RISK MANAGEMENT PLAN FOR RESIDENTIAL AREAS

BUCHANS, NEWFOUNDLAND AND LABRADOR

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EXECUTIVE SUMMARY

This report presents the results of a surficial soil sampling program and a Risk Management Plan (RMP) that was developed for lead in soil exceedances for Residential Areas in the Town of Buchans, Newfoundland and Labrador (Town). Assessment work was also completed for public areas and was reported separately. For the purposes of developing this RMP, Residential Areas were defined as areas of residential occupancy such as privately owned homes, rental properties, etc. Additional investigations were conducted to document environmental conditions at Buchans that included the hand excavation of shallow test holes followed by the collection and analysis of soil samples.

Based on a file review of available environmental documents pertaining to the Town and in consultation with the Province, a sampling program was developed to delineate previously confirmed lead concentrations in soil above the Risk-Based Concentration (RBC). The northern section of Town was sub-divided into 8 Zones that were bounded by pre-existing geographical features such as roads, fences, etc. Soil investigations were then completed between June 23 and 29, 2010 to assess environmental conditions in Residential Areas.

In order to assess the significance of the data and to aid in determining the scope of remediation and/or closure to be completed at each Zone, CRA compared the lead in soil data to the RBC developed in the CRA 2010 Summary HHRA report. The RBC was determined to be 622 mg/kg for lead in soil.

CRA investigated 8 zones in the northern area of Town as shown on Figure 2. CRA combined the analytical data for samples collected from the CRA 2009 Phase II Environmental Site Assessment (ESA), 2010 Human Health Risk Assessment (HHRA), and 2010 RMP.

The following table presents a summary of the lead impacted surface soils for Residential Areas by Zone in each location with areas of impacted lead in soil concentrations that exceeded the RBC criterion.

Risk management alternatives are directly influenced by such factors as existing property usage (children, flower and/or vegetable gardens, etc.), exposure scenarios based on dermal contact limited by surface cover (grass, gravel, asphalt, concrete, etc.) or construction activities (disturbing surface or sub-surface soil), and costs associated with each alternative. In an effort to mitigate lead in soil exceedances reported from the 2009 and 2010 surface soil sampling programs at Residential Areas in the Town, CRA considered potential alternatives during the development of this RMP as summarized below.

- Restrict usage to limit exposures and/or use of the Residential Areas by directing users to wear appropriate personal protective equipment (PPE), thereby blocking potential dermal contact;
- Import and placement of clean imported soil over the existing surfaces followed by reinstatement of landscaping;
- Removal of lead impacted soil with disposal at an approved waste disposal site, import and place clean soil with reinstatement of landscaping; and
- Any combination of the previously listed options.

A variety of landscaped surfaces currently exist at the various residential locations where RMPs are required. Therefore, the type of finished landscaping will be driven by existing conditions and the property owners.

The estimated costs were derived from similar work that CRA completed in New Brunswick as well as recent civil works completed in Buchans, NL during the 2010 construction season. A slight allowance for inflation (5 percent) was also included to account for an extended remedial plan that may be completed in stages. Estimates for the proposed remedial alternatives described in this report are provided under separate cover.

A number of factors were considered in developing a preferred RMP for each of the 24 Residential Areas addressed herein. Firstly, the type of remedial control measure was greatly influenced by existing landscaping finishes, which, in turn, directly influenced estimated costs. The second issue of consideration related to the priority of completing the remedial work based on a review of potential exposure through dermal contact for one location compared to others within the group of Residential Areas that were scrutinized. The Residential Areas with lead impacted soil above the RBC and prioritization is summarized in the table below; note the recommended remedial action for all properties involves the removal of the top 0.3 metres of landscaping features, all of which would be replaced with new imported fill and/or topsoil and sod.

Zone		*Number of Properties*	*Net Area*	*Lead Concentrations*	*Priority*
Number	*Location*		*(m^2)*	*Soil (mg/kg)*	
1-1	7 Gilchrist Rd	1	750	1,600	Moderate
1-2	14 Main St	1	550	1,200	Moderate
2-1	74 to 84 Jackson St, 63 to 77 Church St	12	1,200	670 – 1,600	High
2-2	68 to 82 Church St	8	550	3,000	High
2-3	29 to 43 East St	8	900	1,100	Low
2-4	30 to 44 East St	8	1,000	-	Moderate

Zone		Number of Properties	Net Area	Lead Concentrations	Priority
Number	Location		(m^2)	Soil (mg/kg)	
2-5	41 to 47 Williams Turnpike, including grassy area north of these properties	4	1,000	970 – 3,100	High
3-1	45 to 61 Church St	9	2,100	2,100	Low
3-2	38 to 58 Church St	12	2,000	1,100 – 3,300	High
3-3	1 to 15 East St	8	900	-	High
3-4	13 to 39 Williams Turnpike	10	2,750	820 – 1,800	High
4-1	5 Court Rd, including grassy area south of the property	1	1,050	1,000 – 1,400	Low
4-2	2 to 4 Court Rd, 1 to 3 Gilchrist Rd	4	4,350	2,700	Low
5-1	2 to 10 Center St, 51 to 57 Jackson St	9	3,000	910 – 2,400	Moderate
5-2	52 Jackson St	1	500	1,400	Low
5-3	21 to 25 Church St, 42 Jackson St	4	1,300	1,200 – 1,400	Low
6-1	22 to 28 Church St, 4 South St	4	1,600	1,600	Moderate
6-2	1 to 9 MacLean St	9	1,600	1,200	Low
6-3	2 to 10 MacLean St, 5 to 11 Williams Turnpike	3	3,850	790 – 1,900	Moderate
7-1	10 to 48 Laycock St	20	2,000	1,000 – 1,600	Moderate
7-2	9 to 39 Jackson St	16	1,800	850 – 1,100	Moderate
8-1	2 to 40 Lundberg Ave	20	1,500	1,400 – 1,600	High
8-2	1 to 39 Pine St	20	1,500	690 – 3,200	High
8-3	7 to 37 Lakeview Ave	16	1,800	660 – 2,700	Low

CRA recommend that the remedial action be implemented to address High priority areas first, followed by areas of Moderate priority, then areas of Low priority last. It should also be noted that assumptions concerning the presence of children in a Residential Area of interest were solely based on field observations; any new information regarding the presence of children in a certain area will be considered and CRA reserve the opportunity to revise the priority ranking of affected Residential Areas of interest.

It is also noted that several risk management alternatives include the removal and disposal of lead-impacted soil at a disposal facility approved by the Province. At the time of writing this report, a soil disposal facility does not exist that is approved by the Province for disposal of lead impacted soil; therefore, all lead impacted soil being removed from areas within the Town would require transportation to a facility off the island for disposal. This approach would result in extremely high disposal costs that would render such a remedial alternative as economically unfeasible.

CRA recommend that lead-impacted soil removed from Residential Areas in the Town should be disposed of at a location determined by the Province and the Town that would be nearby Buchans. Such an alternative would require an engineered facility that would meet the same construction criteria as that recently completed for the Tailings Spill Area (TSA) in 2010. An added benefit to nearby disposal is that completion time for construction activities would be dramatically reduced compared to off-island disposal.

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1.0 INTRODUCTION

This report presents the results of a surficial soil sampling program and a Risk Management Plan (RMP) that was developed with lead in soil exceedances for Residential Areas in the Town of Buchans, Newfoundland and Labrador (Town). Assessment work was also completed for public areas and was reported separately; commercial areas were excluded from the assessment. For the purposes of developing this RMP, Residential Areas were defined as areas of residential occupancy such as privately owned homes, rental properties, etc. Conestoga-Rovers & Associates (CRA) has prepared this report on behalf of the Province of Newfoundland and Labrador, Department of Environment and Conservation (Province). Investigations were conducted to document environmental conditions at Buchans that included the hand excavation of shallow test holes followed by the collection and analysis of soil samples.

The Scope of Work (SOW) for the RMP was developed based on the "*Summary Report, Human Health Risk Assessment (HHRA)*" report (March 2010), prepared by CRA for Weirfoulds on behalf of the Province. This report evaluated potential human health impacts due to the deposition of dusts containing metals from historic mining and waste disposal around the Town. The findings from the CRA Summary HHRA report have been summarized in Section 2.3 of this report.

Field investigations at the Town were conducted between June 23 and 29, 2010.

The remainder of this report is organized as follows:

- Section 2.0 – Site Overview and History
- Section 3.0 – Environmental Setting
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2.0 SITE OVERVIEW AND HISTORY

2.1 SITE LOCATION AND DESCRIPTION

The Town is located approximately 10 kilometres (km) northwest of Red Indian Lake in west-central Newfoundland and Labrador (NL). The Site Location Map is presented on Figure 1 and a Site Plan of the study area is presented on Figure 2.

2.2 FORMER SITE OPERATIONS

Major operations at Buchans formerly included mining activities that collectively operated from 1906 until 1984, which included ore extraction and milling operations. Base metal ores, predominantly copper, lead, and zinc, were extracted from the five mines around the Town, transported to the mill, and refined. The main production area of the former mine was west of the Town, where the high-grade ore was processed and concentrated. The mining operations resulted in the extraction and milling of 16,247,100 tonnes of ore, the generation of approximately 10,473,000 tonnes of mine tailings that consisted of approximately 10 percent solids and the generation of approximately 4,600,000 tonnes of waste rock.

Tailings from the floatation refinement process were initially discharged through a wooden sluice to the Buchans River. Occassionally, mine tailings would overflow the wooden sluice at the Tailings Spill Area (TSA); during emergency mill shut downs, ore concentrates and tailings were discharged directly into the TSA area to prevent drying or freezing of the material in the mill equipment. In 1965, tailings and mine discharge water were diverted to a temporary tailings pond, which was located on the northern edge of the existing Tailings Pond 1. Waste rock (rock that was not rich in ore) extracted from each of the mine sites was disposed of in areas immediately adjacent to each mine.

The available surficial soil data collected during the 2009 sampling events provides a clear soil quality distinction between the north and south residential sections of Town, with all tested properties in the south section having lead levels below the developed RBC. Based on this clear distinction, CRA did not consider that supplemental soil testing was necessary in the south residential section of Town; therefore, the focus was on the north section of Town where a high percentage of tested properties exceeded the RBC for lead.

2.3 PREVIOUS INVESTIGATIONS

AMEC conducted a Phase I Environmental Site Assessment (ESA) from August 18 to 21, 2008 and identified 23 Potential Areas of Concern (PAOCs) and other areas of environmental concern; Public Areas were not specifically identified or assessed as a PAOC. Additional details are provided in the report entitled: "*Former ASARCO Mine Site, Phase I Environmental Site Assessment, Buchans, Newfoundland and Labrador*" dated March 2009, (AMEC Phase I ESA).

CRA completed a Phase II ESA for the Town and former surrounding mine infrastructure on behalf of the Province in 2009. The SOW was based on a review of previous environmental reports, a Site reconnaissance inspection, interviews with former mine employees and Town representatives, and a review of additional documents provided by the Province. A total of 33 PAOCs were identified as a result of the Phase II ESA with impacts above generic environmental criteria identified in 30 of the 33 PAOCs investigated. The Phase II ESA concluded that there were 30 PAOCs where remediation was required, one of which was the Public and Residential areas in Town. Additional studies at the remaining 29 PAOCs (located outside Town) with respect to impacted media (soil, groundwater, surface water sediments) have yet to be completed. Additional details are provided in the report entitled: "*Environmental Site Assessment, Abitibi-Consolidated Inc. – Buchans Site, Buchans, Newfoundland*" dated November 2009, (CRA 2009 Phase II ESA).

CRA completed a HHRA for the Province in 2010 that related to impacted surface soil in the Town affected by deposition of metals from historic mining operations and mining waste rock management practices. CRA collected 71 surface soil samples from residential and recreational locations in and around the Town in August and October 2009, all of which were analyzed for total metals; representative samples were also analyzed for metal bio-availability, i.e., the fraction of metals that can be absorbed by the gastrointestinal tract, and local climatic conditions. CRA compared the analytical results to screening criteria developed by federal and provincial agencies to identify metals of interest (MOI), i.e., metals with maximum concentrations that were greater than these generic criteria. Nine metal exceedances were evaluated during the CRA 2010 HHRA where RBCs were developed for each metal. CRA then compared the concentration of MOI in each sample to the site-specific RBCs to identify locations where the MOI concentrations were greater than the site-specific RBC; the MOIs were reduced to only two (arsenic and lead). Additional details are provided in the report entitled: "*Human Health Risk Assessment, Town of Buchans, Buchans, Newfoundland and Labrador*" dated March 2010, (CRA 2010 HHRA).

CRA completed a summary of previous assessment work for the Province in 2010 that specifically targeted residential and Public Areas of Town to evaluate lead and arsenic impacted surface soils. The location where arsenic exceeded its respective RBC was mitigated during the summer of 2010 when the TSA was capped and the Mucky Ditch was remediated. The concise results of the summary HHRA concluded that concentrations of lead in surface soils were greater than its site-specific RBC at 20 residential locations in Town. A final recommendation was to develop a RMP to mitigate potential exposure to these metals (primarily for small children). Additional details are provided in the report entitled: "*Summary Report, Human Health Risk Assessment, Town of Buchans, Buchans, Newfoundland and Labrador*" dated March 2010, (CRA 2010 Summary HHRA).

3.0 ENVIRONMENTAL SETTING

3.1 REGIONAL GEOLOGY

Based upon a review of maps from the Geologic Survey (Newfoundland and Labrador) Department of Natural Resources (2004), the Site is located within the Dunnage Zone, which consists of volcanic and sedimentary rocks. Natural Resources Canada's MIRAGE (Map Image Rendering Database for Geoscience) system shows the area to be composed of volcanic rocks with basic and ultrabasic intrusions and some sedimentary rocks, deformed and metamorphosed. Review of MIRAGE also reveals the Town is located within the geologic province of Appalachian Orogen, the rocks are Paleozoic in age, and there may be basalt, rhyolite, tuff, breccia, and minor subaqueous conglomerates.

3.2 LOCAL GEOLOGY

The "Geology of the Island of Newfoundland", issued by the Department of Mines and Energy, Government of Newfoundland and Labrador (Map 90-01) indicates the Town is underlain by Cambrian to Middle Ordovician stratified rocks including submarine mafic, intermediate and felsic volcanic rocks, including mafic volcanic rocks of ophiolite complexes; mafic rocks predominate in the northern Dunnage Zone and felsic rocks in the south. The bedrock includes unseparated intrusive, sedimentary and metamorphic rocks.

The "Surficial Geology of Insular Newfoundland, Preliminary Version", issued by Geology Survey Branch, Department of Mines and Energy, Government of Newfoundland and Labrador (Map 90-08) indicates that the Buchans Site geology consists of a blanket of diamicton or sand and gravel, 1.5 to 15 metres thick, having irregular hummocky topography and relief of 2 to 10 metres; hummocks are mainly composed of diamicton, but some contain poorly sorted sand and gravel; diamicton is of similar composition to the till veneer unit; bog is commonly found in low areas between hummocks; this unit was mainly deposited by ice disintegration and stagnation during deglaciation.

3.3 SITE CLASSIFICATION

For the purposes of this assessment and RMP, Residential Areas were defined as areas of residence following the Canadian Council of Ministers (CCME) Guidelines.

