Solid Waste Management Feasibility Study; Feasibility Report
South of Park RSWARFC Project Team c/o Indigenous and Northern Affairs Canada

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December 21, 2016
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Record of Revisions

Revision	Date	Description
0	November 30, 2016	Initial Submission to Project Team
1	December 22, 2016	Draft Report with Preferred Alternative

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Executive Summary

Neegan Burnside Ltd. (Neegan Burnside) was retained to provide professional consulting services for the completion of a Solid Waste Management Feasibility Study. The Study is being completed for the Regional Solid Waste and Recycling Facility Initiative Committee (RSWARFIC) who wish to construct a facility to service the following communities:

- Keeseekoowenin First Nation,
- Rolling River First Nation,
- Rural Municipality (R.M.) Of Clanwilliam-Erickson,
- R.M. of Harrison Park and
- The Riding Mountain National Park (RMNP).

Waste disposal sites and recycling facilities within the communities were inspected and assessed. Available reports were reviewed, and options were discussed with all members communities at a workshop on December 8, 2016.

A common theme is that additional disposal space (waste capacity) is needed. For planning purposes, it is assumed that a landfill will require a quarter section to provide space for waste disposal, infrastructures, ponds and other facilities. mproved diversion is needed.

Through discussion with the RSWARFC, the following goals were developed for the system:

- The solution must be protective of the environment
- The solution must offer a comparable level of service to what is currently available for the communities
- It is preferred if the solution keeps jobs in the community.
- The solution must be cost effective, from both a capital and operational standpoint
- Traffic and impact to roads should be minimized.

Options included the following:

- New regional landfills for 5 partner communities
- Expansion of an existing site
- Exporting wastes to another facility outside the partner communities
- Mechanical treatment, such as an incinerator
- Increased diversion
- Construction of a reuse center
- Closing sites

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It was recognized that the preferred solution would include a combination of some of the above. Various reasonable scenarios were developed and detailed costing was completed.

A new landfill with a network of small transfer station is the best option in terms of meeting goals and objectives. However, it is one of the most expensive options. A suitable option would be exporting to Evergreen with a network of small transfer stations.

Table 1-1: Cost of Preferred Alternatives

	Total Capital Costs	Annual Operation Costs	Closure Costs (in 30 yrs)	Post Closure Costs (30-50 yrs)	Life cycle Costs
2: New Landfill – 4 Small Transfer Stations	$6,481,000	$737,000	$571,000	$ 11,000	$ 19,430,000
5 - Exporting to Evergreen – Network of Small Transfer Stations	$2,993,000	$799,000	$ 132,000		$ 17,130,000

Table 1-2: Preferred Alternative compared to Goals

	Environment	Level of Service	Jobs	Roads	Cost
Scenario 2: New Landfill and 4 Small Transfer Stations	■/□	■	■	■	**X**
Scenario 5: Exporting to Evergreen Landfill with Network of Small Transfer Stations	■	■	□	■	□

■ Meets Goal
□ Somewhat Meets Goal
X Does not meet goal

Diversion efforts should be increased, through discussion with stewards so that all waste streams are recycled. Funding is available from the Federation of Canadian Municipalities if recycling rates can reach 60%

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The next steps are outlined as follows:

1. A flier or information sheet will be prepared for distribution to the community.
2. Conversations should be held with Evergreen or other neighbouring sites to determine if exporting is still viable.
3. When weather permits, soil investigation of selected sites should commence.
4. The Communities should discuss and agree on the preferred option, and agreements should be developed.
5. Detailed design and permitting of the preferred solution should commence.

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1.0 Introduction

Neegan Burnside Ltd. (Neegan Burnside) was retained to provide professional consulting services for the completion of a Solid Waste Management Feasibility Study. The Study is being completed for the Regional Solid Waste and Recycling Facility Initiative Committee (RSWARFIC) who wish to construct a facility to service the five member communities. These five communities are collectively known as the Regional Solid Waste and Recycling Facility Communities (RSWARFC). The RSWARFC is comprised of the following communities:

- Keeseekoowenin First Nation,
- Rolling River First Nation,
- Rural Municipality (R.M.) Of Clanwilliam-Erickson,
- R.M. of Harrison Park and
- The Riding Mountain National Park (RMNP).

The partner communities are shown on Figure 1. Figure 2 shows these communities and their waste management facilities.

1.1 Study Methods

1.1.1 Information Review and Investigation

The methodology involved the following:

- Review of reference reports (listed in Section 9).
- Visits to the sites and interviews with the representatives of the communities (completed during the week of October 24, 2016).
- Meeting with Evergreen Waste site in Minnedosa and subsequent tour of the site.
- Teleconferences with:
  - James Bolton – Portage & District Recycling
  - Colleen Culvelier – Little Saskatchewan River Conservation District
  - Kristen Houle – Multi- Material Stewardship Manitoba
  - Laura Hnatiuk – Green Manitoba
  - Jennifer Lusk – Green Manitoba
  - Dennis Neufeld – Electronic Product Recycling Association (EPRA)
  - John Paul - Prairie Propane
  - Cory Switser – Sustainable Development Department of the Environmental Approvals Branch of the Province of Manitoba
  - Randy Webber – Product Care

Meetings and teleconferences were held with the team on the following dates:

- Kick off meeting (Appendix A-1) – October 12, 2016

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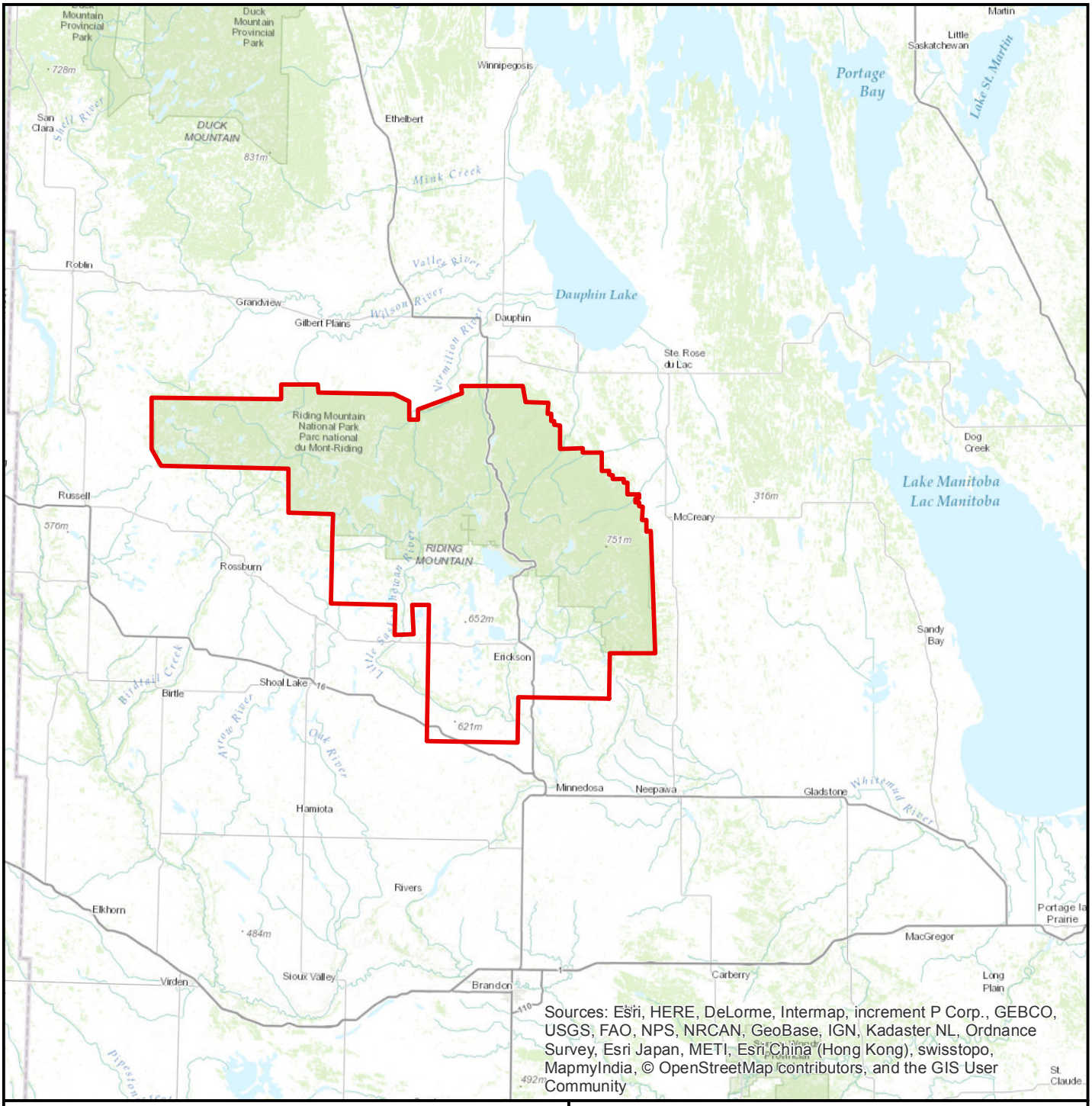


Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

LEGEND

Study Area

N

0 5 10 20 30 40 50 60 70 80 90 100

Kilometers

NEEGAN BURNSIDE

Client / Report

RSWARFIC

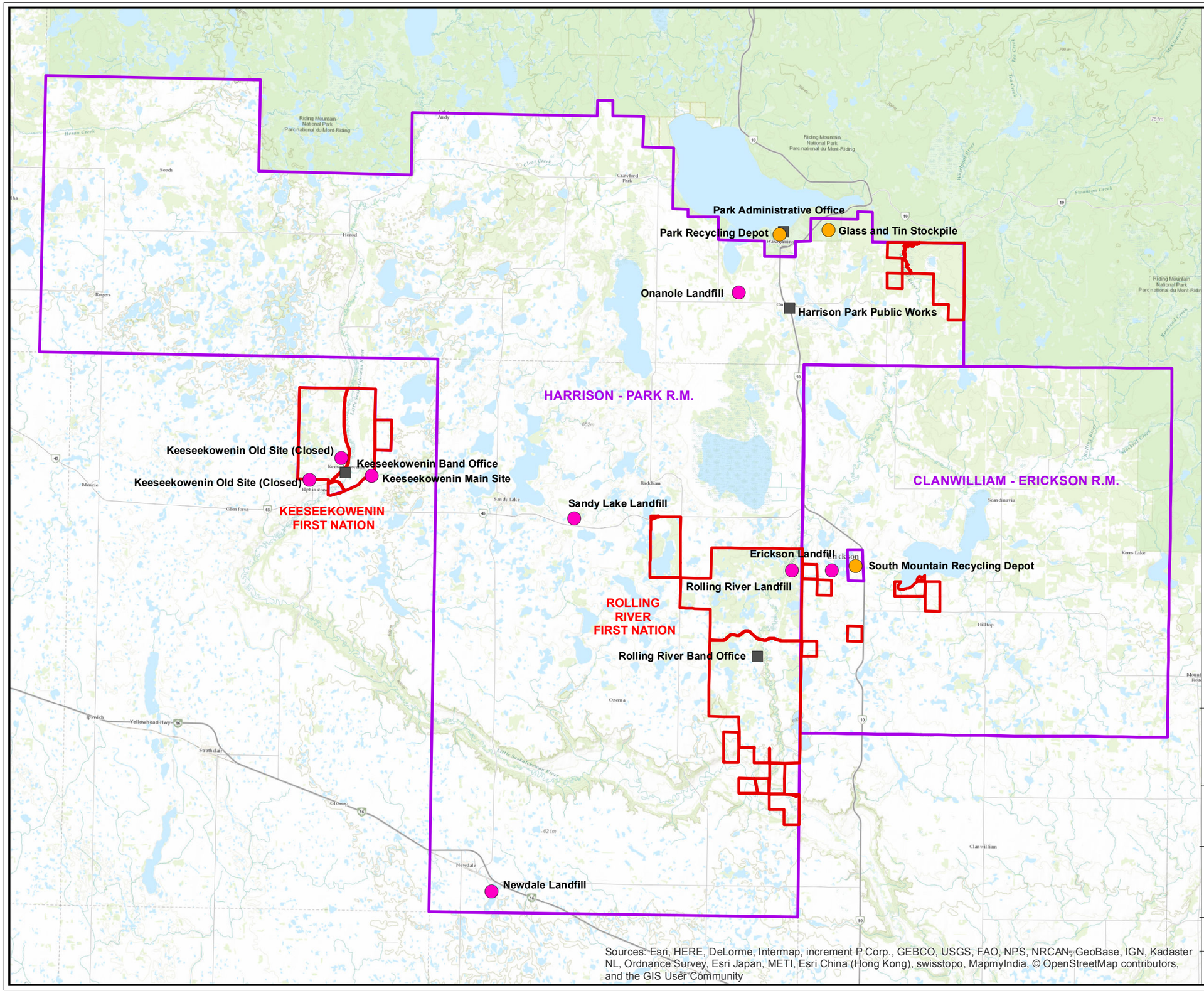
SOLID WASTE MANAGEMENT OPTIONS FEASABILITY STUDY

Figure Title:

REGIONAL SOLID WASTE & RECYCLING FACILITY COMMUNITIES

Drawn	Checked	Date	Figure No.
SK	KH	December 19, 2016	1
Scale		Project No.	
1:1,250,000		300039698	

File Path: gis (DrTeeth) H:\039698 Landfill Locations\039698 Site Location.mxd Print Date: 2016/12/19 Time: 11:07 AM



Legend

- Reserve Boundary
- Municipal Boundary
- Depot
- Landfill
- Building

N

0 1,000 2,000 4,000 6,000 8,000 10,000 12,000 14,000

Meters

NEEGAN BURNSIDE

Client

RSWARFIC

SOLID WASTE MANAGEMENT OPTIONS FEASABILITY STUDY

Figure Title

RSWARFIC COMMUNITIES PLAN

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SK	KH	December 19, 2016	2
Scale		Project No.	
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File Path: H:\039698 Landfill Locations\039698 Site Plan.mxd Print Date: 2016/12/20 Time: 08:35 AM

- Overview of Gap Analysis (Appendix A-2 and A-3) – November 24, 2016 and November 28, 2016
- Meeting to Discuss Options Report (Appendix A-5) – December 8, 2016

1.1.2 Cost evaluation

An important aspect of this study involves cost estimation, for both technology selection and for capital planning purposes. An overview of costing methodologies is included below.

Capital Cost is defined as the initial investment which must be made into the system for equipment and construction to install infrastructure needed for the project. For this report, capital costs include a 15 percent allowance for engineering and 10 percent allowance for contingencies (risk allowance).

Annual Operation and Maintenance (O&M) is defined as the cost per year which must be invested in the site, which includes salaries, vehicle maintenance, fuel for equipment and expendables. Operational costs include a 10 percent contingency.

Life cycle costing (LCC) is an analytical technique used to evaluate different alternatives based on the acquisition or construction of capital assets along with including the associated O&M costs over a specific period of time (i.e., the life cycle) calculated in present day dollars. The formula for calculating life cycle cost is:

$$PV = captial\ costs + \sum_{I=1}^{n} \frac{annual\ costs\ year\ i}{(1 + rate^{i})} + \frac{closure\ costs\ year\ n}{(1 + rate^{n})} + \frac{\sum_{j=1}^{m} \frac{post\ closure\ costs\ year\ m}{(1 + rate^{j})}}{(1 + rate^{n})}$$

Where n= operating life
m = post closure care life
rate = interest rate

The life cycle cost of an option is the total expenditure necessary to initially construct a facility, then operate and maintain it throughout the time span in which the options are being compared. For this study, the LCC comparisons are based upon 30 year timeframes and a real interest rate of 4% was used.

The sensitivity of the LCC comparisons was assessed by varying the real interest rate. All options, including the least cost and most cost options, rank the same regardless of interest rate. This information can be supplied if required.

Haulage costs were obtained primarily from the document entitled *Transport Canada, Economic Analysis Directorate Estimation of Costs of Heavy Vehicle Use per Vehicle-Kilometre in Canada File: T8080 - 05 – 0326*, and adjusted based on our experience and knowledge of the roads. Some truck costs were obtained from suppliers.

Construction costs are based on similar projects completed by Neegan Burnside elsewhere and data supplied by Harrison Park for construction projects in the community.

1.1.3 Gap Assessment Report

The Gap Assessment Report is included as Appendix B-1. Gaps related mainly to hydrogeologic investigations needed for the new sites and geotechnical investigation for the transfer stations. A teleconference was held on November 24 and November 28 to discuss the future work needed and the minutes of these teleconferences are included in Appendix A-2 and A-3. Based on these teleconferences, the Gap Investigation Program was revised (Appendix B-2). During the Options Meeting (Appendix A-5), it was agreed that the investigative program would be deferred until the spring.

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2.0 Baseline Conditions

2.1 Keeseekoowenin First Nation

On October 26, 2016, Neegan Burnside interviewed various members of the Keeseekoowenin community. Two meetings were undertaken.

- The first meeting was with Chief Norman Bone.
- The second meeting was with six members of the Health Staff and Social Works for the community

The community has collection two times per week from all 152 households, using band resources (a flatbed truck). Community members place their garbage in roadside boxes and the collection truck comes along and picks it up. Some community members supply their own collection boxes and the band supplies some. Twice per year a trailer comes through the community and picks up large bulky items.

Previously, the community had a recycling program, but this was discontinued about 15 years ago due to lack of funding. There is currently no recycling in the community, although some band members will travel to Elphinstone (the nearest community – approximately 2 km distance) and place their waste into the recycling containers located there. We were told by members of the Health Staff that the Elphinstone residents are not pleased with the neighbouring community using their recycling bins. It should be noted that Elphinstone is not in the study area.

Persons interviewed indicated that it is likely that hazardous waste is entering the dumpsite. There is currently no method to dispose of hazardous waste in the community.

Overall the community appeared clean and well maintained (no litter visible from streets and public areas).

The interviewees generally agreed that the landfill was running out of space and that something had to be done soon. They felt recycling could be resumed in the communities, but they would need additional funding. The people interviewed had no objections to exporting waste to an off reserve facility.

2.1.1 Keeseekoowenin Landfill

Following the interviews, the landfill site was inspected.

The landfill site is surrounded by trees and rolling grassland terrain and is situated 400 m from a small river which is tributary of the Lower Saskatchewan River. Land adjacent to the active area is used for agriculture. The site has signs specifying that dumping is to be done by members of Keeseekoowenin First Nation only. Metals are dumped in

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various piles. There were many piles of metal including one pile located approximately 70 m from the main disposal area. The Chief indicated that there were several acres of buried metal located on the site.

Household waste is dumped into a large trench approximately 2 m deep by 5 m wide by 30 m long. The waste is then burned.

The dumpsite was not well maintained. There is abundant surface debris outside the active area. Ponding was observed in open trenches and there is the possibility of leachate seeping into the ground water. At the time of the visit, a large pond of standing water contaminated with leachate was observed adjacent to the waste and running towards the river. The site was very muddy and would be difficult for the community to use. It was expressed that the community does not want to go to the site, as there is potential for nails to puncture tires and concern with getting stuck. Health staff indicated that the community complains about smell and smoke when the waste is being burned.

The Chief indicated that waste collection/management employs 6 people part time.

A Phase II Environmental Site Assessment was completed in 2013 by Claw Environmental Services. Four monitoring wells were installed, and the soil was sampled. At the time of the Claw study, three of the four monitoring wells were dry. Stream sampling was completed and it was concluded that the landfill is not having an impact on the stream. Except for arsenic, soil samples were not impacted. No remedial action was proposed, although Claw recommended additional study since the wells were dry. Monitoring wells are still present at the site, but we understand they have not been monitored since the Claw Study in 2013.

2.1.2 Waste Generation

In 2013, a waste management study was completed in the Keeseekoowenin community by Claw Environmental Services. It was estimated that approximately 90 tonnes per year of waste are generated by the community. Based on a 2013 population of 497 (ToR), the waste generation rate is 181 kg/person/yr. This is considerably less than the 660 kg/person/yr standard rates which Green Manitoba uses as a province wide average to calculate levys. It should be noted that waste management audits of this nature are limited to a snap shot of one week and the study does acknowledge that the data is limited. Of the 90 tonnes disposed annually, the Claw study breakdown showed 25 tonnes organics, 40 tonnes of recyclables, and 25 tonnes of residual garbage. The report indicated that the data may be skewed because members of the community were holding back recyclables until they had a means to dispose of them and they may have used the audit as an opportunity to get their recyclables disposed of properly.

