Remedial Action Plan (RAP) for the Remediation of the Garden River Old Dump Site in Wood Buffalo National Park, AB

Prepared by

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on behalf of

Parks Canada Agency

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The Environmental Sciences Group (ESG) was engaged by Parks Canada Agency (PCA) to develop this Remedial Action Plan (RAP). ESG is located at the Royal Military College of Canada, in Kingston, ON, and is under the direction of Dr. Kela Weber.

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GLOSSARY OF ABBREVIATIONS

AANDC	Aboriginal Affairs and Northern Development Canada
AB	Alberta
AMEC	AMEC Earth and Environmental
BTEX	Benzene, toluene, ethylbenzene, xylenes
CALA	Canadian Association for Laboratory Accreditation
CCME	Canadian Council of Environment Ministers
CEPA	Canadian Environmental Protection Act
COC	contaminant of concern
EBA	EBA Engineering Consultants Ltd.
EPP	environmental protection plan
ESA	environmental site assessment
ESG	Environmental Sciences Group
FIGQG	Federal Interim Groundwater Quality Guidelines
LRRCN	Little Red River Cree Nation
MPA	material processing area
PAH	Polycyclic aromatic hydrocarbons
PCA	Parks Canada Agency
PHC	petroleum hydrocarbons
RAP	remedial action plan
SOW	statement of work
SQG	soil quality guidelines
SSTL	Site specific threshold level
WBNP	Wood Buffalo National Park

I. INTRODUCTION

The Environmental Sciences Group (ESG) is a multidisciplinary team of chemists, geologists, biologists, engineers, and geographical information system (GIS) professionals that specializes in the assessment and remediation of contaminated sites in remote environments. In 2013, Parks Canada Agency (PCA) requested ESG's technical and project management support for the remediation of the Garden River Old Dump, which is located in northern Alberta within the community of Garden River at the western edge of Wood Buffalo National Park (WBNP).

Remediation activities at Garden River will include the excavation of materials from a former dump and their containment within a new landfill cell to allow for the closure of the Old Dump site. The new cell (called Cell A) will be adjacent to the present landfill which is located approximately two kilometres east of the community of Garden River. The construction of the new landfill and the remediation of the Old Dump is called "Project A" throughout the contract documents and landfill design documents. There is a second project, "Project B", that may partially overlap in timing to Project A. Project B includes the construction of a new landfill for ongoing community use, and the consolidation and encapsulation of the existing in-use landfill. However the scope of this RAP includes Project A only.

The RAP for the cleanup of Garden River's Old Dump is designed to provide guidance to PCA, Aboriginal Affairs and Northern Development Canada (AANDC) and the Little Red River Cree Nation (LRRCN) and the awarded contractor regarding the various work elements associated with the construction phase of the landfill remediation at Garden River. The RAP's primary purpose is to identify remediation objectives and work elements required to complete the remediation. **The RAP is not intended to be a contractor work methodology plan**. Rather, the RAP provides information on issues such as how to maximize local community benefits and minimize impacts to human health and the environment during execution of the project. The RAP provides additional information to the Tender Documents, but not all work elements discussed in the RAP are part of the construction contract.

The RAP is based on site conditions that applied at the end of 2014. Supplemental information provided by the tender specifications and any further site investigations is included in the RAP as required and/or provided as appendices. It is expected that all applicable environmental and safety acts, regulations, guidelines, and procedures will be followed throughout the project.

Map 1: Garden River, AB
Wood Buffalo National Park
Site Plan - Areas of Interest

Legend

Garden River Community Areas of Interest

NOTES

SCALE

**Refer to scale bar shown in individual figures.*

DATA RESOURCES

Original Sources:
Government of Canada
Environmental Sciences Group
Basemap Imagery: ESRI
Site Overview Image: Google Maps

Datum:
North American Datum 1983 (NAD83)

Projection:
Universal Transverse Mercator (UTM) Zone 12N

Software:
ESRI - ArcMAP 10.0

File Path:
J:\Projects\Garden River\2015\ESRI\Map 1 - Areas of Interest Site Overview.mxd

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PHOTO: Wood Buffalo NP Photo Credit: Parks Canada

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Figure 1: Overview of Wood Buffalo National Park

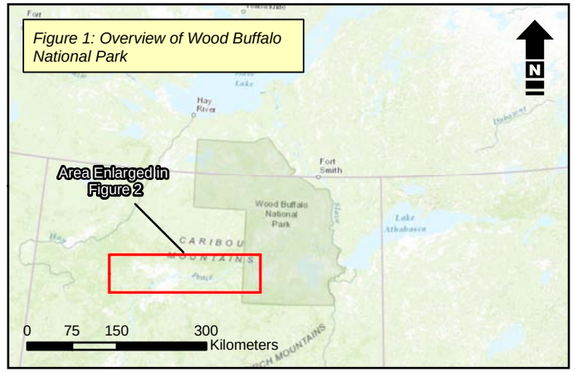

Figure 2: Overview Communities West of Garden River

Figure 3: Garden River Community Site Overview

II. SITE CONDITIONS

A. Site Description

Garden River is a community of approximately 500 members of the Little Red River Cree Nation (LRRCN). The town is located within Wood Buffalo National Park (WBNP), near the park's western boundary at the confluence of Garden Creek and the Peace River. The Parks Canada Agency (PCA) has been working with the LRRCN and AANDC to excise the community from WBNP for the creation of an Indian Reserve.

