOMMENDATIONS.....	19
THE PORT COLBORNE CBRA.....	19
FUTURE CBRAs	20
APPENDICES.....	21

ACKNOWLEDGEMENTS

The Public Liaison Committee (PLC) for the Community Based Risk Assessment for Port Colborne would like to extend our thanks and appreciation to the members of the public that attended and participated in the meetings and other public engagements and for providing your valuable contributions to address the potential environmental and health issues our community faces. The PLC thanks all the property owners and citizens for assisting us in the variety of studies that were conducted in and on our community. We appreciate the time and effort put forth by the Technical Subcommittee, the Lead Task Force and other associated experts in addressing the scientific and technical complexities needed for this assessment. We thank the City representatives and past PLC members for their help and contribution.

NOTE

This document was prepared and submitted to the Director West Central Region of the Ministry of the Environment for Ontario and contains the opinions and recommendations of the PLC on the process used to assess the risk posed by the contamination caused by International Nickel Company Ltd. (INCO) to the community of Port Colborne, Ontario. This document covers the process of the Community Based Risk Assessment and the activities and findings of the Independent Consultant and INCO over the duration of Stage 1 of the Port Colborne Community Based Risk Assessment (CBRA). Draft versions of this report were circulated to the Independent Consultant to assist with final accuracy and processed through the CBRA process in the same manner as all other reports of the CBRA. The final version of this report was formally endorsed by the PLC on June 10, 2010 and represents the opinions of the PLC. The final version of this report was formally submitted to the Director West Central Region of the MOE on July 8, 2010.

This document may be reproduced in whole or in part provided that the opinions of the PLC are represented fairly and that credit is given to the PLC. The PLC retains moral rights under copyright law on the contents of this report.

INTRODUCTION

This Final Report (Report) is not intended to provide a complete reiteration or chronological review of the past ten years of events related to the Community Based Risk Assessment (CBRA) for the Port Colborne community exposed to contamination from the local operations of the INCO nickel refinery. The intent of this Report is to fulfill the current Public Liaison Committee's (PLC) mandate. This Report will provide a brief background on the CBRA process to date for context and relation for the reader only and is not meant to contain the full detail. It is recommended that to understand and have an appreciation of the complexity and scope of the CBRA, one should read all the proceedings, studies, reports and other associated documents. Much of the information presented here was taken from the published reports and presentations circulated throughout the CBRA process that can be obtained upon request to the City of Port Colborne. The comments and opinions expressed in this Report represent the perspectives of the PLC's experiences related to the CBRA to date. The release of this Report to the

Director of West Central Region the Ministry of the Environment (Director) satisfies the final mandate of the PLC for this stage of the CBRA and concludes the obligations of the PLC.

BACKGROUND

The property contamination in Port Colborne gained public attention following the release of a study in 1999 conducted by the MOE and released in 2000 identifying that an adverse environmental affect occurred due to the release of Chemicals of Concern (CoC) from INCO's operations from 1918 -1984. This was then followed by the issuance of an order by the MOE in 2002 for INCO to remediate contaminated properties known as the Rodney Street Properties. There were four CoC identified above the Ministries Generic Guideline levels in the study that were directly associated to INCO's operation, Nickel, Copper, Cobalt and Arsenic.

The CBRA commenced in 2000 as a result of a consensus between INCO, the MOE, Niagara Regional Public Health Department (NRPHD), and the City of Port Colborne (City). The concept was to conduct a modified form of a Site Specific Risk Assessment (SSRA) that would address the risk and derive safe levels of Chemicals of Concern (COC) that give the same level of protection for the community as do generic levels. A SSRA is a technique endorsed by the MOE and used by a property owner of contaminated property where the owner proposes to re-zone and or sell the property but the levels of contamination exceed the MOE Guideline for Use of Contaminated Sites in Ontario. The owner becomes the proponent and conducts an Ecological Risk Assessment (ERA) and a Human Health Risk Assessment (HHRA) to derive the specific safe levels of contamination for that specific property that give the same level of protection for that site as do the generic levels.

INCO committed to the City and MOE to be the proponent and conduct a CBRA for the CoC related to the contamination resulting from their operations and the City endorsed this. The objective of the CBRA was to derive the specific safe levels of COC in the four soil types found in Port Colborne, clay, muck, mixed, and sandy for the three land uses, agricultural, residential and commercial and to integrate these safe levels into a community –specific risk model. The CBRA process has two Stages to it. Stage 1 of the process involved the application of technical and scientific information from general scientific literature as well as information gathered from conducting a number of ERA and HHRA studies specific to Port Colborne. Stage 2 will involve the application of the community-specific risk model developed in Stage 1 to individual properties and the remediation of ant properties found to exceed the risk based soil criteria derived in Stage 1. Along with the commitment of INCO to conduct a CBRA they also committed to two concurrent studies, a Health Monitoring Study (CHAP) and a Socio-Economic Analysis (SEA). The CBRA process was originally predicted to take 18 to 24 months to complete.

Participants of the CBRA were identified to be INCO as the proponent, the MOE, the NRPHD, Property Owners, the City, the PLC, the Independent Consultant and INCO's consultant. Terms of Reference for the PLC were created and the PLC members were selected by the City from a list of applicants that responded to the City's public

request. On May 4, 2000 the PLC held its first meeting and the CBRA was officially under way. The City issued a RFP for an Independent Consultant to assist the PLC in technical matters and the Independent Consultant (Beak) was selected in June 2000. A Technical Scope of Work (TSOW) for Stage 1 of the CBRA was prepared by Inco's consultant Jacques Whitford and agreed to in November 2000 by all parties after 8 months of debate.

With the TSOW now in place INCO's consultants and the Independent Consultant began working on the risk assessments while at the same time other events were starting to unfold that impacted the CBRA. A brief review of these events follows:

MOE 2000 Survey

Between 2000 and 2001, the MOE conducted a new survey of properties in the Rodney Street area, and conducted a health risk assessment. They tested 179 properties in the area and took 1,300 samples. The results confirmed the relative extent of the contamination resulting from the fugitive emissions by INCO and resulted in a draft order being issued to INCO by the MOE in March 2001 to clean up 16 residential properties in the Rodney Street area with soil nickel levels above 10,000 ppm as per the MOE's risk assessment. Their survey revealed that the following percentile out of the 179 properties sampled were in exceedance of the Generic Guidelines allowable levels for the associated metals 99% for nickel, 80% for lead, 62% for cobalt, 54% for copper, 49% for beryllium, 29% for arsenic, 17% for zinc, 2% for antimony and 1% for selenium and cadmium. The 2001 MOE draft order attracted significant media attention with major news papers across Canada and on Network Nation television reporting on the situation. The draft order was revised and finalized in March 2002 as a result of a revision to the human health risk assessment and the intervention level was lowered to 8,000 ppm that expanded the number of properties by another 9. In the end the revised order identified 24 residential properties and 1 park that warranted remediation.

NRPHD Lead Screening Study

In the spring of 2001 the NRPHD conducted a Lead Screening Study with a series of 10 blood lead clinics to determine the potential human health impact of lead contaminated soil. 1,065 people participated in the study with the demographic break down as follows; 32% from the East side, 49% from the West side and 19% from outside of Port Colborne but were believed to be former residents. 12% of the East side group consisted of children under 6 years old. The findings were that six people had elevated levels of lead in their blood due to occupational exposure but there were no correlations demonstrated to the level of lead in soil.

Transport Canada Properties SSRA

Property known as the Transport Canada Properties under federal ownership was subjected to Phase I and II Environmental Site Assessments conducted by Stantec that revealed the soil and water was contaminated with nickel, copper, and arsenic

at levels consistent with the MOE 2000 survey. It was concluded that there was no immediate risk to human health or the environment but action would be required so a 2002 SSRA was conducted.

The ERA concluded that the soil impacts were expected to be minor and localized and based on existing site usage these impacts were not considered significant. For ground water, surface water and sediment the assessments show that the CoC present do not represent an ecological risk.

The HHRA concluded that several CoC are present in soil, groundwater, surface water and sediments but do not represent a human health risk to existing site workers under the three land use scenarios considered, industrial commercial, parkland or residential.

It should be noted that these conclusions in part were based on data derived by Jacques Whitford's work on the CBRA in 2003 and 2005.

Class Proceeding

On March 28, 2001 it was announced that a Class Proceeding was launched against INCO, MOE, City, Public and Catholic School Boards, and NRPHD. This resulted in INCO officially announcing the cancelation of the Socio-Economic Analysis and removal of it from the TSOW on December 19, 2005. The purpose of the SEA was to have an independent property valuation specialist under a separate scope of work assess economic and social concerns caused by the contamination issue. This analysis would have assessed whether contamination from the CoC affected property values in relation to surrounding communities over the time since the contamination issue was first identified.

Lead a CoC

On July 22, 2004 it was announced that INCO was removing lead from consideration as a CoC despite the fact it met the MOE's conditions for a chemical to be considered a CoC that were agreed to in the TSOW. Any chemical that met these three conditions qualified it to be a CoC:

- Chemicals that were historically used or generated in the Inco Refinery or its processes, and
- Chemicals that are present at a community level at concentrations greater than MOE generic effects based guidelines, and
- Chemicals whose distribution in soils shows a scientific link to Inco's operations.

This resulted in the formation of a Lead Task Force committee and the community lead issue to be addressed outside of the CBRA.

Stantec Acquires Beak and Jacques Whitford

October 28, 2002 Stantec Inc. announced that it completed the acquisition of Beak and then on January 2, 2009 Stantec Inc. announced that it completed the acquisition of Jacques Whitford.

Companhia Vale do Rio Doce (Vale) Acquires INCO

On September 24, 2006 it was announced that Vale, a Brazilian company, purchased INCO.

It took almost five years to issue the first final CBRA report and another 3 years to get the last report. A brief review of the studies is presented below for context to the conclusions and recommendations provided in this report:

Ecological Risk Assessment (ERA)

The ERA was conducted according to the Canadian Council of Ministers of the Environment (CCME, 1996) frame work and the MOE (1996a) Guidance on SSRA. This assessment was broken down into two studies, the Crops Study and Natural Environment Study. The end product from the ERA was to be “an empirical model that predicts safe concentrations of CoC based on relevant soil parameters, such as texture, pH, and organic content” that will generate safe community risk-based soil cleanup guidelines.

The Crops Study consisted of Field and Greenhouse experiments conducted in 2000 and 2001 with the primary objective to “determine the concentrations of historically deposited CoC in soil that present a risk (phytotoxicity) to crops grown in Port Colborne”. The final Crops Study was received by the PLC at the September 2006 meeting with INCO’s conclusion that the safe soil CoC thresholds for the agricultural soil found in Port Colborne are:

Sandy soils	750 ppm
Organic soils	2350 ppm
Till soils	1400 ppm
Welland clay	1650 ppm

The objective of the Natural Environment Study was to “assess the risk of adverse effects on local populations of flora and fauna that inhabit the area where soil concentrations of the CoC exceed MOE generic guidelines”. INCO’s consultant’s report was received at the February 17, 2005 PLC meeting and concluded that the study “found no unacceptable risk to the sustainability of the populations of flora and fauna that inhabit the lands where soil CoC concentrations exceed the MOE generic guidelines”

Human Health Risk Assessment (HHRA)

Jacques Whitford issued their final HHRA report in December of 2007 with the primary objective of the HHRA being to “evaluate current risks to human health in Port Colborne due to the presence of CoC in soils resulting from INCO emissions and the follow-up objective of estimating the environmental concentrations of CoC in soil at which no adverse effects on human health are expected to occur”. The target safe soil CoC concentrations that were determined were 21,000 ppm for nickel, 9,300 ppm for copper and 8,100 for cobalt. Based on this finding Jacques Whitford concluded that there was no elevated adverse

human health risk to residents from CoC in Port Colborne soils, because no residential properties were believed to exceed these proposed risk-based soil values.

Integration Report

To pull all three studies of the CBRA together into a remediation plan for Stage 2 of the CBRA INCO developed the Integration Report with four objectives:

- To summarize the findings of the risk assessments in terms of soil types and land uses,
- To describe the process by which INCO intends to translate information in the risk assessments into information for any specific site within the Study area,
- To discuss general approaches for risk reduction, where needed, as a function of soil type and land use, and
- To describe the process INCO will use to determine which properties may need additional sampling.

On January 10, 2008 the final copy of the report was issued and completed Stage 1 of the CBRA for INCO. The report provided a sound logical approach to pulling the three CBRA studies together and using the information gained from them to identify risk associated to the CoC at specific properties. It then goes on to identify the process and parties that would be involved in remediation of the property if required.

CBRA Health Monitoring Study (CHAP)

Concern for the health of the community was addressed by a concurrent health study not to be part of the CBRA. The objective of the CHAP study was to conduct a comprehensive scientific health assessment to provide the Port Colborne residents with scientific information that will assess the health impact of exposure to CoC in Port Colborne. This study consisted of the following 5 studies:

<u>STUDY</u>	<u>DESCRIPTION</u>	<u>CONCLUSION</u>
CHAP "A"	Self Reported Health Assessment	Data suggest some associations but they are not seen across all comparisons and do not exhibit dose response and may be subject to reporting bias by respondents.
CHAP "B"	Case Control Study	Not justified based on A+C
CHAP" C"	Hospital Discharge Analysis	Elevated hospital discharges

		found for four conditions but link to exposure to CoC too weak to justify causation
CHAP "D"	Cancer Incidence and cause of Mortality	INCO cancelled due to no acceptable study design
CHAP "E"	Reproductive study	Reproductive effects were unlikely at soil metal levels found in Port Colborne

The final CHAP A+C Integration Report was received March 10, 2009

According to the TSOW, after a study was completed, the author, INCO or their consultants would make a presentation to the public at an Open House meeting. An additional follow-up Open House presentation facilitated by the PLC and the Independent Consultant would be held providing a review of the study and report with the Independent Consultant's report on the findings. Following a 6 week review period (sometimes longer), review comments by anyone could be forwarded to the document author for incorporation into the final report draft. This would be followed by a tabling of the final report draft at a TSC meeting (if required) and then the submission of the final report to the PLC, TSC and the community. All final reports were received by the PLC for a matter of record for the CBRA. Reports were not approved by the PLC.

THE PUBLIC LIAISON COMMITTEE (PLC)

It was originally decided by the City, INCO, NRPHD, and the MOE that the PLC would be completely uncompensated volunteers consisting of 7 members and 1 alternate that would be a cross section of members from the community. To assist the PLC the City would provide an Independent Consultant and all necessary administrative and advisory services. INCO would compensate the City for all expenses based on an established budget. The City advertised in the local newspapers (The Welland Tribune, and the Port Colborne Leader) for positions on a PLC committee requesting interested persons to apply in writing why they wanted to be a part of the process. The City selected the PLC members based on the submissions received. Through the ten years of the process, the membership of this volunteer committee transformed from the original 7 members to 3 members by the end of the process. The PLC did seek changes to the Terms of Reference to accommodate this when there were resignations of PLC members in February of 2005 and again in June of 2006 after years of proceedings with the belief that the end of the process was near and that the PLC's mandate could be achieved with the three remaining members. The members were selected in March 2000 and the first PLC meeting was held on May 4th, 2000 at City Hall. The number and frequency of the PLC meetings was high in the beginning of the process as there were many technical issues to deal with.

Terms of Reference for the PLC and the Independent Consultant were established with the purpose to define the mandate of the PLC and how the PLC would operate. The

intent of the PLC was twofold; first to investigate and provide input to INCO and the Director West Central Region of the Ministry of the Environment related to the contamination and secondly to solicit public input, inform the public and provide input to INCO and the Director with regards to the (TSOW), preparation and conducting of the CBRA. In order to achieve this, the PLC was given the mandate as follows:

- a. Advise Council of the City on the adequacy of the Terms of Reference for the PLC, and to make recommendations for changing the "Terms" if necessary,
- b. Receive and review all appropriate information respecting the contamination of lands with the identified "COC" in Port Colborne,
- c. Provide input to the Director and INCO respecting the TSOW for the CBRA,
- d. Monitor the progress of the CBRA,
- e. Review the findings and recommendations of the CBRA and provide input to INCO and the Director,
- f. Provide input to INCO and the Director on the methods of implementing the recommendations of the CBRA as may be appropriate,
- g. Submit a final report including comments and advice to the Director with respect to the PLC and CBRA processes.

It is important to recognize that INCO had sole authority for decisions with respect to the CBRA and that neither the PLC nor property owners had any authority. It is also equally important to understand the Director would make decisions pursuant to the provisions of the Environmental Protection Act (EPA) but the CBRA is not addressed in the EPA.

PLC MEETINGS

The PLC held regular meetings, open to all members of the community of Port Colborne, and other interested parties, such as the media. The meetings were chaired by the Chairperson of the PLC and generally held on the third Thursday of every month if possible or whenever needed. The majority of the meetings were held at Port Colborne City Hall, although other locations were used in an attempt to reach a larger group of the community and started at 7:00 pm. The City was represented by two persons at the PLC with one being the scribe and the other being the spokesperson for the City. Over the years, there were changes to the city representatives and some problems occurred in the tracking of the minutes and records. Notification of upcoming meetings was announced at previous PLC meetings, printed in the local newspapers and circulated via email. A typical meeting involved the following:

- review and approval of an agenda;
- review of previous meeting notes prior to approval;
- delegations (if any);
- presentations by the TSC Chair, INCO/their consultants, the PLC consultant, third parties (such as members of the community, Wignell Drain group);
- update of activities from the Independent Consultant for the PLC; and
- a general question and answer period with members of the community and those in attendance from the PLC and TSC.

The schedule for up-coming meetings related to the CBRA was identified and then the meeting was adjourned. This provided a lot of opportunity for public input and engagement.

Minutes from the PLC meetings and associated reports were made available electronically, at the Port Colborne Public Library, at PLC meetings and upon request at City Hall. This was a transparent process and the PLC made every attempt reasonable to ensure this. There were no restrictions on attendance. PLC members regularly liaised with the community members and groups, such as Neighbours helping Neighbours. A part of every PLC agenda was set aside for general questions and answers and the public had the opportunity to be a delegate by submitting their request prior to the commencement of the meeting. In total there were 107 PLC meetings held throughout the CBRA.

THE INDEPENDENT CONSULTANT

An Independent Consultant company was retained by the City in June of 2000, to assist the PLC with the technical issues that would arise in the CBRA. Request for applications by consultant companies were made and there were three respondents, Beak, Cantox and Agra Earth Environmental. The City with recommendation by the PLC agreed to hire Beak and the representative for Beak was Robert Watters. Beak was acquired by Stantec during the CBRA but Rob Watters formed Watters Environmental Group and continued on as the Independent Consultant providing consistent assistance to the PLC. The Independent Consultant attended most of the PLC meetings and all the Open House meetings that the PLC held. The application process for the position of the independent consultant was an open process and open to any consultant interested in this role to apply.

The Independent Consultant performed the functions described in the Anticipated Work Program of the Terms of Reference of the PLC. They were to review and advise the PLC on the various components of the CBRA and were expected to attend all the PLC meetings and provide reports to the PLC as required. Any work outside of that described in the Terms of Reference required City approval. The City established a budget for the Independent Consultant and the funds for the budget were provided by INCO.

THE TECHNICAL SUB-COMMITTEE (TSC) AND TSC MEETINGS

The PLC recognized early in the process that significant time was consumed by the various consultants discussing the technical matters and trying to reach consensus. These discussions reduced the time that was available for the public to participate and PLC meetings extended late into the evenings lasting 3-4 hours at times. It was also observed that some of the public attending the PLC meetings lost interest during the scientific discussions and were becoming frustrated. It was decided to form a Technical Sub-Committee (TSC) that formally reported to the PLC to deal with the numerous technical issues, and hopefully, speed up the CBRA process. The TSC did not have an approvals function. It was to discuss detailed technical CBRA matters and reach a consensus on how to deal with the technical issues. Based on the consensus the TSC

would make recommendations to the PLC. The members of the TSC were identified as the consultants for both INCO and the PLC, the City representative, the MOE, the NRPHD, the members of the PLC and from time to time other consultants or specialist as required. The Independent Consultant for the PLC was designated the Chairperson of the TSC.

The Chairman of the TSC was responsible for scheduling TSC meetings and did so as required with the notification for meetings following the same process as the one used for PLC meetings with an announcement at PLC meetings, sending of emails and advertising in the local newspaper. The first meeting of the TSC was held on August 24, 2000 and 99 meetings were held throughout the time period for Stage 1 of the CBRA. For the first 3 years minutes of TSC meetings were taken and then Chairman notes were made instead of taking minutes for the remaining TSC meetings. TSC meetings were focused meetings and for the most part were called to deal with a specific matter. The meetings were generally open discussion meetings with presentations facilitated by the Chair of the TSC. The TSC meetings were open to the public for observation only in an effort to keep them focused and effective but this was not well received by all members of the public. The public was required to raise questions and concerns through the members of the PLC or in writing to the TSC. Some of the public wanted the TSC meetings to be open for public participation without any restrictions. The stakeholders remained consistent throughout the process, with all original parties present at the end of the process. The first instance when the TSC did not reach a consensus was on whether Lead was a COC or not. In this situation the Independent Consultant stood firm that all the conditions for a CoC as stipulated in the TSOw were met so lead should be a COC. The lack of consensus resulted in the formation of the LTF and taking the community lead problem out of the CBRA. A consensus was not reached on a number of other instances toward the end of the end of the process when the Independent Consultant could not accept the conclusions of INCO for either the ERA or HHRA.