It should be noted that the quantity numbers generally include recycling amounts. However, in an improved system, some recyclables will still not be removed. In order to

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ensure there is adequate space in the waste disposal system, and to be conservative, we are assuming that the entire waste stream will end up in the disposal site.

Generally, waste quantity increases as a function of population increase. Population has grown since the last census, as shown in the following table:

Table 2-1: Population Growth Rate – Keeseekoowenin (INAC data)

	2006	2011	2015
Population	357	450	497
Growth since 2006		4.7%	3.7%
Growth since 2011			2.5%

For the purposes of this study, we will assume a 3.7% population growth rate and waste increase rate for this community.

2.1.3 Potential on Reserve Sites

The potential for a regional site on reserve was discussed with Chief and Health Staff. The Chief was somewhat supportive of the idea if done properly, in that it may mean jobs and revenue for the community. Potential sites were discussed. However, no site of suitable size for the RSWARFC could be identified from a map review and based on the knowledge of the persons who were interviewed. We understand that it is the preference of INAC for First Nation communities to use off reserve sites. Therefore, no potential site on the reserve boundaries will be further explored.

2.2 Rolling River First Nation

On October 26, 2016, Neegan Burnside met with band members from Rolling River First Nation and inspected their waste disposal site. Mr. Elvin Huntinghawk (band manager) and Mr. Claude Shannacappo (Rolling River Councillor) were interviewed to get an understanding of waste issues and processes in the area.

Similar to Keeseekoowenin, the community has a central landfill site and collection. Waste is collected from residents twice per week and from commercial and industrial sites once per week. Waste is disposed of in a pit and is burned as necessary. Approximately every 6 months, a new pit is dug and the old one is covered. They are currently running out of space for future pits.

Metal tends to be segregated and they have a recycler come in periodically and remove it. There is no charge for this, nor is there any revenue. Previously, the community offered recycling in the community, but this was discontinued after funding was stopped. However, we understand that there is strong support for recycling in the community.

The band organises a community litter pick up once a year. This is done by the school children and all youth that participate get a ticket to the fair and a free ride at the fair midway. Overall, the community appeared clean and relatively free of litter.

They have had some bears in the landfill, but there is not a major problem as most of the waste is burned shortly after it is placed in the cell. Electronic waste may end up in the landfill, but Mr. Huntinghawk indicated that tires generally do not go to the landfill (however, during the site inspection, tires were observed).

The landfill is very close to the Erickson Landfill site. It was felt by both Rolling River and Erickson staff that residents of Erickson may be using the Rolling River site if they had waste which they were going to be charged to dispose of (such as a refrigerator) or if they had waste to get rid of and the Erickson site was closed.

The people interviewed had no objectives to exporting waste to an off reserve facility.

2.2.1 Site Inspection

Following the interviews, the landfill site was inspected.

The landfill site is located on the northeastern portion of the reserve, adjacent to Falcon Lake. It comprises a large open pit where waste is placed and burned. Metal is separated if possible and removed from the site at no cost to the community. At the time of the visit, the site was very muddy and difficult to access, leading to some dumping along the site access road. There was standing water in the waste pit.

A Phase II Environmental Site Assessment was completed in May 2016 by Stantec Consulting Ltd. Eight wells were installed and the groundwater and soil was sampled and analysed. The study concluded that marginal soil contamination was present at the site. Groundwater or surface water quality was generally at background concentrations (indicating good quality). Mr. Huntinghawk informed us that a study was done a few years ago, and it concluded that a berm was needed to minimise surface runoff into Falcon Lake. The berm has not been constructed to date. Monitoring wells are still present at the site.

2.2.2 Waste Generation

In March 2016 a waste management study was completed in the Rolling River community by KGS Group. Based on this audit, it was estimated that approximately 1.7 tonnes per week (88.6 tonnes per year) of waste are generated from the community. Based on a 2016 population of 567 (ToR), the waste generation rate is 156 kg/person/yr. This is again considerably less than the 660 kg/person/yr standard rates used by Green Manitoba to calculate levys. The study estimated that 20% of the waste stream was divertible recyclables and up to 6 tonnes of the organics could be diverted. It should be

noted that waste management audits of this nature are limited to a snap shot of one week.

Generally, waste quantity increases as a function of population increase. Population has grown since the last census, as shown in the following table

Table 2-2: Population Growth Rate – Rolling River (INAC)

	2006	2011	2015
Population	336	343	567
Growth since 2006		0.4%	6.0%
Growth since 2011			13.4%

For the purposes of this study, we will assume a 6% population growth rate and waste increase rate for this community.

2.2.3 Potential on Reserve Sites

The potential for a regional site on reserve was discussed during the interview. No site of suitable size for the RSWARF could be identified from a map review and based on the knowledge of the persons who were interviewed. We understand that it is the preference of INAC to no longer have landfills on reserve lands. Therefore, no potential site on the reserve boundaries will be further explored.

2.3 Rural Municipality of Clanwilliam Erickson

On October 27, 2016, Neegan Burnside met with Don Huisman (Councillor) and Iain Edye (Assistant CAO) of the R.M. of Clanwilliam Erickson to discuss the waste disposal services in the Municipality. There is one central landfill located in the community, and the main recycling depot. At the landfill, they also accept tires, oil and antifreeze, metals and batteries. The community of Erickson has curbside garbage collection.

Mr. Huisman stressed that the communities that are part of the RSWARF had small populations and were struggling with new regulations. Furthermore, populations were declining or aging and he was concerned about the smaller population base being able to finance the new regulations. He also had concerns that the landfill was running out of space. Impacts to groundwater and surface water were a concern. He indicated that the community would like to see more recycling.

Mr. Edye stated that it was difficult to offer the services while keeping the costs to the taxpayer low.

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2.3.1 Erickson Landfill

The Erickson landfill is located on the edge of town. The site is not ideally located; it is less than 350 m from Leda Lake. It is easily seen from the west portion of the town as it is on a hill overlooking the town and community.

Waste arriving at the site is stockpiled in an open sided pole shed until a sufficient quantity is accumulated such that it can be shredded.

Mr. Edye noted that previously they were allowed to burn demolition waste, but new regulations no longer allow burning of those materials. There is concern that the landfill will reach capacity very quickly with these new regulations in place and Clanwilliam Erickson does not have an alternative as yet.

There is one part time employee at the landfill site who works approximately 22 hours per week. If the site worker needs a day off, they do not have access to another suitably trained person (there is only one worker at the site). Regulations require only trained workers on site.

Yard waste is composted at the landfill, but composting of other waste types (e.g., kitchen organics) is currently not feasible.

2.3.2 Waste Generation Rates

There are currently no scales at the landfill site, and the quantity of waste arriving at the site is not known. For Green Manitoba reporting purposes, the R.M. assumes 660 kg/person/year (the provincially used rate). Given a population of 901 (Clanwilliam Erickson records), the current waste generated in the community is estimated to be 595 tonnes per year.

Generally speaking, the growth in waste disposal is a function of population growth. At Clanwilliam-Erickson, the population decreased between 2006 to 2011, based on latest census data as shown below:

Table 2-3: Population Growth Rate – Clanwilliam Erickson (census data)

	2006	2011	Growth
Clanwilliam	484	414	-3%
Erickson	486	457	-1%
Total	**970**	**871**	**-2%**

Despite a declining population, to be conservative we have assumed a waste rate increase of 1% per year.

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2.3.3 South Mountain Recycling Corporation

The South Mountain Recycling Center is located in the business area of Erickson. The facility includes drop off areas for local residents to sort and place their recyclable materials, mainly bottles, cardboard, newspaper, plastic, waste oil, used antifreeze and batteries. Separated materials from Riding Mountain National Park, Onanole and local communities are also placed at the site where it is stored, sorted and baled by the site workers. Generally speaking the material is stockpiled over the summer and it takes the staff most of the winter to get the backlog of material caught up. Cardboard is burned at the landfill site. Mr. Huisman stated that when the community got word that cardboard was being burnt, recycling quantities declined considerably, likely because the community felt that if they are burning recyclables, why should they bother to recycle. According to Mr. Huisman, recycling rates were formerly around 130 tonnes per year, but are now closer to 30 tonnes per year. Other recyclable materials are sent to Portage & District Recycling in Portage la Prairie.

2.3.4 Potential Sites in Community

Constraint mapping was reviewed with Mr. Huisman and Mr. Edye. Based on this mapping, no potential sites were identified within the community.

2.4 Rural Municipality of Harrison Park

On October 25, 2016, Neegan Burnside interviewed Lloyd Ewashko (Reeve) of Harrison Park. Chad Davis (CAO) was also present for a portion of the interview.

During the interview Mr. Ewashko provided an overview of the general operations in Harrison Park. The community has 3 waste sites, where most wastes are managed. The main municipal objectives for their waste management system are to increase recycling and improve operation of their sites.

There is curbside collection from Sandy Lake, but not from the rest of the R.M. This is because the collection predated the amalgamation of the communities.

Mr. Ewashko indicated that protection of surface water and groundwater was one of his priorities. Furthermore, roads are frequently difficult to maintain, and Mr. Ewashko wanted to ensure that the waste option selected considered the condition of roads.

Mr. Ewashko indicated that waste generated from the west portion of Harrison Park generally goes to the neighbouring community of Oakburn (not to landfill facilities within Harrison Park). This seems possible since there is no collection and residents will likely drive to the nearest facility, given the chance. It is not known what quantity of waste is being exported out of the R.M. but it is possible that this waste will eventually be redirected to the facility, if one is developed. Therefore a 20% contingency has been

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applied to the Onanole quantities to account for waste which is currently exported out of the R.M.

The R.M. sites do not have a weigh scale. However, a few years ago a study was completed in which all trucks were weighed using a rented scale and this data was used with vehicle and truck counts to estimate quantities received at the sites. The quantities received at the individual sites are further discussed below.

Generally speaking, the waste increase rate is a function of population increase. At Harrison Park, the population has remained consistent between 2006 to 2011, as shown below:

Table 2-4: Population Growth Rate – Harrison Park

	2006	2011	Growth
Harrison	812	864	1%
Park	1002	935	-1%
Total	**1815**	**1799**	**0%**

To be conservative, we have assumed a waste rate increase of 1% per year.