Garden River is located approximately 200 km east of High Level and connected to it by an upgraded gravel road that is considered an all-weather, all season road. An airstrip on the north side of the community can be used by charter aircraft. There is no commercial air travel to Garden River.

Wood Buffalo National Park is home to a significant number wildlife species typical of the northern boreal forest including many species at risk (SARS). The park contains the world's largest self-regulating herd of wood bison. Common animal species found within the park include bears, wolves, moose, lynx, marten, foxes, beavers, and wolverines. Sandhill cranes, owls, hawks, and eagles are some examples of the birds found in the park (Parks Canada Website, 2013).

Forests in the Garden River area consist predominantly of white spruce, black spruce, jack pine, and tamarack, with some birch trees interspersed. It is considered to be part of the Central Mixed wood physiographic region (Natural Regions Committee, 2006).

Summers in WBNP are fairly short, but the days are long. Summer temperatures normally range from 10 to 20°C, with little precipitation. The winter freeze typically begins in late October to early November and lasts until late April or early May. The coldest months of the year are January and February, when temperatures can drop to -40°C (Parks Canada website, 2013).

Garden River is located in the Peace River Lowlands on an active floodplain, with terraces and levee deposits. The area's surficial material comprises alluvial deposits of stratified, stone-free, friable silts and sands (AMEC 2006). Soils range in particle size from silt to gravel with fine clay stringers (Columbia Environmental Consulting Ltd. 2011). The area is underlain by the Ireton Formation, a greenish grey, calcareous shale and siltstone (Hamilton, Price, Langenberg, 1999). Garden Creek is located approximately 470 m south of the landfill

area, and the Peace River is located 1,400 m south of the landfill area. In the landfill area, the surface water flow is south towards Garden Creek.

The community's old dump site is referred to as the Garden River Old Dump. It is located directly south of the Public Works Yard, southeast of the Sister Gloria School and north of the Peace River. The dump is approximately 3,400 m^2 in area and surrounded by three smaller satellite dumps, one to the north and two to the south (Columbia and Franz, 2011).

The location of the new landfill Cell A is east of the current active landfill, referred to as the Garden River Landfill, which is approximately two kilometres west of the Public Works Yard in Garden River, and approximately one kilometre west of the airstrip. The landfill is situated within a forest clearing and is used for the disposal of all household wastes including large appliances, and vehicle bodies and parts (AMEC, 2006).

The Old Dump and the current landfill are described in detail in the following section.

B. Background to the Old Dump and existing landfill

The community of Garden River used the Old Dump until 1998. It is unlined, and there were no restrictions on what could be disposed of there. The composition of waste is highly variable (Columbia and Franz, 2011), but it is likely that its largest constituent is municipal/household waste. Aerial photographs indicate that the dump was likely in operation by 1982 (AMEC, 2006). In 1998 the landfill was closed and capped, a process that involved covering the landfill with a layer of soil (which was likely sourced from the borrow pit south of the site) (Columbia and Franz, 2011).

The Garden River Landfill has been in operation since 1998. This landfill is also unlined and accepts all waste generated by the local community. Waste observed at the landfill includes vehicle bodies and parts, appliances, batteries, electronics, and domestic wastes (AMEC 2006). There is visual evidence of waste being burned onsite and hydrocarbon staining suggesting possible fuel leaks/spills (AMEC 2006). Currently, vehicles destined for disposal are placed at one side of the landfill and transported south for recycling when enough have accumulated to make the trip cost-effective.

EBA Engineering completed a Phase I Environmental Site Assessment (ESA) of various areas in the community, including the Garden River Landfill, in late 2005. As part of their findings, EBA concluded that landfill leachate posed a high risk of soil and groundwater impacts at the site (EBA, 2006). A Phase II ESA was recommended for several parts of the community, including the Garden River Landfill, to determine whether there were any impacts

from previous/current site activities (EBA, 2006). In addition, EBA recommended that a landfill management plan be developed. The Old Dump was not included in the Phase I assessment.

As a follow-up to the Phase I EBA report, AMEC completed a Phase I ESA in November of 2006 that included greater detail about historical activities at Garden River. It noted that the Old Dump was decommissioned by covering its surface with soil, and that no restrictions were placed on wastes disposed of either there or at the Garden River Landfill. The report identified potential soil and groundwater impacts at both landfills and recommended Phase II ESAs at both locations (AMEC 2006).

In 2008, EBA completed a Phase II ESA at Garden River. A number of samples were collected at both landfill sites. The results showed that concentrations of petroleum hydrocarbons (PHCs) and copper exceeded the applicable guidelines for soil (CCME and Alberta Tier 1), and concentrations of pyrene, benzo(a)anthracene, cadmium, manganese, selenium, and zinc exceeded the applicable guidelines for groundwater at the Garden River Landfill. Groundwater samples collected from the Old Dump had concentrations of cadmium, iron, manganese, selenium, and zinc that exceeded applicable guidelines (EBA 2009). EBA recommended that both the current and former landfill be sealed off and capped by placing impermeable soil/material on the landfill surface (EBA, 2009).