OPEN HOUSE MEETINGS

In an attempt to engage the community more specific meetings called Open Houses were established. Notification of these meetings was consistent with the other meetings with the details being announced at PLC and TSC meetings, email notification and advertisement in the local news papers prior to the date of the Open House. These meetings took the form of an open drop-in center or an open presentation. In either case enhanced visual aids were used to present to the public as a group or on an individual one on one basis the concept, aspect, proposal or conclusion related to the studies of the CBRA. In total there were 25 Open House meetings facilitated throughout Stage 1 of the CBRA. At times the PLC held Open House meetings in conjunction with Independent Consultant meetings because the Independent Consultant was the main presenter at many of the Open Houses.

These were opportunities for open sessions with the community members, authors of the reports, peer reviewers, specialists and on other matters related to the CBRA. When a report was received the public was given ample time to read the report, normally six weeks prior to an Open House where that report would be presented. Open Houses

were held at various locations throughout the city, such as the Guild Hall, the Knights of Columbus hall, The Ecole St. Joseph, and City Hall. . Community groups like Neighbours Helping Neighbours used this concept as well to share information and meet with the public.

INDEPENDENT CONSULTANT'S CONCLUSIONS

Crops Study

The objective of the Crops study was “to determine the concentrations of historically deposited CoC in Port Colborne soil that present an unacceptable risk (phytotoxicity) to agricultural crops”.

The Independent Consultant concluded the EC25 values generated by Jacques Whitford are “too high and cannot be regarded as being sufficiently and assuredly protective of agriculture in the Port Colborne Area” and “fails to meet the test for acceptance of site specific criteria to replace the MOE’s generic standards”.

Natural Environment (NE) Study

The objective of this study as agreed to in the TSOW was “to produce an empirical model that predicts the safe concentrations of CoC based on relevant soil parameters, such as texture, pH and organic content, for Port Colborne soils”. Jacques Whitford changed the objective to “determine if CoC in soils, as a result of INCO emissions, present a potentially unacceptable risk to the natural environment found in the Port Colborne area”. For the ERA, an unacceptable risk is defined as “an estimated risk linked to the occurrence of soil concentrations of CoC that prevents sustainable population(s) of flora and fauna, or prevents a sustainable level of ecological functioning within the defined Study Area”.

It is the opinion of the Independent Consultant that the data presented does not support either of the conclusions made by Jacques Whitford and the manner in which the data was analyzed and interpreted introduced significant uncertainties into the findings. “Overall, there are too many uncertainties to justify the conclusions drawn.”

Human Health Risk Assessment (HHRA) Study

Jacques Whitford stated that the “primary objective of the HHRA is to evaluate whether CoC in soils as a result of INCO’s emissions present an unacceptable risk to human health in the Port Colborne community”. They concluded that the Target Safe Soil CoC concentrations are 21,000 ppm for Nickel, 9,300 ppm for copper and 8,100 ppm for cobalt. The Independent Consultant has expressed concern with this objective claiming the Jacques Whitford has reported a different perspective on the overall study objective other than what was originally discussed at TSC and PLC meetings. The opinion of the Independent Consultant is the Jacques Whitford has not provided sufficient scientific rationale to support that the proposed RBSC of 21,000 ppm soil nickel offers the same level of protection to Port Colborne residents as does the current generic value from the MOE Guideline for Use of Contaminated Sites in Ontario for all residents of Ontario. This proposed “safe” soil nickel concentration is two orders of magnitude

greater than the “generic” standard cannot be justified and is scientifically unsupported from the information and analysis provided in the HHRA report.

Chemicals of Concern (CoC)

It is the opinion of the Independent Consultant that Lead meets all the criteria as set forth in the TSOW for a Chemical of Concern and should be included. The Independent Consultant also raised concern about the lack of consideration given to arsenic in some of the studies.

Integration Report

The opinion of the Independent Consultant on the Integration Report is that INCO’s general approach is sound and generally considers the most sensitive receptor with remediation to the level deemed to be “safe” by the CBRA studies; however, the report lacks detail and fails to address the concerns raised by the community. The Independent Consultant points out that this report is based on the three studies of the CBRA being correct and that assumption is not reasonable. If credence is not given to the conclusions of these studies then the structure of this report will be much different. Detail concerning the remediation and logistics associate to that activity as well as the nature and type of documentation that will be provided to the property owner at the end of the process is needed. INCO drafted the Integration report with no real input from the PLC, Independent consultant or public

CBRA Health Monitoring (CHAP) Study

There is no Independent Consultant review or opinion on the CHAP Studies because they do not have the qualifications to evaluate the CHAP studies. All reports from the CHAP studies were reviewed by the TSC. None of the stakeholders on the TSC were qualified to pass judgment on the CHAP studies. An Expert Advisory Committee (EAC) out of the University of Toronto was established to review Study A and C to determine if Study B a case control study was warranted. The EAC concluded that there was no justification for recommending Study B.

SUCCESSFUL ASPECTS

- The PLC, Open Houses and TSC meetings were all open to the public to attend making the process as transparent as it could within the ability of PLC;
- The way the public was made aware of meeting was kept consistent and enough notice was given so people could plan to attend and get prepared to participate;
- For the most part the majority of meetings were held at the City Hall location that provided an easily accessible central location with sufficient space to accommodate attendance of most of the meetings;
- The manner in which Open House meetings were used provided good opportunities for the exchange of information and interaction between the public and all parties involved in the CBRA;
- Lead time prior to Open House meetings provided ample time for everyone to read the reports, become familiar with topics and prepare to participate at the meeting;

- Open House meetings were held and attended by all key stakeholders involved with the CBRA;
- The PLC offered the Public special meetings between them the PLC and the Independent Consultant in a one on one or group format to facilitate more engagement of the Public;
- In-camera meetings that took place between the Independent Consultant and others on CBRA issues were reported to the Public at PLC meetings in an effort to make the process more transparent and address the lack of trust that certain members of the Public had;
- Newspaper articles and columns by PLC Members and the Independent Consultant on topics of the CBRA were published to provide a wider public awareness of the studies being conducted and issues being addressed by the CBRA;
- The organizational structure of the TSC ensured the quality of science, scope of work, detail of the data set and pushed for the use of the best available science;
- The TSC identified additional beneficial studies and those studies were conducted;
- The consensus approach used in the CBRA that preapproved the studies and how they were to be conducted is a more proactive way of conducting the CBRA and gaining acceptance of the findings of the studies;
- The composition and transparency of the TSC ensured that there was good QA/QC for all the studies;
- The TSO and Protocols are good documents that can be used as guidelines for other communities conducting similar risk assessments with appropriate modifications to suit the specific situation;
- Information on and discovered by the studies of the CBRA was provided by the Independent Consultant in a manner so it was easily understandable;
- The Independent Consultant provided the Public a better understanding of the science and their findings for the community and played a key role in representation of the interest of the Public;
- The PLC as a group worked well together and in general developed a good relationship with all the stake holders;
- Those members of the public that stayed involved throughout the process became very knowledgeable in the process and the science employed and provided a lot of valuable contributions;
- The City was cooperative in respect to accepting the PLC's recommendations on the terms of reference for the PLC.

LESS SUCCESSFUL ASPECTS

- Despite all the efforts there is no consensus or resolution to the CBRA with the community and thus resolution rest with the MOE;
- The CBRA organizational structure and funding are not adequate for the scale of this issue ;
- The Public attendance at meetings dwindled and there was a lack of means to attract them;

- The participation and engagement by the community as a whole was poor;
- The Media lost interest in the CBRA and stopped attending and writing about it;
- INCO and NRPD were not completely cooperative and did not provide certain reports that the public requested;
- City support was not adequate for a volunteer based committee and demands associated to the scale and significance of this type of effort;
- There was poor record keeping on the events and documents related to the CBRA;
- With INCO being the proponent and taking on the position of the property owner when they aren't creates a conflict of interest where they have the ability to be the decision maker over properties they don't own;
- The process was too long and complicated for a volunteer group;
- The PLC with no authority could not affect the CBRA process they could only influence it;
- Neither the PLC nor Independent Consultant were privy to meetings between INCO and their consultants and this fostered the miss trust of INCO;
- There was no professional communication adviser or resource for the PLC to address Media or public participation matters;
- The Class Proceeding reduced cooperativeness of INCO and instilled a concern for legal action on other participants resulting in less transparency, cancellation of SEA, reduced participation (NRPD, Media), increased stigma for the community and more expectations on the CBRA;
- Some of the Media attention that the CBRA got was for the wrong reasons and the negative stigma this process has created for the community has not been addressed;
- The trust of the public for the MOE, NRPD and City was never gained;
- The Consensus approach became difficult within context of lawsuits;
- The acquisition of the both the original Independent Consultant (Beak) and INCO consultant (Jacques Whitford) to Stantec and the use of INCO's findings before the end of this process in the Transport Canada Property SSRA;
- The acquisition of INCO by Vale before the end of this process;
- Adversarial stances adopted by some of the citizens in this public process were not beneficial to the process;
- Certain areas of expertise were not within the Independent Consultant's capability and no alternative to this was provided to the PLC;
- The TSC review and effort to reach consensus increased the overall time frame of CBRA, too much time was lost on going back and forth with disagreement for written reports and conclusions;
- The HHRA model used by INCO was not provided to the Independent Consultant, PLC or the Public and this makes the interpretation of their findings and conclusions difficult and presumptuous;
- Indoor air issues raised by the Public and contribution of CoC of indoor air to the risk assessments were not addressed;
- INCO refused to conduct the CHAP "D" study claiming there was no acceptable study design for INCO and they also cancelled the SEA;

- The Public raised concern for the risk to pets but no study was completed and the concern was never addressed to the Public's liking;
- There was no assessment of a cancer end point or arsenic in the HHRA;
- The sampling of the Wignell drain was inadequate and not corrected;
- Lead was not accepted as a CoC by INCO despite meeting the agreed to conditions of a CoC so the Lead issue remains unresolved or addressed;
- The LTF and Independent Consultant were unsuccessful in providing their final reports or documentation to the PLC to be considered in this report so all comments and opinions of the PLC are based on draft reports and dated information;
- Some important issues raised by the Independent Consultant and others were ignored and not addressed by INCO;
- The Integration Report is unclear on how to transfer or apply findings of CBRA to individual properties;
- The question of the Record of Site Condition is not adequately addressed in the Integration Report;
- There is no clear process for the homeowner with affected property to get clear unrestricted land use;
- Property owners are ultimately liable for the condition of their properties and are legally obligated to disclose the conditions of their property that they are aware of to a purchaser if they are selling it. The CBRA has made property owners and purchasers aware of conditions that need to be disclosed that were not known before the CBRA. This is a major concern for the property owners ;
- The Intervention level proposed by INCO is significantly above the previous level set by the MOE of 8,000ppm;
- The conclusions on the risk to Crops are based on the wrong science so the report is questionable;
- The wrong analysis was conducted for the NE and HHRA therefore the interpretations of the findings are questionable;
- Involvement of NRPHD at PLC meetings was not adequate for the significance of this assessment.

CONCLUSIONS

The CBRA Process

The structure of the CBRA with INCO being the proponent and taking the position of the property owner with full authority over the process similar to that in an SSRA is a fundamental flaw of this process. The City representing the community as a whole agreed to the structure and accepted INCO, the party that caused the contamination as the proponent having total authority and control over the process. INCO is in a fundamental position of conflict and this allows them to be able to manipulate the CBRA to their benefit.

The CBRA included the community as a whole and impacted the entire community including those that didn't want to be or didn't need to be included. This process does not put the property owner or the representative selected by the property

owner in a position of control over what happens to their property but it ultimately results in a negative impact to the property owner.

The CBRA started with a lack of transparency because the concept of this process and agreement to implement it was conceived behind closed doors and exactly what transpired between the City, INCO, MOE and NRPD behind those doors has not been fully disclosed to the public or to the PLC. Where possible the PLC made every reasonable attempt possible within its ability to make the proceedings of the CBRA transparent and believe they have performed in an open transparent manner. The Class Proceeding had a negative impact on the transparency of the process. Failures by stakeholders to disclose requested information throughout the process added to the lack of transparency the process started with and members of the public continue to express the lack of trust in the MOE, City, NRPD and INCO.

The CBRA addresses a contamination that took place over 66 years assuming that there have been no emissions from INCO from 1984 to when this assessment was performed. The affected area is a large area of land owned by a large number of people that is used for residential, agricultural, commercial and industrial purposes with sand, Welland clay, Till clay and organic types of soil. Trying to address all the variables of the affected area made this assessment significantly complex and difficult. Performing and properly reviewing all the studies necessary to address the complexity and difficulty of this assessment alone took a long time. Using an approach of consensus between the stakeholders to arrive at agreeable methodology for and interpretation of the studies added additional time to the assessment. Then when consensus couldn't be reached additional time was taken to explain and address the disagreement. All in all the process was very long and complex and the majority of the Public in general did not stay actively involved throughout the process. Those from the community that did stay involved help improve the CBRA significantly and provided valuable input.

Based on the conclusions of the Independent Consultant it is the opinion of the PLC that the objective of the CBRA to "derive the specific safe levels of CoC in the four soil types found in Port Colborne, clay, muck, mixed, and sandy for the three land uses, agricultural, residential and commercial and to integrate these safe levels into a community specific risk model has not been achieved. The PLC understands that the Public are also of the conclusion the CBRA did not achieve its objective. Furthermore, INCO has failed to fulfill its commitment to the community as part of this process to provide the completed Concurrent Studies of CHAP and SEA.

The Terms of Reference

In the opinion of the PLC the Terms of Reference served their purpose to define the mandate of the PLC and how the PLC would operate adequately but they were deficient in assessing the Work Program and how that impacted the PLC membership, meetings, independent consultant and public participation. It is the opinion of the PLC that the mandates associated to Stage 1 of the CBRA were adequately met considering all

of the characteristics of this CBRA and the fact that the PLC was a volunteer committee completely composed of non-compensated members.

The Independent Consultant was essential to the process, represented the community appropriately and assisted the PLC significantly. They provided a tremendous amount of contribution and value to the scientific rigour of the TSOW from an environmental perspective but were not qualified in a number of areas that would have been beneficial to the community. The Independent Consultant attempted with passion and conviction to make INCO and its consultants conform to the agreed TSOW and assess the studies in best interest of the community. The areas the Independent Consultant was not qualified were in communications, medical science and property valuation all of which would be valuable in a CBRA.

Throughout the process the PLC effectively used meetings to engage the Public for the purpose of providing information on the various studies and components of the CBRA as well as seeking input from the public on all the issues related to the contamination. In total there were 231 meetings the public could attend and participate in broken down into 107 PLC, 99 TSC and 25 Open House meetings. Minutes, notes, reports and other related documents were provided to anyone that wanted them in electronic or printed format. It is the PLC's position that the public had sufficient opportunities to receive input and give input throughout the process. Not every question the public raised was answered and not every answer was accepted by the public. INCO and the MOE clearly understood the concerns the public had and have had the opportunity to address those concerns throughout the process. The only time there was not enough Public involvement was in the conception period of the CBRA.

The TSOW

The TSOW was adequate to initiate the CBRA and flexible enough to accommodate changes as required. The Consensus approach on the science was the best approach for the structure of the CBRA and it provided the most acceptable assessment methods. The Science employed in the CBRA was good except for the areas where it was manipulated and interpreted to benefit the proponent as identified by the Independent Consultant.

Lead met all the conditions of a CoC as agreed to in the TSOW by all the stakeholders and should be a CoC. A consensus was never reached on Lead being a CoC and this serves as a perfect example that INCO should not have been the proponent. The Public wanted Lead to be addressed in the CBRA and if they were the proponent it would have, but since they weren't and INCO was, lead was pulled from the process.

Lead and Arsenic were not dealt with properly in the studies or assessments.

The Integration report is insufficient and based on flawed studies and as such this report does not address the most sensitive receptors or reflect the most conservative approach to risk management of the CoC. It doesn't provide for unrestricted land use and provides little information on remedial options of Stage 2.

RECOMMENDATIONS

Port Colborne CBRA

It is the PLC's opinion that the public does not accept the conclusions proposed by INCO and do not believe the MOE will act in the best interest of the community. It is the recommendation of the PLC to the Director Western Central Region of the MOE to take into consideration the conclusions of the Independent Consultant and the comments submitted by the public on the science and findings of the studies and where the data exist, use it to resolve the problems pointed out with the science so the findings reflect the most conservative risk to the most sensitive receptor. The MOE should disclose in public the outstanding issues and their plan to resolve them and allow the Public to participate in reaching resolution. The PLC understands that some of the data does not exist and that additional studies may have to be completed to secure that data but this should be worked into the plan the MOE develops to resolve the outstanding issues.

The PLC recommends that the requirements of O. Reg 153/04 be satisfied by remediation of contaminated properties that are above the current generic standards to the specified levels if the Director is unwilling to resolve the outstanding Public issues of the CBRA. The MOE is encouraged to consider the public stigma that this process has imparted on the community of Port Colborne and their resolution needs to address that and the only way to do that is to have unquestionable scientific findings that reflect public acceptance. The MOE needs to ensure the intervention levels for remediation are not questionable and provide clear unrestricted land use to the existing property owner or potential owners. The MOE needs to implement an action plan to achieve the objective of the CBRA and the issuance of Records of Site Condition for the COC that reflect acceptable conditions.

When this process is finalized all information associated to the CBRA should be translated into French and be available to the public and other interested parties providing all confidential information is protected. There needs to be a professional announcement campaign for the public release of the finalized CBRA conclusions that will go beyond the community to address the stigma that was created when this process began.

The PLC would also recommend the NRPHD undertake a similar effort with regards to the CHAP studies to provide resolution to concerns the community has related to cancer and the CoC that were not addressed due to INCO's cancellation of Study "D".

A collaborative effort should be undertaken by INCO and the City to establish an Information Center to provide current and future residents access to all the information related to this process and the contamination and to provide answers to their questions and concerns about it. There were a lot of documents circulated during the CBRA process and some of them are no longer available to the Public. This recommendation implies that INCO or the City should ensure the information is complete. The establishing of an Information Center should be done with professional consultation and result in a center that is easily accessed and navigated that is kept current for the period as recommended

by the consultant. It is also recommended that there should be some local public involvement in establishing this Information Center.

Based on the PLC's experience in Stage 1 it is the PLC's recommendation that the CBRA organizational structure for Stage 2 be reconsidered. The recommendation of the PLC is to remove INCO from the role of the proponent and any other decision or authority role. As presented in the Integration report an Advisory Committee (AC) or an Independent Remediation Consultant (IRC) should be put in place to conduct the remediation. The AC or IRC would be formed by a community process and not INCO as suggested in bullet 3 on Page 66 of the Integration Report January 10, 2008 and conduct the remediation according to the MOE accepted remediation strategy. Selection of the AC members or IRC should follow a procedure similar to the one that was used to contract the Independent Consultant in Stage 1 of the CBRA and report to the City. The AC or IRC will replace INCO in bullets 4 through 7 on Page 66 of the report identified above. Stage 2 should be conducted as much as possible without INCO's involvement; however, they should remain responsible for the cost of the MOE accepted remediation strategy.

Future CBRAs

The PLC recommends to the Director Western Central Region of the MOE that the following be considered for any future CBRAs to improve them over this one:

In order to drive this process in the best interest of the community and in a fair manner for the generator of the contamination the structure of the organization of the CBRA should be such that it limits the affect the generator of the contamination has on the process but allows them to actively participate in the process. The Proponent for a CBRA should never be the generator of the contamination. The Proponent should be a committee selected by the property owners to represent the property owners. CBRAs can be significant in complexity and long in duration so consideration should be given to contracting an independent chairperson for the committee with the specific skill set required to facilitate PLC meetings and direct the process. Consideration should also be given for the paid key long term positions on the committee. If the CBRA process is expected to be lengthy and there are volunteers involved it is recommended that it be broken down into smaller stages and rotate or change out volunteer committees on a more frequent basis to eliminate burn out and retention issues. This should promote more community involvement and a better end CBRA product.

To ensure economic reasonableness a budget should be set for the process and agreed to by the generator or party accepting the financial responsibility. That budget would be public information and made available to the public. The CBRA would be required to stay within the agreed to budget. Once a budget is set the responsible party should set up a trust fund or other acceptable financial control system that eliminates the responsible party's control of or access to the funds.