2.4.1 Onanole Disposal Site

The Onanole site is the largest waste disposal site in the communities. It accepts most waste types. Municipal waste which arrives at the site is stockpiled in an open pole shed. When the shed is full, a contractor is retained to shred the waste. The shredded waste is incorporated into the above grade waste mound. The shredding occurs approximately every 6 weeks in the summer and once or twice a season in the winter.

Bulky waste is currently also pushed into the mound and covered, although previously a lot of it was burned (prior to the new regulations) to reduce the quantity. However, burning is no longer allowed. Because of this, the site may reach capacity sooner than previously projected.

According to Mr. Ewashko, the site has approximately 30 years of life, but this may be reduced due to limited burning. Upon visual inspection, Neegan Burnside agreed that this seemed reasonable, considering the footprint available and potential height of the site (based on the neighbouring tree height). We do note however, that the Terms of Reference for this study (assessment) prepared by the RSWARF indicates a site life of between 5 and 10 years.

Operators at the Onanole site feel that the waste stream is unique, because of the National Park and cottages in the area. According to the operators, the site receives a considerable quantity of reusable goods. These may be generated in the following ways:

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- Cottagers upgrade materials after limited use since they are only in the community for a few weeks a year and are not interested in bringing materials back.
- Cottages sell and the existing furniture and goods need to be cleaned out as a condition of sale.
- Construction companies in the area have excess materials and it may be easier to dispose of than restock.

Products include furniture, sporting goods such as Stand-Up Paddle Boards and sailboats, barbecues, appliances (some still in box) and garden articles. It was indicated by the operators that a reuse facility at the site may be beneficial. Mr. Huisman (Clanwilliam Erickson) wondered whether some of the First Nations group could use the construction materials as they do have their own housing organizations (since the R.M.s did not actively supply housing, they felt they could not use the materials).

The potential of expanding the Onanole site into a class 1 landfill for the partner communities was discussed. Although space is available, there are the following issues:

- Mr. Ewashko felt that there would be a lot of resistance from the neighbouring community of Onanole as the site is fairly close to the community of Onanole.
- Park staff at RMNP were not supportive of expanding the site because of the proximity to the Park. Groundwater flow from the site is directly into Clear Lake, which is considered a very sensitive environment. They stated that any development in that area would be subject to a Canadian Environmental Assessment, as they have the ability to request this due to “trans-border (Federal to Provincial) privileges”.
- The site is very marginal with respect to the Constraint mapping as it basically falls right on the border of exclusion zones.

2.4.1.1 Quantity

Based on estimates available from Chad Davis of Harrison Park, the site receives approximately 9,132 cubic metres of waste per year. This is based on quantities measured in arriving trucks which are considered loosely packed (assume 250 kg/m^3). Therefore, the total quantity in tonnes would be 2,283 tonnes per year. Waste arriving from Riding Mountain Park is tracked separately and amounts to 675 tonnes per year. Therefore, the total amount arriving at Onanole from Harrison Park is 1,608 tonnes per year.

It should be noted that this quantity is higher than the quantity which was reported to Green Manitoba. The Green Manitoba report for 2015 indicates that the total waste was 902 tonnes (which includes Sandy Lake). This is because the Green Manitoba reporting process does not allow the truck count method, so standard per capita rates are used. However, it is our opinion that the truck count method is likely more reliable, so projections in this report are based on those numbers.

2.4.2 Sandy Lake Site

The Sandy Lake site accepts a wide variety of wastes types. The waste is treated in the following manner:

- Waste is generally placed in a small pit and buried, with a new pit advanced about once per year.
- Cardboard and clean burnables are placed in a bermed area and are burned as required.
- Recyclables arrive bulked but separated from waste and are further sorted by the attendant who subsequently sends them to the South Mountain Recycling Facility in Erickson.
- Hazardous waste such as used oil and fertilizer are placed in tanks and picked up by licenced disposal companies when full.
- Fridges and stoves are separated. Freon is removed by a contractor if necessary and these are sent out as bulk metal when there is a sufficient quantity.
- Tires are stored on site and picked up by licensed disposal companies when there is sufficient quantity.

2.4.2.1 Quantity

According to the attendant, they receive approximately 50 users per day. Based on estimates available from Harrison Park, the site received approximately 680 cubic metres of waste per year. This is based on quantities measured in arriving trucks which are considered loosely packed (assume 250 kg/m^3). Therefore, the total quantity would be 170 tonnes per year.

2.4.3 Newdale Site

Operations are similar to Sandy Lake, except 2 pits are used, one for waste and one for burnables.

2.4.3.1 Quantity

It was difficult for the attendant to estimate usage; however he stated that up to 45 vehicles could arrive in 3 hours, though sometimes it is very slow. It seems that the fill rate would be similar to Sandy Lake (approximately 50 users per day).

Based on estimates available from Harrison Park, the site received approximately 175 cubic metres of waste per year. This is based on quantities measured in arriving trucks which are considered loosely packed (assume 250 kg/m^3). Therefore, the total quantity would be 44 tonnes per year.

It should be noted that this quantity is lower than the quantity reported to Green Manitoba for 2015. The Green Manitoba report indicates that the total waste was 285 tonnes. This is because the Green Manitoba reporting process does not allow the truck

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count method, so standard per capita rates are used. However, it is our opinion that the truck count method is likely more reliable, so our projections are based on those numbers.

2.4.4 Potential Sites in the Harrison Park

Based on the Constraint Mapping, several potential sites were located within the community. These are further discussed in Section 4.1.3. It should be noted that all sites are privately owned. In order to proceed, agreement with the land owner would be necessary.

2.5 Riding Mountain National Park

On October 27, 2016, Neegan Burnside interviewed Kevin Bachewich, Chris Hanson and Cam McKillop of Parks Canada - Riding Mountain National Park (RMNP) to discuss waste management procedures and needs within the park.

The Park has a network of large bear proof dumpsters and “one baggers” (dumpsters which hold only one bag) in which the members of the community dispose of their waste (brand name of Haul-all). The park has 4 collection vehicles which pick up from the dumpsters and haul to the Onanole landfill site. The Park staff also pick up from local campgrounds. There is also a recycling depot in which residents and campers can place their recyclable goods. Although the park is quite large, Park Staff indicated 90% of the waste comes from the Wasagaming area due to the residential and campground areas.

At one time, the Park did have a landfill located north of Clear Lake, however, this has been closed. The Park has no active waste disposal sites. It was stated that it was the Federal Government’s policy to not have any landfills on National Parks. Waste from RMNP is disposed of in the Onanole site as part of an agreement made several years ago. We understand that the RMNP pays Harrison Park $80,000 per year for the disposal privileges at their Onanole site.

Recyclables are disposed of by the community and campers at a recycling depot and then transferred to the depot in Erickson. The Erickson depot sends tin and glass to RMNP. We understand through conversations with Don Huisman (currently a councillor at Clanwilliam-Erickson but formerly the Park Superintendent) that the original agreement involved RMNP crushing the glass and using it in roadway reconstruction. However, this has not been done in a long time and glass is currently stored in a large stockpile located in the works yard. Tin (cans, etc.) is stored in a bunker near the glass pile. Dead animals (e.g., roadkill deer) are often hauled far into the bush and left for scavenging by wolves or other predators provided they do not contain any disease or issues which need to be kept out of the food chain.

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Although the population of the community is small, Park staff indicated that they receive nearly 300,000 visitors per year. Some of these visitors may be day use only and may not contribute much waste. Approximately 675 tonnes per year of waste is collected by parks staff and delivered to the Onanole landfill. It should be noted that this quantity is already included in the volume estimates received at Onanole. The growth rate of the park is not known. However, usage is expected to increase as the surrounding communities grow. We have assumed a 2% rate of increase of waste.

The preferred alternative in the waste management system must be able to account for the highly variable generation rate from the park. Most of the business occurs in the summer months.

One of the main concerns with Park staff is minimising nutrients which are entering Clear Lake. There is concern that if the Onanole site is not watched carefully, groundwater impacts could reach Clear Lake.

2.6 Diversion

All of the non-First Nation communities have recycling and hazardous waste programs in place. The materials collected, public participation and overall effectiveness of the programs varies by community. Overall, some program improvements and public education could be made to further enhance waste diversion objectives. The locations of the various facilities available in the communities are shown on Figure 3.

It seems from the interviews that within the First Nation communities there is a genuine desire for the ability to divert waste from disposal. It is noted that during the waste audits, it was speculated that many community members had been saving recyclables at their home until there was an opportunity to properly dispose of them. It was mentioned that Keeseekoowenin members will drive to Elphinstone (a neighbouring town) to dispose of recyclables.

At both First Nation sites, metal is segregated and removed periodically, although there is currently a lot of metal stockpiled on the Keeseekoowenin site. There is no cost for this, but no revenue either.