In 2010, Columbia Environmental Consulting Ltd. and Franz Environmental Inc. completed a detailed site assessment at the Old Dump to characterize and delineate the former dump site. This included a geophysical survey, installing seven monitoring wells, collecting soil and groundwater samples, visual observations, interviews with community members and analysis of historical site data. Two of the monitoring wells were installed to collect regional, background data, four wells were installed along the perimeter of the dump, and one well was installed within the dump. Soil and groundwater samples were collected at all of the well locations in addition to surface soil samples collected from within the dump. The contaminants of concern (COC) identified in the soil were arsenic, boron, cadmium, copper, lead, naphthalene, phenanthrene, selenium, tin, and zinc. The COCs for groundwater were arsenic, cadmium, fluoride, iron, manganese, and selenium. There were no exceedances of applicable guidelines in any of the perimeter or background wells, allowing for the extents of the Old Dump to be defined (Figures 5-12, Columbia and Franz 2011). The volume of impacted material at the Old Dump was estimated to be 8,000 m^3. The report provided strategies for landfill closure and risk management that involved consolidation of materials, re-grading, capping and re-vegetation of the Old Dump. Installation of fences, annual groundwater

monitoring, and annual landfill gas monitoring were also included as part of the proposed risk-management strategy (Columbia and Franz, 2011).

In 2013, EBA was commissioned to provide an analysis of remediation options based on previously published reports. The EBA report addressed a potential hydrocarbon plume located at the airstrip, as well as conditions at the Old Dump and the Garden River Landfill, and identified four separate remedial options. The first option was to cap the landfills and develop a long-term monitoring strategy. The second option was to excavate the landfills and dispose of the materials at Rainbow Lake, AB. The third option was to build a new landfill at the Old Dump site and excavate and dispose of the materials from the Old Dump in the newly constructed landfill. The fourth option was to build a new landfill cell approximately two kilometres west of Garden River at the current landfill site and place excavated materials from the Old Dump into the new cell (EBA, 2013). The fourth option was the Garden River community's preferred remediation option.

ESG completed a site investigation in October 2013 at the Garden River airstrip to further delineate the hydrocarbon contamination and determine the volume of impacted soil that may require remediation. A total of 81 soil samples were collected. The results of analyses indicated that all samples were below the CCME and Alberta Tier I guidelines for BTEX and PHCs. The report concluded that the hydrocarbon contamination previously identified in the soil has naturally attenuated (ESG 2014a). Therefore no excavation is required at the airstrip and this element of work has not been carried through in the design.

C. New Landfill Cell Design

In the fall of 2013, ESG worked with PCA, AANDC and LRRCN to develop a statement of work (SOW) for the design of a new landfill cell that conforms, to the extent possible given site conditions, to Standards for Landfills in Alberta (Alberta, 2010). The SOW was put out for tender through Parks Canada contracting services in December 2013. In total, eight contractors submitted a bid. The successful bidder, SLR Consulting, received notification on January 28, 2014. The new landfill Cell A was to be located adjacent to the existing landfill as per the remediation option selected by PCA and LRRCN. As part of the landfill design, SLR conducted a groundwater characterization study and installed five monitoring wells in the landfill area, two wells upgradient of the existing and proposed landfill location, and four monitoring wells downgradient of the landfill area. The results from the groundwater characterization indicate that the groundwater flow is to the southwest, and that the groundwater quality has not been significantly impacted to date by the presence of the existing

landfill (SLR, 2015a). The landfill design report indicated that the planned location for landfill Cell A did not meet the siting requirements outlined in "Standards for Landfills in Alberta" (Alberta, 2010), however a similar level of protection could be achieved by including a geosynthetic clay liner at the base of the landfill. Additionally, it was not the intent that Cell A be designed to act as a Hazardous Waste facility, however it has been designed as a modified Class 1 landfill to be able to accept a small amount of hazardous waste that is not feasible to ship offsite. The modified Class 1 design retains the double liner system, but excludes the leakage detection layer between the liners (SLR 2015b). SLR provided an Operation, Maintenance and Closure Plan (SLR, 2015c), a Post Construction Monitoring Plan (SLR, 2015d), and a Contractor Quality Assurance Plan (SLR, 2015e) as part of the design files. The tender specifications and drawings (SLR, 2015f) were used to develop the contract for the construction of the new landfill Cell A and remediation of the Old Dump. Construction work on Cell A and remediation work at the Old Dump is scheduled to occur in late summer 2015.

D. Remediation Objectives and Approach

Key objectives of the remediation project include:

- Construction of Cell A, a modified Class 1 cell to encapsulate waste material from the Old Dump;
- Excavation and removal of all material at the Garden River Old Dump that exceeds Alberta Tier I guidelines and CCME guidelines;
- Confirm the remediation of the soil in the Old Dump and complete site closure by reshaping and/or backfilling of the Old Dump area;
- Closure of Cell A as per the design;
- Implementation of a long-term monitoring plan to monitor the stability and integrity of Cell A; and
- Community and stakeholder involvement throughout all stages of the remediation process.

Based on the tender specifications and information provided from site reconnaissance and community meetings, the RAP also contains information pertaining to:

- Assumptions informing the remediation (chemical and physical limitations, logistics of working in a remote environment, environmental impacts, regulatory requirements, community expectations);

- General timing and steps in the remediation process to provide context to the contractor about the scope of the physical work components (a detailed implementation plan will be provided by the contractor);
- Communication and reporting (e.g., level of stakeholder and community engagement).