The public should be engaged from the conception stage to the remediation stage. The more the Public is involved with the creation of the CBRA the more acceptable the

conclusions will be. With the public involvement from the conception stage throughout should make the process quicker and there should be less mistrust by the community.

Engaging the Public is critical to a CBRA so surveys to measure public awareness, representation, and participation should occur at various times throughout the process and be part of the process. Consideration should be given to include professional communication experts in the process that could help guide and assist Public Liaison and Technical Subcommittees through the process.

At the end of the CBRA process whether there is a consensus in the findings and remediation or a disagreement as in this case, the MOE has the ultimate arbitrator on accepting the intervention limits and proposed remediation as required. With the MOE being one of the stakeholders present throughout the process the MOE should be more active directing the CBRA process in setting and adhering to the TSOW and ensuring the process proceeds quickly.

APPENDICES

Appendix I: The Original Terms of Reference of the Public Liaison Committee for the Community Based Risk Assessment for Soils Contaminated in the Port Colborne Area

Appendix II: Technical Scope of Work Community Based Risk Assessment Plan Port Colborne, Ontario

Appendix III: Written comments received on and for this PLC Report

Appendix I

Original Terms of Reference of the Public Liaison Committee for the Community Based Risk Assessment for Soils Contaminated in the Port Colborne Area

TERMS OF REFERENCE
OF THE
PUBLIC LIAISON COMMITTEE
FOR THE
COMMUNITY BASED RISK ASSESSMENT
FOR
SOILS CONTAMINATED IN THE PORT COLBORNE AREA

NOTE:

The following abbreviations are used within the Terms of Reference:

PLC	=	Public Liaison Committee
CBRA	=	Community Based Risk Assessment
SSRA	=	Site Specific Risk Assessment
MOE	=	Ministry of Environment
Region	=	The Regional Municipality of Niagara
City	=	The City of Port Colborne
Director	=	The Director of the West Central Region of the M.O.E.
INCO	=	INCO LIMITED

Established 2000
Confirmed by PLC _____
Revised _____

1. PURPOSE

These Terms of Reference are intended to define, organize and to establish the operation of a Public Liaison Committee intended to investigate and provide input to INCO and to the Director relating to contamination in the Port Colborne area.

The Public Liaison Committee is intended to solicit public input; to inform the public; and, to provide input to INCO and to the Director respecting the scope of work for and the preparation and conducting of, a proposed Community Based Risk Assessment addressing soils contamination attributed to Inco operations in the Port Colborne area.

2. MANDATE

The Mandate of the PLC is to:

- a) advise Council of the City on the adequacy of the Terms of Reference for the Committee, and, to make recommendations for changing the "Terms" if necessary,
- b) receive and review all appropriate information respecting the contamination of lands with the identified "chemicals of concern" in Port Colborne,
- c) provide input to the Director and to INCO respecting the Scope of Work for the CBRA.
- d) monitor the progress of the CBRA,
- e) review the findings and recommendations of the CBRA and provide input to INCO and the Director,
- f) provide input to INCO and the Director on the methods of implementing the recommendations of the CBRA as may be appropriate,
- g) submit a final report including comments and advice to the Director with respect to the PLC and CBRA processes.

Throughout the process the PLC will liaise with its independent consultant to seek input from the public on all issues relating to the reported contamination and the CBRA, will seek to inform the public respecting the progress of the CBRA, and, will report the public input to INCO and to the Director.

The PLC will provide input to INCO and to the Director with respect to the CBRA but will not make decisions. Rather, the Director will make decisions pursuant to the provisions of the Environmental Protection Act.

3. MEMBERSHIP

The PLC shall consist of seven individuals and an "alternate" to be appointed by City Council. City Council will attempt to appoint a committee representative of the community. PLC members will be appointed at the pleasure of Council.

4. MEETINGS

- a) Appendix A attached is an Anticipated Work Program including an estimate and schedule of the required meetings. Generally, meetings will be scheduled by the Committee or at the call of the Chairperson.
- b) Meetings will be held in the Council Chambers of the City unless otherwise determined by the Committee.
- c) Generally, meetings will be open to the public unless dealing with matters requiring confidentiality as outlined in Section 9.
- d) INCO, the MOE and the City may have representative(s) attend meetings of the PLC in a non voting capacity. Both the MOE and INCO will provide information to, and obtain input from, the PLC as required.

5. AGENDA, CHAIR, MINUTES

- a) The PLC agenda will generally follow the tasks outlined in the Anticipated Work Program attached as Appendix A.
- b) City Council will appoint an interim chairperson to conduct the initial meeting(s) of the PLC. At an early meeting, the PLC will elect a Chairperson and Vice Chairperson. The Vice Chairperson will act as Chair in his or her absence.
- c) Agendas for individual meetings will be set by the Chairperson, in consultation with the independent consultant, and will be distributed

with appropriate materials one week in advance of each meeting.

- d) The PLC with the independent consultant may conduct Public Forums at a time, location and manner to be determined by the Committee.
- e) Five members of the Committee will form a "quorum". The Committee will strive for consensus. However, decisions can be made by a simple majority of members present.
- f) The "alternate" member will attend all meetings and participate in all discussions and functions of the committee. However, the "alternate" will vote only when one or more Committee members are absent.
- g) The Committee secretary will record the minutes of each meeting, a draft of which will be circulated with the agenda for the following meeting for approval of the Committee. Minutes will only be released to the public after approval by the PLC.

6. INDEPENDENT CONSULTANT

- a) The City will retain an independent consultant to assist the PLC to undertake the required "Tasks" by providing ongoing professional and technical advice.
- b) Subject to the provisions of paragraph 6d) herein, the Independent Consultant will generally undertake the functions described in the attached "Anticipated Work Program" and will be expected to attend all meetings of the PLC, and, to provide reports and advice to the Committee as required.
- c) Subject to the provision of paragraph 6d) herein, if the PLC recommends that the Consultant should undertake functions outside of those contemplated by the "Work Program", such additional work will require prior approval by the City.
- d) The City will establish an overall budget for the work of the consultant including a budget for each of the identified tasks. The overall budget for the consultant and the budget for each task will not be exceeded without prior approval of the City.

7. PUBLIC PARTICIPATION

- a) The PLC will seek to inform the public of the CBRA process and to obtain the views of the public when developing input to INCO and to the Director.
- b) The PLC may seek public input through public forums as outlined on the Work Program or as determined by the Committee. At public forums the public will have the opportunity to ask questions of INCO and the MOE related to the CBRA.
- c) Public delegations to regular meetings of the Committee will be permitted. Unless otherwise determined by the PLC, the delegate must register in advance with the Secretary and the delegation will be limited to speak to the subject(s) of the agenda for that meeting. The PLC may restrict the number of delegates and the time permitted each delegate to speak.

8. EXPENSES

- a) All of the City costs associated with hiring and compensating the Independent Consultant to the PLC will be paid by INCO. The City will enter into contracts, as appropriate, with both the Consultant and INCO.
- b) The City will supply all necessary administrative and advisory services to the PLC, however all expenses related to such service(s), including salaries, will be paid by INCO.
- c) The City will provide meeting rooms for the PLC. All other operating expenses of the PLC will be paid by INCO within an established budget.
- d) Committee members will not be compensated for meeting time. However, out of pocket expenses related to PLC business will be compensated at current City rates, provided the business related to those expenses has prior approval of the Committee.

9. CONFIDENTIALITY

- a) PLC members may be presented with reports on and/or examples of technologies, methods or procedures which are of a proprietary nature. Only PLC members who have signed appropriate declarations of confidentiality, in the form attached as Appendix B, will be allowed to receive and/or hear those reports or presentations.
- b) When a meeting has included confidential material as described in a), the PLC shall agree on a statement regarding that part of the meeting both for the minutes and for public release.

APPENDIX 'A'

PUBLIC LIAISON COMMITTEE
ANTICIPATED WORK PROGRAM

TASK	TIMING	PLC ROLE	INDEPENDENT CONSULTANT	INCO ROLE	M.O.E. ROLE	PUBLIC INPUT
TASK I Review Background Information	2 months; 4 meetings	City Appoints PLC -Review and advise Council on Terms of Reference -Receive and review background data	City Retains Consultant -Review Background Data -Advise PLC on Background Data and concept of CBRA	-Provide background information to PLC and independent Consultant as required	-Provide background information to PLC and Consultant as required	-PLC to conduct forum(s) on issues, appropriate
TASK II Review Scope of Work for CBRA	3 months; 3 meetings	-Receive and review Scope of Work for CBRA -Input to Director and INCO on Scope of Work	-Review scope of work and advise PLC	-Inco Consultant presents Scope of Work to PLC as required	-Director to approve Scope of Work	-PLC may conduct public forum(s) on Scope of Work
TASK III Review Progress of CBRA	9 months	-Monitor progress on CBRA	-Monitor progress of CBRA	-Inco Consultant conduct CBRA		
TASK IV Review CBRA Report	4 months; 5 meetings	-Review CNRA Report -Input to INCO and Director on CBRA -Input to Director and INCO on Implementation of CBRA -Final Report to Director on PLC and CBRA process	-Review CBRA and advise PLC -Advise PLC on implementation issues	-Inco Consultants present CBRA to PLC as required	-Director to review and approve CBRA - Director to receive input from PLC on implementation strategies	-PLC to conduct forum(s) on CBRA and implementation

DECLARATION OF CONFIDENTIALITY

THIS AGREEMENT entered into this _____ of _____ 2000, by and between _____, (hereinafter referred to as "RECIPIENT"); and INCO LIMITED ("INCO").

WHEREAS the Recipient is a member of the Public Liaison Committee to the Community Based Risk Assessment for Soils Contaminated with Nickel, Copper and Cobalt in the Port Colborne Area (the "PLC").

AND WHEREAS Inco may present to the PLC reports on and/or examples of technologies, methods or procedures which are of a proprietary nature (hereinafter severally and collectively referred to as "Proprietary Information") relating to remediation of soil.

Now, therefore, RECIPIENT accepts disclosure of the Proprietary Information on the basis of the following conditions:

1. RECIPIENT shall treat as confidential all of the Proprietary Information received from INCO and use such Proprietary Information only for the specific purposes of this PLC and for no other purposes. Orally disclosed Proprietary Information shall be subject to the terms and conditions of this Agreement as well.
2. The provisions of this Agreement shall only apply to:
 - (a) documents that are marked "confidential" at the time the document is provided to the RECIPIENT; and

- (b) Proprietary Information provided to the RECIPIENT orally that is expressly stated to be proprietary and confidential at the time it is provided and which is reduced to writing and delivered to the RECIPIENT within 15 days of oral disclosure and marked "Confidential".

3. The obligations of Paragraph 1 shall not extend to any of the Proprietary Information that is (a) publicly available at the date of its disclosure to RECIPIENT; or (b) which is, at that time, already properly in the possess of RECIPIENT as shown by RECIPIENT's written records; or (c) which after that date becomes publicly available without breach of this Agreement by RECIPIENT, or (d) the disclosure of which is agreed to in writing by INCO; or (e) Proprietary Information which is developed independently by RECIPIENT without reliance upon INCO's Proprietary Information.

4. For the purpose of Paragraph 3, disclosures made to RECIPIENT under this Agreement which are specific, e.g. as to processes, equipment, products, operating condition, catalysts, specific raw materials used, waste, etc., shall not be deemed to be within the foregoing exceptions merely because they are embraced by general disclosures in the public domain or in the possession of RECIPIENT.

5. Even though RECIPIENT may be free to disclose or use certain Proprietary Information through operation of Paragraph 3, RECIPIENT shall not reveal to any third party that such Proprietary Information was received from INCO unless INCO agrees in writing.

6. RECIPIENT shall obtain no rights of any kind, other than those expressly provided herein, in the Proprietary Information by reason of this Agreement.

7. All materials furnished to RECIPIENT, which are designated in writing to be the property of INCO, shall remain the property of INCO and shall be returned to INCO within fifteen (15) days of its written request together with all copies made thereof.

8. This Agreement shall insure to the benefit of and be binding upon the Parties hereto and their respective successors, legal representatives, assigns, subsidiaries and affiliates. This Agreement shall be assignable by INCO to a successor to that portion of the business relating to the subject matter of this Agreement. Such assignment shall not relieve either party of any of the obligations of confidentiality set forth above.

9. This written Agreement embodies all of the understandings and obligations between the Parties with respect to the subject matter hereof.

10. This Agreement shall be governed by and interpreted in accordance with the laws of the Province of Ontario.

INCO LIMITED

By: _____

By: _____

Print: _____

Print: _____

Name: _____

Date: _____

Appendix II

**Technical Scope of Work Community Based Risk Assessment Plan for
Port Colborne, Ontario, Project No. 33826, November 9, 2000**

**TECHNICAL SCOPE OF WORK
COMMUNITY BASED RISK
ASSESSMENT PLAN
FOR PORT COLBORNE, ONTARIO**

Project No. 33826

**Prepared for
Inco Limited
145 King Street West, Suite 1500
Toronto, Ontario M5H 4B7**

November 9, 2000

**Prepared by
Jacques Whitford Environment Limited
1200 Denison Street
Markham, Ontario
L3R 8G6**

TECHNICAL SCOPE OF WORK

**COMMUNITY BASED RISK ASSESSMENT PLAN
FOR PORT COLBORNE, ONTARIO**

November 9, 2000

Prepared for Inco Limited by Jacques Whitford Environment Limited

**Reviewed by the MOE, Regional Health Department, the PLC, and Beak International
Incorporated**

TABLE OF CONTENTS

1.0	INTRODUCTION.....	1
1.1	PURPOSE.....	1
1.2	BACKGROUND.....	1
1.2.1	<i>History of Area</i>	1
1.2.2	<i>MOE Studies</i>	1
1.2.3	<i>CBRA Process</i>	2
1.2.4	<i>CBRA Participants</i>	4
1.3	CHEMICALS OF CONCERN (COC).....	5
2.0	COMMUNITY ASSESSMENT ACTIVITIES.....	7
2.1	TECHNICAL SCOPE OF WORK.....	7
2.1.1	<i>Confirmation of CoC List</i>	7
2.1.2	<i>Human Health Risk Assessment (HHRA)</i>	7
2.1.2.1	HHRA Problem Formulation.....	7
2.1.2.2	HHRA Receptor Identification.....	8
2.1.2.3	HHRA Exposure Assessment.....	8
2.1.2.4	HHRA Hazard Assessment.....	8
2.1.2.5	HHRA Risk Characterization.....	9
2.1.3	<i>Ecological Risk Assessment (ERA)</i>	11
2.1.3.1	Receptor Characterization for the ERA.....	11
2.1.3.2	Exposure Assessment for the ERA.....	12
2.1.3.3	Hazard Assessment for the ERA.....	12
2.1.3.4	Risk Characterization for the ERA.....	12
2.2	CONCURRENT STUDIES.....	13
2.2.1	<i>Health Monitoring Study</i>	13
2.2.2	<i>Socio-Economic Analysis</i>	13
3.0	SPECIFIC ERA STUDIES.....	14
3.1	OVERVIEW.....	14
3.1.1	<i>Ecological Survey and the Selection of VECs</i>	14
3.1.2	<i>Sampling and Analysis Programs</i>	14
3.1.3	<i>Greenhouse Experiments</i>	14
3.1.3.1	Importance of Phyto-Bioavailability Considerations.....	15
3.1.3.2	Critical Phytotoxic Index of Each CoC.....	15
3.1.4	<i>Field Experiments</i>	15
4.0	EVALUATION AND MODEL APPLICATION.....	17
4.1	DERIVATION OF COMMUNITY RISK-BASED SOIL CLEANUP GUIDELINES FROM THE HHRA AND ERA.....	17
4.2	ANALYSIS OF APPLICABLE SOIL REMEDIAL OPTIONS.....	17
4.3	WATER REMEDIATION OPTIONS.....	18
5.0	SUMMARY.....	19
6.0	REFERENCES.....	20

LIST OF FIGURES

Figure 1	1988 Port Colborne Aerial Photograph
Figure 2	Site Plan Showing Regional Topography of Port Colborne
Figure 3	Site Plan Showing Nickel Concentrations in Soil of Port Colborne (1998)
Figure 4	Site Plan Showing Copper Concentrations in Soil of Port Colborne (1998)
Figure 5	Site Plan Showing Cobalt Concentrations in Soil of Port Colborne (1998)
Figure 6	Three Requirements for a Health Risk
Figure 7	Conceptual Model for Human and Ecological Receptors at Port Colborne

LIST OF APPENDICES

APPENDIX I	Receptor Characteristics for HHRA
APPENDIX II	Equations for HHRA Exposure Estimates
APPENDIX III	Toxicity Reference Values for Identified CoCs in HHRA
APPENDIX IV	Risk Characterization for HHRA
APPENDIX V	Definition of Terms

LIST OF ACRONYMS

Beak	Beak International Incorporated
City	City of Port Colborne
CBRA	Community Based Risk Assessment
CCME	Canadian Council of Ministers of the Environment
CoC	Chemical of Concern
Community	All potential receptors (human and ecological) within an area of Port Colborne defined by previous MOE studies as having concentrations of CoCs in soil from Inco's historical operations above the MOE generic Table A guideline.
CPI	Critical Phytotoxic Index
ERA	Ecological Risk Assessment
HHRA	Human Health Risk Assessment
HI	Hazard Index
ILCR	Incremental Lifetime Cancer Risk
Inco	Inco Limited
Jacques Whitford	Jacques Whitford Environment Limited
MOE	Ministry of the Environment
PLC	Public Liaison Committee
RD	Reference Dose
RME	Reasonable Maximum Exposure
SSRA	Site Specific Risk Assessment
TSC	Technical Sub-Committee to the PLC
TDI	Tolerable Daily Intake
TSOW	Technical Scope of Work
VECs	Valued Ecological Components

1.0 INTRODUCTION

1.1 Purpose

Inco Limited (Inco) has committed itself to the community of Port Colborne (represented by the Public Liaison Committee, PLC), the City of Port Colborne (The City) and the Ontario Ministry of the Environment (MOE) to conduct a Community Based Risk Assessment (CBRA). This will be conducted for chemicals of concern (CoC) in the Port Colborne area that are elevated as a result of historical emissions from Inco's Refinery. Figures 1 and 2 show the location and regional topography of the Port Colborne area.

1.2 Background

1.2.1 History of Area

Inco has operated a nickel refinery in the City of Port Colborne since 1918. Historical operations at the refinery released particulate emissions to the environment which caused regional contamination of soil. The MOE has conducted sampling to determine the extent of soil contamination resulting from Inco's operations and has reported on their results and findings (refer to Section 1.2.2).

Inco has acknowledged responsibility for contamination resulting from their operations and is the proponent of the CBRA process, which includes the quantitative assessment of risks for the community as a whole as well as for individual property owners, and includes the removal of identified risks by carrying out remediation on the affected environmental media.

1.2.2 MOE Studies

The MOE (MOE, 2000a) conducted studies of the Port Colborne area in 1998, in particular around the Refinery plant. Soil samples were analyzed for eighteen (18) metals, including aluminum, arsenic, barium, beryllium, calcium, cadmium, cobalt, copper, chromium, iron, magnesium, manganese, molybdenum, nickel, lead, strontium, vanadium, and zinc. The MOE concluded from their sampling that soil concentrations of nickel, copper and cobalt were elevated above MOE effects-based generic soil clean up guidelines and should be considered to be CoCs.

The levels of nickel in soils reported in 1998 were measured at concentrations of up to 5000 ppm, generally with the highest concentrations closest to the Inco stack, and lower concentrations away from the Inco stack. Soil concentrations of copper and cobalt were measured at up to 350 ppm and 150 ppm, respectively. As with nickel, the concentrations of copper and cobalt were found to be highest near where the old Refinery stack was located, and declined further from it. The areas with the concentration of nickel, copper and cobalt exceeding the MOE Table A Generic guidelines as identified from the 1998 data generally occurred in the eastern portions of the City, and agricultural and forested areas to the north and east of the Refinery, an area of approximately 19 km². Spatial

distributions of these metals in exceedance of the soil guidelines were plotted on maps by the MOE and these are reproduced on Figures 3 through 5.

A more detailed phytotoxicology soils investigation of the Port Colborne area by the MOE in 1999 provided more soil chemical data to the existing data set resulting in an increase in the estimated areal extent of Table A Guideline exceedances for these CoCs from 19 km² to 29 km² (MOE, 2000c).

The MOE are continually conducting additional soils investigations of the Port Colborne area. This has recently included woodlots where preliminary findings have indicated soil concentrations of nickel above the maximum values found in the MOE 1998 investigation. The results and findings of this investigation and others will be documented by the MOE in due course.