4.0 FIELD ACTIVITIES

Based on a file review of available environmental documents pertaining to the Town and in consultation with the Province, a sampling program was developed to delineate previously confirmed lead concentrations in soil above the RBC. The northern section of Town where previous impacts were identified was sub-divided into 8 Zones that were bounded by pre-existing geographical features such as roads, fences, etc. Soil investigations were then completed to assess environmental conditions in Residential Areas.

CRA completed surficial soil sample collection activities, all of which were submitted to Maxxam Analytics Inc. (Maxxam) for chemical analyses of lead in soil. Specific details for the investigative activities completed by CRA are presented below.

4.1 BACKGROUND INVESTIGATION

The available soil quality data from the 2009 surficial soil sampling programs of the residential and Public Areas in the northern section of Town did not reveal a uniform concentration gradient that started at potential source areas, as would be expected if airborne dusting of the dry tailings were the only contributing factor. Some low concentration results were found within higher concentration areas in a difficult to decipher pattern, which may be due to a number of compounding factors. Low concentration results may have been caused by historical tilling of surface and sub-surface soil that diluted surface concentrations or importation of low lead containing soil for residential improvements from remote areas (i.e. topsoil or clean fill). High concentration results may have been a combination of airborne tailings dusting magnified further by the historical use of tailings and/or waste rock at selected locations for road building or backfill of low areas. These various factors may contribute to the appearance that soil test results on one property cannot be used to accurately represent the level of lead in soil on immediately adjacent properties.

In advance of and during the supplemental soil sampling program, CRA conducted some interviews with Town officials and local residents to determine historical mining company construction practices in the residential area of the northern part of Town. Very limited information was acquired with most indicating they were unaware of the source of fill material throughout this area; however, a few long-time residents indicated that crushed waste rock was used as gravel for many driveways. Consequently, it is assumed that waste rock was also used for other civil development works throughout the Town such as road building, fill material for leveling, etc.

4.2 FIELD METHODOLOGIES

Between June 23 and 29, 2010, CRA hand-excavated 50 surface soil sample locations that resulted in the collection of 56 samples from Residential Areas. The following subsections provide information regarding the standard operating protocols followed by CRA for the surface soil sample collection program. Except as noted below, CRA collected the samples for this investigation in accordance with CRA's Standard Operating Procedures.

In addition, key features of the properties being sampled were also recorded to assist in the development of RMPs for each potential area that may require remedial effort in the future. A copy of the field notes are presented in Appendix A.

4.2.1 SURFICIAL SOIL SAMPLING

CRA collected composite surficial soil samples throughout previously identified Residential Areas in the Town with a shovel or trowel. Samples were collected from immediately below a vegetative mat cover or from surface to a depth of 0.3 metres below ground surface (mbgs); however, five samples were collected from a sub-surface depth at 0.4 mbgs. All samples were placed in laboratory-supplied containers and delivered under chain-of-custody protocols to Maxxam.

4.2.2 SUMMARY OF FIELD ACTIVITIES

CRA collected a total of 56 soil samples from Residential Areas. A complete summary of CRA's field activities is provided in the Table below for soil samples. Figures 2.2A to 2.2H provide the locations for all samples collected.

The following table provides a summary of the field activities completed in 2010 at Residential Areas in each Zone for the Buchans Site:

ZONE		*TYPE OF INVESTIGATION*	
Number	*Street Locations*	*Surface*	*Sub-Surface*
1	Jackson, Forebay, Market, Main, Gilchrist	2	-
2	William's Turnpike, Jackson, North, East, Church	4	1
3	North, Jackson, Main, William's Turnpike, Sleepy Valley, East, Church	8	1
4	Main, Water, Center, Prospect, West, Gilchrist, Court, tennis court, health care facility, community centre	6	1

ZONE		TYPE OF INVESTIGATION	
Number	*Street Locations*	*Surface*	*Sub-Surface*
5	Main, Center, South, Church, Jackson, Water	7	1
6	Main, Sleepy Valley, Church, South, Lake, William's Turnpike, MacLean, Water, swimming pool	5	-
7	South, Laycock, Walsh Memorial, Lundberg, Walwyn, Church	7	-
8	South, Lundberg, Walsh Memorial, Lakeview, Pine, playground	8	1

4.3 SURFICIAL GEOLOGY ENCOUNTERED

CRA noted surficial soils during the 2010 sampling program that consisted of densely packed sandy silt and gravel with some topsoil and sod or crushed stone for surface cover. Fill material was encountered at all 2010 sample locations, which only reached a maximum depth of 0.4 mbgs.

These findings were consistent with past ESA work completed by CRA in 2009 throughout and around the Town. The till, or native material, previously observed was comprised of silty sand, silty clay, sand and gravel, with some organic silt and peat.

5.0 APPLICABLE REGULATORY CRITERIA AND GUIDANCE

In order to assess the significance of the data and to aid in determining the scope of remediation and/or closure to be completed at each Zone, CRA compared the lead in soil data to the RBC developed in the CRA 2010 Summary HHRA report. The RBC was determined to be 622 mg/kg for lead in soil.

6.0 ANALYTICAL RESULTS

6.1 QA/QC

CRA received the analytical data from the laboratory through an electronic data deliverable. The first step in interpretation of the data was an examination of the quality control test results that included a review of blind field duplicates and original analytical results for general conformity to a Relative Percent Difference (RPD) target of 35% based on US EPA guidance document SOP#HW-2, Rev 13, September 2006. Laboratory replicate analyses were also reviewed against a 10% conformance standard. Quality Assurance/Quality Control (QA/QC) of the data was validated by CRA based on the laboratory Quality Control (QC) standard using the Certified Reference Material (CRM).

All soil sample analytical results from the Residential Areas reported QC standards of 105 to 108% for the eight sets of analyses, all of which were within the conformance standard range of 90 to 110%.

In addition, the RPD of two laboratory duplicate samples was evaluated. The RPD between laboratory duplicates and parent samples was 0% for Z1-SS1 and 4.3% for Z8-SS-40-D all of which were within the conformance standard range of 10%.

Finally, six field duplicates were collected and submitted for analysis. The RPD between field duplicates and parent samples was 2.7% for Z2-SS1, 1.8% for Z3-SS4, 25% for Z4-SS5, 24.0% for Z6-SS2, 0% for Z7-SS3, and 5.4% for Z8-SS3, all of which were within the conformance standard range of 35%.

Once the data was quality assured, it was used for interpretation. Copies of the Laboratory Certificates of Analysis are presented in Appendix B.

6.2 2009-2010 ANALYTICAL RESULTS DISCUSSION

CRA investigated 8 zones in the northern area of Town as shown on Figure 2. CRA combined the analytical data for samples collected from the CRA 2009 Phase II ESA, 2010 HHRA, and 2010 RMP. This section presents a discussion of all lead in soil analytical results for each Zone investigated in preparation for developing a RMP for the Residential Areas. Analytical results from the 2010 soil sampling program are provided in Table 1 with all combined results for each Zone provided in Table 2.

Zone 1: Jackson-Forebay-Market-Main

Zone 1 is bounded to the northwest by Forebay Road and Market Street, to the south by Main Street, and to the east by Jackson Street along with Gilchrist Road contained within the boundaries noted above. Two Residential Areas of interest were identified in Zone 1 as follows:

- Z1-R1 – Residence located at 7 Gilchrist Road; and
- Z1-R2 – Residence located at 14 Main Street.

In 2009, CRA collected composite surface soil samples from two residential properties in a predominantly commercial area of Zone 1 as shown on Figure 2A. Two additional composite samples were collected in 2010 to provide some degree of delineation. The following table presents a summary of all residential sampling locations in Zone 1.

Sample ID	*Sample Year*	*Civic Address*	*Sample Notes*
SS-23	2009	7 Gilchrist Road	Side Yard
SS-25	2009	3 Gilchrist Road	Side Yard
Z1-SS1	2010	6 Gilchrist Road	Back Yard
Z1-SS2	2010	14 Main Street	Back Yard

The table below presents a summary of lead in soil analytical results at concentrations greater than the RBC criterion.

Parameter	*Criterion (mg/kg)*	*Number of Results Greater Than RBC Criterion*	*Minimum Result Greater Than Criterion (mg/kg)*	*Maximum Result Greater Than Criterion (mg/kg)*
Lead	622	2	1,200	1,600
Note: 4 soil samples in total were analyzed for lead.				

Zone 2: William's Turnpike-Jackson-North

Zone 2 is bounded to the east and north by William's Turnpike, to the west by Jackson Street, and to the south by North Street along with sections of East Street and Church Street contained within the above noted boundaries. Five Residential Areas of interest containing 40 residential properties were identified in Zone 2 as follows:

- Z2-R1 – 74 to 84 Jackson Street (front yards) and 63 to 77 Church Street (front and back yards);
- Z2-R2 – 68 to 82 Church Street (front and back yards);

- Z2-R3 – 29 to 43 East Street (front and back yards, except front yard of 35 East Street);
- Z2-R4 – 30 to 44 East Street (front and back yards); and
- Z2-R5 – 41 to 47 Williams Turnpike (front and back yards), including grassy area north of these properties.

In 2009, CRA collected composite surface soil samples from four residential locations in Zone 2 as shown on Figure 2B. Also, garden samples were collected from three of these four locations. A total of eight composite samples, including one field duplicate, were collected in 2010 to provide some degree of delineation. In addition, one sub-surface sample was collected at approximately 0.4 mbgs in the vicinity of a 2009 sample location (SS-34). The following table presents a summary of all residential sampling locations in Zone 2.

Sample ID	*Sample Year*	*Civic Address*	*Sample Notes*
SS-27, SS-29G	2009	84 Jackson Street	Back Yard & Garden
Z2-SS7	2010	84 Jackson Street	Front Yard
SS-47	2009	77 Church Street	Side Yard
Z2-SS1	2010	67-69 Church Street	Front Yard
Z2-SS6	2010	80 Church Street	Front Yard
SS-36 SS-36G	2009	35 East Street	Back Yard & Garden
Z2-SS5	2010	41 East Street	Front Yard
Z2-SS2	2010	Williams Turnpike	Sheds
Z2-SS3	2010	Williams Turnpike	Sheds
Z2-SS4	2010	Williams Turnpike	Grassy Area Adjacent to 47 Williams Turnpike
SS-34 SS-34G	2009	47 Williams Turnpike	Back Yard & Garden
Z2-SS-34-D	2010	47 Williams Turnpike	Back Yard, Sub-Surface

The table below presents a summary of lead in soil analytical results at concentrations greater than the RBC criterion.

Parameter	*Criterion (mg/kg)*	*Number of Results Greater Than RBC Criterion*	*Minimum Result Greater Than Criterion (mg/kg)*	*Maximum Result Greater Than Criterion (mg/kg)*
Lead	622	11	670	3,100
Note: 16 soil samples in total were analyzed for lead (including field duplicate).				

Zone 3: North-Jackson-Main-William's Turnpike-Sleepy Valley

Zone 3 is bounded to the north by North Street, to the west by Jackson Street, to the south by Main Street, and to the east by William's Turnpike along with sections of East Street and Church Street contained within the above noted boundaries; this Zone also includes the north side of Sleepy Valley Place. Four Residential Areas of interest containing 39 residential properties were identified in Zone 3 as follows:

- Z3-R1 – 45 to 61 Church Street (front and back yards);
- Z3-R2 – 38 to 58 Church Street (front and back yards);
- Z3-R3 – 1 to 15 East Street (back yards).; and
- Z3-R4 – 13 to 39 Williams Turnpike (front and back yards).

In 2009, CRA collected composite surface soil samples from four residential locations in Zone 3 as shown on Figure 2C. A total of 10 composite samples, including one field duplicate, were collected in 2010 to provide some degree of delineation. In addition, one sub-surface sample was collected at approximately 0.4 mbgs in the vicinity of a 2009 sampling location (SS-38). The following table presents a summary of all residential sampling locations in Zone 3.

Sample ID	*Sample Year*	*Civic Address*	*Sample Notes*
SS-49	2009	70 Jackson Street	Front Yard
Z3-SS3	2010	45 Church Street	Front Yard
Z3-SS9	2010	40 Church Street	Back Yard
SS-38	2009	48 Church Street	Back Yard
Z2-SS-38-D	2010	48 Church Street	Back Yard, Sub-Surface
Z3-SS6	2010	60 Church Street	Back Yard
Z3-SS2	2010	9 East Street	Front Yard
Z3-SS4	2010	8 East Street	Back Yard
Z3-SS1	2010	22 East Street	Back Yard
Z3-SS7	2010	13-15 Williams Turnpike	Back Yard
SS-48	2009	17 Williams Turnpike	Back Yard
SS-42	2009	56 Williams Turnpike	Side Yard
SS-48	2009	17 Williams Turnpike	Back Yard
Z3-SS8	2010	25 Williams Turnpike	Back Yard

The table below presents a summary of lead in soil analytical results at concentrations greater than the RBC criterion.

Parameter	Criterion (mg/kg)	Number of Results Greater Than RBC Criterion	Minimum Result Greater Than Criterion (mg/kg)	Maximum Result Greater Than Criterion (mg/kg)
Lead	622	8	820	3,300
Note: 15 soil samples in total were analyzed for lead.				

Zone 4: Main-Water-Center

Zone 4 is bounded to the north by Main Street, to the west by Market Street, to the south by the extent of the tennis court, health care facility, and community centre, and to the east by Center Street along with sections of Prospect Street, West Street, Gilchrist Road, and Court Road contained within the above noted boundaries. Two Residential Areas of interest containing five residential properties were identified in Zone 4 as follows:

- Z4-R1 – Residence located at 5 Court Road (front and back yards), including grassy area south of the property.
- Z4-R2 – 2 to 4 Court Road (front and back yards) and 1 to 3 Gilchrist Road (front and back yards).

In 2009, CRA collected composite surface soil samples from five residential locations in Zone 4 as shown on Figure 2D. Also, one garden sample was collected from one of these five locations. In addition, seven composite samples, including one field duplicate, were collected in 2010 to provide some degree of delineation. The following table presents a summary of all residential sampling locations in Zone 4.

Sample ID	Sample Year	Civic Address	Sample Notes
SS-33	2009	4 Prospect Street	Side Yard
SS-35	2009	1 Prospect Street	Back Yard
SS-43, SS-45G	2009	12 Prospect Street	Front Yard & Garden
SS-53	2009	6 Gilchrist Road	Front Yard
Z4-SS2	2010	3 Gilchrist Road	Back Yard
Z4-SS4	2010	2 Prospect Street	Side Yard
Z4-SS5	2010	5 Center Street	Back Yard
Z4-SS6	2010	1 Court Road	Grassy Area
Z4-SS7	2010	5 Court Road	Front Yard
Z4-SS8	2010	5 Court Road	Back Yard

The table below presents a summary of lead in soil analytical results at concentrations greater than the RBC criterion.

Parameter	Criterion (mg/kg)	Number of Results Greater Than RBC Criterion	Minimum Result Greater Than Criterion (mg/kg)	Maximum Result Greater Than Criterion (mg/kg)
Lead	622	5	1,000	4,500
Note: 14 soil samples in total were analyzed for lead, including one field duplicate.				