E. Background Sampling Program

The environmental site assessments conducted in Garden River by EBA, Columbia Environmental Consulting Ltd, and Franz Environmental Inc. suggest that while landfills, storage tanks and airstrip activities have altered the quality of soil and groundwater, the elevated levels of some identified contaminants may be explained by the local geology (EBA, 2009) (Columbia and Franz, 2011). Knowledge of background inorganic concentrations would allow for easier detection of potential impacts arising from anthropogenic activities and establish a baseline for future landfill monitoring programs and/or evaluation of potentially contaminated soils. As a result, ESG developed and implemented a background soil investigation at Garden River (ESG 2015).

In total 111 surface soil samples and 34 depth soil samples were collected using a uniform random sampling program in an area that started 50 m beyond the area of current or past human activity and continued to 500 m beyond that starting point to allow sufficient distance from anthropogenically impacted areas while preventing sampling at excessive distances. The analytical results included a 31 inorganic element suite and at PAH suite. The analytical results were used to determine if site specific threshold levels (SSTLs) would be warranted. Field observations of the soil characteristics and analytical results supported the presence of two geochemically different terrain units at the study site; the Sandy Glaciolacustrine (SG) terrain unit located in the north and west area of the site and Silty/Clayey Glaciolacustrine (CG) terrain unit located in the south and east area of the site. The existing community landfill is located in the SG terrain unit, and the Old Dump is located in the CG terrain unit.

After extensive statistical analysis, it was determined that the residential/parkland SQGs are appropriate for the Sandy Glaciolacustrine terrain unit and that SSTLs are not recommended. However for the Silty/Clayey Glaciolacustrine terrain unit it was determined that the residential/parkland SQGs are not recommended for arsenic, selenium and zinc and that the use of SSTLs should be considered. The recommended SSTLs in the Silty/Clayey Glaciolacustrine terrain unit for As, Se and Zn are 14 ppm, 1.2 ppm and 350 ppm, versus the SQGs of 12 ppm, 1.0 ppm and 200 ppm respectively. If the agricultural land use is applied,

then an SSTL is recommended for boron for both terrain units of 6 ppm in the SG terrain unit, and 17 in the CG terrain unit. The use of the SSTLs will need to be approved by PCA and the LRRCN prior to their application for guiding remediation or risk management decisions for Garden River (ESG 2015).

Based on a review of the SLR groundwater characterization report (SLR, 2015a), it was determined that groundwater at the site of the existing landfill may be slightly impacted by the landfill. Two upgradient wells were installed by SLR as part of their groundwater characterization program. The wells are situated relatively close to the existing landfill and the proposed location for Cell A. Samples collected from these wells suggests that the wells are being impacted by the landfill and are not true background wells. To address this issue, two new background wells will be installed at a greater distance from the landfill in the summer of 2015 on the north and northeast side of the road across from the landfill area. The purpose of the two background wells is to better establish the groundwater quality entering the landfill area, and allow for assessment of landfill impacts to the groundwater quality

F. Regulating Authorities

Since the site is located on federally owned lands, planned work activities will be federally regulated. Construction and remediation work will be conducted in accordance with federal statutes and regulations, however, provincial/municipal requirements will be used if there are no federal requirements.

Although provincial approval is not required, the design will adhere, to the extent that it is technically and economically feasible given the remote location and hydrogeological features specific to the selected site, to all Government of Alberta design standards for landfills including the Standards for Landfills in Alberta, (Alberta, 2010).

The landfill design was completed by SLR in 2014. The location did not meet the Standards for Landfills in Alberta (Alberta, 2010) as there was not a natural clay layer present. Therefore SLR has included a composite liner in the design of the facility to provide a similar level of protection. SLR reviewed the option to design the landfill to a Class 2 standard, however, the cost to properly characterize the soil and ship the small amount of hazardous waste to an offsite disposal area made it more cost effective to design the landfill to a modified Class 1 landfill. Therefore the design by SLR includes the lining system included in a Class 1 landfill design, but does not include the leakage detection layer.

G. Criteria Selection

When a site is assessed, it is standard practice to compare the concentrations of the chemicals in the soil (i.e., potential contaminants) or other media with the applicable environmental quality guidelines. These guidelines are drawn from a number of peer reviewed sources and comparing guidelines with onsite data is one of the first steps in deciding what must be remediated at the site.

The appropriate guidelines must be selected to identify where remediation is required. There are two sources of soil, surface water and groundwater guidelines applicable to the work in Garden River: they are (1) federal guidelines that include the CCME soil quality guidelines, and interim groundwater quality guidelines, and (2) provincial guidelines, the Alberta Tier 1 soil and groundwater guidelines. The CCME guidelines are the preferred guidelines for this site because the Garden River land is federally owned; the provincial guidelines are provided only for reference. Both federal and provincial guidelines are considered generic (they take into account the most sensitive receptor and exposure pathways to be protective under all environmental conditions), and can be applied at any site. These guidelines, when used in conjunction with information obtained from the background sampling program, will form the remediation guidelines used for the cleanup of Garden River's Old Dump.