Generally, the off reserve landfills (Erickson, Onanole, Sandy Lake and Newdale) accept:

- Recyclable products such as newspaper, magazines, several types of plastic, boxboard, cardboard, aseptic (juice) boxes, steel cans, glass gable top cartons, Telephone books, aluminum cans.
- Oil and antifreeze, filters, containers
- Appliances and scrap metal
- Fluorescent lights (Erickson only)

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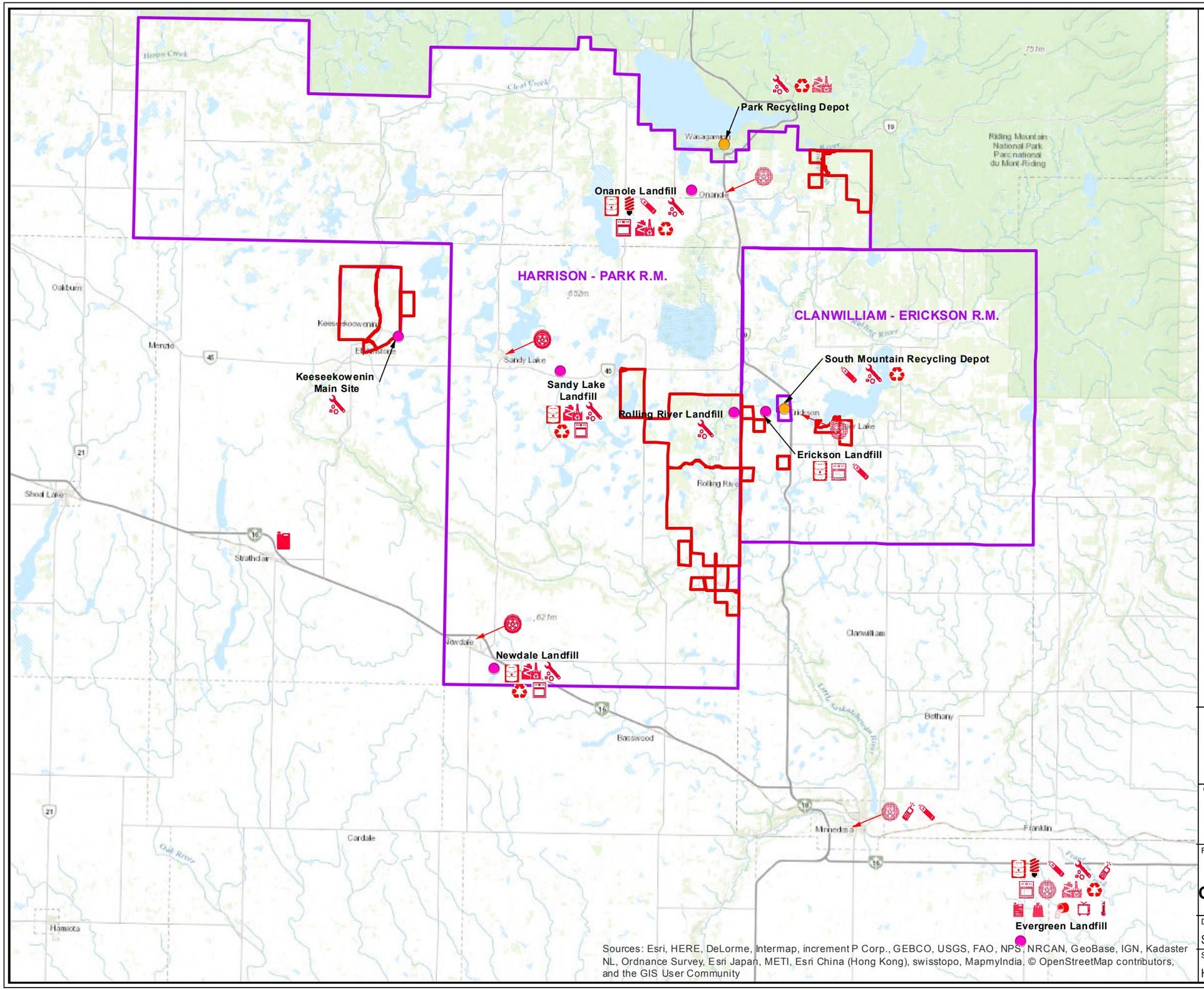

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Legend

- Municipal Boundary
- Reserve Boundary
- Landfill
- Depot
- Oil and Antifreeze
- Fluorescent Lights
- White Goods
- Tires
- Batteries
- Paper and Glass
- Scrap Metal
- Recyclables
- Plastic Bags
- Mercury Containing Thermometers
- Cell Phone
- Pesticides
- Paint
- Electronics

N

0 1,000 2,000 4,000 6,000 8,000 10,000 12,000 14,000 16,000 18,000
Meters

NEEGANBURNSIDE

Client

RSWARFIC

SOLID WASTE MANAGEMENT OPTIONS FEASABILITY STUDY

Figure Title

PRODUCER RESPONSIBILITY ORGANIZATIONS(PRO) LOCATIONS

Drawn	Checked	Date	Figure No.
SK	KH	December 19, 2016	3
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File Path: H:\039698 Landfill Locations\039698 Recycle Items.mxd Print Date: 2016/12/19 Time: 11:02 AM

- Pesticide containers (Sandy Lake only)
- Batteries
- Tires (Harrison Park)
- Propane Tanks (Onanole)

South Mountain Recycling Depot accepts:

- Recyclables (both from the public and from the landfills listed above)
- Cell phones

RMNP has facilities for the park users and residents to dispose of products such as newspaper, magazines, several types of plastic, boxboard, cardboard, aseptic (juice) boxes, steel cans, glass gable top cartons, telephone books and aluminum cans.

Auto service centers located in Newdale, Erickson, Sandy Lake and Onanole also collect tires.

Recyclable materials are sent to Portage & District Recycling in Portage La Prairie, Manitoba. In addition to the materials listed, Portage & District Recycling also accepts cardboard, glass and Electronic Waste.

Currently there are no programs in the communities for mercury containing thermometers, paint, pharmaceuticals and electronics. It has been indicated that electronics are an issue because the receiver usually requires residential electronics separated from commercial electronics, and they do not receive waste in that manner. We understand some electronics are scavenged and reclaimed for raw materials. Other than that, most materials are either placed in the disposal area, or the generator may take them to a depot located outside of the communities, such as Elphinstone, Evergreen or facilities in Strathclair.

Although the material is accepted, it may not be managed as efficiently as possible. We note the following:

- Cardboard is accepted and burned (not recycled). It should be noted that as of February 1, 2016, any community participating in the Multi-Material Steward Manitoba (MMSM) program must recycle cardboard and boxboard. Since the communities are participating in these programs, cardboard should not be burned but should be recycled. Mr. Huisman has indicated that the when the public found out (assumed through the media) that the cardboard was not recycled, recycling rates dropped significantly.
- Glass is sent to the works yard at RMNP where it is stockpiled but not recycled. According to the staff interviewed, the glass has been stockpiled since the 90s. Again, glass must be recycled for participation in the MMSM program.
- Propane tanks are landfilled.

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According to reports supplied by Green Manitoba:

- Between July 2015 and June 2016, Clanwilliam Erickson recycled approximately 15 tonnes of material. This equates to a rate of 17 kg per person. Given that the 2015 waste generation rate was estimated at 535 tonnes, 3% of waste is recycled.
- Harrison Park reported approximately 55 tonnes was recycled during the same period or 31 kg per person. The 2015 waste generation rate was approximately 1,822 tonnes (note: there is a discrepancy between quantities at Harrison Park, as discussed above). Therefore approximately 3% of waste is recycled.

According to records from RMNP, a total of 112 tonnes of recyclables were collected out of 645 tonnes of waste in 2014- 2015. Therefore, the recycling rate from RMNP is approximately 17%.

It should be noted that some of the waste streams accepted, such as cell phones, tires, fluorescent lights, and pesticide containers which are collected in the communities do not appear on the official Producer Responsibility Organizations (PRO) website and are therefore likely not recognised by Green Manitoba data. There may be additional diversion from the landfill which is not reported.

Currently there is no program to divert household organics from disposal in any of the RSWARFC.

It is generally accepted that up to 30% of the waste stream may contain recyclable materials. The 2013 Claw Waste Audit Report indicated a recycling potential from Keeseekoowenin of nearly 45%. Although it is recognised that there may be some inaccuracies in these numbers and issues with the reporting method, we believe that there is room for improvement in the recycling quantity in the RSWARFC.

2.7 Evergreen Landfill

The Evergreen Landfill Site (Evergreen) is located near Minnedosa, outside of the study area. However, during the Kick-off teleconference on October 12, 2016, it was mentioned that if exporting of wastes was selected as an option, Evergreen may be a potential disposal site. The Evergreen location is shown on Figure 3. Evergreen is located the following distances from the communities:

- Distance from Keeseekoowenin – 80 km
- Distance from RMNP (Wasagaming) – 75 km
- Distance from Onanole –70 km
- Distance from Sandy Lake – 70 km
- Distance from Erickson – 50 km
- Distance from Newdale – 45 km
- Distance from Southern edge of Harrison Park– 35 km

At these distances, a network of transfer stations would be necessary in all communities.

On October 24, 2016, Neegan Burnside inspected the site. The landfill accepts:

- Municipal solid waste which it landfills,
- Hog's hair from the local industries, which it landfills
- Hydrocarbon impacted soil, which it landfarms and uses for daily cover
- Divertible materials as registered with the thirteen producer responsibility organizations (PROs).

Waste is baled and the bales are used to construct the landfill cell. The current construction method is a row of bales, a layer of hogs hair, a layer of bales and then operational cover. Leachate is collected and managed through a series of evaporative ponds. At the current fill rate, the remaining site life is approximately 100 years.

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3.0 Needs Assessment

3.1 Disposal Capacity

A common theme is that additional disposal space (waste capacity) is needed. This was mentioned in every community, with the exception of Onanole, which may have more than 30 years of capacity according to Harrison Park Reeve Mr. Ewashko. However, the impacts of the 2016 landfill standards, particularly the inability to burn furniture and other processed, laminated or treated wood products, are not known and are likely to reduce the life of this landfill.

Waste quantities are discussed above under each landfill and disposal site and summarized in the following table:

Table 3-1: Waste Generation Rate

	Rate (tonnes per year)	**Growth Rate (based on population growth)**
Keeseekoowenin First Nation	90	3.7%
Rolling River First Nation	90	6.0%
Clanwilliam-Erickson	595	1.0%
Harrison Park		
Sandy Lake	170	
Newdale	44	
Onanole	2283	
Subtract RMNP (included)	-675*	
TOTAL	**1822**	1.0%
RMNP	675*	2.0%

* Note: 675 tonnes is the quantity from 2013 to 2014, which is greater than the quantity from 2014 to 2015. To be conservative, we are using the highest number.

The Harrison Park estimates are based on truck counts and approximate tonnages per truck. It is noted that the Harrison Park quantities do not coincide with numbers reported to Green Manitoba. This is because the Green Manitoba reporting process does not allow the truck count method, so standard per capita rates are used by them. However, it is our opinion that the truck count method is likely more reliable, so our projections are based on those numbers.