The MOE (1997b) and the Regional Health Department conducted a human health risk assessment in 1997 for residents potentially exposed to the metals nickel, copper and cobalt in soils in the area of Port Colborne. The study concluded that there were no adverse health risks associated with exposure of people to these metals. Subsequent to this MOE and the Regional Health Department study, the Health Department revisited the original report in light of the 1998/1999 MOE data and with respect to regional cancer statistics, and its findings which have been published in an updated report (MOE, 2000a) do not refute their earlier findings.

1.2.3 CBRA Process

As the proponent of the CBRA process, Inco is committed to developing a scientifically sound, risk based and practical solution which protects human health and the environment, to resolve the issue of contamination as a result of Inco's operations. Within the MOE's 1997 "Guideline for Use at Contaminated Sites in Ontario", there are several approaches that can be used by a proponent to achieve site restoration. One of these, namely the Site Specific Risk Assessment (SSRA) approach, is being adopted by Inco in the present case. The SSRA is a scientific technique that estimates risks to humans and the natural environment from exposure to chemicals of concern at the site. Because of specific site characteristics, there may exist numerical differences between safe concentrations of chemicals in the site's soil and the MOE generic safe levels. The SSRA is able to derive safe levels of chemicals that give the same level of protection for that site as do the generic levels.

In the Port Colborne issue, it is clear from soil analyses that certain chemicals originating from Inco's operations have been spread over a large area and are not confined to a single site or property. While it might be possible to conduct individual SSRAs on the hundreds of properties within the affected area, the cost of doing such would be prohibitive and the time to accomplish all the assessments, including each being approved by the MOE, would likely be ten years or more. Inco discussed with the MOE whether a community based risk assessment (CBRA) could be done more efficiently. The MOE agreed that the concept of a CBRA approach could be an extension of various SSRAs and Inco therefore has worked toward that end.

The Port Colborne CBRA process being proposed by Inco will:

- assess human health and environmental impacts of chemicals of concern and will develop a scientifically-based model that will calculate Port Colborne-specific soil clean-up guidelines that protect human and environmental health;
- determine remediation options for all environmental media having concentrations above the Port Colborne-specific guidelines and apply remediation actions that will fully protect human and environmental health far into the future.

Inco believes the benefits of conducting a CBRA are:

- that the time required for determining what risks are present and solutions for the entire community is shorter than conducting individual SSRAs;
- that the community will receive safe levels specific to their particular local environmental media;
- that a community-based human health study can be carried out that is more meaningful for the community than doing human health studies for the specific residents of each property;
- that the community as a whole will receive information on property value issues;
- that the risk assessment process will be transparent to the entire community;
- that the risk assessment and remedial actions taken will be consistently applied across the community so that all properties within the community are treated on the same basis;
- that the application of the CBRA model can be carried out using site-specific information and that therefore the CBRA is closely linked to an SSRA; and
- that the CBRA process can also be used to facilitate development approvals in Port Colborne, without requiring application of an SSRA or cleanup to MOE generic effects-based guidelines.

There are two stages envisioned for the CBRA Process. Stage 1 involves the application of technical and scientific information, both from the general scientific literature and Port Colborne, to derive a model to calculate risks from all possible exposures to the chemicals of concern. Once the chemicals of concern have been identified, then Human Health Risk Assessments (HHRAs) and Ecological Risk Assessments (ERAs) will be carried out for each such chemical. An HHRA is the evaluation of the probability of adverse health consequences, and the accompanying uncertainties, to humans caused by exposure to a chemical. The evaluation takes into consideration that many contaminants may be present simultaneously in several media such as food, air water, soil or dust and that they may reach humans through multiple pathways. A Port Colborne community health study (conducted by independent medical personnel) will provide additional data for the HHRA.

The ERA component of Stage 1 is a process which quantifies risks from a chemical to the environment and its non-human flora and fauna. The results of the HHRA and the ERA will then be integrated into a community-specific risk model. The model will calculate community wide risk-based soil clean-up guidelines using the specific characteristics of Port Colborne's environmental media.

Inco has asked Jacques Whitford Environment Limited (Jacques Whitford) to conduct the studies necessary for this first stage. Each part of Stage 1 will have community input. The final results and model derivation will be independently peer-reviewed by outside experts, and the MOE, to assure scientific integrity.

Stage 2 involves application of the model developed in Stage 1 to individual properties. This will only be done with the consent of the property owner. For sites having a concentration of a chemical of concern near or above the Port Colborne community specific risk-based safe guideline for that chemical, soil characteristics from that site will be fed into the community specific risk-based model. The model will determine whether remediation is necessary and what remedial options are possible for the site. Inco will pay for remediation after agreement with the property owner and the MOE. No one will be forced to have their property remediated; nor will the property owner waive any civil or legal rights. The CBRA process has the objective of finding out what risks exist, if any, and determining how to remove such risks in a scientifically sound and practical manner. Each property owner will determine whether they want to participate in having the CBRA process applied to their property.

1.2.4 CBRA Participants

Inco is the proponent of the CBRA process and is seeking input from the public, the City and the appropriate government agencies regarding conducting the CBRA.

The MOE is the environment government agency responsible for ensuring that the Inco and their consultant, Jacques Whitford conduct the CBRA according to the principles of the SSRA process, as outlined in the MOE (1997a) *Guideline for Use at Contaminated Sites in Ontario*. The Director of the West Central Region of the MOE will make decisions pursuant to the provisions of the Environmental Protection Act.

The Public Health Department of the Region of Niagara is the government agency responsible for providing technical input on health issues into the CBRA.

The property owners of Port Colborne can use the findings of the CBRA to the benefits as outlined in Section 1.2.3.

The City supports the CBRA process.

A Public Liaison Committee (PLC) has been established by The City Council to solicit public input; to inform the public; and, to provide input to Inco and to the Director of the MOE respecting the scope of work for and the preparation and conducting of, a proposed CBRA addressing nickel, copper and cobalt contamination in the Port Colborne area. In particular, the PLC is to satisfy the conditions within their terms of reference as follows:

- advise Council of the City on the adequacy of the Terms of Reference for the Committee, and, to make recommendations for changing the "Terms" if necessary,
- receive and review all appropriate information respecting the contamination of lands with nickel, copper and cobalt in Port Colborne,
- provide input to the Director (of the MOE) and to Inco respecting the Scope of Work for the CBRA,
- monitor the progress of the CBRA,
- review the findings and recommendations of the CBRA and provide input to Inco and the Director (of the MOE),
- provide input to Inco and the Director on the methods of implementing the recommendations of the CBRA as may be appropriate,
- submit a final report including comments and advice to the Director with respect to the PLC and CBRA processes.

Beak International Incorporated (Beak) is the PLC's independent consultant to provide technical support and advice respecting the CBRA.

Jacques Whitford has been retained by Inco to prepare and implement a Technical Scope of Work (TSOW) for Stage 1 of the CBRA process for Port Colborne. This work is designed to establish a credible basis for the management of the elevated concentrations of CoCs in soils in a manner which is safe and acceptable to all participants, including the residents of Port Colborne, the City, the MOE and Inco.

A Technical Sub-Committee (TSC) of the PLC has been formed with members from the PLC, Beak, the MOE and Jacques Whitford. Representatives of the Public Health Department and Inco are participants at the TSC meetings. This committee is a sub-committee of the PLC and reports its findings to the PLC. The purpose of the TSC is to have meetings for resolution of technical issues, including protocols, throughout the CBRA process. The public has an observational capacity at the TSC meetings.

1.3 Chemicals of Concern (CoC)

According to the MOE, a chemical can only be considered as a CoC for this CBRA if all of the following conditions are found, as follows:

Chemicals that were historically used or generated in the Inco Refinery or its processes, and

Chemicals that are present at a community level at concentrations greater than MOE generic effects-based guidelines, and

Chemicals whose distribution in soils shows a scientific link to Inco's operations.

As part of the CBRA an investigation will be conducted to identify the CoCs. However, it should be noted that experience in other parts of the province shows that elevated levels of chemicals may be found that are unrelated to the operations being studied.

2.0 COMMUNITY ASSESSMENT ACTIVITIES

2.1 Technical Scope of Work

The technical scope of work (TSOW) which constitutes Stage 1 of the CBRA process includes:

- an evaluation to confirm that all relevant CoCs have been considered,
- performing a quantitative human health risk assessment (HHRA),
- performing a quantitative ecological risk assessment (ERA), and
- an evaluation of all applicable remediation options.

The HHRA and the ERA components of the TSOW will follow the protocols and principles of the SSRA process, as outlined in the MOE (1997a) *Guideline for Use at Contaminated Sites in Ontario*, the MOE (1996a) *Guidance on Site-Specific Risk Assessment for use at Contaminated Sites in Ontario* and the Canadian Council of Ministers of the Environment (CCME, 1996) *A Framework for Ecological Risk Assessment: General Guidance*.

2.1.1 Confirmation of CoC List

An investigation will be carried out to identify chemicals that should be considered as CoCs for inclusion in Stage 1 of the CBRA. The investigations will include:

- a literature review of historical and current nickel refining,
- review of literature relating to CoC concentrations in Port Colborne soils,
- selection with the TSC of a list of potential chemicals for analysis, and
- sampling and analysis of soils, water, air and other environmental media.

2.1.2 Human Health Risk Assessment (HHRA)

A HHRA will be conducted to assess potential risks associated with community exposure to CoCs in areas of Port Colborne. The HHRA is being conducted to address media that were affected as identified in Section 2.1.1. As part of this assessment, site-specific concentrations of CoC will be obtained from soils, surface water, groundwater, sediment and the local food basket. The HHRA will incorporate all of the environmental data available for the areas of potential concern. The method to conduct the HHRA will be based on the MOE (1996a) Guidance document, the US EPA (1989) Risk Assessment Guidance for Superfund and other related documents.

2.1.2.1 HHRA Problem Formulation

The problem formulation step of the HHRA will identify the CoC's, the potential receptors in the community and the potential exposure pathways that will be assessed in the HHRA.

2.1.2.2 HHRA Receptor Identification

Receptors for the HHRA are considered to be people that have the greatest potential exposure to chemicals of concern. People who reside and/or work (including farmers and field workers) in the City of Port Colborne and the surrounding area are considered to be the receptors for the HHRA. Since the soil contamination is present in residential and agricultural areas, infants, toddlers, young children, adolescents and adults will all be considered as receptors for the purposes of the HHRA. For the assessment of both non-carcinogenic and carcinogenic endpoints, the life stage with the greatest exposure to CoCs will be considered to be the most sensitive receptor (e.g., toddlers often receive higher potential exposures of CoCs than adults).

2.1.2.3 HHRA Exposure Assessment

The HHRA will consider various land use scenarios, including agricultural, residential/parkland, woodlot, and commercial/industrial. In estimating the level of potential exposure of people to the CoCs in each land use scenario, the primary goal will be to identify reasonable maximum exposure (RME) estimates that closely reflect the actual situation for the population in Port Colborne.

A human health risk of a CoC to a human receptor can only occur if there is a pathway (Figure 6). Exposure of human receptors to CoCs may occur via several pathways. These pathways include, but are not limited to: a) soil ingestion; b) dermal contact with soil; c) inhalation of fugitive dust from soils; d) ingestion of water; and e) ingestion of foods. There may be other relevant exposure pathways. Reasonable maximum exposure factors will be used to calculate exposure for people in accordance with the land use. Exposure factors include residence time, incidental soil ingestion rate, inhalation rate, and others. These will be based on Canadian data (Richardson, 1997). US EPA exposure factors (US EPA, 1997) may be used if there are insufficient data available from Canadian sources regarding specific exposure routes.

Site-specific data will be obtained for soils, water, food basket (including garden and purchased food) and air quality. An illustration of potential exposure pathways is illustrated in Figure 7.

2.1.2.4 HHRA Hazard Assessment

Toxicity reference values below which potential human health risks are not expected will be obtained from literature sources. A threshold-based approach will be used for non-carcinogenic chemicals, expressed as tolerable daily intakes (TDI) or Reference Doses (RfD). The RfD is the estimate of lifetime daily exposure to a non-carcinogenic substance for the general human population that appears to be without appreciable risk of deleterious effects. It is expressed as mg chemical/kg body weight/day.

If CoCs are identified to be carcinogens, then potency estimates reflective of carcinogenic potential will be used to assess the risks for these chemicals. A slope factor (SF) is used for assessment of carcinogenic effects of a chemical. The SF is a plausible upper-bound estimate of the probability of a response per unit intake of a chemical over a lifetime. It is used to estimate an upper bound probability of an individual developing cancer as a result of exposure to a particular level of a potential carcinogen.

An attempt will be made to differentiate between different compounds of CoCs in the environment (e.g., metal speciation) that may affect potential toxicity and exposure to the CoCs. The bioavailability of the CoCs will be evaluated for each route of exposure quantified for this assessment based on the available literature. The impact of speciation on CoC exposure, CoC toxicity, and potential chemical interactions will be discussed.

2.1.2.5 HHRA Risk Characterization

Risk characterization is the final stage of a quantitative risk assessment, where the potential health risks from exposure to CoCs are quantified. An estimate of the potential risks from exposure to CoCs in various media will be calculated by comparing the exposure estimate to the toxicity reference dose.

For a non-carcinogen, risk characterization will be expressed as a hazard quotient (HQ), such that $HQ = (\text{estimated exposure})/(\text{reference dose})$. The sum of the individual HQs for each exposure pathway is expressed as a Hazard Index (HI). An HI of greater than one (1.0) represents a potential health concern that should be more closely examined. For carcinogenic chemicals, the incremental lifetime cancer risk (ILCR) will be calculated as the (predicted exposure) x (slope factor). Incremental lifetime cancer risks of more than one in a million represent a potential health concern that should be more closely examined.

The risk characterization will provide information regarding whether the elevated CoC concentrations present at some areas in the Port Colborne area have the potential to cause adverse health effects. Safe, risk-based criteria will be identified for each CoC for different land use areas. The method by which risk-based criteria are calculated is a back-calculation from standard calculations of risk. For instance, the soil concentration of CoC at a site is used as input to identify whether there is a risk at a site. The potential risk is expressed as an HI or ILCR. An acceptable soil concentration at a site may be higher or lower than the current soil concentration. The acceptable soil concentration is back-calculated using the target risk value (e.g., $HI=1$) to identify the risk-based criteria. Soil concentrations at or below the risk-based criteria will be protective of the people in different land use areas (e.g., agricultural, residential/parkland, woodlot, and commercial/industrial), based on all potential pathways.

The RBC from the HHRA will be used, together with the RBC from the ERA in derivation of safe CBRA soil clean-up criteria.

2.1.3 Ecological Risk Assessment (ERA)

The ERA will be conducted according to the Canadian Council of Ministers of the Environment (CCME, 1996) framework and the MOE (1996a) Guidance on SSRA. The ERA will be conducted at the same time as the HHRA. In this way, both human and ecological receptors will be considered for the CBRA. Details are provided in the following sections.

2.1.3.1 Receptor Characterization for the ERA

The Receptor Characterization component of the ERA may involve biological assessment of local plants and animals at various levels such as in ecosystems (e.g., a red maple swamp), as ecosystem functions (e.g., nutrient cycling), as a specific community or habitat (e.g., a woodlot), or as a specific species (e.g., robins or local agricultural crops). The objective of the receptor characterization is to identify and characterize local ecosystems potentially at risk from exposure to the CoCs.

The focus will be on defining one or more specific ecological receptors known as Valued Ecological Components (VECs) for more detailed studies. These are receptors that have been determined to be of major local importance.

VECs will be determined from literature review, discussions with the public, and by carrying out field investigations involving flora and fauna present in the Port Colborne area. Potential VECs that may be considered include agricultural and backyard garden crops, domestic and farm animals, local wild animals (e.g., voles, frogs, weasels, worms), and wild and domesticated plants (e.g., red oaks, silver maples). Rare and endangered species will be considered in this assessment. If rare and endangered species are identified as VECs, the ERA will be conducted using surrogate species for which toxicity and behavioral data are available in the literature.

Particular attention will be paid to possible adverse impacts of soil metals on maple trees in the Port Colborne area. Existing maple trees will be evaluated as to variety/cultivar, location, and potential exposures. Selected trees will be evaluated for environmental impacts (disease, insects) from CoCs.

The ERA will also consider phytotoxic effects associated with different land use areas and soil types, with crops and other vegetation as the principal ecological receptors. Other ecological exposure pathways and receptors will also be addressed including: i) aquatic receptors in surface water and ii) fauna that may ingest impacted soils. In addition to the selection of VECs based on exposure pathways, where possible, all VECs will be selected for which existing studies and scientific literature have documented bioaccumulation, and sensitivity to concentrations of CoCs.

In summary, the selection of VECs for the ERA will fulfill as many of the following criteria as is possible:

occurs in the study area in sufficient numbers or covers sufficient area to allow for meaningful assessment and analysis of data;
has a demonstrated and understood pathway for CoC bioaccumulation, and sensitivity to CoCs which have been documented in the literature;
has a life cycle with duration that will allow for a meaningful assessment of the magnitude of actual and potential exposure to CoC concentrations in the soils of the study area;
allows for the relatively easy collection of sufficient samples in a manner which is both systematic and repeatable; and
represents, or is part of, a naturally occurring population/community which has been identified as of concern and/or requiring protection by an ERA.

2.1.3.2 Exposure Assessment for the ERA

The Exposure Assessment component of the ERA will involve detailed assessments of the characteristics, contamination levels and CoC speciation in each of the major soils from the Port Colborne area.

Exposure assessment will be conducted for each CoC identified. The assessment will consider the magnitude, frequency and duration of exposure. Consideration will also be given to potential interactions between biota with respect to food webs. The bioavailability of CoCs will be considered for different areas representing places where varying soil characteristics and CoC speciation exist. Exposure pathways will be considered for each VEC or surrogate, and the most important pathways will be evaluated in detail for the purpose of this assessment.

2.1.3.3 Hazard Assessment for the ERA

The hazard assessment component of the ERA will involve determining the toxicity of each CoC to each of the VECs (fauna and flora) in order to define dose-response relationships. Literature-based assessment and/or toxicity tests will be used for the hazard assessment of fauna and flora in the community to define levels of exposure to CoCs that will represent unacceptable risks to identified VECs.

For plants, greenhouse and field test plot experiments will be conducted to establish plant soil metals uptake and phytotoxicity for the CoCs (refer to Section 3). The TSOW will include determinations of bioavailability for each of the CoCs to crops and other plants for a range of soil types typically found in the Port Colborne area. The study will involve experiments to determine plant growth, and the uptake, bioavailability and toxicity of CoCs to plants.

2.1.3.4 Risk Characterization for the ERA

The risk characterization phase of the ERA will be similar to that of the HHRA. The risks for previously identified VECs will be quantified by comparing the exposure of the VEC to the toxicity of the CoCs. Risks will be characterized for the VEC in different soils, and a discussion of uncertainty will be provided based on the exposure and hazard assessment. A hazard quotient of one will be used as the target, where a quotient of less than one is considered to be acceptable and a quotient greater than one implies a potential adverse impact to the VECs.

Discussion of the results in the risk assessment will be thorough and will address issues such as the significance of the levels of the risk found and the uncertainties associated with the assessment. The discussion of uncertainty will include, but not be limited to, the bioavailability of the CoCs in soils. The end product of the ERA will be an empirical model that predicts safe concentrations of CoCs based on relevant soil parameters, such as texture, pH and organic content, for Port Colborne soils. The model will generate safe community risk-based soil cleanup guidelines for the CoCs in Port Colborne.

2.2 Concurrent Studies

Inco is also proposing to undertake concurrent studies that will provide additional information to the Port Colborne community. The findings from the concurrent studies will be addressed in the detailed report prepared by Jacques Whitford as a result of conducting the TSOW. The concurrent studies include:

- 1) a health monitoring study, and
- 2) a socio-economic analysis.

2.2.1 Health Monitoring Study

A health monitoring study will be conducted by an independent group of qualified health science professionals. A separate draft scope of work for this study is currently being developed for presentation, discussion with and approval from the PLC. The results and findings of this health study will be addressed in the HHRA component of the CBRA.

2.2.2 Socio-Economic Analysis

A Socio-Economic Analysis (SEA) will be carried out by independent property valuation specialists to assess economic and social concerns caused by the contamination issue. A separate draft scope of work for this study is currently being developed for presentation, discussion with and approval from the PLC. The SEA will assess whether contamination from the CoCs has affected property values in Port Colborne in relation to the surrounding community over time since the contamination issue was first identified. The findings of the SEA will be reported in a separate report and considered in the CBRA process.

3.0 SPECIFIC ERA STUDIES

3.1 Overview

As part of the ERA, a number of distinct studies will be carried out. These will include:

an ecological survey in the Port Colborne area and the selection of VECs, sampling of environmental media including soil, water and air, greenhouse testing, and field test plot programs.