Guidelines are developed for different land use categories. The two federal land use categories that could apply at Garden River are the Agricultural land use and Residential/Parkland land use. The Agricultural land use guidelines take into consideration growing crops or livestock, as well as human occupancy and includes lands, such as national parks, that provide habitat for local fauna and resident and transitory wildlife (CCME 1999). The Agricultural land use guidelines are considered the most applicable for the area of the new and existing landfill as it is accessible to wildlife. The Residential/Parkland land use includes sites where the primary activity is residential or recreational. This classification may include campgrounds and urban parks, but it excludes wild lands in provincial or national parks, which are considered in the agricultural land use in federal guidance or natural lands in the provincial guidance (Alberta 2014; CCME 1999). The Old Dump is located within the residential area of Garden River and therefore the Residential/Parkland land use is the most applicable land use for the guidelines for the Old Dump remediation.

In the provincial guidance there is another classification that differs from Agricultural called Natural Areas, which describes an area that is away from human habitation and activity and where the primary concern is the protection of ecological receptors (Alberta, 2014; CCME 1999). This definition includes national parks that are remote or associated with minimal human impacts.

The Federal Interim Groundwater Quality Guidelines provide generic guidelines for contaminant concentrations in groundwater for contaminated sites on federal land (FCSAP 2014). These guidelines are considered to be applicable to Garden River.

Based on the contaminants found during previous investigations at the Old Dump, inorganic elements, polycyclic aromatic hydrocarbons, volatile organic compounds and PHCs are considered to be the contaminants of concern at the site and will require analysis as part of the confirmatory sampling program for the base of the Old Dump.

H. Capacity Building

Building partnerships with the LRRCN should be central to the development and implementation of the Garden River remediation project. Strong partnerships build trust and increase the likelihood of a project being completed in a timely and cost effective manner. Community meetings involving PCA, the onsite PCA representative, members of the LRRCN (including Chief and Council) and the contractor who is awarded the project should be scheduled regularly to facilitate partnerships that will foster solutions tailored to local and regional challenges and opportunities as well as promote inclusion of traditional knowledge into the project's decision-making process.

As part of the contracting process, socioeconomic opportunities for the LRRCN is being encouraged through the use of mandatory bid criteria as well as optional bid criteria that allow for up to a maximum of a 10% downward adjustment to a bidder's total actual bid price. Economic opportunities for LRRCN can be generated in the short term through a commitment to use LRRCN labour and equipment during the construction phase of the project. Longer term economic benefits can be achieved through the provision of training and mentoring opportunities to interested LRRCN band members. The training can include technical skills needed to support the future operation and maintenance of the landfill cell or project management skills that are transferable and can be applied and further developed through experience on other construction projects.

Some of the local services identified by the LRRCN that are available to support the Garden River remediation project are the provision and operation of equipment, the provision of granular materials for roads and the provision of work camp facilities required to perform the work. The provision of these and other services should be considered when developing the work plan. Inquiries regarding the services available in Garden River should be directed to:

Little Red River Forestry Ltd.
Land and Resource Management Services
12210-95 Street
High Level, Alberta
T0H 1Z0
Phone: (780)926-5725
Fax: (780)926-2780

Further details regarding the services available in Garden River are provided in section III.F.

III. GENERAL PROJECT CONSIDERATIONS

A. Permitting

The contractor is responsible for identifying and obtaining all relevant permits, scheduling inspections and utility clearances and posting any notices for the construction work required by local, provincial and federal agencies. PCA should be contacted to determine if additional permits are required for the project.

In addition, community consultations with the LRRCN community members should take place when project milestones are reached. At a minimum community consultations must occur at the following points during the contract:

- After contract award but prior to mobilizing to site
- Prior to starting construction work;
- Prior to site closure and demobilization.

B. Contract Requirements

The construction work is to begin as early as possible following the contract award in the summer of 2015 and all work is to be completed prior to the arrival of winter (early November) 2015.

The contractor is required to implement the following health and safety and environmental policy recommendations during the landfill construction and remediation work:

- Workers should be in conformance with Federal and Provincial safety regulations;

- A Spill Contingency Plan, Worker Health and Safety Plan, and Environment Protection Plan for the project developed for approval by PCA as per the specifications;
- Adequate first-aid supplies are to be available during the project;
- At the start of the project, all workers should participate in an orientation seminar that describes the cleanup activities and provides specific instruction in applicable security, health, safety, and environmental policies and regulations related to the cleanup program.

C. Road Maintenance

The road conditions at Garden River vary in quality according to the weather. All roads within the community, including Highway 58, are gravel. Heavy use of these roads, especially during wet periods, may significantly impact their quality. Road repairs and maintenance may be required to keep the infrastructure in good condition throughout the duration of the project to minimize local community impacts and prevent work delays.

Granular material for road construction or maintenance is available from LRRF. The optional site visit during the tender process for bidding contractors is recommended to familiarize the potential contractor with the current state of the road and locations of granular materials.

If new roads must be built to facilitate the work above those specified in the contract documents, details about their location, size, and function should be submitted to PCA for approval prior to construction.

D. Granular Materials

Various components of the project will require aggregates, including the construction of the new landfill, road maintenance, and backfill for the Old Dump after its excavation is complete.

Granular source locations require the approval of PCA before extraction of materials. Disruption to the environment should be limited wherever possible. Approval to excavate borrow from a previously unused source will be granted by PCA only when all other borrow sources have been developed, are deemed to be unsuitable, or if using the new unidentified

source is consistent with environmental protection goals. There is a borrow source west of the location for Cell A, which is owned by PCA and would require permission from PCA to use.