The total design capacity is summarized as follows:

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Table 3-2: Waste Projections

		Keesee-kownenin	Rolling River	Clanwilliam-Erickson	Harrison Park	RMNP	TOTAL (tonnes)	Cumulative (tonnes)
		3.7%	6.0%	1.0%	1.0%	2.0%		
	2015	90	90	535	1822	675	3,212	3,212
	2016	93	95	540	1840	688	3,256	6,468
1	2017	96	100	545	1858	701	3,300	9,768
2	2018	99	106	550	1876	715	3,346	13,114
3	2019	102	112	555	1894	729	3,392	16,506
4	2020	105	118	560	1912	743	3,438	19,944
5	2021	108	125	565	1931	757	3,486	23,430
6	2022	111	132	570	1950	772	3,535	26,965
7	2023	115	139	575	1969	787	3,585	30,550
8	2024	119	147	580	1988	802	3,636	34,186
9	2025	123	155	585	2007	818	3,688	37,874
10	2026	127	164	590	2027	834	3,742	41,616
11	2027	131	173	595	2047	850	3,796	45,412
12	2028	135	183	600	2067	867	3,852	49,264
13	2029	139	193	606	2087	884	3,909	53,173
14	2030	144	204	612	2107	901	3,968	57,141
15	2031	149	216	618	2128	919	4,030	61,171
16	2032	154	228	624	2149	937	4,092	65,263
17	2033	159	241	630	2170	955	4,155	69,418
18	2034	164	255	636	2191	974	4,220	73,638
19	2035	170	270	642	2212	993	4,287	77,925
20	2036	176	286	648	2234	1012	4,356	82,281
21	2037	182	303	654	2256	1032	4,427	86,708
22	2038	188	321	660	2278	1052	4,499	91,207
23	2039	194	340	666	2300	1073	4,573	95,780
24	2040	201	360	672	2323	1094	4,650	100,430
25	2041	208	381	678	2346	1115	4,728	105,158
26	2042	215	403	684	2369	1137	4,808	109,966
27	2043	222	427	690	2392	1159	4,890	114,856
28	2044	230	452	696	2415	1182	4,975	119,831
29	2045	238	479	702	2439	1205	5,063	124,894
30	2046	246	507	709	2463	1229	5,154	130,048

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These numbers assume that diversion rates will remain fairly consistent (3%). Better diversion will increase the life of the landfill site.

Manitoba Regulations state that if a community generates more than 5,000 tonnes per year or 400 tonnes in 30 day period, they must have a Class I landfill. It is worth noting

that the total volume at year 30 is only slightly over 5,000 tonnes and one may be able to argue that a Class II site is reasonable. However, due to the seasonality of waste, it is reasonable to assume that the monthly quantity is greater than 400 tonnes (per month waste generation rates are not available) and we therefore recommend designing to the Class I standards.

The volume and aerial extent which this quantity of waste will occupy is influenced by many factors. These include:

- Total compaction (most sites achieve between 450 to 550 kg/m^3)
- Depth below and height of fill above grade
- Operational cover methods – This may add approximately 25% to the total volume

Assuming a 450 kg/m^3 final compaction rate (which is conservative) and a 2 m depth below grade, the footprint of the landfill would be approximately12 ha (with a 30 m buffer on all sides). Therefore, a minimum of 12 ha is needed for landfill capacity or a quarter quarter section. For planning purposes, we are assuming a full quarter section to provide space for infrastructure, ponds, other facilities and future (beyond 30 years) expansion.

3.2 Weigh-scale

Assuming a landfill is constructed in the communities, a weighscale is recommended. Currently, the amount of waste being disposed is not known. A weighscale allows internal auditing of the system and tracking, so that work can be more efficient. This would also help with apportioning costs (if the RSWARFC decide this is how they want to manage the financing).

In addition, the Province uses a per capita rate of 660 kg/person/year to determine the levy which must be paid. This quantity is usually high. This is higher than some of the RSWARFC estimates, meaning levies would be assessed at additional costs to the community beyond those required. (The exception may be Onanole, which seems to exceed this rate). It was stated that generally when communities install a scale, more accurate data is obtained and the levy fees are greatly reduced.

3.3 Recycling/Diversion Capacity

Based on our review of the facilities in the communities, there is the ability to recycle many different materials within the community. The following materials do not have recycling depots within the communities:

- Electronics
- Household printed paper,
- Mercury containing thermometers,
- Hazardous waste (paint) and
- Pharmaceuticals.

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Depots for these facilities are needed.

Additional needs include better methods to manage:

- Cardboard
- Glass
- Propane tanks

The diversion rate is estimated at 3% for Clanwilliam Erickson and Harrison Park. RMNP diversion is approximately 17%. Improved diversion is needed.

Registration of all existing facilities with Green Manitoba is recommended. Green Manitoba supports community diversion of recyclables through payments to the communities on a tonnage basis.

3.4 Composting

Currently, there is no appreciable composting ongoing in the communities. Diversion of organics from the landfill would increase life and provide a usable product (compost). Some form of organic diversion is needed by the communities.

3.5 Reuse Depot

It was stated by the operators at Onanole site that the community could benefit from a Reuse Depot. As previously discussed, it is believed that the waste stream is unique and contains a lot of materials which could be used by others in the community. A reuse depot is therefore included as a need.

3.6 Service Agreement around Solid Waste

If a joint landfill is to be built in the communities for the RSWARFC, a Service Agreement would be needed to ensure that all partners are treated fairly and the terms and conditions of the facility are clearly understood. Generally, a lawyer would be retained to draft agreements ensuring needs are met and obligations understood. This would be needed if a landfill is selected as the preferred alternative and may be desirable if transfer stations are selected.

3.7 Additional Needs

Depending on the options selected, there will be equipment needs within the community. These may include:

- A roll off truck (it is assumed that one truck could be used by the partner communities) to pick up roll off bins and haul to the transfer stations. Note: This would be in addition to the collection trucks used by RMNP and the FN communities
- Roll off bins (shared by communities)

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- Public education and awareness (one campaign for all communities)

3.8 Goals

During the interviews with community members and at the Options Meeting of December 8, the preferences of the community were discussed. Common objectives shared by many communities (environmental protection, innovation) were evaluated by the representatives based on the understanding of the needs. From these discussions, the following was determined:

Environmental Protection: As can be expected, environmental protection ranked very high among all members of the RSWARFC. Therefore, environmental protection will be included as an objective of the system.

Innovation: Innovation generally means the desire to try new technologies or approaches which have not been proven to date. Within Keeseekoowenin and Harrison Park there was some interest in being innovative although it was stressed that this was not a priority. The other communities did not view innovation as overly important. We have not carried innovation forward as a priority in the screening matrix. Therefore, solutions which are innovative (or representing newer technologies) such as incineration, will not be given preference, but will still be considered.

Independence: Independence means that all wastes generated in the community are managed within the community. The community has total control over their wastes and can set pricing and polices as they see fit. Among the partner communities, independence was not ranked as a priority. Options such as exporting waste can be considered.

Level of Service: During the Options Meeting on December 8, 2016 representatives of the communities indicated that maintaining a level of service which is equivalent to what is currently available is necessary. This has been included as an objective.

Jobs: It was expressed during the Options Meeting on December 8, 2016 that all things being equal, solutions which keep the jobs in the community would be preferable over those which send the jobs elsewhere. This has been carried as a goal for the system.

Costs: The R.M.s are small and options should be cost effective as there is a small tax base available for use.

Protection of Roads: It was expressed that damage to roads was a concern, and that options which did not have an impact to roads would be preferred over those which may damage the roads.

On this basis, we have developed the following goals for the system:

- The solution must be protective of the environment

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- The solution must offer a comparable level of service to what is currently available for the communities
- It is preferred that the solution keeps jobs in the community.
- The solution must be cost effective, from both a capital and operational standpoint
- Traffic and impact to roads should be minimized.

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4.0 Waste Management Options

4.1 New Regional Landfill for 5 Partner Communities

4.1.1 Overview

A new landfill could be designed and installed in the study area for the 5 partner communities. Based on the waste projections (Table 3-2), we are allowing a quarter section for the facility. The landfill method would involve waste placement within a mound and regular cover (waste may be shredded or baled). Leachate would be collected and managed in evaporative lagoons.

As a rule of thumb, if the travel distance from the centroid (weighted center) of the waste generation area to the landfill is greater than 45 km a transfer station becomes cost effective. If it is closer than 45 km, direct drive of the waste is preferable. Depending on the final location of the site, transfer stations may be needed in conjunction with the new landfill site.

4.1.2 Advantages/Disadvantages

The advantages of a new landfill are as follows:

- Convenience
- Community has total control over their own wastes
- Local job creation
- Generally less traffic on roads than a transfer station, meaning less road damage

The disadvantages are as follows:

- Siting is difficult and controversial. There may be no sites available.
- More costly than other options.
- If the site is not operated properly, there is a potential for environmental impact.
- There is long term environmental liability associated with operating a landfill site.

4.1.3 Proposed Sites

Prior to any investigation, selection and confirmation of the sites is necessary. A preliminary screening of RSWARFC land base was completed to eliminate those areas considered as not suitable for a landfill site. According to the Manitoba Environment Act, Regulation 37/2016:

> *The site of a landfill at the time it is established must be at least*
>
> *(a) 100 metres from any railway or public road, other than the access road to the landfill;*
>
> *(b) 400 metres from the property boundary of any cemetery;*

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(c) 400 metres from any potable water well;

(d) 100 metres from a natural gas pipeline or an underground utility corridor;

(e) 400 metres from any building; and

(f) 1 kilometre from any surface water.

Additional constraints which were also considered during the first assessment are as follows:

(g) 15 km from an airport – As specified in the Transport Canada Sharing the Skies Study (2004)

Generally speaking, clayey soils are preferable over sandy soils. Geological mapping is shown on Figure 4. The following soil types are considered unsuitable for the landfill development (refer to Figure 4):

- A: Alluvial Sediments - sand and gravel, sand, silt clay, organic detritus
- C: Colluvium - landslide debris ,eroded slopes, mass-flow deposits
- G: Proximal Glaciofluvial Sediments - sand and gravel
- Gs: Distal Glaciofluvial Sediments- fine sand, minor gravel, silt and clay interbeds
- O: Organic Deposits - peat, muck

The following soil types are considered suitable for landfill development:

- Lc: Offshore Glaciolacustrine Sediments - clay, silt, minor sand
- Ls: Marginal Glaciolacustrine Sediments - littoral sand and gravel
- Rm: Mesozoic Terrane - shale-dominated rocks
- Tc: Silt Diamicton - calcareous, largely composed of Paleozoic rocks
- Tm: Clay Diamicton - calcareous, largely composed of Mesozoic rocks

These areas are also included on the constraint mapping.