3.1.1 Ecological Survey and the Selection of VECs

Some agricultural crops should be considered as VECs and for these, greenhouse and field testing has already commenced. As part of the ERA a field survey of the flora and fauna in the Port Colborne area will be carried out. The purpose of this study is to identify valued ecosystems potentially at risk.

3.1.2 Sampling and Analysis Programs

As part of the ERA, soil sampling will be carried out in the Port Colborne area. Some of this sampling and associated analyses will be carried out in conjunction with other ERA activities (e.g., greenhouse testing) and HHRA activities (e.g., soil sampling also occurring when backyard produce is sampled). For example, an extensive program of soil sampling, collection and analyses was carried out with PLC approval to obtain, prepare, and characterize the soils used during the greenhouse testing program of the summer of 2000. In addition to such support programs, stand alone soil sampling and soil analysis programs will be carried out. In addition to soil sampling carried out by Jacques Whitford, some archived soil samples taken earlier by the MOE will be accessed and further analyzed.

Groundwater and surface water within the community will be sampled and analyzed to determine if the water has been contaminated by CoCs. The sampling will include water wells, and surface water in streams and ditches in the community.

Sampling of ambient air will also be conducted to assess whether air-blown dust (particulate matter) from soil contaminated with CoCs is presenting a potential health risk to residents and workers (including agricultural workers) within the community.

3.1.3 Greenhouse Experiments

Greenhouse testing is proposed using soils obtained from the Port Colborne community to assess the bioavailability and toxicity of CoCs to plants (phytotoxicity) grown in the soils. The greenhouse tests would also assess the applicability of soil amendments to prevent phytotoxicity.

3.1.3.1 Importance of Phyto-Bioavailability Considerations

Bioavailability refers to how much of a chemical that can be taken up from the environment (e.g., soil) by an organism (e.g., a plant). The bioavailability of a chemical can be variable in different matrices (e.g., the bioavailability of CoCs can be lower when adsorbed to soil than dissolved in water). The MOE recognized in their MOE (2000) report that different soil conditions, such as higher soil pH and organic content would result in lower bioavailabilities for plants and therefore lower phytotoxicities of the CoCs.

One or more sets of greenhouse experiments will be conducted to assess bioavailability.

3.1.3.2 Critical Phytotoxic Index of Each CoC

The safe maximum soil concentration of a CoC in this study will be defined as the concentration of the CoC in soil that will not cause losses in plant yield due to phytotoxicity. The critical soil concentration will be determined by measuring the CoC concentration in soil and the concentration of the CoC accumulated in the lowest tissue of a plant grown in the soil where toxicity occurs (Macnicol and Beckett, 1985). The lowest plant tissue (that is the leaves closest to the ground) will be used since metal CoCs are readily accumulated here and the concentrations are not diluted by lower CoC concentrations in the remainder of the plant. The maximum non-phytotoxic plant tissue concentration of a CoC will be used in assessing the affect of soil parameters, such as pH, and CoC bioavailability. The parameters of plant tissue concentration, bioavailable CoC and soil pH will define the critical rating for that plant grown in a particular soil type with a known texture, CoC content, organic matter content and pH.

A bioavailable CoC concentration in soil can be related directly to critical CoC toxicity concentrations in the plant (i.e. the critical phytotoxicity index or CPI). The CPI general relationship is represented by the following equation:

Critical Phytotoxic Index (CPI) = (Concentration of CoC in the plant)/(Concentration of CoC in the soil).

3.1.4 Field Experiments

In addition to the greenhouse experiments, similar outdoor field plot experiments will be conducted. Three existing field sites near Port Colborne will be used: one involving organic soil, and two on mineral clay soils. In addition to the three agricultural crop plants of the greenhouse experiments (field corn, oats and soybeans), sweet corn and radishes will also be grown, as will phytoextracting plants. So far as is practical, experimental parameters (e.g., harvesting times) will be comparable to those for the simultaneous greenhouse experiments. Critical phytotoxicity indices will be determined for the field plot experiments in similar fashion to that described above for the greenhouse experiments. The results from

field plot experiments will be combined with the results from the greenhouse experiments to determine safe concentrations of CoCs in soils that are not phytotoxic.

4.0 EVALUATION AND MODEL APPLICATION

4.1 Derivation of Community Risk-Based Soil Cleanup Guidelines from the HHRA and ERA

A matrix will be developed for community risk-based soil clean-up guidelines for each CoC for various land uses and soil types. For each combination of soil type and land use, the most sensitive of the HHRA- and the ERA- derived community risk-based soil clean-up guidelines developed during the TSOW, will be proposed for any soil remediation in the Port Colborne area.

4.2 Analysis of Applicable Soil Remedial Options

The purpose of the remedial actions will be to mitigate any unacceptable risk to human health or the environment. Remedial option(s) will be selected based on site specific conditions. At present, the preferred remedial option for each soil type and for each land use is unknown.

An analysis of potential remedial options for the Port Colborne area will be done. The following remedial options will be assessed in terms of their value based on the following criteria: practicality, impact on HHRA, impact on ERA, feasibility, permanency, public input and cost. This analysis will include remedial options potentially applicable for the Port Colborne area, such as:

Contaminant Removal

phytoextraction,
"remove and replace"
soil washing
a combination of 1), 2) and/or 3)

Risk Management

encapsulation
capping
fencing
phytostabilization
a combination of 1), 2), 3) and/or 4)

Phytoextraction is the use of special plants that take up soil CoCs into their tissues. These plants can then be harvested and ashed, with residue being recycled to a metals refinery or disposed of at an approved facility. Several crops are usually required to reduce soil CoC concentrations sufficiently.

Remove and replace is the excavation, the haulage and disposal of contaminated soil to local MOE-approved landfill sites and replacement with clean soil.

Soil Washing is the process of washing CoCs out of the impacted soil. This would involve excavation of the contaminated soil, processing the soil at a washing facility and returning the cleaned soil to the excavated sites.

Phytostabilization involves the immobilization of soil contaminants by amending soils with materials such as pH adjustment agents, diminishing the availability of contaminants to plants and inhibiting their leaching.

4.3 Water Remediation Options

Potential options will be analyzed for addressing contamination of surface water and groundwater, including potable and non-potable sources. These options include:

- 1) Treatment of water to applicable standards or guidelines (e.g., potable water guidelines);
- 2) Contaminant source mitigation, including removal, isolation, contaminant migration controls, or other controls; and,
- 3) Alternate supply.

5.0 SUMMARY

In summary, a TSOW consisting of a human health and ecological risk assessment will be carried out for receptors potentially exposed to CoCs in soils, water, air and other environmental media. The human health and ecological risk assessments will provide reasonable maximum exposure estimates. These will be used to determine the potential risks to human and ecological receptors.

The TSOW will establish the soil concentrations of the CoCs that are safe for the intended land use in Port Colborne. The TSOW will ensure that the levels of CoCs in soil, water, air and other environmental media will be safe for people that reside and work in the Port Colborne area as well as for ecological receptors that may inhabit or frequent the area.

Remedial options will be proposed to reduce unacceptable exposures to the CoCs, based on site-specific data. The findings will be thoroughly discussed, an interpretation of the findings provided, and the limitations of the study documented. The results of the TSOW, with proposed remedial recommendations, will be communicated to the community, the PLC and other participants.

6.0 REFERENCES

- CCME 1996. A Framework for Ecological Risk Assessment: General Guidance. The National Contaminated Sites Remediation Program. Canadian Council of Ministers of the Environment.
- CCME. 1996. A Protocol for the Derivation of Environmental and Human Health Soil Quality Guidelines. Canadian Council of Ministers of the Environment.
- Chambers, D.B., Chaney, R.L., Conard, B.R., Garisto, N.C., Kukier, U., Phillips, H.A. and Fernandes, S. 1998. Risk Assessment for Nickel in Soil, with a Critical Review of Soil-Nickel Phytotoxicity.
- Cowherd, Jr. 1983. A New Approach to estimating wind generated emissions from coal storage piles, presented at the APCA Specialty Conference on Fugitive Dust Issues in the Coal Use Cycle, Pittsburgh, PA.
- EPA. 1989. Risk Assessment Guidance for Superfund: Volume I - Human Health Evaluation Manual (Part A), EPA/540/1-89/002, Office of Emergency and Remedial Response, Washington, DC.
- Health Canada 1994. Nickel and its Compounds. Canadian Environmental Protection Act. Priority Substances List Assessment Report.
- Korcak, R. F. and Fanning, D.S. 1978. Extractability of cadmium, copper, nickel and zinc by double acid versus DTPA and plant content at excessive soil levels. *J. Environ. Qual.* 7:506-512.
- Macnicol, R.D. and Beckett, P.H.T. 1985. Critical tissue concentration of potentially toxic elements. *Plant and Soil* 85: 107-129.
- McBride, M.B., Tyler, L.D., and Hovde, D.A. 1981. Cadmium adsorption by soils and uptake by plants as affected by soil chemical properties. *Soil Sci. Soc. Am. J.* 45:739-744.
- Meranger, J.C., Subramanian, K.S., and Chalifoux, C. 1981. Survey for Cadmium, Cobalt, Chromium, Copper, Nickel, Lead, Calcium, and Magnesium in Canadian drinking water supplies. *J. Assoc. of Anal Chem* 64:44-53.
- MOE 1996a. Guidance on Site Specific Risk Assessment for Use at Contaminated Sites in Ontario. Ministry of Environment and Energy. May 1996.
- MOE 1997a. Guideline for Use at Contaminated Sites in Ontario. Ministry of the Environment. February 1997.
- MOE 1997b. Assessment of Potential Health Risks of Reported Soil Levels of Nickel, Copper and Cobalt in Port Colborne and Vicinity. May 1997. Prepared by: B. Lece. Standards Development

Branch, Ontario Ministry of Environment and Energy and S. Rifat, Health Services Department, Region of Niagara.

MOE 2000a Phytotoxicity Soil Investigation: Inco – Port Colborne (1998). Ontario Ministry of Environment and Energy. January 2000.

MOE 2000b Update to MOE 1997b. Assessment of Potential Health Risks of Reported Soil Levels of Nickel, Copper and Cobalt in Port Colborne and Vicinity. May 1997. Prepared by: B. Leece, Standards Development Branch, Ontario Ministry of Environment and Energy and S. Rifat, Health Services Department, Region of Niagara.

MOE 2000c Phytotoxicity Soil Investigation: Inco – Port Colborne (1999). Ontario Ministry of Environment and Energy. July 2000.

Page, G.W. 1981. Comparison of Groundwater and Surface Water for Patterns and Levels of Contamination by Toxic Substances. *Environmental Science and Technology*. 15:1475-1481.

Richardson, G.M. 1997. *Compendium of Canadian Human Exposure Factors for Risk Assessment*.

US EPA 1989. *Risk Assessment Guidance for Superfund EPA/540/1-89/002 – December 1989*.

US EPA 1995. *Compilation of Air Pollutant Emission Factors, AP-42, fifth edition, 1995*.

US EPA 1997. *Exposure Factors Handbook*. United States Environmental Protection Agency. EPA/600/P-95/002Fa – August 1997.

US EPA 1999. *Integrated Risk Information System database*. United States Environmental Protection Agency, Cincinnati, OH. <http://www.epa.gov/iris/index.html> . Last updated 08/11/99.

APPENDICES

APPENDIX I

RECEPTOR CHARACTERISTICS FOR HHRA

Receptor characteristics will be selected based on site-specific data and information from the Canadian Council of Ministers of the Environment (CCME) document, *A Protocol for the Derivation of Environmental and Human Health Soil Quality Guidelines* (1996) and *Compendium of Canadian Human Exposure Factors for Risk Assessment* Richardson (1997). If additional information is required that is not available from Canadian sources, further information will be obtained from the "Exposure Factors Handbook" US EPA (1997). As discussed in the main text, the exposure assessment for the HHRA will provide a conservative estimate of reasonable maximum exposure for people living and working in the community.

Receptors in the area include agricultural workers, residents and commercial/industrial workers. Conservative receptor characteristics will be used for each exposure scenario. The characteristics used for each of the receptors will be as specific to the Port Colborne area as reasonably possible, based on site-specific information, the available literature and consultation with the PLC.

Some of the assumptions proposed for use in the HHRA are outlined below:

- Residents in the town and surrounding agricultural area will conservatively be assumed to reside in the area all year, for an exposure frequency of 365 days/year with no provisions for time spent away from the site on vacation;
- Workers will be conservatively assumed to work 8 hours/day for 260 days/year, based on a 5 day work week, with no adjustment made for vacation time that would reduce exposure;
- The exposure frequency will be adjusted to account for days with snow cover and frozen ground, since direct contact with soils is negligible during the winter months in Port Colborne. On average, it will be assumed that there is no direct contact with soils from late December through the end of February due to snow cover and frozen ground (Canadian Climate Normals), which is conservatively assumed to be 2 out of 12 months of the year. Therefore, the exposure frequency of 365 days/year to soils at the site will be adjusted by a factor of 0.84;
- A conservative estimate of daily exposure will be used for people in residential and in an agricultural setting. The time spent at a site will be determined following discussions with the public;

- A conservative estimate of the length of time a person may reside at one site is 30 years. It is possible that a person may reside in one house or one area for 70 years, however this is not typical of the population. Similarly, a 30-year exposure duration is not typical of the North American population. The typical length of time an adult may reside at one residence is assumed to be 9 years (US EPA, 1997). However, it is expected that people in small towns have a longer residency time than the average population, since there is less mobility in these areas than in large urban populations. Accordingly for the HHRA, a conservative exposure duration of 30 years will be used;
- Air intake rates (e.g., inhalation rate) will be based on values suggested by the CCME (1996). These will be provided for each age range in the CBRA, and include a rate of 23 m³/day for an adult;
- Soil intake rates for the receptor age groups will be based on data suggested by Canadian regulators (CCME, 1996) will be used to estimate exposure. The CCME (1996) suggests soil intake values of 80 mg/day for toddlers and 20 mg/day for other age groups.
- The dermal bioavailability for each chemical of concern will be based on the most current scientific literature.

The above assumptions will be reviewed and discussed at an appropriate TSC meeting to ensure that they represent community specific characteristics.

As mentioned in the main text, potential exposure to CoCs may occur via several exposure pathways. The significance of each of these pathways will be assessed following a review of all data available. Receptor characteristics will be provided for each operable exposure pathway. An example of some calculations that may be used for the exposure assessment are provided in Appendix II.

APPENDIX II

EQUATIONS FOR HHRA EXPOSURE ESTIMATES

Exposure of human receptors to CoC may occur via several pathways. Currently, these pathways are known to include: a) soil ingestion; b) dermal contact with soil; and c) inhalation of fugitive dust from soils. Additionally, there may be other relevant exposure pathways, including but not limited to, drinking water for residents with groundwater wells, dermal contact with water, consumption of non-local dietary sources, local produce, local game or local fish. The operable exposure pathways will be determined following analysis of environmental data from the site.

The potential for adverse health effects from chemicals increases with increasing exposure. Exposure from each of the operable exposure pathways will be considered in the HHRA. If certain exposure pathways are found to be minimal or inapplicable, then these will not be further considered for quantitative assessments under the HHRA. Selection of operable exposure pathways will be decided upon following discussions with the public.

CoC concentrations in media (eg., soils) retained for quantitative evaluation under the HHRA will be assessed using the 95th percentile concentrations in each of the areas of potential environmental concern to be considered in the assessment. This will provide an estimate of the upper bound exposure for residents in each area. Additionally, exposure to the 95th upper confidence limit of the mean will be estimated to provide information relevant for typical exposures in each area.

Particulate samples have been obtained from the site. Since these were obtained at one point in time, JWEL also proposes that fugitive dust modeling be conducted to assess the concentrations of CoCs in ambient air resulting from windblown dust. The potential sources will be mainly due to wind erosion of exposed contaminated soil, agricultural operations, and vehicle traffic (that may introduce CoC-contaminated particulates deposited on roadways back into the atmosphere). This will be conducted for the residential and agricultural scenarios separately, since increased levels of dust are expected from agricultural tilling and larger areas of unvegetated land certain times of the year. Modeled concentrations for CoCs in air will be used for the exposure assessment. For the purpose of modeling concentrations of fugitive dust in air, the contaminated area in the vicinity of Port Colborne will be subdivided into a number of chemical concentration zones. Chemical emission rates from each zone due to wind erosion will be conservatively estimated from available empirical data and relationships (US EPA (1995) and Cowherd (1983)). Using these emissions data, annual-average ground level CoC concentrations at receptors located in Port Colborne and surrounding areas will be estimated using the US EPA Fugitive Dust Model (FDM). FDM was designed to model particulate dispersion from area sources accounting for plume depletion and tilting due to gravitational settling of the particulate matter in the plume. Meteorological data from the nearest station will be used with FDM to generate the estimates for

predicted annual-average ambient concentrations of CoCs adsorbed to particulates. The modeled results for PM₁₀ concentrations in air will be compared against annual average PM₁₀ concentrations for a rural area for the purpose of model validation.

For the HHRA, exposure estimates will be calculated for all pathways and expressed as mg chemical/kg body weight/day for each exposure pathway retained for assessment. Examples of some of the equations to determine exposure estimates are given below. Separate exposure assessments will be conducted for each of the areas of potential environmental concern that will be evaluated based on soil chemistry data.

Soil Ingestion:

$DR_{SI} = \frac{IR_{SI} \times C_s \times BIO_{SI} \times ET \times EF \times ED}{BW \times AT \times CF}$	Equation 1
---	------------

Where:

- DR_{SI} = estimated dose from soil ingestion of chemical (mg/kg bw/day)
- IR_{SI} = soil ingestion rate (kg/day)
- C_s = chemical concentration in soil (mg/kg, or ppm)
- BIO_{SI} = bioavailability factor via ingestion of soil (unitless)
- ET = exposure time (hours/day / 24 hours/day)
- EF = exposure frequency (days/year)
- ED = exposure duration (years)
- BW = body weight (kg)
- AT = averaging time (yr)
- CF = conversion factor (365 days/yr)

Dermal Contact with Soil:

$DR_{DC} = \frac{SA \times SDAF \times C_s \times BIO_{DC} \times ET \times EF \times ED}{BW \times AT \times CF}$	Equation 2
--	------------

Where:

- DR_{DC} = dose rate from dermal contact with chemical in soil (mg/kg bw/day)
- SA = surface area of body available for dermal contact (m²)
- SDAF = soil dust adherence factor (kg/m²-day)
- C_s = chemical concentration in soil (mg/kg, or ppm)
- BIO_{DC} = bioavailability of chemical via dermal contact (unitless)
- ET = exposure time (hours/day / 24 hours/day)
- EF = exposure frequency (days/year)
- ED = exposure duration (years)
- BW = body weight (kg)
- AT = averaging time (yr)
- CF = conversion factor (days/yr)

Inhalation of Fugitive Dust from Soil:

$$DR_{IH} = \frac{IR \times C_A \times BIO_{ID} \times EF \times EF \times ED}{BW \times AT \times CF_1 \times CF_2} \quad \text{Equation 3}$$

Where:

- DR_{IH} = dose rate from inhalation of chemical of airborne particles (mg/kg bw/day)
- IR = inhalation rate (m³/hour)
- C_A = chemical concentration in air (µg/ m³)
- BIO_{ID} = bioavailability of chemical via fugitive dust inhalation (unitless)
- ET = exposure time (hours/day)
- EF = exposure frequency (days/year)
- ED = exposure duration (years)
- BW = body weight (kg)
- AT = averaging time (yr)
- CF₁ = conversion factor (days/yr)
- CF₂ = conversion factor (1000 µg/mg)

Ingestion of Local Produce:

$$DR_{PR} = \frac{IR_{PR} \times C_{PR} \times BIO_{PR} \times EF \times ED}{BW \times AT \times CF} \quad \text{Equation 4}$$

Where:

- DR_{PR} = dose rate of chemical from local produce (mg/kg bw/day)
- IR_{PR} = ingestion rate of local produce (kg/day)
- C_{PR} = chemical concentration in local produce (mg/kg, or ppm)
- BIO_{PR} = bioavailability of chemical via ingestion of produce (unitless)
- EF = exposure frequency (days/year)
- ED = exposure duration (years)
- BW = body weight (kg)
- AT = averaging time (yr)
- CF = conversion factor (days/yr)

Ingestion of Local Game:

$$DR_{GA} = \frac{IR_{GA} \times C_{GA} \times BIO_{GA} \times EF \times ED}{BW \times AT \times CF} \quad \text{Equation 5}$$

Where:

- DR_{GA} = dose rate of chemical from ingestion of local game (mg/kg bw/day)
- IR_{GA} = ingestion rate of local game (kg/day)
- C_{GA} = chemical concentration in local game (mg/kg, or ppm)
- BIO_{GA} = bioavailability of chemical via ingestion of edible tissue of game (unitless)
- EF = exposure frequency (days/year)
- ED = exposure duration (years)
- BW = body weight (kg)
- AT = averaging time (yr)
- CF = conversion factor (days/yr)

Ingestion of Drinking Water:

$$DR_{DW} = \frac{IR_{DW} \times C_{DW} \times BIO_{DW} \times EF \times ED}{BW \times AT \times CF} \quad \text{Equation 6}$$

Where:

DR_{DW} = dose rate of chemical from ingestion of drinking water (mg/kg bw/day)

IR_{DW} = ingestion rate of drinking water (L/day)

C_{DW} = chemical concentration in drinking water (mg/L)

BIO_{DW} = bioavailability of chemical via ingestion of drinking water (unitless)

EF = exposure frequency (days/year)

ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time (yr)

CF = conversion factor (days/yr)

Ingestion of Local Fish:

$$DR_F = \frac{IR_F \times C_F \times BIO_F \times EF \times ED}{BW \times AT \times CF} \quad \text{Equation 7}$$

Where:

DR_F = dose rate of chemical from ingestion of local fish (mg/kg bw/day)

IR_F = ingestion rate of local fish (kg/day)

C_F = chemical concentration in edible tissue of local fish (mg/kg, or ppm)

BIO_F = bioavailability of chemical via ingestion of local fish (unitless)

EF = exposure frequency (days/year)

ED = exposure duration (years)

BW = body weight (kg)

AT = averaging time (yr)

CF = conversion factor (days/yr)

Dermal Contact with Surface Water While Swimming:

$$DR_{SW} = \frac{SA \times K_p \times C_{SW} \times BIO_{SW} \times ET \times EF \times ED \times CF}{BW \times AT \times CF} \quad \text{Equation 8}$$

Where:

DR_{SW} = dose rate from dermal contact with chemical in water while swimming (mg/kg bw/day)

SA = surface area of body available for dermal contact (cm²)

K_p = chemical permeability constant (cm/hr)

C_{SW} = chemical concentration in surface water (mg/L)

BIO_{SW} = bioavailability of chemical via dermal contact with water while swimming (unitless)

ET = exposure time (hours/day)

EF = exposure frequency (days/year)

ED = exposure duration (years)

CF = conversion factor (L/cm³)

BW = body weight (kg)

AT = averaging time (yr)

CF = conversion factor (days/yr)

APPENDIX III

TOXICITY REFERENCE VALUES FOR IDENTIFIED CoC IN HHRA

The following is a discussion on toxicity reference values for copper, cobalt and nickel. If other CoCs are identified to be included within this CBRA, then these will also be reviewed for toxicity reference values.