Zone 5: Main-Center-South-Church

Zone 5 is bounded to the north by Main Street, to the west by Center Street, to the south by South Street, and to the east by Church Street along with sections of Jackson Street and Water Street contained within the above noted boundaries. Three Residential Areas of interest containing 14 residential properties were identified as follows:

- Z5-R1 – 2 to 10 Center Street (front and back yards) and 51 to 57 Jackson Street (front and back yards);
- Z5-R2 – Residence located at 52 Jackson Street (front and back yards); and
- Z5-R3 – 21 to 25 Church Street (front and back yards) and 42 Jackson Street (front and back yards).

In 2009, CRA collected composite surface soil samples from four residential locations in Zone 5 as shown on Figure 2E. Eight composite samples were collected in 2010 to provide some degree of delineation. In addition, one sub-surface sample was collected at approximately 0.4 mbgs in the vicinity of a 2009 sample location (SS-41). The following table presents a summary of all residential sampling locations in Zone 5.

Sample ID	Sample Year	Civic Address	Sample Notes
Z5-SS6	2010	4 Center Street	Front Yard
SS-41	2009	6 Center Street	Front Yard
Z5-SS-41-D	2010	6 Center Street	Front Yard, Sub-Surface
Z5-SS8	2010	10 Center Street	Front Yard
Z5-SS3	2010	43 Jackson Street	Back Yard
Z5-SS2	2010	44 Jackson Street	Front Yard
SS-52	2009	53 Jackson Street	Front Yard
Z5-SS7	2010	57 Jackson Street	Front Yard
Z5-SS5	2010	52 Jackson Street	Front Yard
SS-22	2009	54 Jackson Street	Front Yard
Z5-SS1	2010	21 Church Street	Front Yard
SS-24	2009	25 Church Street	Front Yard
Z5-SS4	2010	29 Church Street	Front Yard

The table below presents a summary of lead in soil analytical results at concentrations greater than the RBC criterion.

Parameter	*Criterion (mg/kg)*	*Number of Results Greater Than RBC Criterion*	*Minimum Result Greater Than Criterion (mg/kg)*	*Maximum Result Greater Than Criterion (mg/kg)*
Lead	622	8	910	2,400
Note: 13 soil samples in total were analyzed for lead.				

Zone 6: Main-Church-South-Lake-William's Turnpike

Zone 6 is bounded to the north by Main Street and Sleepy Valley Place, to the west by Church Street, to the south by South Street, and to the east by the school on Lake Road and the swimming pool on William's Turnpike along with sections of Lakeview Avenue, William's Turnpike, MacLean Street, and Water Street contained within the above noted boundaries. Three Residential Areas of interest containing 16 residential properties were identified in Zone 6 as follows:

- Z6-R1 – 22 to 28 Church Street (front and back yards) and 4 South Street (front and back yards);
- Z6-R2 – 1 to 9 MacLean Street (front and back yards); and
- Z6-R3 – 2 to 10 MacLean Street (front and back yards) and 5 to 11 Williams Turnpike (front and back yards).

In 2009, CRA collected composite surface soil samples from two residential locations in Zone 6 as shown on Figure 2F. Five composite samples, including one field duplicate, were collected in 2010 to provide some degree of delineation. The following table presents a summary of all residential sampling locations in Zone 6.

Sample ID	*Sample Year*	*Civic Address*	*Sample Notes*
SS-32	2009	34 Church Street	Front Yard
Z6-SS1	2010	5 MacLean Street	Front Yard
Z6-SS2	2010	2 MacLean Street	Front Yard
SS-46	2009	5 Williams Turnpike	Side Yard
Z6-SS3	2010	7 Williams Turnpike	Front Yard
Z6-SS4	2010	4 South Street	Back Yard

The table below presents a summary of lead in soil analytical results at concentrations greater than the RBC criterion.

Parameter	Criterion (mg/kg)	Number of Results Greater Than RBC Criterion	Minimum Result Greater Than Criterion (mg/kg)	Maximum Result Greater Than Criterion (mg/kg)
Lead	622	5	790	1,900
Note: 7 soil samples in total were analyzed for lead, including one field duplicate.				

Zone7: South-Laycock-Walsh Memorial-Lundberg

Zone 7 is bounded to the north by South Street, to the west by sheds on Laycock Street, to the south by sheds on Walsh Memorial Street, and to the east by Lundberg Avenue along with sections of Walwyn Street, Church Street, and Jackson Street contained within the above noted boundaries. Two Residential Areas of interest containing 36 residential properties were identified in Zone 7 as follows:

- Z7-R1 – 10 to 48 Laycock Street (front and back yards); and
- Z7-R2 – 9 to 39 Jackson Street (front and back yards).

In 2009, CRA collected composite surface soil samples from two residential locations in Zone 7 as shown on Figure 2G. Seven additional composite samples, including one field duplicate, were collected in 2010 to provide some degree of delineation. The following table presents a summary of all residential sampling locations of interest in Zone 7.

Sample ID	Sample Year	Civic Address	Sample Notes
Z7-SS1	2010	10 Laycock Street	Front Yard
Z7-SS7	2010	30 Laycock Street	Front Yard
Z7-SS3	2010	42 Laycock Street	Front Yard
Z7-SS5	2010	19 Jackson Street	Front Yard
Z7-SS4	2010	33 Jackson Street	Back Yard
SS-20	2009	33 Jackson Street	Front Yard
SS-44	2009	15 Lundberg Avenue	Back Yard
Z7-SS6	2010	17 Lundberg Avenue	Front Yard

The table below presents a summary of lead in soil analytical results at concentrations greater than the RBC criterion.

Parameter	Criterion (mg/kg)	Number of Results Greater Than RBC Criterion	Minimum Result Greater Than Criterion (mg/kg)	Maximum Result Greater Than Criterion (mg/kg)
Lead	622	7	850	1,600
Note: 10 soil samples in total were analyzed for lead, including one field duplicate.				

Zone 8: South-Lundberg-Walsh Memorial-Lakeview

Zone 8 is bounded to the north by South Street, to the west by Lundberg Avenue, to the south by sheds on Walsh Memorial Street, and to the east by the playground on Lakeview Avenue along with sections of Lakeview Avenue and Pine Street contained within the above noted boundaries. Three Residential Areas of interest containing 56 residential properties were identified in Zone 8 as follows:

- Z8-R1 – 2 to 40 Lundberg Avenue (front and back yards);
- Z8-R2 – 1 to 39 Pine Street (front and back yards); and
- Z8-R3 – 7 to 37 Lakeview Avenue (front and back yards).

In 2009, CRA collected composite surface soil samples from three residential locations in Zone 8 as shown on Figure 2H. Eight composite samples, including one field duplicate, were collected in 2010 to provide some degree of delineation. In addition, one sub-surface sample was collected at approximately 0.4 mbgs in the vicinity of a 2009 sampling location (SS-40). The following table presents a summary of all residential sampling locations of interest in Zone 8.

Sample ID	*Sample Year*	*Civic Address*	*Sample Notes*
SS-26	2009	2 Lundberg Avenue	Side Yard
Z8-SS7	2010	4 Lundberg Avenue	Front Yard
Z8-SS5	2010	40 Lundberg Avenue	Front Yard
Z8-SS6	2010	31 Pine Street	Back Yard
SS-40	2009	39 Pine Street	Side Yard
Z8-SS-40D	2010	39 Pine Street	Front Yard, Sub-Surface
Z8-SS3	2010	18 Pine Street	Side Yard
Z8-SS4	2010	40 Pine Street	Front Yard
Z8-SS1	2010	7 Lakeview Avenue	Side Yard
SS-16	2009	15 Lakeview Avenue	Front Yard
Z8-SS2	2010	25 Lakeview Avenue	Front Yard

The table below presents a summary of lead in soil analytical results at concentrations greater than the RBC criterion.

Parameter	*Criterion (mg/kg)*	*Number of Results Greater Than RBC Criterion*	*Minimum Result Greater Than Criterion (mg/kg)*	*Maximum Result Greater Than Criterion (mg/kg)*
Lead	622	8	660	3,200
Note: 12 soil samples in total were analyzed for lead, including one field duplicate.				

7.0 SUMMARY OF LEAD IMPACTED SOIL IN RESIDENTIAL AREAS

The following table presents a summary of the impacted surface soils by Zone in each location with areas of impacted lead in soil concentrations that exceeded the RBC criterion, which were determined based on sample results presented in Section 6.0.

Zone		*Net Area*	*Lead Concentrations*
Number	*Location*	*(m^2)*	*Soil (mg/kg)*
1-1	7 Gilchrist Rd	750	1,600
1-2	14 Main St	550	1,200
2-1	74 to 84 Jackson St, 63 to 77 Church St	1,200	670 – 1,600
2-2	68 to 82 Church St	550	3,000
2-3	29 to 43 East St	900	1,100
2-4	30 to 44 East St	1,000	-
2-5	41 to 47 Williams Turnpike, including grassy area north of these properties	1,000	970 – 3,100
3-1	45 to 61 Church St	2,100	2,100
3-2	38 to 58 Church St	2,000	1,100 – 3,300
3-3	1 to 15 East St	900	-
3-4	13 to 39 Williams Turnpike	2,750	820 – 1,800
4-1	5 Court Rd, including grassy area south of the property	1,050	1,000 – 1,400
4-2	2 to 4 Court Rd, 1 to 3 Gilchrist Rd	4,350	2,700
5-1	2 to 10 Center St, 51 to 57 Jackson St	3,000	910 – 2,400
5-2	52 Jackson St	500	1,400
5-3	21 to 25 Church St, 42 Jackson St	1,300	1,200 – 1,400
6-1	22 to 28 Church St, 4 South St	1,600	1,600
6-2	1 to 9 MacLean St	1,600	1,200
6-3	2 to 10 MacLean St, 5 to 11 Williams Turnpike	3,850	790 – 1,900
7-1	10 to 48 Laycock St	2,000	1,000 – 1,600
7-2	9 to 39 Jackson St	1,800	850 – 1,100
8-1	2 to 40 Lundberg Ave	1,500	1,400 – 1,600
8-2	1 to 39 Pine St	1,500	690 – 3,200
8-3	7 to 37 Lakeview Ave	1,800	660 – 2,700

The following basic formula was used to calculate the Net Area to be addressed by the RMP:

$$An = RAF * (Ag - Ab)$$

where:

An: Net Area

RAF: Factor to allow for a reduced surface area based on ancillary buildings (i.e. sheds), walkways, driveways, large trees, etc.; ranged from 10 to 50% of Ag

Ag: Gross Area of the impacted location contained within geographical boundaries

Ab: Building Area addresses any larger structures on the location

Net area calculations are presented in Table 3.

8.0 RISK MANAGEMENT ALTERNATIVES

8.1 RISK ASSESSMENT

An HHRA estimates potential cancer and non-cancer health impacts from exposure to chemicals of potential concern. These estimates are based on methods, calculations, and input assumptions developed by regulatory agencies. The HHRA was conducted using surface soil data obtained from sampling conducted in the Public and Residential Areas of Town in 2009. CRA screened the metals data by comparing the maximum concentrations detected in the August and October 2009 surface soil samples to generic residential soil screening criteria developed by federal and provincial agencies to determine the MOIs.

The HHRA developed site-specific RBCs and subsequently evaluated the significance of metals concentrations by first examining potential pathways by which individuals may come in contact with surface soil in the Town. In this case, the potential pathways that could lead to exposure included the following:

- *Potential Source of Metals* – TSA and exposed tailings around existing tailings ponds and soils around the Town;
- *Release of Mechanism* – Airborne particulate dust dispersion or waste rock from mining operations;
- *Media of Concern* – Surface soil in Town;
- *Receptors* – Adults and children, with children being identified as the most sensitive receptors for non-carcinogens such as lead; and
- *Exposure Routes* – Incidental ingestion, direct dermal contact, and dust inhalation

The intent of this RMP is to mitigate exposure to lead impacted soil, i.e. remove the potential to be in direct contact with the soil to remove the risk of exposure.

8.2 RISK MANAGEMENT ALTERNATIVES

Risk management alternatives are directly influenced by such factors as existing property usage (playground, parking lot, etc.), exposure scenarios based on dermal contact limited by surface cover (grass, gravel, asphalt, concrete, etc.) or construction activities (disturbing surface or sub-surface soil), and costs associated with each alternative. In an effort to mitigate lead in soil exceedances reported from the 2009 and

2010 surface soil sampling programs at Residential Areas in the Town, CRA considered potential alternatives during the development of this RMP as summarized below.

Potential alternatives considered during this assessment included the following:

- Restrict usage to limit exposures and/or use of the Residential Areas by directing homeowners, tenants, or construction workers to use appropriate personal protective equipment (PPE), thereby blocking potential dermal contact;
- Import and placement of clean imported soil over the existing surfaces followed by reinstatement of landscaping;
- Removal of lead impacted soil with disposal at an approved waste disposal site, import and place clean soil with reinstatement of landscaping; and
- Any combination of the previously listed options.

Additional discussion is presented below. Estimated unit price costs associated with each alternative are provided under separate cover.

8.2.1 RESTRICTED USAGE

Restricted usage of Residential Areas by the property occupants was not considered as a socially viable alternative; therefore, further discussion is not presented regarding this option.

8.2.2 IMPORT AND PLACE CLEAN FILL

This option is based on the assumption that existing soil and landscaped surfaces remain intact; however, clean imported topsoil with finished landscaping would be required to establish an adequate barrier between lead impacted soil and the surface. Since these are Residential Areas, 0.3 metres of clean fill material will be adequate to establish a cover barrier as sub-surface soils below the clean fill will likely not be disturbed.

Importation and placement of clean fill over existing lead impacted soils has the advantage of eliminating any need for impacted soil disposal considerations and eliminates the need for removal, replacement, and trucking. Disadvantages include the raised elevation of finished landscaped surfaces that may not be complimentary to fixed features such as sidewalks, steps, curbs, fencing, flower beds, shrubs, trees, etc.

8.2.3 REPLACEMENT OF LEAD IMPACTED SOIL

The third option involves removal of lead impacted soil and vegetative surface covering (i.e. sod) and replacement with clean imported soil and finished landscaping. The same assumption applies in this alternative that 0.3 metres of clean fill material will be adequate to establish a cover barrier as sub-surface soils below the clean fill will likely not be disturbed, except by construction workers.

Removal of impacted soil and replacement with clean fill and finished landscaping has the advantage of maintaining previously established surface elevations. Disadvantages include the need for removal, replacement, and trucking of impacted soil, handling and re-planting of any shrubs or flower beds in the affected area, and completion of finished landscaping that may include sods, concrete/asphalt/gravel walkways, fencing, etc. It is assumed that lead-impacted soil will be disposed of at a location near the Town rather than transported off the island to a registered disposal facility on the mainland.

8.2.4 IMPORT CLEAN FILL AND/OR REPLACE LEAD IMPACTED SOIL

The final option considered involves a combined approach of placing clean imported fill over lead impacted soil at select areas and/or removal of lead impacted soil with vegetative surface covering (i.e. sod) and replacement with clean imported soil and finished landscaping at the remaining areas. The same assumption applies in this alternative that 0.3 metres of clean fill material will be adequate to establish a cover barrier as sub-surface soils below the clean fill will likely not be disturbed, except by construction workers.

Placement of clean imported fill material may be a favourable alternative in areas where raising the surface elevation is not an issue (i.e. existing grades area already low in comparison to surrounding fixed features). Other areas where an increased surface elevation is an issue can be addressed by removal of impacted soil and replacement with clean fill and finished landscaping. This alternative has the advantage optimizing the two remedial approaches to maximize cost and time efficiencies. It is assumed that lead-impacted soil will be disposed of at a location near the Town rather than transported off the island to a registered disposal facility on the mainland.