E. Logistical considerations

Due to Garden River's remote location, a number of logistical considerations must be taken into account. Garden River is 200 km from High Level; however it takes a minimum of 2.5 hours to drive between the two locations. High Level is the largest community in proximity to Garden River; however John D'Or Prairie is approximately 1 hour away and has a grocery store, gas station, etc.

A temporary camp will likely be required for the duration of the project to provide worker accommodations during construction activities. The camp would require facilities for food preparation and serving, potable water, sewage treatment and disposal, meals and catering, sleeping and washroom facilities, laundry and janitorial services and recreational facilities suitable for the number of workers required on site. LRRF will be providing camp facilities and services to the contractor as stated in the Mandatory Criteria. Please contact LRRF to discuss what is available and to determine the location for the camp facilities.

Whenever possible, local businesses should be considered for provision of services related to the work for this project.

F. Local Resources

Little Red River Forestry Limited (LRRF) provides employment and business development opportunities for LRRCN members. LRRF is COR-certified, fully insured, bondable and WCB compliant. LRRF has a range of mid to full size heavy equipment, and can provide services including but not limited to: clearing, gravel hauling, camp provision, catering, cleaning staff as well as labour crew. LRRF will be able to provide information on local personnel and businesses that could be hired by the contractor. Please contact Sylvester Auger Project Manager (780)-926-5725, ext. 4102 to discuss what equipment and services LRRF can provide for the project.

G. Environmental Protection Plan

Cleanup activities are to be carried out in conformance with a site-specific Environmental Protection Plan (EPP) prepared by the selected contractor prior to the start of work onsite. The contractor's personnel as well as all sub-contractors and their personnel are

expected to be familiar with and abide by all aspects of the EPP. The EPP should specifically address protection and/or mitigation measures for all aspects of the program, including:

- Domestic waste management, including sewage
- Fuel storage
- Spill response
- Surface water run-off
- Water withdrawals for camp use
- Protection of historical and archaeological resources
- Impacts to wildlife present at the site, including potential species at risk
- Handling and transport of hazardous waste and other dangerous goods
- Handling of potentially impacted groundwater in excavation or landfill
- Dust and erosion control
- Storage of waste materials prior to transport off site
- Site restoration and aesthetics.

It should be noted that for reseeding purposes, seed mixes should be native mixes that will not introduce invasive species into the Park.

1. Wildlife Protection

The objective is to avoid and prevent wildlife mortality as a direct consequence of construction activities as well as prevent negative impacts on wildlife populations and their habitats. The EPP should address vehicle movement and restrict movements to construction areas, access roads and community roads. Wildlife should not be harassed or approached, and are to be allowed to passively disperse from roads and work areas. Excavations and work areas should have fences installed around them to prevent wildlife from entering the work areas.

H. Litter Control

There is the potential for windblown litter to be dispersed during the excavation of wastes from the Old Dump, transport and placement in Cell A. There is the potential for significant quantities of paper and plastic products, which could be easily dispersed. Covers for haul trucks may be required, depending on wind conditions and the waste materials encountered, to reduce windblown litter. Litter control measures should also include regular inspections of the work areas and surrounding areas to collect any litter from the project work.

I. Dust Control

If dust impacts are noticeable during work activities (typically during hot, dry conditions), these can be reduced through watering and the use of approved dust suppressants. Waste oils are not to be used. Low vehicle speeds should be enforced to aid in reducing possible dust impacts.

Dust created during spreading and compaction of waste material in Cell A must be minimized as much as possible to prevent the spread of contaminated dust.

Revegetation of disturbed areas, including the backfilled Old Dump and the cover material of Cell A, will help to reduce dust from wind erosion and should be completed as soon as possible.

IV. REMEDIATION ACTIVITIES

A. Construction of Landfill Cell A

Landfill Cell A is being constructed adjacent to the existing landfill that is currently in use by the community of Garden River. Public access to the existing landfill must be maintained throughout the construction project.

Cell A has been designed to contain over 8000 m^3 of waste material from the Old Dump. The construction of Cell A includes the stripping of the topsoil, and excavation of the subsoil. These materials are to be stockpiled separately nearby for use as intermediate fill and for the capping of Cell A. A basal liner system that includes a Geosynthetic clay liner, a HDPE geomembrane and a geotextile is placed below the leachate collection system in the base of Cell A. Once the leachate drainage system has been installed, waste material from the Old Dump can be placed in Cell A.

B. Excavation of the Old Dump & Placement in Cell A

The Old Dump covers an area of approximately 3,400m^2, which includes the main cell and the one area to the north and the two areas to the south, with an approximate total volume of less than 8,000m^3. Heavy equipment will be required to excavate soils and materials at the Old Dump. The excavated material will be trucked to Cell A, and placed in the new facility. Cell A has been designed to accept all materials. However oversize materials and debris is to be removed to prior to placement in Cell A and stockpiled. To allow for proper compaction of materials and prevent the creation of void spaces, the oversized materials must be cut or crushed prior to placement in Cell A. Sealed drums, boxed and containers are to be removed

intact whenever possible. Liquid wastes should be segregated and reviewed by PCA prior to placement in Cell A. Debris is discussed further in section III-D and E.