1.0 COPPER

Copper is a micro-nutrient and an essential element in the diet. The oral RfD for copper to be used for the purpose of the HHRA will be the provisional tolerable daily intake (PTDI) of copper provided by Health Canada. In children, an "adequate and safe" concentration of copper in the diet was estimated to be 0.05 to 0.1 mg/kg-day (Health and Welfare Canada, 1990). The lower end of this range, 0.05 mg/kg-day, will be used as the oral RfD for the purpose of this assessment.

No data are available in the literature reviewed for the current assessment to calculate toxicity reference values for inhalation and dermal exposure. For this reason, the oral RfD will be used for the inhalation and dermal routes of exposure.

The bioavailability of copper to human receptors for each exposure route of interest will be determined from available literature. Speciation data will be used for this assessment, where applicable.

References

CCME. 1999. Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health: Copper. Canadian Council of Ministers of the Environment. Winnipeg, MN, Canada.

Health and Welfare Canada. 1990. Nutrition recommendations – The report of the Scientific Review Committee – 1990. Cat. No. H49-42/1990E. Supply and Services Canada. Cited In: CCME, 1999.

2.0 COBALT

The US EPA (1999) provides an oral RfD of $6E-2$ mg/kg-day for cobalt. This value is based on the upper range of the average intake of cobalt in the diet for children. The range of cobalt in the diet will be used for guidance for the purpose of this assessment, with consideration given to the oral RfD provided by the US EPA (1992). No toxicity reference values for cobalt are available from Health Canada or the MOE. Dermatitis has been associated with exposure to cobalt and there are interrelationships between cobalt and nickel sensitization (US EPA, 1992). These data will be considered in this assessment.

References:

US EPA. 1992. Oral Toxicity Assessment for Cobalt. Memorandum from Kenneth A. Poirier to Roxy Barnett. United States Environmental Protection Agency. Office of Research and Development. Environmental Criteria and Assessment Office. Cincinnati, OH.

US EPA. 1999. Region 9 Preliminary Remediation Goals (PRGs) 1999. San Francisco, CA.

3.0 NICKEL

As with copper, nickel is an essential micro-nutrient. However, elevated dosages may cause problems. The oral reference dose for nickel (soluble salts) is $2E-2$ mg/kg-day (US EPA, 1999) based on decreased body weight and organ weights in rats exposed to nickel in food for two years (Ambrose et al., 1976). Nickel was administered in the diet as nickel sulfate hexahydrate in this study. The NOAEL from this study was 5 mg/kg-day, and an uncertainty factor of 300 was applied to the NOAEL to account for inter- and intra-species variabilities as well as inadequate data from reproduction studies.

Nickel refinery dust has been shown to be a respiratory carcinogenic in several occupationally exposed populations, with endpoints of lung and nasal tumors. A slope factor of 0.8 (mg/kg-day)⁻¹ may be used for the assessment of nickel (as nickel refinery dust) carcinogenicity via inhalation exposure. The inhalation slope factor was derived from epidemiological studies of humans following occupational exposure. Occupational exposure to nickel refinery dust in dusty areas of a refinery areas where calcining, leaching and sintering were carried out in Port Colborne, Ontario has been claimed to result in an increased incidence of lung and nasal cancer in men (Roberts et al., 1983). One measurement of nickel refinery flue dust from Port Colborne, Ontario showed that it was comprised of 20% nickel sulfate, 59% nickel subsulfide and 6.3% nickel oxide (US EPA, 1999). The unit risk for nickel refinery dust was $4.8E-4$ ($\mu\text{g}/\text{m}^3$)⁻¹. It is noted that the unit risk for nickel subsulfide was $2.4E-4$ ($\mu\text{g}/\text{m}^3$)⁻¹ that can be expressed as a slope factor of 1.7 (mg/kg-day)⁻¹. A factor of 2 can be applied to the nickel subsulfide unit risk estimate to obtain the estimate for nickel refinery dust, assuming a composition of 50% nickel subsulfide in nickel refinery dust (US EPA, 1999).

The actual forms of nickel in the Port Colborne soils are unknown but is believed that they may be in amorphous states. Appropriate chemical analyses of these soils will be attempted to determine their composition. The toxicity assessment will incorporate information from the chemical analyses.

The bioavailability of nickel to human receptors for each exposure route of interest will be determined from available literature. Speciation data will be used for this assessment, where applicable.

References

Ambrose, A.M., Larson, D.S, Borzelleca, J.R. and Hennigar, G.R. 1976. Long term toxicologic assessment of nickel in rats and dogs. *J Food Sci Technol* 13:181-87. Cited In: US EPA, 1999.

Roberts, R.S., Julian, J.A., Muir, D.C.F. and Shannon, H. 1983. Cancer mortality associated with nickel sintering. *Occupational Health Faculty of Health Sciences*. McMaster University Hamilton,

Ontario, Canada. Presented at the IARC Nickel symposium, March 1983, Lyon, France. Cited In: US EPA, 1999.

US EPA. 1999. Integrated Risk Information System. IRIS Database On-Line Search. U.S. Environmental Protection Agency, Cincinnati, OH.

APPENDIX IV

RISK CHARACTERIZATION FOR HHRA

Risk characterization is the final stage of a quantitative risk assessment, where the health risks from exposure to CoCs at a site, or the community of Port Colborne in this situation are quantified. An estimate of the potential risks from exposure to CoCs in various media will be calculated by comparing the exposure estimate to the toxicity reference dose.

For a threshold-acting chemical, risk characterization will be expressed as a hazard quotient (HQ), such that $HQ = (\text{estimated exposure})/(\text{reference dose})$. The sum of the individual HQs for each exposure pathway is expressed as a Hazard Index (HI). A risk estimate of greater than one represents a health concern that should be more closely examined. For non-threshold acting chemicals, the incremental lifetime cancer risk (ILCR) will be calculated as the $(\text{predicted exposure}) \times (\text{slope factor})$. Incremental lifetime cancer risks of more than one in a million represent a potential health concern that should be more closely examined.

As part of the risk characterizations, risks associated with exposure to CoCs in the Port Colborne area will be compared to risks associated with background exposures (identified from literature sources). This aspect will be addressed in more detail under the HHRA.

The risk characterization phase of the HHRA will assess whether the elevated CoC concentrations present at some areas in the Port Colborne area have the potential to cause adverse health risks. The magnitude of risk from exposure to CoCs in soils will be compared to the risk from background exposure. Discussion of the results in the assessment will be thorough and will address issues such as the significance of the levels of the risk found, implications from the comparison to the background levels, the uncertainties associated with the assessment. The goal will be to provide a balanced, factual and thorough interpretation of the findings. Residents living in areas with different concentrations of CoCs and different soil types (resulting in different CoC bioavailabilities) will have different levels of risk associated with elevated CoCs in soils of their area. This will be communicated under the HHRA.

APPENDIX V

DEFINITION OF TERMS

- **Hazard Identification** – The identification of the environmental hazards (e.g., chemicals of concern) that may pose a health risk. The chemical hazards at the site are identified based on the results of data reviewed and field investigations, as well as an understanding of the toxicology of the chemicals of concern (CoCs);
- **Receptor Identification** – The identification of the receptors that may be exposed to the CoCs. For the human health risk assessment, residents of the area will be considered, including infants, toddlers, adolescents and adults. For ecological risk assessment, valued ecological components (VECs) will be considered to be the most sensitive receptors. For the purpose of this assessment, plants (e.g., crops) have been identified as one VEC. Other VECs, such as terrestrial animals, soil dwelling organisms, avian species and aquatic species, will be evaluated as part of the environmental risk assessment;
- **Exposure Assessment** – A qualitative or quantitative evaluation of the degree to which the receptors will be exposed to the CoCs. For the exposure assessment, all potential exposure pathways are identified for each CoC-receptor combination. From this list, a qualitative assessment of the likelihood of exposure is made for each pathway. Those pathways with the highest likelihood of exposure (and thus with the highest likelihood to contribute a health risk) are carried forward for further quantitative analysis. This is done for each of the human and ecological receptors selected for the purpose of this assessment;
- **Toxicity Assessment** – Toxicity reference values will be obtained for the CoCs. The reference dose (RfD) is the estimate of lifetime daily exposure to a noncarcinogenic substance for the general human population that appears to be without appreciable risk of deleterious effects. It is expressed as mg chemical/kg body weight/day. The slope factor (SF) is a plausible upper-bound estimate of the probability of a response per unit intake of a chemical over a lifetime, expressed as $(\text{mg/kg body weight /day})^{-1}$. It is used to estimate an upper bound probability of an individual developing cancer as a result of exposure to a particular level of a potential carcinogen. For ecological receptors, the toxicity reference values will be selected based on the literature for test species that are related as closely as possible to the VEC selected;
- **Risk Characterization** – A qualitative or quantitative assessment of the actual health risk of each hazard to each receptor, based on the degree of exposure. The potential of adverse

effects for human and ecological receptors are assessed by comparing the potential exposure with the toxicity of each CoC. The quantification of health risks is calculated for the identified pathways using generally accepted exposure scenarios and appropriate predictive models, where appropriate. The risk characterization can determine if the existing chemical concentrations cause an unacceptable risk to human health or it can determine the concentration of the CoCs which would cause the risk; and

- **Uncertainty Assessment** – A qualitative or quantitative assessment of the uncertainty associated with the risk estimation. Uncertainty is associated with a number of components of the HHRA, including the exposure estimate, the toxicity reference value, and the assumed bioavailability of the CoCs from the exposure matrix.

Appendix III

Written comments received on and for this Final PLC Report

Ellen Smith May 19, 2010

Paul Dayboll May 20, 2010

Dave McLaughlin June 10, 2010

Wells, Harry

From: Ellen Smith [buchnertwig@sympatico.ca]
Sent: Wednesday, May 19, 2010 9:53 AM
To: Wells, Harry
Cc: Ellen Smith
Subject: Comments on PLC report

Morning Harry,

Here are some of the corrections that I'd like to suggest:

Inserted text should be in [], or completely rewritten sentences. I've tried to make it as easy as possible as to where in the document these corrections are from. If any else is needed, please feel free to ask.

Ellen

pg 5 - Background - The property contamination in Port Colborne gained public attention following a study in 1997 conducted by the MOE [and released in 2000] identifying that an adverse environmental affect occurred due to the release of Chemicals of Concern (CoC) from INCO's operations from 1918 - 1984.

pg 6 - the paragraph starting, "With the TSOW now in place...." - should there be mention that BEAK was also involved/assisting with the risk assessments?

pg 6 - MOE 2000 Survey - The March 2001 MOE order was placed on Inco to clean up 16 residential properties over 10,000 ppm ni as per the MOE's risk assessment. That risk assessment was revised and in March 2002 the intervention level and clean up order was lowered to 8,000 ppm ni and included an additional 9 properties.

pg 7 - Class Proceeding - On [March 28, 2001] it was announced that a Class Proceeding was launched....

pg 12 - Independent Consultant - last sentence of 1st paragraph says that the selection for the Independent Consultant was an open public process. I don't believe it was open to the public to assist in selecting the consultant.

pg12-13 - TSC and meetings - 2nd paragraph - "Chairman's notes were made instead of taking minutes for the TSC meetings." It wasn't until years into the CBRA that Chairman's Notes came into being. For the first 3-4 years there were actual TSC meeting minutes that were sent to TSC members for approval before being reluctantly given to members of the public when requested.

- "...all original parties were present at the end of the process.." - Jacques Whitford wasn't.

- 2nd paragraph, 2nd last sentence doesn't make sense. "In this situation the Independent Consultant stood firm that all conditions for a CoC as stipulated in the TSOW (were met) so lead should be a CoC.

pg 13 - Open House Meetings - should be noted when in the process that open houses were established.

- paragraph starting on pg 13 continuing on pg 14, 2nd last paragraph is a repeated statement regarding how open houses were advertised.

pg 15 - Independent Consultants's Conclusions - CHAP - "...no Independent Consultant review...not qualified" yet the "CHAP studies were reviewed by the TSC". There should be mention as to which stakeholders on the TSC have the qualifications to review the CHAP studies.

pg 15 - 16 - Successful Aspects -

- "The PLC, Open Houses and TSC meetings were all open to the public to [attend] making the process as transparent as it could within the ability of the PLC"
- "The manner in which Open House meeting were used...." There should be mention that many of the open houses received poor attendance.
- "In-camera meetings that took place...." There is no mention of the numerous "Consultant Meetings" between BEAK/Stantec/Watters and JWEL that the public was not made aware of. There is also no mention of the meetings that took place between Watters, the City, the MOE and/or Inco that the public also wasn't aware of nor were the meetings discussed publicly.
- "The TSC identified additional beneficial studies..." Should name them.
- "The consensus approach used in the CBRA....is a more proactive way of conducting the CBRA."
[However, there has been no consensus on the findings of the studies.]
- "TSOW and protocols are good documents...used as guidelines for other communities..." Yes, if they are actually followed.
- "The Independent Consultant played a key role....representation of the interest of the public". How was that achieved?

pg 16 - Less Successful Aspects -

- first bullet doesn't make sense
- 2nd bullet - PLC should explain why the funding is not adequate

Wells, Harry

From: Paul Dayboll [pauldayboll@cogeco.ca]
Sent: Thursday, May 20, 2010 12:06 PM
To: Wells, Harry
Subject: Re: PLC Final Report
Attachments: Paul Dayboll's comments regarding.docx; ATT638744.htm

Hi Harry

The report is well done. I have attached my comments. They are mainly an emphasis of your comments. Thank you for the opportunity to review the final report of the PLC. I am sorry I missed the chance to be part of the committee until the end.

Regards,
Paul

Paul Dayboll's comments regarding
Final Public Liaison Committee Report
on the Port Colborne
Community Based Risk Assessment.

The layout of the report is effective and the writing is clear and concise. The overview and timeline were helpful.

I support the recommendations that INCO should not have been allowed to take the position of the lead investigator in the CBRA. In essence INCO was playing the part of the landowner within a modified SSRA. In hindsight, the MOE's attempt to create a modified SSRA was flawed. A totally new model needs to be created for a CBRA.

With INCO as proponent it was allowed to lead the scientific process that created unnecessary distrust. I agree that the generator in a CBRA should be a party in the process but not the lead entity.

While I agree that an independent project manager should be a contract position, I am concerned that the public committee would be reporting to him/her. Would it not be more effective if the project manager were a resource for the committee? Then since the committee would be directing the process, the project manager would guide them.

A third-party group that works independently under the direction and supervision of a Technical Subcommittee (TSC) should do the gathering of the scientific information.

The members of the TSC consist of PLC, PLC consultant, MOE, MOH, and the generator. The science-gathering group would be there to consult on the work to be done. This would allow the TSC to set the scope of work for each study but the science gathering would be done independently allowing greater confidence in the results.

The science methods used to draw conclusions need to be established earlier in the process. The MOE needs to take a greater role in the process to ensure the science is done properly as the work is being done.

The role of the MOE is difficult since this is the ultimate arbitrator in the process. It needs to find a method of ensuring the science gathering and analysis is done correctly during the process. A risk assessment using the SSRA process is normally a quick process and if the MOE finds the science flawed it can send the proponent back to do further work. Doing so within an SSRA only affects the proponent and their land while in a CBRA it is affecting the landowner, who is not the generator.

In a CBRA the landowner is affected unfairly and the delay in completing the assessment is onerous on them. The MOE should ensure the process proceeds quickly. Being more active in setting the scope of work and directing studies to be completed properly would make the process more rapid.

MOE saw a conflict in helping direct a process in which it is the final arbitrator. Judges do this daily as they make rulings during the trial. If courts followed the MOE's method they would never function.

I would like to emphasize how important it is that the landowners be given documentation that allows them to prove their property is free of defect and that the land is safe for use as zoned. It is not enough to point to the CBRA report as proof. It is also important that the documentation can be registered on title to reassure all parties that the property is free of defects from INCO contamination.

RECEIVED FROM DAVE McLAUGHLIN

June 10/2010.

**The Final Public Liaison Committee Report
on the
Port Colborne
Community Based Risk Assessment**

DRAFT

June 10, 2010

Harry, Vivian, Rosemary
thank you for a comprehensive
report, some editions for your
consideration

[Signature]

Table of Contents

ACKNOWLEDGEMENTS	3
NOTE	3
INTRODUCTION.....	4
BACKGROUND	4
MOE 2000 SURVEY.....	5
NRPHD LEAD SCREENING STUDY.....	5
TRANS CANADA PROPERTY SSRA	6
CLASS ACTION LAWSUIT.....	6
LEAD NOT A COC.....	6
STANTEC ACQUIRES BEAK AND JACQUES WHITFORD....	6
ECOLOGICAL RISK ASSESSMENT (ERA).....	7
HUMAN HEALTH RISK ASSESSMENT (HHRA).....	7
INTEGRATION REPORT.....	8
CBRA HEALTH MONITORING STUDY (CHAP).....	8
PUBLIC LIAISON COMMITTEE (PLC).....	9
PLC MEETINGS.....	10
INDEPENDENT CONSULTANT.....	11
TECHNICAL SUBCOMMITTEE (TSC).....	11
OPEN HOUSE MEETINGS.....	12
INDEPENDENT CONSULTANT'S CONCLUSIONS.....	13
CROPS STUDY	13
NATURAL ENVIRONMENT STUDY	13
HUMAN HEALTH RISK ASSESSMENT	13
CHEMICALS OF CONCERN (COC)	14
INTEGRATION REPORT.....	14
CHAP STUDY.....	14
SUCCESSFUL ASPECTS	14
LESS SUCCESSFUL ASPECTS	15
CONCLUSIONS.....	17
THE CBRA PROCESS	17
THE TERMS OF REFERENCE.....	18
THE TECHNICAL SCOPE OF WORK (TSOW).....	19
RECOMMENDATIONS.....	19
THE PORT COLBORNE CBRA.....	19
FUTURE CBRAs	20
APPENDICES	21

DRAFT

ACKNOWLEDGEMENTS

The Public Liaison Committee (PLC) for the Community Based Risk Assessment for Port Colborne would like to extend our thanks and appreciation to the members of the public that attended and participated in the meetings and other public engagements and for providing your valuable contributions to address the potential environmental and health issues our community faces. The PLC thanks all the property owners and citizens for assisting us in the variety of studies that were conducted in and on our community. We appreciate the time and effort put forth by the Technical Subcommittee, the Lead Task Force and other associated experts in addressing the scientific and technical complexities needed for this assessment. We thank the City representatives and past PLC members for their help and contribution.