8.2.5 SUMMARY OF RISK MANAGEMENT ALTERNATIVES AND COSTING

A variety of landscaped surfaces currently exist at the various residential locations where RMPs are required. Therefore, the type of finished landscaping will be driven by existing conditions and the property owners.

The estimated costs were derived from similar work that CRA completed in New Brunswick as well as recent civil works completed in Buchans, NL during the 2010 construction season. A slight allowance for inflation (5 percent) was also included to account for an extended remedial plan that may be completed in stages.

9.0 RECOMMENDATIONS

A number of factors were considered in developing a preferred RMP for each of the Residential Areas addressed herein. Firstly, the type of remedial control measure was greatly influenced by existing landscaping finishes, which, in turn, directly influenced estimated costs. The second issue of consideration related to the priority of completing remedial work based on a review of potential exposure through dermal contact for one location compared to others within the group of Residential Areas that were scrutinized.

9.1 PROPOSED RISK MANAGEMENT ALTERNATIVES

As noted above, the proposed risk management alternatives were influenced by a variety of factors. Additional information is provided within this Section to further detail how the proposed alternative was determined for each Residential Area based on Zonal boundaries.

Exposure potential was initially assigned on the basis of reported surficial soil analytical results (High > 3,000 mg/kg; 3,000 mg/kg < Moderate < 1,500 mg/kg; Low < 1,500 mg/kg), then modified based on assumed current occupancy (presence of children), property usage (gardening), and finally surface cover (vegetation or the lack thereof). The determination of children at each block of properties was based on field observations during the completion of the field program in June 2010.

Estimates for proposed remedial alternatives are provided under separate cover.

9.1.1 ZONE 1 – RESIDENTIAL AREA 1: 7 GILCHRIST

The property, located at 7 Gilchrist Road (Z1-R1), is predominantly covered with the residence, vegetation, and driveway. For the purposes of this investigation, it has been assumed that children currently do not reside or frequent this property, that occupants are actively involved with gardening; exposed surface soils were noted. The evaluation matrix is presented to below to determine the exposure potential.

Evaluation Criteria	*Indicator*	*Exposure Potential*	
		Assigned	*Area Potential*
Maximum Lead in Soil Concentration	1,600	Moderate	**Moderate**
Children	N	Low	
Gardening	N	Low	
Exposed Surface Soils	Y	Moderate	

Placement of new fill material over the existing landscaped surfaces will result in increased elevations compared to fixed structures on the Site (such as walkway, driveway, steps, trees, shrubs, etc.).

Based on the existing Site conditions, it is recommended that removal of the top 0.3 metres of soil and sod, all of which should be disposed of at a lead-impacted soil disposal facility approved by the Province. Reinstatement would include the supply and placement of 0.15 metres of clean fill, then 0.15 metres of clean topsoil, followed by sods. Note that asphalt walkways and driveways would not require removal or replacement unless damaged by the work. Particular attention will be required when working around shrubs and trees to prevent excessive root damage during the remedial work. In addition, maintenance care will be required for 60 days following sod placement (and shrubbery replanting, if required) to ensure adequate root regrowth is established. A 909 Litre (L) furnace oil aboveground storage tank (AST) was also observed on the property that will require caution when working near the AST.

9.1.2 ZONE 1 – RESIDENTIAL AREA 2: 14 MAIN

The property, located at 14 Main Street (Z1-R2), is predominantly covered with the residence, some vegetation, wooden ramp and steps with a gravel driveway. For the purposes of this investigation, it has been assumed that children currently do not reside or frequent this property, or that occupants are actively involved with gardening, and that surface cover of exposed areas is limited, the exposure potential has been identified as moderate. The majority of the Site is surrounded with 150mm square timber edging.

Evaluation Criteria	*Indicator*	*Exposure Potential*	
		Assigned	*Area Potential*
Maximum Lead in Soil Concentration	1,200	Low	**Moderate**
Children	N	Low	
Gardening	Y	Moderate	
Exposed Surface Soils	Y	Moderate	

Placement of new fill material over the existing landscaped surfaces will result in increased elevations compared to fixed structures on the Site (such as driveway, steps, trees, shrubs, etc.).

Based on the existing Site conditions, it is recommended that removal of the top 0.3 metres of soil and sod, all of which should be disposed of at a lead-impacted soil disposal facility approved by the Province. Reinstatement would include the supply and placement of 0.15 metres of clean fill, then 0.15 metres of clean topsoil, followed by sods. Particular attention will be required when working around shrubs and trees to prevent excessive root damage during the remedial work. In addition, maintenance care will be required for 60 days following sod placement (and shrubbery replanting, if required) to ensure adequate root regrowth is established. A 909 L furnace oil AST was also observed on the property that will require caution when working near the AST.

9.1.3 ZONE 2 – RESIDENTIAL AREA 1: 74-84 JACKSON & 63-77 CHURCH

The block of 12 residential properties, located at 74 to 84 Jackson Street and 63 to 77 Church Street (Z2-R1), is predominantly covered with residences, vegetation, wooden patios and/or steps with concrete, asphalt, and/or gravel driveways. For the purposes of this investigation, it has been assumed that children currently reside or frequent these properties and some occupants are actively involved with gardening; some exposed surface soils were noted.

Evaluation Criteria	*Indicator*	*Exposure Potential*	
		Assigned	*Area Potential*
Maximum Lead in Soil Concentration	1,600	Moderate	**High**
Children	Y	High	
Gardening	Y	Moderate	
Exposed Surface Soils	Some	Low	

Placement of new fill material over the existing landscaped surfaces will result in increased elevations compared to fixed structures on the Site (such as driveway, steps, trees, shrubs, gardens, etc.).

Based on the existing Site conditions, it is recommended that removal of the top 0.3 metres of soil, sod, and gravel, all of which should be disposed of at a lead-impacted soil disposal facility approved by the Province. Reinstatement would include the supply and placement of 0.15 metres of clean fill, then 0.15 metres of clean topsoil, followed by sods or 0.15 metres of Class "A" material for gravel areas/driveways. Particular attention will be required when working around shrubs and trees to prevent excessive root damage during the remedial work. In addition, maintenance care will be required for 60 days following sod placement (and shrubbery replanting, if required) to ensure adequate root regrowth is established. A number of 909 L furnace oil ASTs were also observed on many of the properties that will require caution when working near the ASTs. Fencing was observed on approximately 50% of the properties in Z2-R1.

9.1.4 ZONE 2 – RESIDENTIAL AREA 2: 68-82 CHURCH

The block of 8 residential properties, located at 68 to 82 Church Street (Z2-R2), is predominantly covered with residences, vegetation, wooden patios and/or steps with concrete, asphalt, and/or gravel driveways. For the purposes of this investigation, it has been assumed that children currently reside or frequent some of the dwellings in this area; gardening was not observed, and that exposed surface soil is limited. Properties generally have some amount of fencing and ancillary structures present (i.e. sheds).

Evaluation Criteria	*Indicator*	*Exposure Potential*	
		Assigned	*Area Potential*
Maximum Lead in Soil Concentration	3,000	High	**High**
Children	Y	High	
Gardening	N	Low	
Exposed Surface Soils	Some	Low	

Placement of new fill material over the existing landscaped surfaces will result in increased elevations compared to fixed structures on the Site (such as driveway, steps, trees, shrubs, etc.).

Based on the existing Site conditions, it is recommended that removal of the top 0.3 metres of soil and sod, all of which should be disposed of at a lead-impacted soil disposal facility approved by the Province. Reinstatement would include the supply

and placement of 0.15 metres of clean fill, then 0.15 metres of clean topsoil, followed by sods. Particular attention will be required when working around shrubs and trees to prevent excessive root damage during the remedial work. In addition, maintenance care will be required for 60 days following sod placement (and shrubbery replanting, if required) to ensure adequate root regrowth is established. A mixture of 909 L furnace oil ASTs and fill lines for furnace oil underground storage tanks (USTs) were also observed on various properties in Z2-R2 that will require caution when working near the ASTs and/or USTs.

9.1.5 ZONE 2 – RESIDENTIAL AREA 3: 29-43 EAST

The block of 8 residential properties, located at 29 to 43 East Street (Z2-R3), is predominantly covered with residences, vegetation, wooden patios and/or steps with concrete, asphalt, and/or gravel driveways. For the purposes of this investigation, it has been assumed that children currently do not reside or frequent this property, occupants are not actively involved with gardening, and that exposed surface soil is limited. Fencing and ancillary structures were noted along the back yards.

Evaluation Criteria	*Indicator*	*Exposure Potential*	
		Assigned	*Area Potential*
Maximum Lead in Soil Concentration	1,100	Low	**Low**
Children	N	Low	
Gardening	N	Low	
Exposed Surface Soils	Some	Low	

Placement of new fill material over the existing landscaped surfaces will result in increased elevations compared to fixed structures on the Site (such as driveway, steps, trees, shrubs, etc.).

Based on the existing Site conditions, it is recommended that removal of the top 0.3 metres of soil and sod, all of which should be disposed of at a lead-impacted soil disposal facility approved by the Province. Reinstatement would include the supply and placement of 0.15 metres of clean fill, then 0.15 metres of clean topsoil, followed by sods. Particular attention will be required when working around shrubs and trees to prevent excessive root damage during the remedial work. In addition, maintenance care will be required for 60 days following sod placement (and shrubbery replanting, if required) to ensure adequate root regrowth is established. Furnace oil ASTs were not during the Site visit; however, it is suspect that residential properties in this area have furnace oil USTs that will require caution when working near the USTs.

9.1.6 ZONE 2 – RESIDENTIAL AREA 4: 30-44 EAST

The block of 8 residential properties, located at 30 to 44 East Street (Z2-R4), is predominantly covered with residences, vegetation, wooden patios and/or steps with concrete, asphalt, and/or gravel driveways. For the purposes of this investigation, it was assumed that children do not currently reside or frequent this property, occupants are not actively involved with gardening, and that exposed surface soil is limited.

Evaluation Criteria	*Indicator*	*Exposure Potential*	
		Assigned	*Area Potential*
Maximum Lead in Soil Concentration	*3,100	High	**Moderate**
Children	N	Low	
Gardening	N	Low	
Exposed Surface Soils	Some	Low	

* Assumed based on adjacent area analytical results.

Placement of new fill material over the existing landscaped surfaces will result in increased elevations compared to fixed structures on the Site (such as driveway, steps, trees, shrubs, etc.).

Based on the existing Site conditions, it is recommended that removal of the top 0.3 metres of soil and sod, all of which should be disposed of at a lead-impacted soil disposal facility approved by the Province. Reinstatement would include the supply and placement of 0.15 metres of clean fill, then 0.15 metres of clean topsoil, followed by sods. Particular attention will be required when working around shrubs and trees to prevent excessive root damage during the remedial work. In addition, maintenance care will be required for 60 days following sod placement (and shrubbery replanting, if required) to ensure adequate root regrowth is established. Although this area was not inspected, it is assumed that residences in Z2-R4 have furnace oil ASTs that will require caution when working near the ASTs.

9.1.7 ZONE 2 – RESIDENTIAL AREA 5: 41-47 WILLIAMS TURNPIKE

The block of 4 residential properties, located at 41 to 47 Williams Turnpike (Z2-R5), is predominantly covered with residences, vegetation, wooden patios and/or steps with gravel driveways. For the purposes of this investigation, it has been assumed that

children currently do not reside or frequent this area; it was noted that one or more occupants are actively involved with gardening; and that exposed surface soil is limited.

Evaluation Criteria	*Indicator*	*Exposure Potential*	
		Assigned	*Area Potential*
Maximum Lead in Soil Concentration	3,100	High	**High**
Children	N	Low	
Gardening	Y	Moderate	
Exposed Surface Soils	Some	Low	

Placement of new fill material over the existing landscaped surfaces will result in increased elevations compared to fixed structures on the Site (such as driveway, steps, trees, shrubs, etc.).

Based on the existing Site conditions, it is recommended that removal of the top 0.3 metres of soil and sod, all of which should be disposed of at a lead-impacted soil disposal facility approved by the Province. Reinstatement would include the supply and placement of 0.15 metres of clean fill, then 0.15 metres of clean topsoil, followed by sods. Particular attention will be required when working around shrubs and trees to prevent excessive root damage during the remedial work. In addition, maintenance care will be required for 60 days following sod placement (and shrubbery replanting, if required) to ensure adequate root regrowth is established. Fencing was noted around many of the individual dwellings. Although furnace oil ASTs were not observed at the time of the Site visit, it is believed that USTs may be present that will require caution when working near the USTs.

9.1.8 ZONE 3 – RESIDENTIAL AREA 1: 45-61 CHURCH

The block of 9 residential properties, located at 45 to 61 Church Street (Z3-R1), is predominantly covered with residences, vegetation, wooden patios and/or steps with concrete, asphalt, and/or gravel driveways. For the purposes of this investigation, it has been assumed that children currently do not reside or frequent this property, that occupants are not actively involved with gardening, and that exposed surface soil was limited.

Evaluation Criteria	*Indicator*	*Exposure Potential*	
		Assigned	*Area Potential*
Maximum Lead in Soil Concentration	2,100	Moderate	**Low**
Children	N	Low	
Gardening	N	Low	
Exposed Surface Soils	Some	Low	

Placement of new fill material over the existing landscaped surfaces will result in increased elevations compared to fixed structures on the Site (such as driveway, steps, trees, shrubs, etc.).

Based on the existing Site conditions, it is recommended that removal of the top 0.3 metres of soil and sod, all of which should be disposed of at a lead-impacted soil disposal facility approved by the Province. Reinstatement would include the supply and placement of 0.15 metres of clean fill, then 0.15 metres of clean topsoil, followed by sods. Particular attention will be required when working around shrubs and trees to prevent excessive root damage during the remedial work. In addition, maintenance care will be required for 60 days following sod placement (and shrubbery replanting, if required) to ensure adequate root regrowth is established. Fencing was noted around many of the individual dwellings. Although furnace oil ASTs were not observed at the time of the Site visit, it is believed that USTs may be present that will require caution when working near the USTs.

9.1.9 ZONE 3 – RESIDENTIAL AREA 2: 38-58 CHURCH

The block of 12 residential properties, located at 38 to 58 Church Street (Z3-R2), is predominantly covered with residences, vegetation, wooden patios and/or steps with gravel driveways. For the purposes of this investigation, it has been assumed that children currently reside or frequent this property, that occupants are not actively involved with gardening, and that exposed surface soil was limited.

Evaluation Criteria	*Indicator*	*Exposure Potential*	
		Assigned	*Area Potential*
Maximum Lead in Soil Concentration	3,300	High	**High**
Children	Y	High	
Gardening	N	Low	
Exposed Surface Soils	Some	Low	

Placement of new fill material over the existing landscaped surfaces will result in increased elevations compared to fixed structures on the Site (such as driveway, steps, trees, shrubs, etc.).

Based on the existing Site conditions, it is recommended that removal of the top 0.3 metres of soil and sod, all of which should be disposed of at a lead-impacted soil disposal facility approved by the Province. Reinstatement would include the supply and placement of 0.15 metres of clean fill, then 0.15 metres of clean topsoil, followed by sods. Particular attention will be required when working around shrubs and trees to prevent excessive root damage during the remedial work. In addition, maintenance care will be required for 60 days following sod placement (and shrubbery replanting, if required) to ensure adequate root regrowth is established. Fencing was noted around many of the individual dwellings. Although furnace oil ASTs were not observed at the time of the Site visit, it is believed that USTs may be present that will require caution when working near the USTs.