Run-on surface water should be prevented from entering the Old Dump excavation and groundwater or rainwater entering the excavation should be removed to prevent contamination of the water. Water in Cell A should be prevented from prolonged contact with the placed waste material to reduce contamination. All water in Cell A should be removed promptly. Water in contact with potentially contaminated materials should be dealt with according to the specifications and the EPP.

The working face, the area where waste is unloaded, moved and compacted, should be limited to a small area to reduce potential for litter dispersal and allow for good compaction of the waste material. The initial layers of waste must be placed carefully and in accordance with the specifications to protect the base liner system. Subsequent layers of waste are to be compacted and the final surface graded towards the perimeter of the landfill cell as per the specifications. If less waste material is excavated and placed in Cell A than estimated, revisions may be required for the capping layers.

Any visible debris around the perimeter of the Old Dump should be discussed with the PCA Representative and removed according to instructions given by the PCA Representative.

Once the base of the excavation has been reached, test pits will be excavated by the contractor to confirm that no further debris remains. A confirmatory sampling program is to be developed and implemented at the base of the excavation by a PCA sub-consultant as detailed in the following section.

C. Confirmatory Sampling of the Old Dump

Confirmatory sampling is required at the base of the Old Dump after the landfill has been fully excavated. This will ensure that all contamination has been successfully removed to allow for site closure.

Once all visible debris has been removed, test pits should be excavated in multiple locations at the base of the excavation to a depth one metre to ensure there is no additional debris below. If debris is discovered, more excavation is required. Once it is determined that no debris remains, confirmatory sampling should be completed in the base.

The confirmatory sampling procedure involves collection of discrete samples at surface and depth in a grid pattern at the base and sidewalls of the excavation. The size of the grid will

depend on the size of the excavation. Based on the current landfill estimation of 3,400 m^2, samples would be collected in a 12 m x 12 m sampling grid, with further samples collected from the walls of the excavation.

If analytical results indicate that contamination is still present, further excavation is required, as well as further rounds of confirmatory sampling and analysis. This process must be repeated until test results are below criteria.

D. Closure of the Old Dump

After the PCA Representative has approved the excavation for backfill, the area is to be backfilled and regraded to match the surrounding terrain. The backfilled area is to be covered with a thin layer of topsoil and the disturbed area is to be seeded with a native seed mix.

1. Monitoring Well Abandonment

Groundwater monitoring wells are no longer required in the area of the Old Dump. All monitoring wells are to be decommissioned as per ASTM D5299 Standard Guide for Decommissioning of Groundwater Wells, Vadose Zone Monitoring Devices, Boreholes, and Other Devices for Environmental Activities (ASTM, 2012). Decommissioning should take place prior to excavation to facilitate easier access and movement around the site.

E. Closure of Cell A

Once all waste from the Old Dump has been placed in Cell A, the facility can be closed. The closure plan includes a grading layer from the stockpiled base material, a gas collection layer from the stockpiled sand base material, installation of a textured LLDPE geomembrane, geotextile installation, a gravel drainage layer, and soil from the stockpiled base material. The capping layers are to be graded to match the design details to promote drainage off the landfill surface. Landfill gas vents are to be installed in the capping layer.

F. Surface Water Management

Perimeter ditches around Cell A have been designed to divert surface water away from the landfill toe. The ditches around Cell A are designed to flow into a swale to the southwest of Cell A to allow for stormwater retention and infiltration.

Sediment and erosion control measure may be required in the perimeter ditches at Cell A or in the area around the Old Dump to prevent sediment migration offsite.

G. Site Restoration

After the completion of construction activities at Cell A, all areas disturbed over the course of the work should be restored to match adjacent surface elevations and/or surface conditions existing before the initiation of the work. The area that the work camp facilities will also likely require restoration once the camp has been removed.

V. LONG-TERM MONITORING

Long-term environmental monitoring will be an integral part of the management of the new landfill facility at Garden River. Monitoring will provide scientifically based quantitative information that will enable stakeholders to make informed, environmentally sound planning decisions and help to set appropriate goals for environmental management. The monitoring requirements described in the Post Construction Monitoring Plan written by SLR (SLR 2015d) are in accordance with the Alberta Standards for Landfills.

The capping system for Cell A was designed to prevent infiltration through the cover materials. As the waste placed into Cell A is older, and combined with the low-permeability cap, the leachate generated in the landfill should be minimal. However, leachate management has been included in the long term monitoring program.

The long term monitoring program includes:

- Groundwater monitoring
- Surface water quality monitoring
- Leachate monitoring and management and
- Landfill gas management

Details of the long term monitoring program are provided in Table 1 below and further information can be found in the SLR Post Construction Monitoring Plan (SLR, 2015d). The long-term monitoring program is not part of this contract and no monitoring is required at this time.