NOTE

This document was prepared and submitted to the Director of the Ministry of the Environment for Ontario and contains the opinions and recommendations of the PLC on the process used to assess the risk posed by the contamination caused by International Nickel Company Ltd. (INCO) to the community of Port Colborne, Ontario. This document covers the process of the Community Based Risk Assessment and the activities and findings of the Independent Consultant and INCO over the duration of Stage 1 of the Port Colborne Community Based Risk Assessment (CBRA). Draft versions of this report were circulated to the Independent Consultant to assist with final accuracy and processed through the CBRA process in the same manner as all other reports of the CBRA. The final version of this report was formally endorsed by the PLC on June 10, 2010 and represents the opinions of the PLC. The final version of this report was formally submitted to the Director of the MOE on July 8, 2010.

This document may be reproduced in whole or in part provided that the opinions of the PLC are represented fairly and that credit is given to the PLC. The PLC retains moral rights under copyright law on the contents of this report.

INTRODUCTION

This Final Report (Report) is not intended to provide a complete reiteration or chronological review of the past ten years of events related to the Community Based Risk Assessment (CBRA) for the Port Colborne community exposed to contamination from the local operations of the INCO nickel refinery. The intent of this Report is to fulfill the current Public Liaison Committee's (PLC) mandate. This Report will provide a brief background on the CBRA process to date for context and relation for the reader only and is not meant to contain the full detail. It is recommended that to understand and have an appreciation of the complexity and scope of the CBRA, one should read all the proceedings, studies, reports and other associated documents. Much of the information presented here was taken from the published reports and presentations circulated throughout the CBRA process that can be obtained upon request to the City of Port Colborne. The comments and opinions expressed in this Report represent the perspectives of the PLC's experiences related to the CBRA to date. The release of this Report to the Director of the Ministry of the Environment (Director) satisfies the final mandate of the PLC for this stage of the CBRA and concludes the obligations of the PLC.

BACKGROUND

2002
1999
The property contamination in Port Colborne gained public attention following the release of a study in 1997 conducted by the MOE identifying that an adverse environmental affect occurred due to the release of Chemicals of Concern (CoC) from INCO's operations from 1918 -1984. This was then followed by the issuance of an order by the MOE in 2001 for INCO to remediate contaminated properties known as the Rodney Street Properties. There were four CoC identified above the Ministries Generic Guideline levels in the study that were directly associated to INCO's operation, Nickel, Copper, Cobalt and Arsenic.

The CBRA commenced in 2000 as a result of a consensus between INCO, the MOE, Niagara Regional Public Health Department (NRPHD), and the City of Port Colborne (City). The concept was to conduct a modified form of a Site Specific Risk Assessment (SSRA) that would address the risk and derive safe levels of Chemicals of Concern (COC) that give the same level of protection for the community as do generic levels. A SSRA is a technique endorsed by the MOE and used by a property owner of contaminated property where the owner proposes to use the property but the levels of contamination exceed the MOE Guideline for Use of Contaminated Sites in Ontario. The owner becomes the proponent to conduct an Ecological Risk Assessment (ERA) and a Human Health Risk Assessment (HHRA) to derive the specific safe levels of contamination for that specific property that give the same level of protection for that site as do the generic levels.

INCO committed to the City and MOE to be the proponent and conduct a CBRA for the CoC related to the contamination resulting from their operations and the City endorsed this. The objective of the CBRA was to derive the specific safe levels of COC in the four soil types found in Port Colborne, clay, muck, mixed, and sandy for the three land uses, agricultural, residential and commercial and to integrate these safe levels into a community-specific risk model. The CBRA process has two Stages to it. Stage 1 of the

found to exceed the risk-based soil criteria derived in Stage 1.

process involved the application of technical and scientific information from general scientific literature as well as information gathered from conducting a number of ERA and HHRA studies specific to Port Colborne. Stage 2 will involve the application of the community-specific risk model developed in Stage 1 to individual properties. Along with the commitment of INCO to conduct a CBRA they also committed to two concurrent studies, a Health Monitoring Study (CHAP) and a Socio-Economic Analysis (SEA). The CBRA process was originally predicted to take 18 to 24 months to complete the process.

Participants of the CBRA were identified to be INCO as the proponent, the MOE, the NRPD, Property Owners, the City, the PLC, the Independent Consultant and INCO's consultant. Terms of Reference for the PLC were created and the PLC members were selected by the City from a list of applicants that responded to the City's public request. On May 4, 2000 the PLC held its first meeting and the CBRA was officially under way. The City issued a RFP for an Independent Consultant to assist the PLC in technical matters and the Independent Consultant (Beak) was selected in June 2000. A Technical Scope of Work (TSOW) for Stage 1 of the CBRA was prepared by Inco's consultant Jacques Whitford and agreed to in November 2000 by all parties after 8 months of debate.

With the TSOW now in place INCO's consultants began working on the risk assessments while at the same time other events were starting to unfold that impacted the CBRA. A brief review of these events follows:

2000/01
MOE 2000 Survey

2000/01
draft
In 2000, the MOE conducted a new survey of properties in the Rodney Street area, and conducted a health risk assessment. They tested 179 properties in the area and took 1,300 samples. The results confirmed the relative extent of the contamination resulting from the fugitive emissions by INCO and resulted in an order being issued to INCO by the MOE in March 2001 to clean up 11 Rodney Street area properties with soil nickel levels above 8,000 ppm. Their survey revealed that the following percentile out of the 179 properties sampled were in exceedance of the Generic Guidelines allowable levels for the associated metals 99% for nickel, 80% for lead, 62% for cobalt, 54% for copper, 49% for beryllium, 29% for arsenic, 17% for zinc, 2% for antimony and 1% for selenium and cadmium. The 2001 MOE order attracted significant media attention with major news papers across Canada and on Network Nation television reporting on the situation. *The draft Order was revised and finalized in March 2001 as a result of a revision of the health risk assessment.*

NRPD Lead Screening Study Order identified 24 residential properties

In the spring of 2001 the NRPD conducted a Lead Screening Study with a series of 10 blood lead clinics to determine the potential human health impact of lead contaminated soil. 1,065 people participated in the study with the demographic break down as follows; 32% from the East side, 49% from the West side and 19% from outside of Port Colborne but were believed to be former residents. 12% of the East side group consisted of children under 6 years old. The findings were that

and 1 p that warrants remediation

six people had elevated levels of lead in their blood due to occupational exposure but there were no correlations demonstrated to the level of lead in soil.

Transport Canada Properties SSRA

Property known as the Transport Canada Properties under federal ownership was subjected to Phase I and II Environmental Site Assessments conducted by Stantec that revealed the soil and water was contaminated with nickel, copper, and arsenic at levels consistent with the MOE 2000 survey. It was concluded that there was no immediate risk to human or the environment but action would be required so a 2002 SSRA was conducted. *Health*

The ERA concluded that the soil impacts were expected to be minor and localized and based on existing site usage these impacts were not considered significant. For ground water, surface water and sediment the assessments show that the CoC present do not represent an ecological risk.

The HHRA concluded that several CoC are present in soil, groundwater, surface water and sediments but do not represent a human health risk to existing site workers under the three land use scenarios considered, industrial commercial, parkland or residential.

It should be noted that these conclusions in part were based on data derived by Jacques Whitford's work on the CBRA in 2003 and 2005.

Class Proceeding

On February 21, 2002 it was announced that a Class Pro was launched against INCO, MOE, City, Public and Catholic School Boards, and NRPD. This resulted in INCO officially announcing the cancellation of the Socio-Economic Analysis and removal of it from the TSOW on December 19, 2005. The purpose of the SEA was to have an independent property valuation specialist under a separate scope of work assess economic and social concerns caused by the contamination issue. This analysis would have assessed whether contamination from the CoC affected property values in relation to surrounding communities over the time since the contamination issue was first identified. *Proceeding*

Lead a CoC

On July 22, 2004 it was announced that INCO was removing lead from consideration as a CoC despite the fact it met the MOE's conditions for a chemical to be considered a CoC that were agreed to in the TSOW. Any chemical that met these three conditions qualified it to be a CoC:

- Chemicals that were historically used or generated in the Inco Refinery or its processes, and
- Chemicals that are present at a community level at concentrations greater than MOE generic effects based guidelines, and
- Chemicals whose distribution in soils shows a scientific link to Inco's operations.

Note: it is the MOE's contention that Pb does not meet condition 2 as it is not above generic standards across the CBRA study area - only in the East Side Community.

This resulted in the formation of a Lead Task Force committee and the community lead issue to be addressed outside of the CBRA.

Stantec Acquires Beak and Jacques Whitford

October 28, 2002 Stantec Inc. announced that it completed the acquisition of Beak and then on January 2, 2009 Stantec Inc. announced that it completed the acquisition of Jacques Whitford.

Companhia Vale do Rio Doce (Vale) Acquires INCO

On September 24, 2006 it was announced that Vale, a Brazilian company, purchased INCO.

It took almost five years to issue the first final CBRA report and another 3 years to get the last report. A brief review of the studies is presented below for context to the conclusions and recommendations provided in this report:

Ecological Risk Assessment (ERA)

The ERA was conducted according to the Canadian Council of Ministers of the Environment (CCME, 1996) framework and the MOE (1996a) Guidance on SSRA. This assessment was broken down into two studies the Crops Study and Natural Environment Study. The end product from the ERA was to be "an empirical model that predicts safe concentrations of CoC based on relevant soil parameters, such as texture, pH, and organic content" that will generate safe community risk based soil cleanup guidelines.

The Crops Study consisted of Field and Greenhouse experiments conducted in 2000 and 2001 with the primary objective to "determine the concentrations of historically deposited CoC in soil that present a risk (phytotoxicity) to crops grown in Port Colborne". The final Crops Study was received by the PLC at the September 2006 meeting with INCO's conclusion that the safe soil CoC thresholds for the soil found in Port Colborne are:

Sandy soils 750 ppm
Organic soils 2350 ppm
Till soils 1400 ppm
Welland clay 1650 ppm

ag/Mex/1/1/10/1

The objective of the Natural Environment Study was to "assess the risk of adverse effects on local populations of flora and fauna that inhabit the area where soil concentrations of the CoC exceed MOE generic guidelines". INCO's consultant's report was received at the February 17, 2005 PLC meeting and concluded that the study "found no unacceptable risk to the sustainability of the populations of flora and fauna that inhabit the lands where soil CoC concentrations exceed the MOE generic guidelines"

Human Health Risk Assessment (HHRA)

Jacques Whitford issued their final HHRA report in December of 2007 with the primary objective of the HHRA being to "evaluate current risks to human health in Port Colborne due to the presence of CoC in soils resulting from INCO emissions and the follow-up objective of estimating the environmental concentrations of CoC in soil at which no adverse effects on human health are expected to occur". The target safe soil CoC concentrations that were determined were 21,000 ppm for nickel, 9,300 ppm for copper and 8,100 for cobalt. Based on this finding Jacques Whitford concluded that there was no elevated adverse human health risk to residents from CoC in Port Colborne soils, because no residential properties were believed to exceed these risk-based soil values.

Integration Report

To pull all three studies of the CBRA together into a remediation plan for Stage 2 of the CBRA INCO developed the Integration Report with four objectives:

- To summarize the findings of the risk assessments in terms of soil types and land uses,
- To describe the process by which INCO intends to translate information in the risk assessments into information for any specific site within the Study area,
- To discuss general approaches for risk reduction, where needed, as a function of soil type and land use, and
- To describe the process INCO will use to determine which properties may need additional sampling.

On January 10, 2008 the final copy of the report was issued and completed Stage 1 of the CBRA for INCO. The report provided a sound logical approach to pulling the three CBRA studies together and using the information gained from them to identify risk associated to the CoC at specific properties. It then goes on to identify the process and parties that would be involved in remediation of the property if required.

CBRA Health Monitoring Study (CHAP)

Concern for the health of the community was addressed by a concurrent health study not to be part of the CBRA. The objective of the CHAP study was to conduct a comprehensive scientific health assessment to provide the Port Colborne residents with scientific information that will assess the health impact of exposure to CoC in Port Colborne. This study consisted of the following 5 studies:

<u>STUDY</u>	<u>DESCRIPTION</u>	<u>CONCLUSION</u>
CHAP "A"	Self Reported Health Assessment	Data suggest some associations but they are not seen across all comparisons and do not exhibit dose response and may be subject

to reporting bias by respondents.

CHAP "B" Case Control Study

Not justified based on A+C

CHAP "C" Hospital Discharge Analysis

Elevated hospital discharges found for four conditions but link to exposure to CoC too weak to justify causation

CHAP "D" Cancer Incidence and cause of Mortality

INCO cancelled due to no acceptable study design

CHAP "E" Reproductive study

Link to CoC could not be confirmed with confidence

The final CHAP A+C Integration Report was received March 10, 2009

According to the TSO, after a study was completed, the author INCO or their consultants would make a presentation to the public at an Open House meeting. An additional follow-up Open House presentation facilitated by the PLC and the Independent Consultant would be held providing a review of the study and report with the Independent Consultant's report on the findings. Following a 6 week review period (sometimes longer), review comments by anyone could be forwarded to the document author for incorporation into the final report draft. This would be followed by a tabling of the final report draft at a TSC meeting (if required) and then the submission of the final report to the PLC, TSC and the community. All final reports were received by the PLC for a matter of record for the CBRA. Reports were not approved by the PLC.

Actually the conclusion was that reproductive effects were unlikely + soil metal levels found in Port Colborne

THE PUBLIC LIAISON COMMITTEE (PLC)

It was originally decided by the City, INCO, NRPHD, and the MOE that the PLC would be completely uncompensated volunteers consisting of 7 members and 1 alternate that would be a cross section of members from the community. To assist the PLC the City would provide an Independent Consultant and all necessary administrative and advisory services. INCO would compensate the City for all expenses based on an established budget. The City advertised in the local newspapers (The Welland Tribune, and the Port Colborne Leader) for positions on a PLC committee requesting interested persons to apply in writing why they wanted to be a part of the process. The City selected the PLC members based on the submissions received. Through the ten years of the process, the membership of this volunteer committee transformed from the original 7 members to 3 members by the end of the process. The PLC did seek changes to the Terms of Reference to accommodate this when there were resignations of PLC members in February of 2005 and again in June of 2006 after years of proceedings with the belief that the end of the process was near and that the PLC's mandate could be achieved with the three remaining members. The members were selected in March 2000 and the first PLC meeting was held on May 4th, 2000 at City Hall. The number and frequency of the

PLC meetings was high in the beginning of the process as there were many technical issues to deal with.

West
Central
Region

Terms of Reference for the PLC and the Independent Consultant were established with the purpose to define the mandate of the PLC and how the PLC would operate. The intent of the PLC was twofold; first to investigate and provide input to INCO and the Director of the MOE related to the contamination and secondly to solicit public input, inform the public and provide input to INCO and the Director with regards to the (TSOW), preparation and conducting of the CBRA. In order to achieve this, the PLC was given the mandate as follows:

- a. Advise Council of the City on the adequacy of the Terms of Reference for the PLC, and to make recommendations for changing the "Terms" if necessary,
- b. Receive and review all appropriate information respecting the contamination of lands with the identified "COC" in Port Colborne,
- c. Provide input to the Director and INCO respecting the TSOW for the CBRA,
- d. Monitor the progress of the CBRA,
- e. Review the findings and recommendations of the CBRA and provide input to INCO and the Director;
- f. Provide input to INCO and the Director on the methods of implementing the recommendations of the CBRA as may be appropriate,
- g. Submit a final report including comments and advice to the Director with respect to the PLC and CBRA processes.

It is important to recognize that INCO had sole authority for decisions with respect to the CBRA and that neither the PLC nor property owners had any authority. It is also equally important to understand the Director would make decisions pursuant to the provisions of the Environmental Protection Act (EPA) but the CBRA is not addressed in the EPA.

PLC MEETINGS

The PLC held regular meetings, open to all members of the community of Port Colborne, and other interested parties, such as the media. The meetings were chaired by the Chairperson of the PLC and generally held on the third Thursday of every month if possible or whenever needed. The majority of the meetings were held at Port Colborne City Hall, although other locations were used in an attempt to reach a larger group of the community and started at 7:00 pm. The City was represented by two persons at the PLC with one being the scribe and the other being the spokesperson for the City. Over the years, there were changes to the city representatives and some problems occurred in the tracking of the minutes and records. Notification of upcoming meetings was announced at previous PLC meetings, printed in the local newspapers and circulated via email. A typical meeting involved the following:

- review and approval of an agenda;
- review of previous meeting notes prior to approval;
- delegations (if any);

- presentations by the TSC Chair, INCO/their consultants, the PLC consultant, third parties (such as members of the community, Wignell Drain group);
- update of activities from the Independent Consultant for the PLC; and
- a general question and answer period with members of the community and those in attendance from the PLC and TSC.

The schedule for up-coming meetings related to the CBRA was identified and then the meeting was adjourned. This provided a lot of opportunity for public input and engagement.

Minutes from the PLC meetings and associated reports were made available electronically, at the Port Colborne Public Library, at PLC meetings and upon request at City Hall. This was a transparent process and the PLC made every attempt reasonable to ensure this. There were no restrictions on attendance. PLC members regularly liaised with the community members and groups, such as Neighbours helping Neighbours. A part of every PLC agenda was set aside for general questions and answers and the public had the opportunity to be a delegate by submitting their request prior to the commencement of the meeting. In total there were 107 PLC meetings held throughout the CBRA.

THE INDEPENDENT CONSULTANT

An Independent Consultant company was retained by the City in June of 2000, to assist the PLC with the technical issues that would arise in the CBRA. Request for applications by consultant companies were made and there were three respondents, Beak, Cantox and Agra Earth Environmental. The City, with recommendation by the PLC agreed to hire Beak and the representative for Beak was Robert Watters. Beak was acquired by Stantec during the CBRA but Rob Watters formed Watters Environmental Group and continued on as the Independent Consultant providing consistent assistance to the PLC. The Independent Consultant attended most of the PLC meetings and all the Open House meetings that the PLC held. The selection for the Independent Consultant was an open public process.

The Independent Consultant performed the functions described in the Anticipated Work Program of the Terms of Reference of the PLC. They were to review and advise the PLC on the various components of the CBRA and were expected to attend all the PLC meetings and provide reports to the PLC as required. Any work outside of that described in the Terms of Reference required City approval. The City established a budget for the Independent Consultant and the funds for the budget were provided by INCO.

THE TECHNICAL SUB-COMMITTEE (TSC) AND TSC MEETINGS

The PLC recognized early in the process that significant time was consumed by the various consultants discussing the technical matters and trying to reach consensus. These discussions reduced the time that was available for the public to participate and PLC meetings extended late into the evenings lasting 3-4 hours at times. It was also observed that some of the public attending the PLC meetings lost interest during the

scientific discussions and were becoming frustrated. It was decided to form a Technical Sub-Committee (TSC) that formally reported to the PLC to deal with the numerous technical issues, and hopefully, speed up the CBRA process. The TSC did not have an approvals function. It was to discuss detailed technical CBRA matters and reach a consensus on how to deal with the technical issues. Based on the consensus the TSC would make recommendations to the PLC. The members of the TSC were identified as the consultants for both INCO and the PLC, the City representative, the MOE, the NRPD, the members of the PLC and from time to time other consultants or specialist as required. The Independent Consultant for the PLC was designated the Chairperson of the TSC.

The Chairman of the TSC was responsible for scheduling TSC meetings and did so as required with the notification for meetings following the same process as the one used for PLC meetings with an announcement at PLC meetings, sending of emails and advertising in the local newspaper. The first meeting of the TSC was held on August 24, 2000 and 99 meetings were held throughout the time period for Stage 1 of the CBRA. Chairman notes were made instead of taking minutes for the TSC meetings. TSC meetings were focused meetings and for the most part were called to deal with a specific matter. The meetings were generally open discussion meetings with presentations facilitated by the Chair of the TSC. The TSC meetings were open to the public for observation only in an effort to keep them focused and effective but this was not well received by all members of the public. The public was required to raise questions and concerns through the members of the PLC or in writing to the TSC. Some of the public wanted the TSC meetings to be open for public participation without any restrictions. The stakeholders remained consistent throughout the process, with all original parties present at the end of the process. There was only one instance when the TSC did not reach a consensus and that was on whether Lead was a COC or not. In this situation the Independent Consultant stood firm that all the conditions for a CoC as stipulated in the TSO were met so lead should be a COC. The lack of consensus resulted in the formation of the LTF and taking the community lead problem out of the CBRA.