9.1.10 ZONE 3 – RESIDENTIAL AREA 3: 1-15 EAST STREET

The block of 8 residential properties, located at 1 to 15 East Street (Z3-R3), is predominantly covered with residences, vegetation, wooden patios and/or steps with gravel driveways. For the purposes of this investigation, it has been assumed that children do not currently reside or frequent this property, that occupants are not actively involved with gardening, and that exposed surface soil was limited.

Evaluation Criteria	*Indicator*	*Exposure Potential*	
		Assigned	*Area Potential*
Maximum Lead in Soil Concentration	3,300	High	**High**
Children	N	Low	
Gardening	N	Low	
Exposed Surface Soils	Some	Low	

* Assumed based on adjacent area analytical results.

Placement of new fill material over the existing landscaped surfaces will result in increased elevations compared to fixed structures on the Site (such as driveway, steps, trees, shrubs, etc.).

A Site inspection of Z3-R3 was not completed at the time of the field investigation, but property conditions are anticipated to be similar to the surrounding areas. Therefore, it is recommended that removal of the top 0.3 metres of soil and sod, all of which should be disposed of at a lead-impacted soil disposal facility approved by the Province. Reinstatement would include the supply and placement of 0.15 metres of clean fill, then 0.15 metres of clean topsoil, followed by sods. Particular attention will be required when working around shrubs and trees to prevent excessive root damage during the remedial work. In addition, maintenance care will be required for 60 days following sod placement (and shrubbery replanting, if required) to ensure adequate root regrowth is established. Fencing is assumed to be present around many of the individual dwellings and it is believed that USTs may also be present that will require caution when working near the USTs.

9.1.11 ZONE 3 – RESIDENTIAL AREA 4: 13-39 WILLIAMS TURNPIKE

The block of 10 residential properties, located at 13 to 39 Williams Turnpike (Z3-R4), is predominantly covered with residences, vegetation, wooden patios and/or steps with gravel or asphalt driveways. For the purposes of this investigation, it has been assumed that children do not currently reside or frequent this property, that occupants are not actively involved with gardening, and that exposed surface soil was limited.

Evaluation Criteria	*Indicator*	*Exposure Potential*	
		Assigned	*Area Potential*
Maximum Lead in Soil Concentration	3,300	High	**High**
Children	N	Low	
Gardening	N	Low	
Exposed Surface Soils	Some	Low	

Placement of new fill material over the existing landscaped surfaces will result in increased elevations compared to fixed structures on the Site (such as driveway, steps, trees, shrubs, etc.).

Based on the existing Site conditions, it is recommended that removal of the top 0.3 metres of soil and sod, all of which should be disposed of at a lead-impacted soil disposal facility approved by the Province. Reinstatement would include the supply and placement of 0.15 metres of clean fill, then 0.15 metres of clean topsoil, followed by sods. Particular attention will be required when working around shrubs and trees to prevent excessive root damage during the remedial work. In addition, maintenance care will be required for 60 days following sod placement (and shrubbery replanting, if

required) to ensure adequate root regrowth is established. Fencing was noted around many of the individual dwellings. Although furnace oil ASTs were not observed at the time of the Site visit, it is believed that USTs may be present that will require caution when working near the USTs.

9.1.12 ZONE 4 – RESIDENTIAL AREA 1: 5 COURT

The property, located at 5 Court Road (Z5-R1), is predominantly covered with the residence, some vegetation, wooden steps with asphalt driveway. For the purposes of this investigation, it has been assumed that children currently do not reside or frequent this property, or that occupants are actively involved with gardening, and that exposed surface soil was limited.

Evaluation Criteria	*Indicator*	*Exposure Potential*	
		Assigned	*Area Potential*
Maximum Lead in Soil Concentration	1,400	Low	**Low**
Children	N	Low	
Gardening	N	Low	
Exposed Surface Soils	Some	Low	

Placement of new fill material over the existing landscaped surfaces will result in increased elevations compared to fixed structures on the Site (such as driveway, steps, trees, shrubs, etc.).

Based on the existing Site conditions, it is recommended that removal of the top 0.3 metres of soil and sod, all of which should be disposed of at a lead-impacted soil disposal facility approved by the Province. Reinstatement would include the supply and placement of 0.15 metres of clean fill, then 0.15 metres of clean topsoil, followed by sods. Particular attention will be required when working around shrubs and trees to prevent excessive root damage during the remedial work. In addition, maintenance care will be required for 60 days following sod placement (and shrubbery replanting, if required) to ensure adequate root regrowth is established.

9.1.13 ZONE 4 – RESIDENTIAL AREA 2: 2-4 COURT & 1-3 GILCHRIST

The block of 4 residential properties, located at 2 to 4 Court Road and 1 to 3 Gilchrist Road (Z4-R2), is predominantly covered with residences, vegetation, wooden patios and/or steps with gravel driveways. For the purposes of this investigation, it has been

assumed that children currently do not reside or frequent this property, that occupants are not actively involved with gardening, and that exposed surface soil was limited.

Evaluation Criteria	*Indicator*	*Exposure Potential*	
		Assigned	*Area Potential*
Maximum Lead in Soil Concentration	2,700	Moderate	**Low**
Children	N	Low	
Gardening	N	Low	
Exposed Surface Soils	Some	Low	

Placement of new fill material over the existing landscaped surfaces will result in increased elevations compared to fixed structures on the Site (such as driveway, steps, trees, shrubs, etc.).

Based on the existing Site conditions, it is recommended that removal of the top 0.3 metres of soil and sod, all of which should be disposed of at a lead-impacted soil disposal facility approved by the Province. Reinstatement would include the supply and placement of 0.15 metres of clean fill, then 0.15 metres of clean topsoil, followed by sods. Particular attention will be required when working around shrubs and trees to prevent excessive root damage during the remedial work. In addition, maintenance care will be required for 60 days following sod placement (and shrubbery replanting, if required) to ensure adequate root regrowth is established.

9.1.14 ZONE 5 – RESIDENTIAL AREA 1: 2-10 CENTER & 51-57 JACKSON

The block of 9 residential properties, located at 2 to 10 Center Street and 51 to 57 Jackson Street (Z5-R1), is predominantly covered with residences, vegetation, wooden patios and/or steps with concrete/asphalt/gravel driveways. For the purposes of this investigation, it has been assumed that children do not currently reside or frequent this property, that occupants are actively involved with gardening, and that exposed surface soil was limited.

Evaluation Criteria	*Indicator*	*Exposure Potential*	
		Assigned	*Area Potential*
Maximum Lead in Soil Concentration	2,400	Moderate	**Moderate**
Children	N	Low	
Gardening	Y	Moderate	
Exposed Surface Soils	Some	Low	

Placement of new fill material over the existing landscaped surfaces will result in increased elevations compared to fixed structures on the Site (such as driveway, steps, trees, shrubs, etc.).

Based on the existing Site conditions, it is recommended that removal of the top 0.3 metres of soil and sod, all of which should be disposed of at a lead-impacted soil disposal facility approved by the Province. Reinstatement would include the supply and placement of 0.15 metres of clean fill, then 0.15 metres of clean topsoil, followed by sods. Particular attention will be required when working around shrubs and trees to prevent excessive root damage during the remedial work. In addition, maintenance care will be required for 60 days following sod placement (and shrubbery replanting, if required) to ensure adequate root regrowth is established.

9.1.15 ZONE 5 – RESIDENTIAL AREA 2: 52 JACKSON

The property, located at 52 Jackson Street (Z5-R2), is predominantly covered with the residence, some vegetation, and wooden steps with a gravel driveway. For the purposes of this investigation, it has been assumed that children do not currently reside or frequent this property, that occupants are not actively involved with gardening, and that exposed surface soil was limited.

Evaluation Criteria	*Indicator*	*Exposure Potential*	
		Assigned	*Area Potential*
Maximum Lead in Soil Concentration	1,400	Low	**Low**
Children	N	Low	
Gardening	N	Low	
Exposed Surface Soils	Some	Low	

Placement of new fill material over the existing landscaped surfaces will result in increased elevations compared to fixed structures on the Site (such as driveway, steps, trees, shrubs, etc.).

Based on the existing Site conditions, it is recommended that removal of the top 0.3 metres of soil and sod, all of which should be disposed of at a lead-impacted soil disposal facility approved by the Province. Reinstatement would include the supply and placement of 0.15 metres of clean fill, then 0.15 metres of clean topsoil, followed by sods. Particular attention will be required when working around shrubs and trees to prevent excessive root damage during the remedial work. In addition, maintenance care

will be required for 60 days following sod placement (and shrubbery replanting, if required) to ensure adequate root regrowth is established. A 454 L AST was also observed on the property that will require caution when working near the AST.

9.1.16 ZONE 5 – RESIDENTIAL AREA 3: 21-25 CHURCH & 42 JACKSON

The block of 4 residential properties, located at 21 to 25 Church Street and 42 Jackson Street (Z5-R3), is predominantly covered with residences, vegetation, wooden/concrete patios and/or steps with gravel driveways. For the purposes of this investigation, it has been assumed that children do not currently reside or frequent this property, that occupants are not actively involved with gardening, and that exposed surface soil was limited.

Evaluation Criteria	*Indicator*	*Exposure Potential*	
		Assigned	*Area Potential*
Maximum Lead in Soil Concentration	1,400	Low	**Low**
Children	N	Low	
Gardening	N	Low	
Exposed Surface Soils	Some	Low	

Placement of new fill material over the existing landscaped surfaces will result in increased elevations compared to fixed structures on the Site (such as driveway, steps, trees, shrubs, etc.).

Based on the existing Site conditions, it is recommended that removal of the top 0.3 metres of soil and sod, all of which should be disposed of at a lead-impacted soil disposal facility approved by the Province. Reinstatement would include the supply and placement of 0.15 metres of clean fill, then 0.15 metres of clean topsoil, followed by sods. Particular attention will be required when working around shrubs and trees to prevent excessive root damage during the remedial work. In addition, maintenance care will be required for 60 days following sod placement (and shrubbery replanting, if required) to ensure adequate root regrowth is established.

9.1.17 ZONE 6 – RESIDENTIAL AREA 1: 22-28 CHURCH & 4 SOUTH

The block of 5 residential properties, located at 22 to 28 Church Street and 4 South Street (Z6-R1), is predominantly covered with residences, vegetation, wooden patios and/or steps with gravel/asphalt driveways. For the purposes of this investigation, it has been

assumed that children do not currently reside or frequent this property, that occupants are actively involved with gardening, and that exposed surface soil was limited.

Evaluation Criteria	*Indicator*	*Exposure Potential*	
		Assigned	*Area Potential*
Maximum Lead in Soil Concentration	1,600	Moderate	**Moderate**
Children	N	Low	
Gardening	Y	Moderate	
Exposed Surface Soils	Some	Low	

Placement of new fill material over the existing landscaped surfaces will result in increased elevations compared to fixed structures on the Site (such as driveway, steps, trees, shrubs, etc.).

Based on the existing Site conditions, it is recommended that removal of the top 0.3 metres of soil and sod, all of which should be disposed of at a lead-impacted soil disposal facility approved by the Province. Reinstatement would include the supply and placement of 0.15 metres of clean fill, then 0.15 metres of clean topsoil, followed by sods. Particular attention will be required when working around shrubs and trees to prevent excessive root damage during the remedial work. In addition, maintenance care will be required for 60 days following sod placement (and shrubbery replanting, if required) to ensure adequate root regrowth is established. A 909 L AST was also observed on one property that will require caution when working near the AST.

9.1.18 ZONE 6 – RESIDENTIAL AREA 2: 1-9 MACLEAN

The block of 9 residential properties, located at 1 to 9 MacLean Street (Z6-R2), is predominantly covered with residences, vegetation, wooden patios and/or steps with gravel driveways. For the purposes of this investigation, it has been assumed that children currently do not reside or frequent this property, that occupants are not actively involved with gardening, and that exposed surface soil was limited.

Evaluation Criteria	*Indicator*	*Exposure Potential*	
		Assigned	*Area Potential*
Maximum Lead in Soil Concentration	1,200	Low	**Low**
Children	N	Low	
Gardening	N	Low	
Exposed Surface Soils	Some	Low	

Placement of new fill material over the existing landscaped surfaces will result in increased elevations compared to fixed structures on the Site (such as driveway, steps, trees, shrubs, etc.).

Based on the existing Site conditions, it is recommended that removal of the top 0.3 metres of soil and sod, all of which should be disposed of at a lead-impacted soil disposal facility approved by the Province. Reinstatement would include the supply and placement of 0.15 metres of clean fill, then 0.15 metres of clean topsoil, followed by sods. Particular attention will be required when working around shrubs and trees to prevent excessive root damage during the remedial work. In addition, maintenance care will be required for 60 days following sod placement (and shrubbery replanting, if required) to ensure adequate root regrowth is established.

9.1.19 ZONE 6 – RESIDENTIAL AREA 3: 2-10 MACLEAN & 5-11 WILLIAMS TURNPIKE

The block of 3 residential properties, located at 2 to 10 MacLean Street and 5 to 11 Williams Turnpike (Z6-R3), is predominantly covered with residences, vegetation, wooden patios and/or steps, and walkways with gravel/asphalt driveways. For the purposes of this investigation, it has been assumed that children do not currently reside or frequent this property, that occupants are actively involved with gardening, and that exposed surface soil was limited.

Evaluation Criteria	*Indicator*	*Exposure Potential*	
		Assigned	*Area Potential*
Maximum Lead in Soil Concentration	1,900	Moderate	**Moderate**
Children	N	Low	
Gardening	Y	Moderate	
Exposed Surface Soils	Some	Low	

Placement of new fill material over the existing landscaped surfaces will result in increased elevations compared to fixed structures on the Site (such as driveway, steps, trees, shrubs, etc.).

Based on the existing Site conditions, it is recommended that removal of the top 0.3 metres of soil and sod, all of which should be disposed of at a lead-impacted soil disposal facility approved by the Province. Reinstatement would include the supply and placement of 0.15 metres of clean fill, then 0.15 metres of clean topsoil, followed by

sods. Particular attention will be required when working around shrubs and trees to prevent excessive root damage during the remedial work. In addition, maintenance care will be required for 60 days following sod placement (and shrubbery replanting, if required) to ensure adequate root regrowth is established.

9.1.20 ZONE 7 – RESIDENTIAL AREA 1: 10-48 LAYCOCK

The block of 20 residential properties, located at 10 to 48 Laycock Street (Z7-R1), is predominantly covered with residences, vegetation, wooden patios and/or steps with walkways and gravel/asphalt driveways. For the purposes of this investigation, it has been assumed that children do not currently reside or frequent this property, that occupants are actively involved with gardening, and that exposed surface soil was limited.

Evaluation Criteria	*Indicator*	*Exposure Potential*	
		Assigned	*Area Potential*
Maximum Lead in Soil Concentration	1,600	Moderate	**Moderate**
Children	N	Low	
Gardening	Y	Moderate	
Exposed Surface Soils	Some	Low	

Placement of new fill material over the existing landscaped surfaces will result in increased elevations compared to fixed structures on the Site (such as driveway, steps, trees, shrubs, etc.).