Table 1: Long Term Monitoring Requirements

Monitoring Activity	Locations	Frequency	Parameters
Groundwater quality: • Background criteria	Six existing monitoring wells.	Biannually in first 4 years of operation of any cell, then once every 3 years.	Background parameters as per the Alberta Standards for Landfills
Groundwater quality: • Detection criteria	Six existing monitoring wells.	After first 4 years biannually for remainder of operational & post-closure period.	Detection parameters as per the Alberta Standards for Landfills
Surface water quality: • Nearest watercourse	Nearest point on Garden Creek.	Annually.	• pH • Total Dissolved Solids • Total Suspended Solids • Ammonia (Total) • Chloride • Sodium • Sulphate • Chemical Oxygen Demand • Oil and Grease
Surface water quality: • Swale	Near centre of swale as possible.	Whenever surface water is present during groundwater sampling event.	• pH • Total Dissolved Solids • Total Suspended Solids • Ammonia (Total) • Chloride • Sodium • Sulphate • Chemical Oxygen Demand • Oil and Grease
Leachate depth:	Cell A sump	Weekly during operational period.	Inferred depth of leachate in sump, from calibration post-construction and depth measured to leachate surface.
Leachate quality:	Cell A sump	Annually	• pH, • Total Dissolved Solids, • Total Suspended Solids, • Ammonia (total), • Total Kjeldahl Nitrogen, • Chloride, • Sodium, • Sulphate, • COD, • Metals, • BTEX, F1 & F2 petroleum hydrocarbons, and • Phenols

Monitoring Activity	Locations	Frequency	Parameters
Landfill Gas quality: • In waste	Venting wells in Cell A	Biannually during operational period	• Oxygen, • Carbon dioxide, • Methane, • Hydrogen sulphide, • Atmospheric pressure.

VI. REFERENCES

Alberta Environment and Sustainable Resource Development (Alberta 2014). Alberta Tier 1 Soil and Groundwater Remediation Guidelines. May 2014.

Alberta Environment and Sustainable Resource Development (Alberta 2010). Stanards for Landfills in Alberta. February 2010.

AMEC Earth and Environmental (AMEC 2006). Phase I Environmental Assessment, Garden River Land Claim Selection Areas, Wood Buffalo National Park, Alberta. November 2006.

American Society for Testing and Materials (ASTM, 2012) D5299 Standard Guide for Decommissioning of Groundwater Wells, Vadose Zone Monitoring Devices, Boreholes, and Other Devices for Environmental Activities. Originally approved 1992, current edition approved February 15, 2012.

Canadian Council of Ministers of the Environment (CCME 1999). Canadian Environmental Quality Guidelines. Updated 2001, 2002, 2004, 2006 and 2007. Winnipeg, MB.

Columbia Environmental Consulting Ltd. and Franz Environmental Inc. (Columbia and Franz, 2011). Detailed Site Assessment, Garden River Old Dump in Wood Buffalo National Park. February 2011

EBA Engineering Consultants Ltd. (EBA 2006). Phase 1 (Modified) Environmental Site Assessment, Garden River Indian Reserve, Little Red River Cree nation, Wood Buffalo National Park, Alberta. March 2006.

EBA Engineering Consultants Ltd. (EBA 2009). Contaminated Site Assessment, Initial and Detailed Testing Programs, Wood Buffalo National Park, various locations in the community of Garden River, Alberta. February 2009.

EBA Engineering Consultants Ltd. (EBA 2013). Garden River, AB Community Airstrip and Old Landfill Reports Review and Remediation Options Analysis. March 2013.

Environmental Sciences Group (ESG 2014a). Environmental Site Assessment of the Airstrip Landfill Hydrocarbon Contamination at Garden River in Wood Buffalo National Park, Alberta. March 2014

Environmental Sciences Group (ESG 2014b). Implementation Plan: Garden River, Wood Buffalo National Park, Alberta 2014 Background Investigation. March 2014.

Environmental Sciences Group (ESG 2015) Garden River Wood Buffalo National Park Alberta 2014 Background Soil Assessment. March 2015.

Federal Contaminated Sites Action Plan (FCSAP 2014) Guidance Document on Federal Interim Groundwater Quality Guidelines for Federal Contaminated Sites; prepared by Millennium EMS Solutions Ltd.; prepared for Environment Canada, November 2012 - Revised March 2014, 55 pgs.

Hamilton, W.N., Price, M.C. and Langenberg, C.W. (compilers)(1999). Geological Map of Alberta. Alberta Geological Survey, Alberta Energy and Utilities Board. Map No. 236. Scale 1:1,000,000.

Health Canada (Health Canada 2012). Guidelines for Canadian Drinking Water Quality - Summary Table. Prepared by the Federal-Provincial-Territorial Committee on Drinking Water of the Federal-Provincial-Territorial Committee on Health and the Environment. Water, Air and Climate Change Bureau, Healthy Environments and Consumer Safety Branch, Health Canada, Ottawa, Ontario. August 2012.

Natural Regions Committee (2006). Natural Regions and Subregions of Alberta. Compiled by D.J. Downing and W.W. Pettapiece. Government of Alberta. Pub. No. T/852.

SLR Consulting Ltd (2015e). Garden River Remediation Project – Construction Quality Assurance Plan, May 2015.

SLR Consulting Ltd (2015b). Garden River Remediation Project – Detailed Landfill Design Report, January 2015.

SLR Consulting Ltd (2015c). Garden River Remediation Project – Operations, Maintenance and Closure Plan, May 2015.

SLR Consulting Ltd (2015d). Garden River Remediation Project – Post Construction Monitoring Plan, May 2015.

SLR Consulting Ltd (2015a). Groundwater Characterization Report, February 2015.

SLR Consulting Ltd (2015f). Specification Section 31 and Drawings for Garden River Contaminated Site Remediation Project, March 2015.