OPEN HOUSE MEETINGS

In an attempt to engage the community more specific meetings called Open Houses were established. Notification of these meetings was consistent with the other meetings with the details being announced at PLC and TSC meetings, email notification and advertisement in the local news papers. These meetings took the form of an open drop-in center or an open presentation. In either case enhanced visual aids were used to present to the public as a group or on an individual one on one basis the concept, aspect, proposal or conclusion related to the studies of the CBRA. In total there were 25 Open House meetings facilitated throughout Stage 1 of the CBRA. At times the PLC held Open House meetings in conjunction with Independent Consultant meetings because the Independent Consultant was the main presenter at many of the Open Houses.

These were opportunities for open sessions with the community members, authors of the reports, peer reviewers, specialists and on other matters related to the CBRA. When a report was received the public was given ample time to read the report, normally

Not so
WEG does not
concur with
the conclusions
of either
or the other
Consensus
could not
be reached on
many technical
issues
the end of
the process
Consensus
did not
work

six weeks prior to an Open House where that report would be presented. Open Houses were held at various locations throughout the city, such as the Guild Hall, the Knights of Columbus hall, The Ecole St. Joseph, and City Hall. Open Houses were publicized in the local newspapers, via email, and announced at PLC meetings prior to the date of the Open House. Community groups like Neighbours Helping Neighbours used this concept as well to share information and meet with the public.

INDEPENDENT CONSULTANT'S CONCLUSIONS

Crops Study

The objective of the Crops study was "to determine the concentrations of historically deposited CoC in Port Colborne soil that present an unacceptable risk (phytotoxicity) to agricultural crops".

The Independent Consultant concluded the EC25 values generated by Jacques Whitford are "too high and cannot be regarded as being sufficiently and assuredly protective of agriculture in the Port Colborne Area" and "fails to meet the test for acceptance of site specific criteria to replace the MOE's generic standards".

Natural Environment (NE) Study

The objective of this study as agreed to in the ISOW was "to produce an empirical model that predicts the safe concentrations of CoC based on relevant soil parameters, such as texture, pH and organic content, for Port Colborne soils". Jacques Whitford changed the objective to "determine if CoC in soils, as a result of INCO emissions, present a potentially unacceptable risk to the natural environment found in the Port Colborne area. For the ERA, an unacceptable risk is defined as an estimated risk linked to the occurrence of soil concentrations of CoC that prevents sustainable population(s) of flora and fauna, or prevents a sustainable level of ecological functioning within the defined Study Area".

It is the opinion of the Independent Consultant that the data presented does not support either of the conclusions made by Jacques Whitford and the manner in which the data was analyzed and interpreted introduced significant uncertainties into the findings. "Overall, there are too many uncertainties to justify the conclusions drawn."

Human Health Risk Assessment (HHRA) Study

Jacques Whitford stated that the "primary objective of the HHRA is to evaluate whether CoC in soils as a result of INCO's emissions present an unacceptable risk to human health in the Port Colborne community". They concluded that the Target Safe Soil CoC concentrations are 21,000 ppm for Nickel, 9,300 ppm for copper and 8,100 ppm for cobalt. The Independent Consultant has expressed concern with this objective claiming the Jacques Whitford has reported a different perspective on the overall study objective other than what was originally discussed at TSC and PLC meetings. The opinion of the Independent Consultant is the Jacques Whitford has not provided sufficient scientific rationale to support that the proposed RBSC of 20,000 ppm soil nickel offers the same level of protection to Port Colborne residents as does the current generic value from the MOE Guideline for Use of Contaminated Sites in Ontario for all residents of

Ontario. This proposed "safe" soil nickel concentration is two orders of magnitude greater than the "generic" standard cannot be justified and is scientifically unsupported from the information and analysis provided in the HHRA report.

Chemicals of Concern (CoC)

It is the opinion of the Independent Consultant that Lead meets all the criteria as set forth in the TSOW for a Chemical of Concern and should be included. The Independent Consultant also raised concern about the lack of consideration given to arsenic in some of the studies.

Integration Report

The opinion of the Independent Consultant on the Integration Report is that INCO's general approach is sound and generally considers the most sensitive receptor with remediation to the level deemed to be "safe" by the CBRA studies; however, the report lacks detail and fails to address the concerns raised by the community. The Independent Consultant points out that this report is based on the three studies of the CBRA being correct and that assumption is not reasonable. If credence is not given to the conclusions of these studies then the structure of this report will be much different. Detail concerning the remediation and logistics associated to that activity as well as the nature and type of documentation that will be provided to the property owner at the end of the process is needed. INCO drafted the Integration report with no real input from the PLC, Independent consultant or public

CBRA Health Monitoring (CHAP) Study

There is no Independent Consultant review or opinion on the CHAP Studies because they do not have the qualifications to evaluate the CHAP studies. All reports from the CHAP studies were reviewed by the TSC. An Expert Advisory Committee (EAC) out of the University of Toronto was established to review Study A and C to determine if Study B a case control study was warranted. The EAC concluded that there was no justification for recommending Study B.

SUCCESSFUL ASPECTS

- The PLC, Open Houses and TSC meetings were all open to the public to make the process as transparent as it could within the ability of PLC;
- The way the public was made aware of meeting was kept consistent and enough notice was given so people could plan to attend and get prepared to participate;
- For the most part the majority of meetings were held at the City Hall location that provided an easily accessible central location with sufficient space to accommodate attendance of most of the meetings;
- The manner in which Open House meetings were used provided good opportunities for the exchange of information and interaction between the public and all parties involved in the CBRA;
- Lead time prior to Open House meetings provided ample time for everyone to read the reports, become familiar with topics and prepare to participate at the meeting;

- Open House meetings were held and attended by all key stakeholders involved with the CBRA;
- The PLC offered the Public special meetings between them the PLC and the Independent Consultant in a one on one or group format to facilitate more engagement of the Public;
- In-camera meetings that took place between the Independent Consultant and others on CBRA issues were reported to the Public at PLC meetings in an effort to make the process more transparent and address the lack of trust that certain members of the Public had;
- Newspaper articles and columns by PLC Members and the Independent Consultant on topics of the CBRA were published to provide a wider public awareness of the studies being conducted and issues being addressed by the CBRA;
- The organizational structure of the TSC ensured the quality of science, scope of work, detail of the data set and pushed for the use of the best available science;
- The TSC identified additional beneficial studies and those studies were conducted;
- The consensus approach used in the CBRA that preapproved the studies and how they were to be conducted is a more proactive way of conducting the CBRA and gaining acceptance of the findings of the studies; *regrettably consensus was not reached on all issues.*
- The composition and transparency of the TSC ensured that there was good QA/QC for all the studies;
- The TSO and Protocols are good documents that can be used as guidelines for other communities conducting similar risk assessments with appropriate modifications to suit the specific situation;
- Information on and discovered by the studies of the CBRA was provided by the Independent Consultant in a manner that was easily understandable;
- The Independent Consultant provided the Public a better understanding of the science and their findings for the community and played a key role in representation of the interest of the Public;
- The PLC as a group worked well together and in general developed a good relationship with all the stake holders;
- Those members of the public that stayed involved throughout the process became very knowledgeable in the process and the science employed and provided a lot of valuable contributions;
- The City was cooperative in respect to accepting the PLC's recommendations on the terms of reference for the PLC.

LESS SUCCESSFUL ASPECTS

- Despite all the efforts there is no consensus or resolution to the CBRA with the community and this resolution rest with the MOE;
- The CBRA organizational structure and funding are not adequate for the scale of this issue ;
- The Public attendance at meetings dwindled and there was a lack of means to attract them;

- The participation and engagement by the community as a whole was poor;
- The Media lost interest in the CBRA and stopped attending and writing about it;
- INCO and NRPD were not completely cooperative and did not provide certain reports that the public requested;
- City support was not adequate for a volunteer based committee and demands associated to the scale and significance of this type of effort;
- There was poor record keeping on the events and documents related to the CBRA;
- With INCO being the proponent and taking on the position of the property owner when they aren't creates a conflict of interest where they have the ability to be the decision maker over properties they don't own;
- The process was too long and complicated for a volunteer group;
- The PLC with no authority could not affect the CBRA process they could only influence it;
- *Neither* → The PLC nor Independent Consultant were privy to meetings between INCO and their consultants and this fostered the mistrust of INCO;
- There was no professional communication adviser or resource for the PLC to address Media or public participation matters;
- The Class Proceeding reduced cooperativeness of INCO and instilled a concern for legal action on other participants resulting in less transparency, cancellation of SEA, reduced participation (NRPD, Media), increased stigma for the community and more expectations on the CBRA;
- Some of the Media attention that the CBRA got was for the wrong reasons and the negative stigma this process has created for the community has not been addressed;
- The trust of the public for the MOE, NRPD and City was never gained;
- The Consensus approach became difficult within context of lawsuits;
- The acquisition of the both the original Independent Consultant (Beak) and INCO consultant (Jacques Whitford) to Stantec and the use of INCO's findings before the end of this process in the Transport Canada Property SSRA;
- The acquisition of INCO by Vale before the end of this process;
- Adversarial stances adopted by some of the citizens in this public process were not beneficial to the process;
- Certain areas of expertise were not within the Independent Consultant's capability and no alternative to this was provided to the PLC;
- The TSC review and effort to reach consensus increased the overall time frame of CBRA; Too much time was loss on going back and forth with disagreement for written reports and conclusions;
- The HHRA model used by INCO was not provided and this made the interpretation of their findings and conclusions difficult and presumptuous; *to the Independent Consultant*
- Indoor air issues raised by the Public and contribution of CoC of indoor air to the risk assessments were not addressed;
- INCO refused to conduct the CHAP "D" study claiming there was no acceptable study design for INCO and they also cancelled the SEA;
- The Public raised concern for the risk to pets but no study was completed and the concern was never addressed to the Public's liking;

- There was no assessment of a cancer end point or arsenic in the HHRA;
- The sampling of the Wignell drain was inadequate and not corrected;
- Lead was not accepted as a CoC by INCO despite meeting the agreed to conditions of a CoC so the Lead issue remains unresolved or addressed;
- The LTF and Independent Consultant were unsuccessful in providing their final reports or documentation to the PLC to be considered in this report so all comments and opinions of the PLC are based on draft reports and dated information;
- Some important issues raised by the Independent Consultant and others were ignored and not addressed by INCO;
- The Integration Report is unclear on how to transfer or apply findings of CBRA to individual properties;
- The question of the Record of Site Condition is not adequately addressed in the Integration Report;
- There is no clear process for the homeowner with affected property to get clear unrestricted land use;
- Property owners are ultimately liable for the condition of their properties and are legally obligated to disclose the conditions of their property that they are aware of to a purchaser if they are selling it. The CBRA has made property owners and purchasers aware of conditions that need to be disclosed that were not known before the CBRA. This is a major concern for the property owners ;
- The Intervention level proposed by INCO is significantly above the previous level set by the MOE of 8,000ppm;
- The conclusions on the risk to Crops are based on the wrong science so the report is questionable;
- The wrong analysis was conducted for the NE and HHRA therefore the interpretations of the findings are questionable;
- Involvement of NRP/HD at PLC meetings was not adequate for the significance of this assessment

CONCLUSIONS

The CBRA Process

The structure of the CBRA with INCO being the proponent and taking the position of the property owner with full authority over the process similar to that in an SSRA is a fundamental flaw of this process. The City representing the community as a whole agreed to the structure and accepted INCO, the party that caused the contamination as the proponent having total authority and control over the process. INCO is in a fundamental position of conflict and this allows them to be able to manipulate the CBRA to their benefit.

The CBRA included the community as a whole and impacted the entire community including those that didn't want to be or didn't need to be included. This process does not put the property owner or the representative selected by the property owner in a position of control over what happens to their property but it ultimately results in a negative impact to the property owner.

The CBRA started with a lack of transparency because the concept of this process and agreement to implement it was conceived behind closed doors and exactly what transpired between the City, INCO, MOE and NRPHD behind those doors has not been fully disclosed to the public or to the PLC. Where possible the PLC made every reasonable attempt possible within its ability to make the proceedings of the CBRA transparent and believe they have performed in an open transparent manner. The Class Proceeding had a negative impact on the transparency of the process. Failures by stakeholders to disclose requested information throughout the process added to the lack of transparency the process started with and members of the public continue to express the lack of trust in the MOE, City, NRPHD and INCO.

The CBRA addresses a contamination that took place over 66 years assuming that there have been no emissions from INCO from 1984 to when this assessment was performed. The affected area is a large area of land owned by a large number of people that is used for residential, agricultural, commercial and industrial purposes with sand, Welland clay, Till clay and organic types of soil. Trying to address all the variables of the affected area made this assessment significantly complex and difficult. Performing and properly reviewing all the studies necessary to address the complexity and difficulty of this assessment alone took a long time. Using an approach of consensus between the stakeholders to arrive at agreeable methodology for and interpretation of the studies added additional time to the assessment. Then when consensus couldn't be reached additional time was taken to explain and address the disagreement. All in all the process was very long and complex and the majority of the Public in general did not stay actively involved throughout the process. Those from the community that did stay involved help improve the CBRA significantly and provided valuable input.

Based on the conclusions of the Independent Consultant it is the opinion of the PLC that the objective of the CBRA to "derive the specific safe levels of CoC in the four soil types found in Port Colborne, clay, muck, mixed, and sandy for the three land uses, agricultural, residential and commercial and to integrate these safe levels into a community specific risk model has not been achieved. The PLC understands that the Public are also of the conclusion the CBRA did not achieve its objective. Furthermore, INCO has failed to fulfill its commitment to the community as part of this process to provide the completed Concurrent Studies of CHAP and SEA.

The Terms of Reference

In the opinion of the PLC the Terms of Reference served their purpose to define the mandate of the PLC and how the PLC would operate adequately but they were deficient in assessing the Work Program and how that impacted the PLC membership, meetings, independent consultant and public participation. It is the opinion of the PLC that the mandates associated to Stage 1 of the CBRA were adequately met considering all of the characteristics of this CBRA and the fact that the PLC was a volunteer committee completely composed of non-compensated members.

The Independent Consultant was essential to the process, represented the community appropriately and assisted the PLC significantly. They provided a tremendous amount of contribution and value to the scientific rigour of the TSOW from an environmental perspective but were not qualified in a number of areas that would have been beneficial to the community. The Independent Consultant attempted with passion and conviction to make INCO and its consultants conform to the agreed TSOW and assess the studies in best interest of the community. The areas the Independent Consultant was not qualified were in communications, medical science and property valuation all of which would be valuable in a CBRA.

Throughout the process the PLC effectively used meetings to engage the Public for the purpose of providing information on the various studies and components of the CBRA as well as seeking input from the public on all the issues related to the contamination. In total there were 231 meetings the public could attend and participate in broken down into 107 PLC, 99 TSC and 25 Open House meetings. Minutes, notes, reports and other related documents were provided to anyone that wanted them in electronic or printed format. It is the PLC's position that the public had sufficient opportunities to receive input and give input throughout the process. Not every question the public raised was answered and not every answer was accepted by the public. INCO and the MOE clearly understood the concerns the public had and have had the opportunity to address those concerns throughout the process. The only time there was not enough Public involvement was in the conception period of the CBRA.

The TSOW

The TSOW was adequate to initiate the CBRA and flexible enough to accommodate changes as required. The Consensus approach on the science was the best approach for the structure of the CBRA and it provided the most acceptable assessment methods. The Science employed in the CBRA was good except for the areas where it was manipulated and interpreted to benefit the proponent as identified by the Independent Consultant.

Lead met all the conditions of a CoC as agreed to in the TSOW by all the stakeholders and should be a CoC. A consensus was never reached on Lead being a CoC and this serves as a perfect example that INCO should not have been the proponent. The Public wanted Lead to be addressed in the CBRA and if they were the proponent it would have, but since they weren't and INCO was, lead was pulled from the process.

Lead and Arsenic were not dealt with properly in the studies or assessments.

The Integration report is insufficient and based on flawed studies and as such this report does not address the most sensitive receptors or reflect the most conservative approach to risk management of the CoC. It doesn't provide for unrestricted land use and provides little information on remedial options of Stage 2.

West Carleton Region

RECOMMENDATIONS

Port Colborne CBRA

It is the PLC's opinion that the public does not accept the conclusions proposed by INCO and do not believe the MOE will act in the best interest of the community. It is the recommendation of the PLC to the Director of the MOE to take into consideration the conclusions of the Independent Consultant and the comments submitted by the public on the science and findings of the studies and where the data exist, use it to resolve the problems pointed out with the science so the findings reflect the most conservative risk to the most sensitive receptor. The MOE should disclose in public the outstanding issues and their plan to resolve them and allow the Public to participate in reaching resolution. The PLC understands that some of the data does not exist and that additional studies may have to be completed to secure that data but this should be worked into the plan the MOE develops to resolve the outstanding issues.

The PLC recommends that the requirements of O. Reg 153/04 be satisfied by remediation of contaminated properties that are above the current generic standards to the specified levels if the Director is unwilling to resolve the outstanding Public issues of the CBRA. The MOE is encouraged to consider the public stigma that this process has imparted on the community of Port Colborne and their resolution needs to address that, and the only way to do that is to have unquestionable scientific findings that reflect public acceptance. The MOE needs to ensure the intervention levels for remediation are not questionable and provide clear unrestricted land use to the existing property owner or potential owners. The MOE needs to implement an action plan to achieve the objective of the CBRA and the issuance of Records of Site Condition for the COC that reflect acceptable conditions.

When this process is finalized, all information associated to the CBRA should be translated into French and be available to the public and other interested parties providing all confidential information is protected. There needs to be a professional announcement campaign for the public release of the finalized CBRA conclusions that will go beyond the community to address the stigma that was created when this process began.

The PLC would also recommend the NRPHD undertake a similar effort with regards to the CHAP studies to provide resolution to concerns the community has related to cancer and the CoC that were not addressed due to INCO's cancellation of Study "D".

A collaborative effort should be undertaken by INCO and the City to establish an Information Center to provide current and future residents access to all the information related to this process and the contamination and to provide answers to their questions and concerns about it. There were a lot of documents circulated during the CBRA process and some of them are no longer available to the Public. This recommendation implies that INCO or the City should ensure the information is complete. The establishing of an Information Center should be done with professional consultation and result in a center that is easily accessed and navigated that is kept current for the period as recommended

by the consultant. It is also recommended that there should be some local public involvement in establishing this Information Center.

Based on the PLC's experience in Stage 1 it is the PLC's recommendation that the CBRA organizational structure for Stage 2 be reconsidered. The recommendation of the PLC is to remove INCO from the role of the proponent and any other decision or authority role. As presented in the Integration report an Advisory Committee (AC) or an Independent Remediation Consultant (IRC) should be put in place to conduct the remediation. The AC or IRC would be formed by a community process and not INCO as suggested in bullet 3 on Page 66 of the Integration Report January 10, 2008 and conduct the remediation according to the MOE accepted remediation strategy. Selection of the AC members or IRC should follow a procedure similar to the one that was used to contract the Independent Consultant in Stage 1 of the CBRA and report to the City. The AC or IRC will replace INCO in bullets 4 through 7 on Page 66 of the report identified above. Stage 2 should be conducted as much as possible without INCO's involvement; however, they should remain responsible for the cost of the MOE accepted remediation strategy.

Future CBRAs

The PLC recommends to the director that the following be considered for any future CBRAs to improve them over this one:

The structure of the organization of the CBRA should be such that it limits the affect the generator of the contamination has on the process. The Proponent for a CBRA should never be the generator of the contamination the Proponent should be a party or committee selected by the community acting on behalf of the property owners. Because CBRAs can be significant in complexity and long in duration consideration should be given to contracting a party with the specific skill set required and for paid positions on the committee. This could result in the contacting of an Independent Manager in a paid position and the formation of volunteer committees from the community reporting into him.

If the CBRA process is expected to be lengthy and there are volunteers involved it is recommended that it be broken down into smaller stages and rotate or change out volunteer committees on a more frequent basis to eliminate burn out and retention issues. This should promote more community involvement and a better end CBRA product.

To ensure economic reasonableness a budget should be set for the process and agreed to by the generator or party accepting the financial responsibility. That budget would be public information and made available to the public. The CBRA would be required to stay within the agreed to budget. Once a budget is set the responsible party should set up a trust fund or other acceptable financial control system that eliminates the responsible party's control of or access to the funds.

The public should be engaged from the conception stage to the remediation stage. The more the Public is involved with the creation of the CBRA the more acceptable the

conclusions will be. With the public involvement from the conception stage throughout should make the process quicker and there should be less mistrust by the community.

Engaging the Public is critical to a CBRA so surveys to measure public awareness, representation, and participation should occur at various times throughout the process and be part of the process. Consideration should be given to include professional communication experts in the process that could help guide and assist Public Liaison and Technical Subcommittees through the process.

APPENDICES

- Appendix I:** The Original Terms of Reference of the Public Liaison Committee for the Community Based Risk Assessment for Soils Contaminated in the Port Colborne Area
- Appendix II:** Technical Scope of Work Community Based Risk Assessment Plan Port Colborne, Ontario

DRAFT

www