Based on the existing Site conditions, it is recommended that removal of the top 0.3 metres of soil and sod, all of which should be disposed of at a lead-impacted soil disposal facility approved by the Province. Reinstatement would include the supply and placement of 0.15 metres of clean fill, then 0.15 metres of clean topsoil, followed by sods. Particular attention will be required when working around shrubs and trees to prevent excessive root damage during the remedial work. In addition, maintenance care will be required for 60 days following sod placement (and shrubbery replanting, if required) to ensure adequate root regrowth is established. A number of 909 L ASTs were also observed in Z7-R1 that will require caution when working near the ASTs.

9.1.21 ZONE 7 – RESIDENTIAL AREA 2: 9-39 JACKSON

The block of 16 residential properties, located at 9 to 39 Lundberg Avenue (Z7-R2), is predominantly covered with residences, vegetation, wooden patios and/or steps, walkways with gravel/asphalt driveways. For the purposes of this investigation, it has been assumed that children do not currently reside or frequent this property, that occupants are actively involved with gardening, and that exposed surface soil was limited.

Evaluation Criteria	*Indicator*	*Exposure Potential*	
		Assigned	*Area Potential*
Maximum Lead in Soil Concentration	1,500	Moderate	**Moderate**
Children	N	Low	
Gardening	Y	Moderate	
Exposed Surface Soils	Some	Low	

Placement of new fill material over the existing landscaped surfaces will result in increased elevations compared to fixed structures on the Site (such as driveway, steps, trees, shrubs, etc.).

Based on the existing Site conditions, it is recommended that removal of the top 0.3 metres of soil and sod, all of which should be disposed of at a lead-impacted soil disposal facility approved by the Province. Reinstatement would include the supply and placement of 0.15 metres of clean fill, then 0.15 metres of clean topsoil, followed by sods. Particular attention will be required when working around shrubs and trees to prevent excessive root damage during the remedial work. In addition, maintenance care will be required for 60 days following sod placement (and shrubbery replanting, if required) to ensure adequate root regrowth is established. A number of 909 L ASTs were also observed in Z7-R2 that will require caution when working near the ASTs.

9.1.22 ZONE 8 – RESIDENTIAL AREA 1: 2-40 LUNDBERG

The block of 20 residential properties, located at 2 to 40 Lundberg Avenue (Z8-R1), is predominantly covered with residences, vegetation, wooden patios and/or steps, and walkways with gravel/asphalt driveways. For the purposes of this investigation, it has been assumed that children currently reside or frequent this property, that occupants are actively involved with gardening, and that exposed surface soil was limited.

Evaluation Criteria	*Indicator*	*Exposure Potential*	
		Assigned	*Area Potential*
Maximum Lead in Soil Concentration	1,600	Moderate	**High**
Children	Y	High	
Gardening	Y	Moderate	
Exposed Surface Soils	Some	Low	

Placement of new fill material over the existing landscaped surfaces will result in increased elevations compared to fixed structures on the Site (such as driveway, steps, trees, shrubs, etc.).

Based on the existing Site conditions, it is recommended that removal of the top 0.3 metres of soil and sod, all of which should be disposed of at a lead-impacted soil disposal facility approved by the Province. Reinstatement would include the supply and placement of 0.15 metres of clean fill, then 0.15 metres of clean topsoil, followed by sods. Particular attention will be required when working around shrubs and trees to prevent excessive root damage during the remedial work. In addition, maintenance care will be required for 60 days following sod placement (and shrubbery replanting, if required) to ensure adequate root regrowth is established.

9.1.23 ZONE 8 – RESIDENTIAL AREA 2: 1-39 PINE

The block of 20 residential properties, located at 1 to 39 Pine Street (Z8-R2), is predominantly covered with residences, vegetation, wooden patios and/or steps with gravel driveways. For the purposes of this investigation, it has been assumed that children currently reside or frequent this property, that occupants are actively involved with gardening, and that exposed surface soil was limited.

Evaluation Criteria	*Indicator*	*Exposure Potential*	
		Assigned	*Area Potential*
Maximum Lead in Soil Concentration	3,200	High	**High**
Children	Y	High	
Gardening	Y	Moderate	
Exposed Surface Soils	Some	Low	

Placement of new fill material over the existing landscaped surfaces will result in increased elevations compared to fixed structures on the Site (such as driveway, steps, trees, shrubs, etc.).

Based on the existing Site conditions, it is recommended that removal of the top 0.3 metres of soil and sod, all of which should be disposed of at a lead-impacted soil disposal facility approved by the Province. Reinstatement would include the supply and placement of 0.15 metres of clean fill, then 0.15 metres of clean topsoil, followed by sods. Particular attention will be required when working around shrubs and trees to prevent excessive root damage during the remedial work. In addition, maintenance care will be required for 60 days following sod placement (and shrubbery replanting, if required) to ensure adequate root regrowth is established.

9.1.24 ZONE 8 – RESIDENTIAL AREA 3: 7-37 LAKEVIEW

The block of 16 residential properties, located at 7 to 37 Lakeview Avenue (Z8-R3), is predominantly covered with residences, vegetation, wooden patios and/or steps with gravel driveways. For the purposes of this investigation, it has been assumed that children do not currently reside or frequent this property, that occupants are not actively involved with gardening, and that exposed surface soil was limited.

Evaluation Criteria	*Indicator*	*Exposure Potential*	
		Assigned	*Area Potential*
Maximum Lead in Soil Concentration	2,700	Moderate	**Low**
Children	N	Low	
Gardening	N	Low	
Exposed Surface Soils	Some	Low	

Placement of new fill material over the existing landscaped surfaces will result in increased elevations compared to fixed structures on the Site (such as driveway, steps, trees, shrubs, etc.).

Based on the existing Site conditions, it is recommended that removal of the top 0.3 metres of soil and sod, all of which should be disposed of at a lead-impacted soil disposal facility approved by the Province. Reinstatement would include the supply and placement of 0.15 metres of clean fill, then 0.15 metres of clean topsoil, followed by sods. Particular attention will be required when working around shrubs and trees to prevent excessive root damage during the remedial work. In addition, maintenance care will be required for 60 days following sod placement (and shrubbery replanting, if required) to ensure adequate root regrowth is established. A number of 909 L ASTs were also observed in Z7-R2 that will require caution when working near the ASTs.

9.2 PRIORITIZATION OF RESIDENTIAL AREA REMEDIATION

As described in above in Section 9.1, a total of 24 primary areas of concern were identified through the 2009 and 2010 surficial soil sampling programs conducted in Residential Areas. These areas were further investigated to determine type of existing surface cover that could act as barriers to lead-impacted soil, exposure potential to adults and/or children along with duration of exposures. Based on the information presented, the following table summarizes the Zone, Residential Area, location, and priority level allocated to each area of concern.

Zone		*Number of Properties*	*Net Area*	*Lead Concentrations*	*Priority*
Number	*Location*		*(m^2)*	*Soil (mg/kg)*	
1-1	7 Gilchrist Rd	1	750	1,600	Moderate
1-2	14 Main St	1	550	1,200	Moderate
2-1	74 to 84 Jackson St, 63 to 77 Church St	12	1,200	670 – 1,600	High
2-2	68 to 82 Church St	8	550	3,000	High
2-3	29 to 43 East St	8	900	1,100	Low
2-4	30 to 44 East St	8	1,000	-	Moderate
2-5	41 to 47 Williams Turnpike, including grassy area north of these properties	4	1,000	970 – 3,100	High
3-1	45 to 61 Church St	9	2,100	2,100	Low
3-2	38 to 58 Church St	12	2,000	1,100 – 3,300	High
3-3	1 to 15 East St	8	900	-	High
3-4	13 to 39 Williams Turnpike	10	2,750	820 – 1,800	High
4-1	5 Court Rd, including grassy area south of the property	1	1,050	1,000 – 1,400	Low
4-2	2 to 4 Court Rd, 1 to 3 Gilchrist Rd	4	4,350	2,700	Low
5-1	2 to 10 Center St, 51 to 57 Jackson St	9	3,000	910 – 2,400	Moderate
5-2	52 Jackson St	1	500	1,400	Low
5-3	21 to 25 Church St, 42 Jackson St	4	1,300	1,200 – 1,400	Low
6-1	22 to 28 Church St, 4 South St	4	1,600	1,600	Moderate
6-2	1 to 9 MacLean St	9	1,600	1,200	Low
6-3	2 to 10 MacLean St, 5 to 11 Williams Turnpike	3	3,850	790 – 1,900	Moderate
7-1	10 to 48 Laycock St	20	2,000	1,000 – 1,600	Moderate
7-2	9 to 39 Jackson St	16	1,800	850 – 1,100	Moderate
8-1	2 to 40 Lundberg Ave	20	1,500	1,400 – 1,600	High
8-2	1 to 39 Pine St	20	1,500	690 – 3,200	High
8-3	7 to 37 Lakeview Ave	16	1,800	660 – 2,700	Low

CRA recommend that the remedial action be implemented to address High priority areas first, followed by areas of Moderate priority, then areas of Low priority last. It should also be noted that assumptions concerning the presence of children in a Residential Area of interest were solely based on field observations; any new information regarding the presence of children in a certain area will be considered and CRA reserve the opportunity to revise the priority ranking of affected Residential Areas of interest.

Figure 3 shows the northern section of Town with the Residential Areas of interest prioritized according to the information presented above. A summary of the proposed remedial alternatives with estimated costs as described above is presented under separate cover.

9.3 OTHER ISSUES OF CONCERN

Several risk management alternatives include the removal and disposal of lead-impacted soil at a disposal facility approved by the Province. At the time of writing this report, a soil disposal facility does not exist that is approved by the Province for disposal of lead impacted soil; therefore, all lead impacted soil being removed from areas within the Town would require transportation to a facility off the island for disposal. This approach would result in extremely high disposal costs that would render such a remedial alternative as economically unfeasible.

CRA recommend that lead-impacted soil removed from Public Areas in the Town should be disposed of at a location determined by the Province and the Town that would be nearby Buchans. Such an alternative would require an engineered facility that would meet the same construction criteria as that recently completed for the TSA in 2010. An added benefit to nearby disposal is that completion time for construction activities would be dramatically reduced compared to off-island disposal.

An estimated cost to construct an engineered landfill to accommodate the lead-impacted soil from the Public Areas is provided under separate cover. The costs were based on the tendered unit price costs from the engineered landfill construction work completed at the TSA in 2010.

10.0 REFERENCES

Report entitled "Environmental Site Assessment, Abitibi-Consolidated Inc. – Buchans Mine Site, Buchans, Newfoundland" submitted to Weirfoulds, LLP and the Province of Newfoundland and Labrador, prepared by CRA, dated November 2009.

Report entitled "Human Health Risk Assessment, Town of Buchans, Newfoundland and Labrador" submitted to the Province of Newfoundland and Labrador, prepared by CRA, dated March 2010.

Report entitled "Summary Report, Human Health Risk Assessment, Town of Buchans, Newfoundland and Labrador" submitted to the Province of Newfoundland and Labrador, prepared by CRA, dated March 2010.

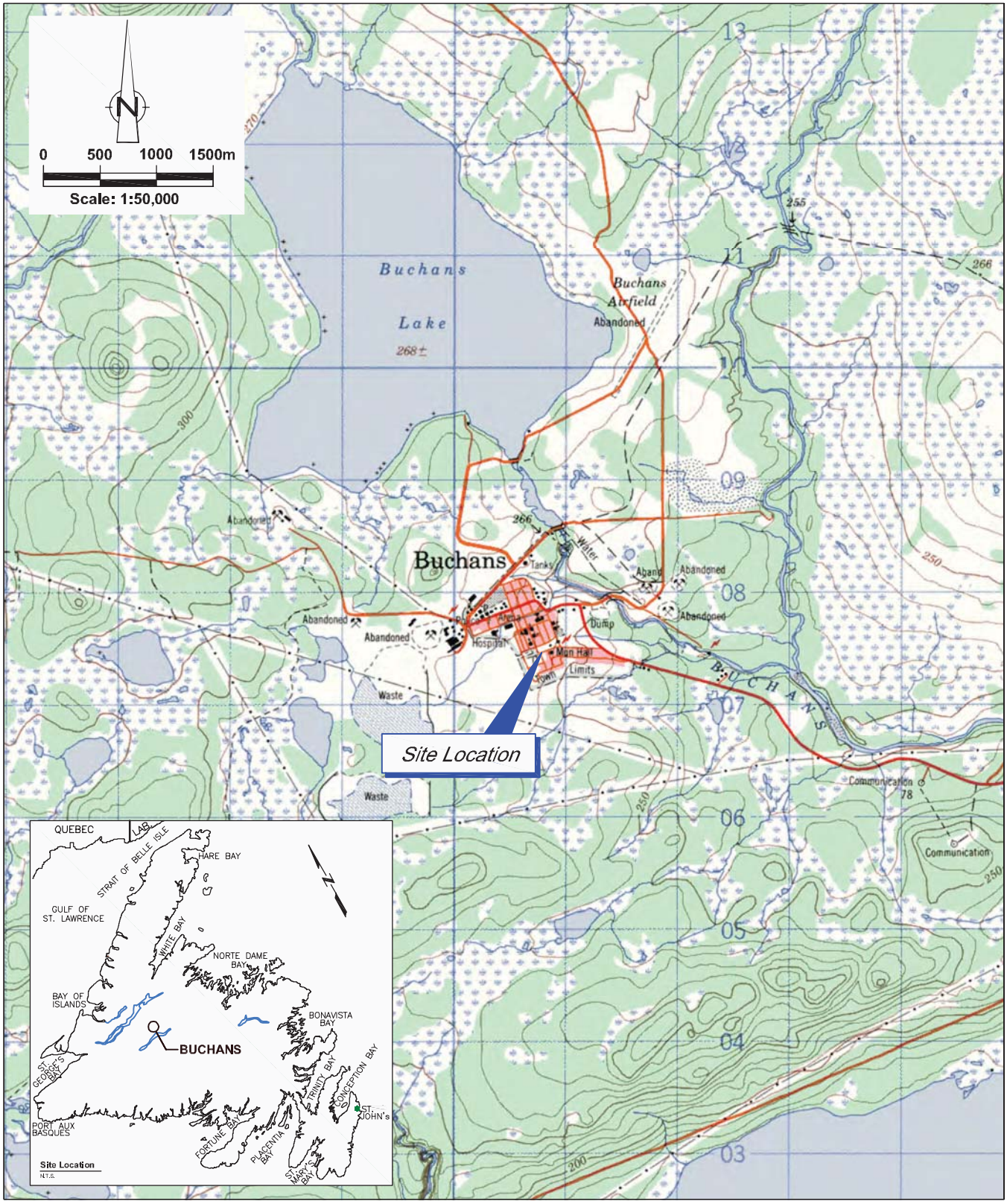


figure 1

SITE LOCATION MAP
RISK MANAGEMENT PLAN FOR RESIDENTIAL AREAS
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
Buchans, NL

070854(004) GN-NL001

figure 2

AERIAL SITE PLAN
RISK MANAGEMENT PLAN FOR RESIDENTIAL AREAS
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
Buchans, NL

070854(003)GN-DA002 DECEMBER 21/2010

figure 2A

AERIAL SITE PLAN WITH SAMPLE LOCATIONS - ZONE 1
RISK MANAGEMENT PLAN FOR RESIDENTIAL AREAS
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
Buchans, NL