Traditional hunting areas, traditional plant harvesting or ceremonial grounds have not been identified in this preliminary screening. This was discussed with First Nations communities and none of significance was identified.

Figures 5 and 6 show the communities with the constraint mapping based on all the water bodies in the community. Condition A shows all constraints (1000 m from surface water as identified on GIS mapping as “blue”). Condition B shows constraints with the surface water buffer reduced to 500 m only.

Generally speaking, if these constraints are used, there are no potential sites within a reasonable distance from the communities. However, the landfill standards[1] state the following:

1

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Legend

- Reserve Boundary
- Municipal Boundary
- Railway
- Roadway

Surficial Geology

- A: Alluvial Sediments - sand and gravel, sand, silt clay, organic detritus
- C: Colluvium - landslide debris, eroded slopes, mass-flow deposits
- G: Proximal Glaciofluvial Sediments - sand and gravel
- Gs: Distal Glaciofluvial Sediments - fine sand, minor gravel, silt and clay interbeds
- Lc: Offshore Glaciolacustrine Sediments - clay, silt, minor sand
- Ls: Marginal Glaciolacustrine Sediments - littoral sand and gravel
- O: Organic Deposits - peat, muck
- Rm: Mesozoic Terrane - shale-dominated rocks
- Tc: Silt Diamicton - calcareous, largely composed of paleozoic rocks
- Tm: Clay Diamicton - calcareous, largely composed of Mesozoic rocks

N

0 1,000 2,000 4,000 6,000 8,000 10,000 12,000 14,000

Meters

NEEGAN BURNSIDE

Client

RSWARFIC

SOLID WASTE MANAGEMENT OPTIONS FEASIBILITY STUDY

Figure Title

SURFICIAL GEOLOGY

Drawn	Checked	Date	Figure No.
SK	KH	December 19, 2016	4
Scale		Project No.	
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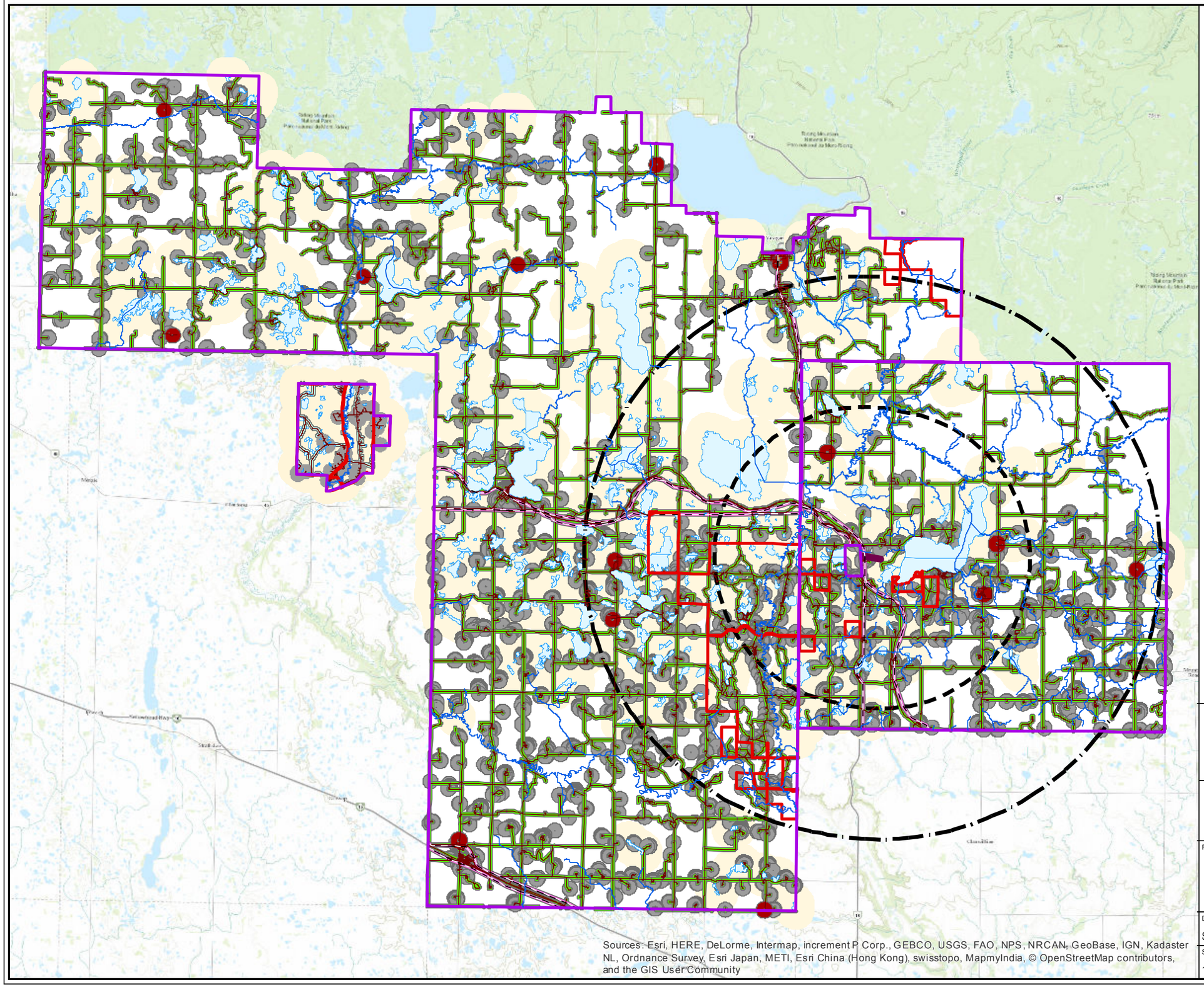
File Path: H:\039698 Landfill Locations\039698 Surficial Geology.mxd Print Date: 2016/12/19 Time: 11:01 AM



Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

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RSWARFIC

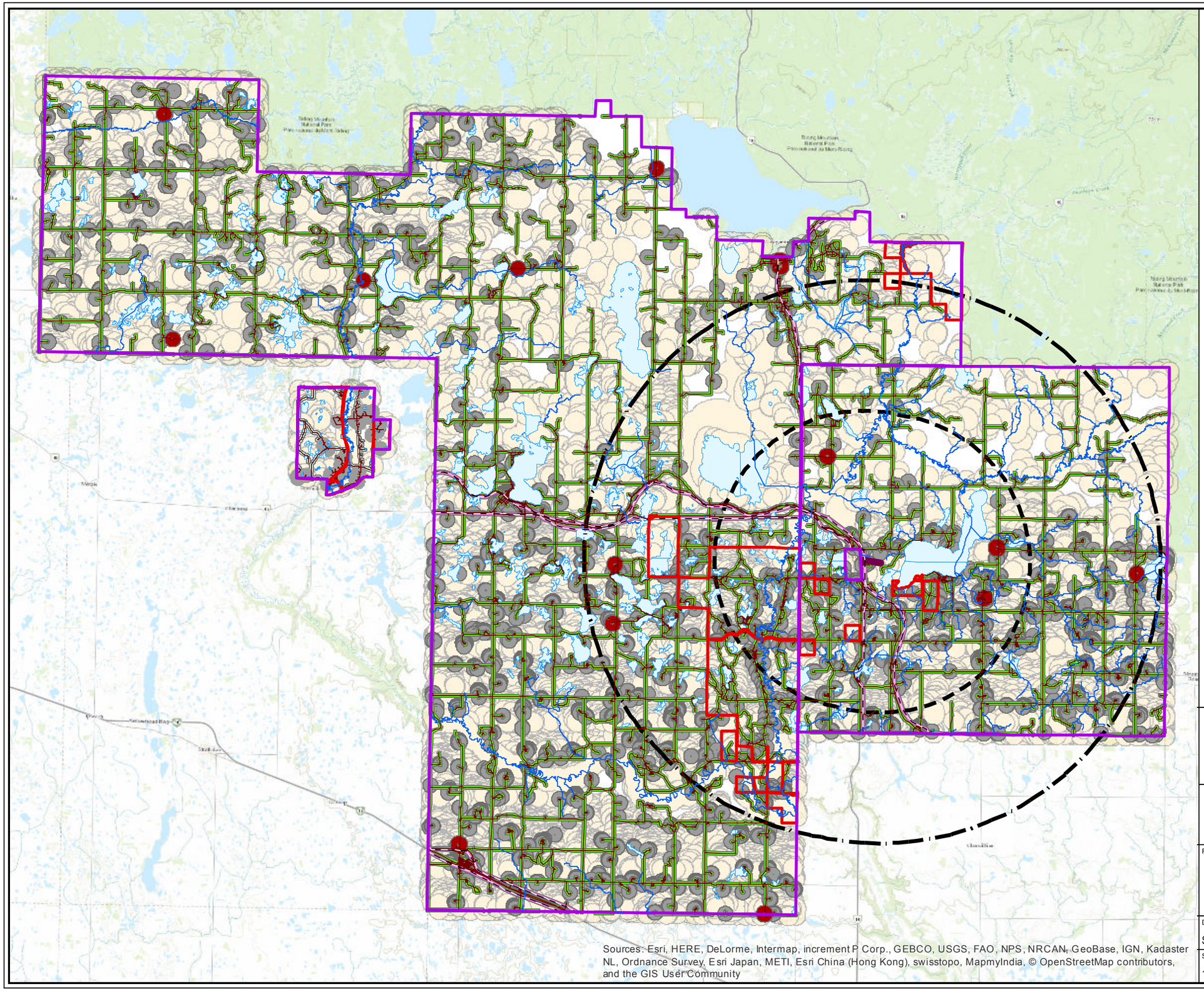
SOLID WASTE MANAGEMENT OPTIONS FEASIBILITY STUDY

Figure Title

CONSTRAINTS MAPPING - A

Drawn	Checked	Date	Figure No.
SK	KH	December 19, 2016	5
Scale		Project No.	
1:200,000		300039698	

File Path: H:\300396 98 Landfill Locations\039698 Constraints Mapping - A.mxd Print Date: 2016/12/19 Time: 11:01 AM



Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

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SOLID WASTE MANAGEMENT OPTIONS FEASIBILITY STUDY

Figure Title

CONSTRAINTS MAPPING - B

Drawn	Checked	Date	Figure No.
SK	KH	December 19, 2016	6
Scale		Project No.	
1:200,000		300039698	