070854(003)GN-DA02A DECEMBER 21/2010

figure 2B

AERIAL SITE PLAN WITH SAMPLE LOCATIONS - ZONE 2
RISK MANAGEMENT PLAN FOR RESIDENTIAL AREAS
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
Buchans, NL

070854(003)GN-DA02B DECEMBER 21/2010

figure 2C

AERIAL SITE PLAN WITH SAMPLE LOCATIONS - ZONE 3
RISK MANAGEMENT PLAN FOR RESIDENTIAL AREAS
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
Buchans, NL

070854(003)GN-DA02C DECEMBER 21/2010

figure 2D

AERIAL SITE PLAN WITH SAMPLE LOCATIONS - ZONE 4
RISK MANAGEMENT PLAN FOR RESIDENTIAL AREAS
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
Buchans, NL

070854(003)GN-DA02D DECEMBER 21/2010

figure 2E

AERIAL SITE PLAN WITH SAMPLE LOCATIONS - ZONE 5
RISK MANAGEMENT PLAN FOR RESIDENTIAL AREAS
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
Buchans, NL

070854(003)GN-DA02E DECEMBER 21/2010

figure 2F

AERIAL SITE PLAN WITH SAMPLE LOCATIONS - ZONE 6
RISK MANAGEMENT PLAN FOR RESIDENTIAL AREAS
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
Buchans, NL

070854(003)GN-DA02F DECEMBER 21/2010

figure 2G

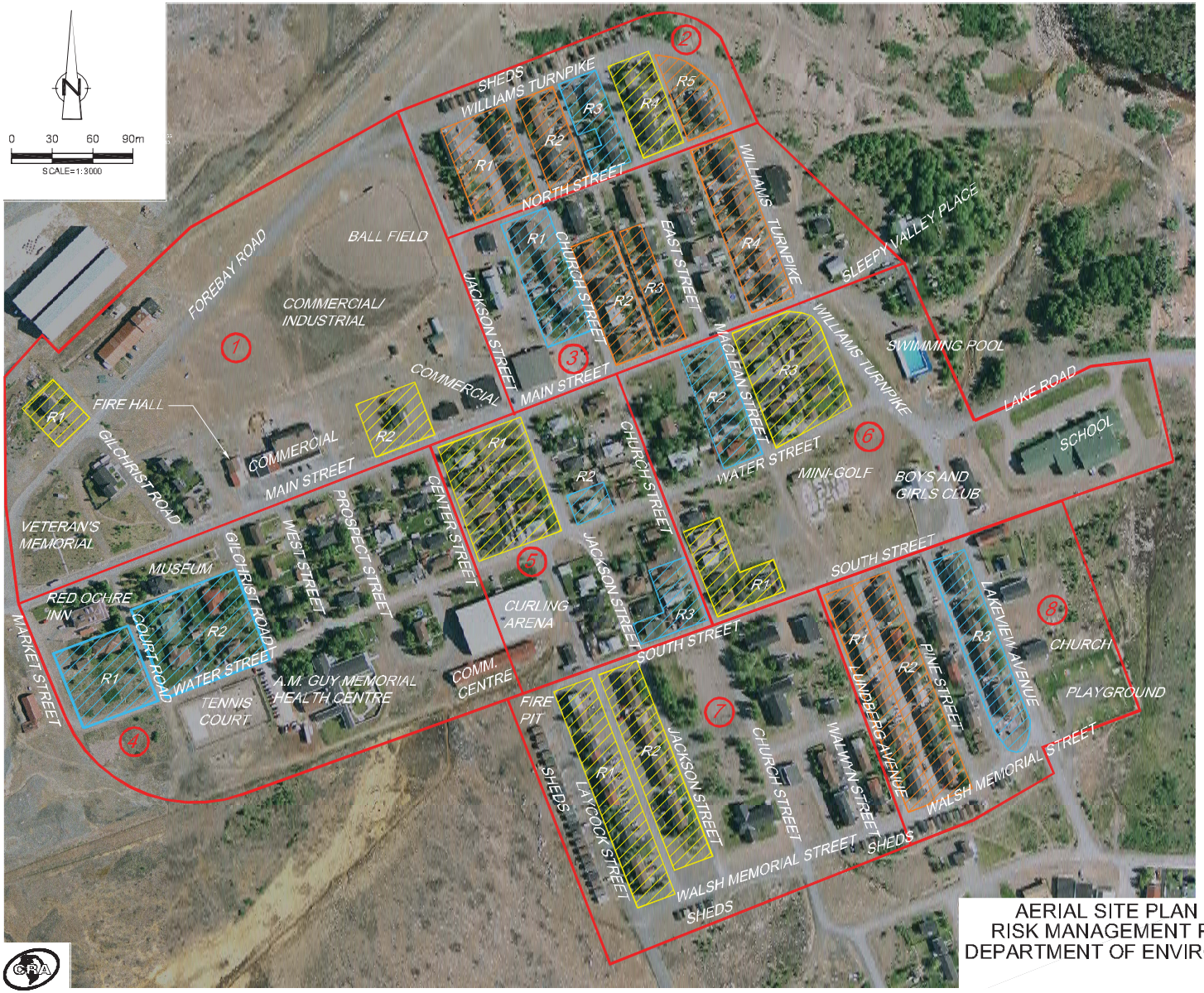
AERIAL SITE PLAN WITH SAMPLE LOCATIONS - ZONE 7
RISK MANAGEMENT PLAN FOR RESIDENTIAL AREAS
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
Buchans, NL

070854(003)GN-DA02G DECEMBER 21/2010

figure 2H

AERIAL SITE PLAN WITH SAMPLE LOCATIONS - ZONE 8
RISK MANAGEMENT PLAN FOR RESIDENTIAL AREAS
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
Buchans, NL

070854(003)GN-DA02H DECEMBER 21/2010



ZONE AREA NUMBER	NUMBER OF PROPERTIES	NET AREA (m^2)	LEAD CONCENTRATION SOIL (mg/kg)	PRIORITY
1 - 1	1	750	1,600	MODERATE
1 - 2	1	550	1,200	MODERATE
2 - 1	12	1,200	670 - 1,600	HIGH
2 - 2	8	550	3,000	HIGH
2 - 3	8	900	1,000	LOW
2 - 4	8	1,000	-	MODERATE
2 - 5	4	1,000	970 - 3,100	HIGH
3 - 1	9	2,100	2,100	LOW
3 - 2	12	2,000	1,000 - 3,300	HIGH
3 - 3	8	900	-	HIGH
3 - 4	10	2,750	820 - 1,800	HIGH
4 - 1	1	1,050	1,000 - 1,400	LOW
4 - 2	4	4,350	2,700	LOW
5 - 1	9	3,000	910 - 2,400	MODERATE
5 - 2	1	500	1,400	LOW
5 - 3	4	1,300	1,200 - 1,400	LOW
6 - 1	4	1,600	1,600	MODERATE
6 - 2	9	1,600	1,200	LOW
6 - 3	3	3,850	790 - 1,900	MODERATE
7 - 1	16	2,000	850 - 1,100	MODERATE
7 - 2	20	1,800	1,800	MODERATE
8 - 1	20	1,500	1,400 - 1,600	HIGH
8 - 2	20	1,500	690 - 3,200	HIGH
8 - 3	16	1,800	660 - 2,700	LOW

LEGEND

- ZONE BOUNDARIES
- HIGH PRIORITY
- MODERATE PRIORITY
- LOW PRIORITY

figure 3

AERIAL SITE PLAN WITH ZONAL AREA PRIORITIES
RISK MANAGEMENT PLAN FOR RESIDENTIAL AREAS
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
Buchans, NL

TABLE 1

SOIL ANALYTICAL RESULTS
AVAILABLE LEAD (mg/kg)
RISK MANAGEMENT PLAN FOR RESIDENTIAL AREAS
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
BUCHANS, NL

Zone	Sample ID	Date	Depth (m)	Lead	Comments	
					Imported fill/soil	Potential mine waste
1	**Z1-SS1**	26-Jun-10	0.1	140	**Yes**	n/a
	Z1-SS1 Lab-Dup	26-Jun-10	0.1	140	**Yes**	n/a
	Z1-SS2	26-Jun-10	0.1	**1,200**	**Yes**	n/a
2	**Z2-SS1**	26-Jun-10	0.1	**750**	**Yes**	n/a
	Z2-SS1 DUP	26-Jun-10	0.1	**730**	**Yes**	n/a
	Z2-SS2	28-Jun-10	0.1	**1,200**	No	n/a
	Z2-SS3	28-Jun-10	0.1	**2,100**	No	n/a
	Z2-SS4	28-Jun-10	0.1	**1,500**	No	n/a
	Z2-SS5	28-Jun-10	0.1	**1,100**	No	n/a
	Z2-SS6	28-Jun-10	0.1	**3,000**	No	n/a
	Z2-SS7	28-Jun-10	0.1	**1,600**	No	**Possible**
	Z2-SS-34-D	27-Jun-10	0.4	**970**	No	n/a
3	**Z3-SS1**	26-Jun-10	0.1	320	Yes	n/a
	Z3-SS2	26-Jun-10	0.1	290	No	n/a
	Z3-SS3	26-Jun-10	0.1	**2,100**	**Yes**	n/a
	Z3-SS4	26-Jun-10	0.1	550	No	n/a
	Z3-SS4-DUP	26-Jun-10	0.1	560	No	n/a
	Z3-SS5	27-Jun-10	0.1	**820**	**Yes**	n/a
	Z3-SS8	28-Jun-10	0.1	**1,800**	No	n/a
	Z3-SS9	29-Jun-10	0.1	**2,000**	No	n/a
	Z3-SS-38-D	26-Jun-10	0.4	**1,100**	No	n/a
4	**Z4-SS2**	26-Jun-10	0.1	**2,700**	No	**Possible**
	Z4-SS4	26-Jun-10	0.1	530	No	n/a
	Z4-SS5	26-Jun-10	0.1	160	**Yes**	n/a
	Z4-SS5-DUP	26-Jun-10	0.1	120	**Yes**	n/a
	Z4-SS6	28-Jun-10	0.1	**1,400**	No	n/a
	Z4-SS7	28-Jun-10	0.1	**1,000**	No	n/a
	Z4-SS8	28-Jun-10	0.1	**1,400**	No	n/a
	Z4-SS-01-D	26-Jun-10	0.4	**4,500**	n/a	n/a
5	**Z5-SS1**	25-Jun-10	0.1	**1,200**	n/a	n/a
	Z5-SS2	25-Jun-10	0.1	430	n/a	n/a
	Z5-SS3	25-Jun-10	0.1	210	No	n/a
	Z5-SS4	25-Jun-10	0.1	500	**Yes**	**Possible**
	Z5-SS5	25-Jun-10	0.1	**1,400**	No	n/a
	Z5-SS6	25-Jun-10	0.1	250	No	n/a
	Z5-SS7	25-Jun-10	0.1	**2,100**	No	n/a
	Z5-SS8	25-Jun-10	0.1	**2,400**	No	n/a
	Z5-SS-41-D	25-Jun-10	0.4	**1,300**	No	n/a

TABLE 1

SOIL ANALYTICAL RESULTS
AVAILABLE LEAD (mg/kg)
RISK MANAGEMENT PLAN FOR RESIDENTIAL AREAS
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
BUCHANS, NL

Zone	Sample ID	Date	Depth (m)	Lead	Comments	
					Imported fill/soil	Potential mine waste
6	**Z6-SS1**	25-Jun-10	0.1	**1,200**	No	n/a
	Z6-SS2	25-Jun-10	0.1	**790**	No	n/a
	Z6-SS2-DUP	25-Jun-10	0.1	600	No	n/a
	Z6-SS3	25-Jun-10	0.1	**1,900**	**Yes**	**Possible**
	Z6-SS4	26-Jun-10	0.1	**1,600**	**Yes**	n/a
7	**Z7-SS1**	27-Jun-10	0.1	**1,000**	**Yes**	n/a
	Z7-SS3	27-Jun-10	0.1	**1,600**	**Yes**	**Yes**
	Z7-SS3-DUP	27-Jun-10	0.1	**1,600**	**Yes**	**Yes**
	Z7-SS4	27-Jun-10	0.1	**1,500**	No	n/a
	Z7-SS5	27-Jun-10	0.1	**1,100**	No	n/a
	Z7-SS6	28-Jun-10	0.1	460	**Yes**	n/a
	Z7-SS7	28-Jun-10	0.1	**1,300**	No	n/a
8	**Z8-SS1**	26-Jun-10	0.1	**1,200**	No	n/a
	Z8-SS2	27-Jun-10	0.1	**2,700**	**Yes**	n/a
	Z8-SS3	27-Jun-10	0.1	560	No	n/a
	Z8-SS3-DUP	27-Jun-10	0.1	530	No	n/a
	Z8-SS4	27-Jun-10	0.1	590	**Yes**	n/a
	Z8-SS5	27-Jun-10	0.1	**1,600**	No	n/a
	Z8-SS6	28-Jun-10	0.1	**1,500**	No	**Possible**
	Z8-SS7	28-Jun-10	0.1	**1,400**	**Yes**	n/a
	Z8-SS-40-D	27-Jun-10	0.4	**690**	**Yes**	n/a
	Z8-SS-40-D Lab-Dup	27-Jun-10	0.4	**660**	**Yes**	n/a
Site-Specific Risk-Based Concentration in Soil [2]				**622**	-	-

NOTES 1 - Comments based on field observations and property occupants

2 - Developed by CRA in the Human Health Risk Assessment Report dated March 2010

n/a- Information not available from resident

**- Rental property; therefore, information available

0.00 Exceeds Risk-Based Concentration

TABLE 2

HISTORICAL SURFACE SOIL ANALYTICAL RESULTS
AVILABLE LEAD (mg/kg)
RISK MANAGEMENT PLANS FOR RESIDENTIAL AREAS
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
BUCHANS, NL

Zone	Sample ID	Date	Depth (m)	Lead	Comments [1]	
					Imported fill/soil	Potential mine waste
1	SS-23	13-Oct-09	0.1	**1,600**	n/a	n/a
	SS-25	13-Oct-09	0.1	410	**Yes**	n/a
	Z1-SS1	26-Jun-10	0.1	140	**Yes**	n/a
	Z1-SS1 Lab-Dup	26-Jun-10	0.1	140	**Yes**	n/a
	Z1-SS2	26-Jun-10	0.1	**1,200**	**Yes**	n/a
2	SS-27	13-Oct-09	0.1	420	n/a	n/a
	SS-29G	13-Oct-09	0.1	100	n/a	n/a
	SS-29G (Lab Dup)	13-Oct-09	0.1	110	n/a	n/a
	SS-34	14-Oct-09	0.1	**3,100**	n/a	n/a
	SS-34G	14-Oct-09	0.1	87	n/a	n/a
	SS-36	14-Oct-09	0.1	230	**Yes**	**Possible**
	SS-36G	14-Oct-09	0.1	58	**Yes**	**Possible**
	SS-47	14-Oct-09	0.1	**670**	**Yes**	n/a
	Z2-SS1	26-Jun-10	0.1	**750**	**Yes**	n/a
	Z2-SS1 DUP	26-Jun-10	0.1	**730**	**Yes**	n/a
	Z2-SS2	28-Jun-10	0.1	**1,200**	No	n/a
	Z2-SS3	28-Jun-10	0.1	**2,100**	No	n/a
	Z2-SS4	28-Jun-10	0.1	**1,500**	No	n/a
	Z2-SS5	28-Jun-10	0.1	**1,100**	No	n/a
	Z2-SS6	28-Jun-10	0.1	**3,000**	No	n/a
	Z2-SS7	28-Jun-10	0.1	**1,600**	No	**Possible**
	Z2-SS-34-D	27-Jun-10	0.3	**970**	No	n/a
3	RSS-02	31-Aug-09	0.3	97	n/a	n/a
	SS-38	14-Oct-09	0.1	**3,300**	n/a	n/a
	SS-42	14-Oct-09	0.1	530	**Yes**	n/a
	SS-48	15-Oct-09	0.1	**1,300**	No	n/a
	SS-49	14-Oct-09	0.1	560	**Yes**	n/a
	Z3-SS1	26-Jun-10	0.1	320	Yes	n/a
	Z3-SS2	26-Jun-10	0.1	290	No	n/a
	Z3-SS3	26-Jun-10	0.1	**2,100**	**Yes**	n/a
	Z3-SS4	26-Jun-10	0.1	550	No	n/a
	Z3-SS4-DUP	26-Jun-10	0.1	560	No	n/a
	Z3-SS5	27-Jun-10	0.1	**820**	**Yes**	n/a
	Z3-SS6**	28-Jun-10	0.1	480	n/a	n/a
	Z3-SS7**	29-Jun-10	0.1	**1,800**	n/a	n/a
	Z3-SS8	28-Jun-10	0.1	**1,800**	No	n/a
	Z3-SS9	29-Jun-10	0.1	**2,000**	No	n/a
	Z3-SS-38-D	26-Jun-10	0.3	**1,100**	No	n/a
4	RSS-06	31-Aug-09	0.3	470	n/a	n/a
	SS-33	14-Oct-09	0.1	240	**Yes**	n/a
	SS-35	14-Oct-09	0.1	540	No	n/a
	SS-43	14-Oct-09	0.1	310	**Yes**	n/a
	SS-45G	15-Oct-09	0.1	540	**Yes**	n/a
	SS-53	15-Oct-09	0.1	410	**Yes**	n/a
	Z4-SS2	26-Jun-10	0.1	**2,700**	No	**Possible**
	Z4-SS4	26-Jun-10	0.1	530	No	n/a
	Z4-SS5	26-Jun-10	0.1	160	**Yes**	n/a
	Z4-SS5-DUP	26-Jun-10	0.1	120	**Yes**	n/a
	Z4-SS6**	28-Jun-10	0.1	**1,400**	n/a	n/a
	Z4-SS7	28-Jun-10	0.1	**1,000**	No	n/a
	Z4-SS8	28-Jun-10	0.1	**1,400**	No	n/a
	Z4-SS01-D	26-Jun-10	0.3	**4,500**	n/a	n/a

TABLE 2

HISTORICAL SURFACE SOIL ANALYTICAL RESULTS
AVILABLE LEAD (mg/kg)
RISK MANAGEMENT PLANS FOR RESIDENTIAL AREAS
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
BUCHANS, NL

Zone	Sample ID	Date	Depth (m)	Lead	Comments [1]	
					Imported fill/soil	Potential mine waste
5	**SS-22**	13-Oct-09	0.1	270	n/a	n/a
	SS-24	13-Oct-09	0.1	**1,400**	n/a	n/a
	SS-41	14-Oct-09	0.1	**990**	n/a	n/a
	SS-52	15-Oct-09	0.1	**910**	No	n/a
	Z5-SS1**	25-Jun-10	0.1	**1,200**	No	n/a
	Z5-SS2	25-Jun-10	0.1	430	n/a	n/a
	Z5-SS3	25-Jun-10	0.1	210	No	n/a
	Z5-SS4	25-Jun-10	0.1	500	**Yes**	**Possible**
	Z5-SS5	25-Jun-10	0.1	**1,400**	No	n/a
	Z5-SS6	25-Jun-10	0.1	250	No	n/a
	Z5-SS7	25-Jun-10	0.1	**2,100**	No	n/a
	Z5-SS8	25-Jun-10	0.1	**2,400**	No	n/a
	Z5-SS-41-D	25-Jun-10	0.3	**1,300**	No	n/a
6	**SS-32**	14-Oct-09	0.1	100	No	n/a
	SS-46	15-Oct-09	0.1	**1,000**	**Yes**	n/a
	Z6-SS1	25-Jun-10	0.1	**1,200**	No	n/a
	Z6-SS2	25-Jun-10	0.1	**790**	No	n/a
	Z6-SS2-DUP	25-Jun-10	0.1	600	No	n/a
	Z6-SS3	25-Jun-10	0.1	**1,900**	**Yes**	**Possible**
	Z6-SS4	26-Jun-10	0.1	**1,600**	**Yes**	n/a
7	**SS-18**	13-Oct-09	0.1	440	n/a	n/a
	SS-20	13-Oct-09	0.1	**850**	n/a	n/a
	SS-44	14-Oct-09	0.1	450	**Yes**	n/a
	Z7-SS1	27-Jun-10	0.1	**1,000**	**Yes**	n/a
	Z7-SS3	27-Jun-10	0.1	**1,600**	**Yes**	**Yes**
	Z7-SS3-DUP	27-Jun-10	0.1	**1,600**	**Yes**	**Yes**
	Z7-SS4	27-Jun-10	0.1	**1,500**	No	n/a
	Z7-SS5	27-Jun-10	0.1	**1,100**	No	n/a
	Z7-SS6	28-Jun-10	0.1	460	**Yes**	n/a
	Z7-SS7	28-Jun-10	0.1	**1,300**	No	n/a
8	**SS-16**	13-Oct-09	0.1	**660**	No	n/a
	SS-26	13-Oct-09	0.1	580	**Yes**	n/a
	SS-40	14-Oct-09	0.1	**2,900**	**Yes**	n/a
	SS-40 (Lab Dup)	14-Oct-09	0.1	**3,200**	Yes	n/a
	Z8-SS1	26-Jun-10	0.1	**1,200**	No	n/a
	Z8-SS2	27-Jun-10	0.1	**2,700**	**Yes**	n/a
	Z8-SS3	27-Jun-10	0.1	560	No	n/a
	Z8-SS3-DUP	27-Jun-10	0.1	530	No	n/a
	Z8-SS4	27-Jun-10	0.1	590	**Yes**	n/a
	Z8-SS5	27-Jun-10	0.1	**1,600**	No	n/a
	Z8-SS6	28-Jun-10	0.1	**1,500**	No	**Possible**
	Z8-SS7	28-Jun-10	0.1	**1,400**	**Yes**	n/a
	Z8-SS-40-D	27-Jun-10	0.3	**690**	**Yes**	n/a
	Z8-SS-40-D Lab-Dup	27-Jun-10	0.1	**660**	**Yes**	n/a
Site-Specific Risk-Based Concentration in Soil [2]				**622**	-	-

NOTES 1 - Comments based on field observations and property occupants
2 - Developed by CRA in the Human Health Risk Assessment Report dated March 2010
n/a- Information not available from resident
*- Area is a public area therefore no survey completed
**- Merv Stacey rental property therefore no survey available

0.00 Exceeds Risk-Based Concentration

TABLE 3

NET AREA CALCULATIONS OF LEAD IN SOIL
RISK MANAGEMENT PLAN FOR RESIDENTIAL AREAS
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
BUCHANS, NL

ZONE	RESIDENTIAL AREA	GENERAL LOCATION	GROSS AREA	RESIDENCE FOOTPRINTS	NON-RESIDENCE AREA	REDUCTION ADJUSTMENT FACTOR	NET AREA
1	1	7 Gilchrist	1,600	100	1,500	50	750
	2	14 Main St	875	100	775	30	543
2	1	74-84 Jackson St & 63-77 Church St	2,875	1,040	1,835	35	1,193
	2	68-82 Church St	1,540	448	1,092	50	546
	3	29-43 East St	2,240	448	1,792	50	896
	4	30-44 East St	2,450	464	1,986	50	993
	5	41-47 Williams Turnpike	1,350	250	1,100	10	990
3	1	45-61 Church St	3,325	850	2,475	15	2,104
	2	38-58 Church St	3,000	684	2,316	15	1,969
	3	1-15 East St	2,000	256	1,744	50	872
	4	13-39 Williams Turnpike	4,550	900	3,650	25	2,738
4	1	5 Court Rd	1,500	200	1,300	20	1,040
	2	2-4 Court Rd & 1-3 Gilchrist Rd	5,600	500	5,100	15	4,335
5	1	2-10 Center St & 51-57 Jackson St	5,250	1,000	4,250	30	2,975
	2	52 Jackson St	700	150	550	10	495
	3	21-25 Church St & 42 Jackson St	2,450	750	1,700	25	1,275
6	1	22-28 Church St & 4 South St	2,725	470	2,255	30	1,579
	2	1-9 McLean St	2,700	750	1,950	20	1,560
	3	2-10 McLean St & 5-11 Williams Turnpike	5,850	1,350	4,500	15	3,825
7	1	10-48 Laycock St	4,375	1,500	2,875	30	2,013
	2	9-39 Jackson St	3,750	1,200	2,550	30	1,785
8	1	2-40 Lundberg	3,500	1,500	2,000	25	1,500
	2	1-39 Pine St	3,500	1,500	2,000	25	1,500
	3	7-37 Lakeview Ave	3,750	1,200	2,550	30	1,785

NOTES Gross Area = Gross Residential Area of Outlined Lead Impacted Surface Soils
Residence Footprints = Approximate Residential Building Footprint Area
Non-Residence Area = Difference of Gross Area and Residence Footprint
Reduction Adjustment Factor = Allowance for Area Reduction Based on Ancillary Buildings (Sheds), Walkways, Driveways, etc.
Net Area = Difference of Gross Area and Residence Footprints Reduced by the Reduction Adjustment Factor

TABLE 4

ESTIMATE FOR PROPOSED REMEDIAL ALTERNATIVES
RISK MANAGEMENT PLAN FOR RESIDENTIAL AREAS
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
BUCHANS, NL

ZONE	RESIDENTIAL AREA	GENERAL LOCATION	NET AREA	NUMBER OF RESIDENCES	UNIT RATES								SUB-TOTAL	ZONAL SUB-TOTALS
					FENCE REMOVAL ALLOWANCE	EXCAVATE LEAD IMPACTED SOIL	TRANSPORT /DISPOSAL	*MISC ALLOWANCE	SUPPLY, COMPACTION SOIL	SUPPLY, PLACEMENT 0.15m TOPSOIL	SUPPLY, PLACEMENT SOD	FENCE REINSTATEMENT ALLOWANCE		
					$500	$10	$20	$500	$15	$6	$7	$500		
1	1	7 Gilchrist	750	1	-	$7,500	$9,000	$500	$11,250	$4,500	$5,250	-	$38,000	$66,000
	2	14 Main St	550	1	-	$5,500	$6,600	$500	$8,250	$3,300	$3,850	-	$28,000	
2	1	74-84 Jackson St & 63-77 Church St	1,200	12	$3,000	$12,000	$14,400	$6,000	$18,000	$7,200	$8,400	$6,000	$75,000	$289,500
	2	68-82 Church St	550	8	$4,000	$5,500	$6,600	$4,000	$8,250	$3,300	$3,850	$4,000	$39,500	
	3	29-43 East St	900	8	$4,000	$9,000	$10,800	$4,000	$13,500	$5,400	$6,300	$4,000	$57,000	
	4	30-44 East St	1,000	8	$4,000	$10,000	$12,000	$4,000	$15,000	$6,000	$7,000	$4,000	$62,000	
	5	41-47 Williams Turnpike	1,000	4	$2,000	$10,000	$12,000	$2,000	$15,000	$6,000	$7,000	$2,000	$56,000	
3	1	45-61 Church St	2,100	9	$4,500	$21,000	$25,200	$4,500	$31,500	$12,600	$14,700	$4,500	$118,500	$446,000
	2	38-58 Church St	2,000	12	$6,000	$20,000	$24,000	$6,000	$30,000	$12,000	$14,000	$6,000	$118,000	
	3	1-15 East St	900	8	$4,000	$9,000	$10,800	$4,000	$13,500	$5,400	$6,300	$4,000	$57,000	
	4	13-39 Williams Turnpike	2,750	10	$5,000	$27,500	$33,000	$5,000	$41,250	$16,500	$19,250	$5,000	$152,500	
4	1	5 Court Rd	1,050	1	$500	$10,500	$12,600	$500	$15,750	$6,300	$7,350	$500	$54,000	$277,500
	2	2-4 Court Rd & 1-3 Gilchrist Rd	4,350	4	$2,000	$43,500	$52,200	$2,000	$65,250	$26,100	$30,450	$2,000	$223,500	
5	1	2-10 Center St & 51-57 Jackson St	3,000	9	$4,500	$30,000	$36,000	$4,500	$45,000	$18,000	$21,000	$4,500	$163,500	$261,000
	2	52 Jackson St	500	1	$500	$5,000	$6,000	$500	$7,500	$3,000	$3,500	$500	$26,500	
	3	21-25 Church St & 42 Jackson St	1,300	4	$2,000	$13,000	$15,600	$2,000	$19,500	$7,800	$9,100	$2,000	$71,000	
6	1	22-28 Church St & 4 South St	1,600	5	$2,500	$16,000	$19,200	$2,500	$24,000	$9,600	$11,200	$2,500	$87,500	$378,000
	2	1-9 McLean St	1,600	9	$4,500	$16,000	$19,200	$4,500	$24,000	$9,600	$11,200	$4,500	$93,500	
	3	2-10 McLean St & 5-11 Williams Turnpik	3,850	3	$1,500	$38,500	$46,200	$1,500	$57,750	$23,100	$26,950	$1,500	$197,000	
7	1	10-48 Laycock St	2,000	20	$10,000	$20,000	$24,000	$10,000	$30,000	$12,000	$14,000	$10,000	$130,000	$244,000
	2	9-39 Jackson St	1,800	16	$8,000	$18,000	$21,600	$8,000	$27,000	$10,800	$12,600	$8,000	$114,000	
8	1	2-40 Lundberg	1,500	20	$10,000	$15,000	$18,000	$10,000	$22,500	$9,000	$10,500	$10,000	$105,000	$324,000
	2	1-39 Pine St	1,500	20	$10,000	$15,000	$18,000	$10,000	$22,500	$9,000	$10,500	$10,000	$105,000	
	3	7-37 Lakeview Ave	1,800	16	$8,000	$18,000	$21,600	$8,000	$27,000	$10,800	$12,600	$8,000	$114,000	

NOTES Gross Area = Gross Residential Area of Outlined Lead Impacted Surface Soils
Residence Footprints = Approximate Residential Building Footprint Area
Non-Residence Area = Difference of Gross Area and Residence Footprint
Reduction Adjustment Factor = Allowance for Area Reduction Based on Ancillary Buildings (Sheds), Walkways, Driveways, Large Trees, etc.
Net Area = Difference of Gross Area and Residence Footprints Reduced by the Reduction Adjustment Factor (Rounded from Detailed Calculations)

DEPTH OF REMOVAL 0.3 metres

*Includes shrub replanting, securing trees, fence adjustments, etc.