File Path: H:\300396 98 Landfill Locations\300396 98 Constraints Mapping - B.mxd Print Date: 2016/12/19 Time: 11:00 AM

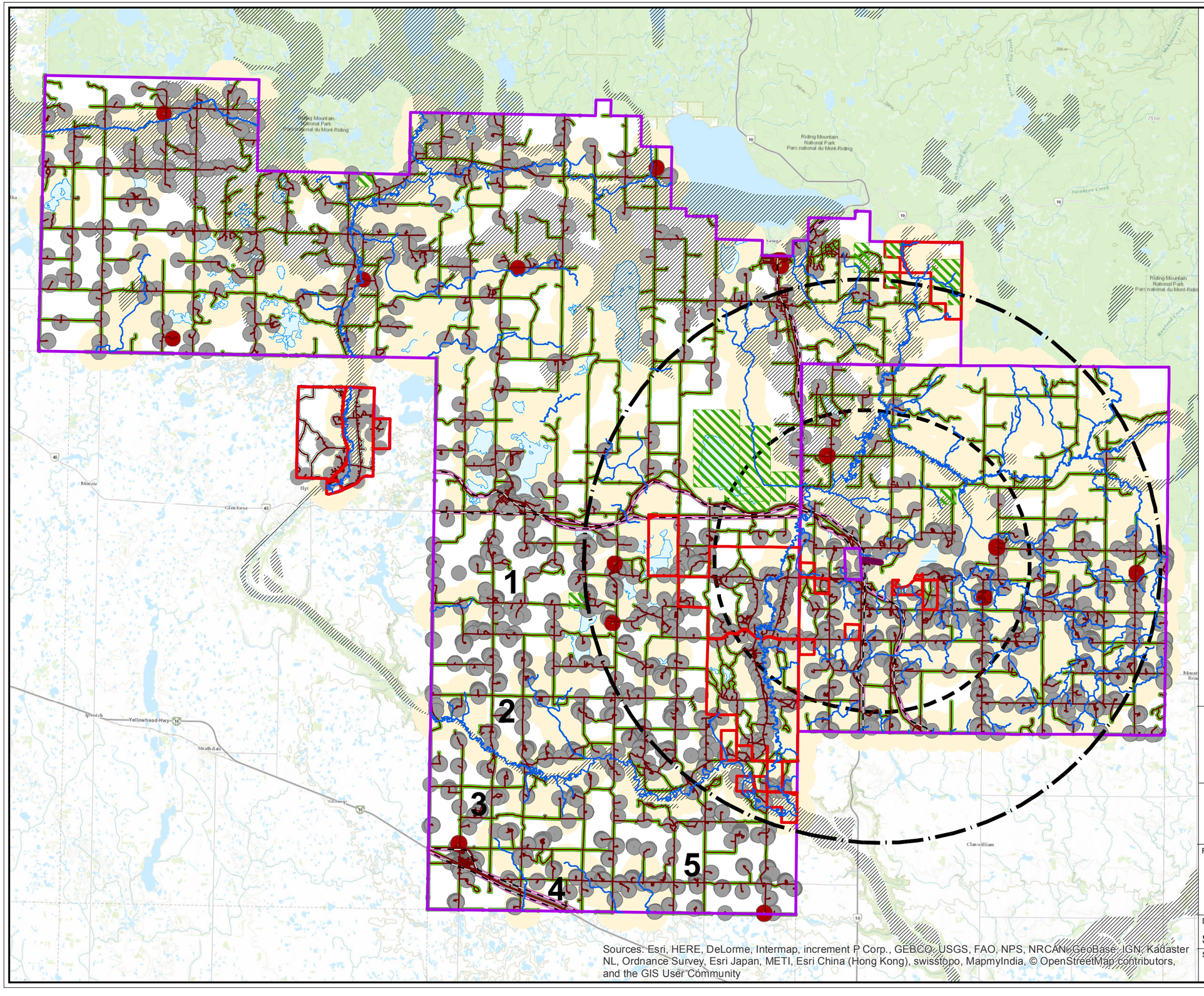
> *Upon written request from the proponent, a variance, with or without conditions, may be issued with regard to the above setback requirements. Variances will only be considered if suitable alternatives are not available, and the variance does not result in unacceptable degradation of the environment.*

We suggest that consideration be given to modification of the constraint criteria because many pockets being mapped as a water body are seasonal, shallow and likely not significant (referred to locally as potholes). If these depressions are included in the constraint mapping, it is extremely difficult to find three suitable sites. We suggest that the surface water buffer be based on recognized lakes and streams as mapped by regulators. Mapping was obtained from the Little Saskatchewan River Conservation District, through conversations with the authority and from their website (Appendix D). This revised constraint mapping is shown on Figure 7 as Condition C.

A teleconference was held with Cory Switser and Siobhan Ross of Sustainable Development Department of the Environmental Approvals Branch of the Province of Manitoba on November 30, 2016. Generally they had no concerns with the approach as suggested by Neegan Burnside. Notes from this teleconference are included in Appendix A-4.

As previously mentioned, within Condition A and B there are no potential locations which are considered feasible. However, within Condition C there are sites available. Interviews with the partners indicated the following:

- Constraint mapping (Condition C) was reviewed with Keeseekoowenin Chief Norman Bone and members of the Health Services Staff. The Chief was somewhat supportive of the idea of using land on the reserve for the landfill site, in that it may mean jobs and revenue for the community. Potential sites were discussed. However, no site of suitable size could be identified based on the knowledge of the persons who were interviewed. We understand that it is the preference of Indigenous and Northern Affairs Canada (INAC) to no longer have landfill sites on reserve lands. Therefore, no potential site on the Keeseekoowenin reserve boundaries will be further explored.
- No sites of suitable size were identified on the Rolling River reserve.
- Constraint mapping (Condition C) was reviewed with Mr. Don Huisman and Mr. Iain Edye of Clanwilliam Erickson. No potential sites were identified within the R.M.
- Federal regulations do not allow landfills within National Parks. Therefore, there are no potential sites within the RMNP.
- Constraint Mapping (Condition C) was discussed with Lloyd Ewashko of Harrison Park. It was agreed that there may be suitable sites in the area. Figure 7 shows some areas which will be considered. This will be further explored as the project advances.



Legend

- Reserve Boundary
- Municipal Boundary
- Wildlife Management Areas
- Airport Strip
- Railway
- Roadway
- 15km Buffer from Airport
- 8km Buffer from Airport
- Cemetery
- Building
- 400m Buffer from Cemetery
- 400m Buffer from Building
- Geology Constraints
- 100m Buffer from Railway
- 100m Buffer from Public Road
- Surface Water (Open Water)
- 1000m Buffer from Surface Water

THERMAL: 80m x 125m FOOTPRINT
20m x 20m WASTE AREA
10m x 5m INCINERATOR

TRANSFER STATION: 100m x 150m FOOTPRINT
40m x 40m WASTE AREA

LANDFILL: 350m x 350m FOOTPRINT
250m x 250m WASTE AREA

Note: options shown to scale

N

0 1,000 2,000 4,000 6,000 8,000 10,000 12,000 14,000
Meters

Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

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SOLID WASTE MANAGEMENT OPTIONS FEASABILITY STUDY

Figure Title

CONSTRAINTS MAPPING - C

Drawn	Checked	Date	Figure No.
SK	KH	December 19, 2016	7
Scale		Project No.	
1:200,000		300039698	

File Path: H:\039698 Landfill Locations\039698 Constraints Mapping - C.mxd Print Date: 2016/12/20 Time: 08:36 AM

4.1.4 Costs

Based on conversation during the Options Study, we have assumed $250,000 for a quarter section, which would include an easement allowance for a roadway to the site.

On this basis, the cost for a new landfill is $4,000,000 as shown in Appendix E. Savings would be approximately $80,000 every 5 years if compacted clay liner could be used instead of an HDPE liner.

4.2 Expansion of Existing Site

Expansion of an existing site is often viewed as a preferable alternative. The community is familiar and has already accepted the landfill location. Limiting the site to a brownfield site (former landfill) conserves the land base for future use and farmland is not used. Land is expensive in the area, and using the existing site can be cost effective. The potential to expand existing sites is considered as follows:

4.2.1 Expansion of Onanole Site

It has been expressed by the partner communities (specifically Harrison Park and RMNP) that expansion of the Onanole site is not a preference. This is because of the proximity to the National Park, downgradient (e.g., potential groundwater impacts) proximity to Clear Lake and the potential for the landfill to create nuisance bears. Therefore, this option is not considered further. We believe that the other communities would be supportive of excluding expansion of this site, given the sensitive environmental nature of the park.

4.2.2 Expansion of Erickson Site

The Erickson landfill is not considered suitable for expansion. It is too close to surface water receptors and it can be seen from the Townsite (which is not desirable). Based on regional geological maps, soil types may not be acceptable. Therefore, this option is not considered further.

4.2.3 Expansion of Sandy Lake Site

Expansion of the Sandy Lake Site, north of the highway was evaluated, but the site is not considered suitable due to the proximity to the Trans-Canada Trail, and surface water bodies.

4.2.4 Expansion of Newdale Site

There appears to be insufficient space to expand the Newdale Site. The site is close to surface water and not considered suitable for expansion.

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4.2.5 Expansion of First Nation Sites

Expansion of the First Nations Sites was discussed, and not considered feasible at this time. There is insufficient suitable land around the sites. The Rolling River site is located adjacent to a water body and the Keeseekoowenin site is located adjacent to a stream. We understand that it is the preference of INAC to no longer have on-reserve landfills. Therefore, expansion of the First Nation sites will not be further explored.

4.3 A New Regional Site for a Larger Community Base

A new Regional Site could be developed within or outside of the study area for the 5 partner communities and additional communities who opt into the program. We understand from discussions with Don Huisman that there may be 11 communities interested in participating. At this time, the study area is limited to the 5 partner communities so this option will not be explored further under this work program.

4.4 Exporting Waste to Facility Located Outside of Partner Communities

4.4.1 Overview

A feasible option involves a network of transfer stations with ultimate disposal out of community. An ultimate disposal location could be the Evergreen Landfill located in Minnedosa. Although Minnedosa is the closest landfill, the Brandon Landfill or Dauphin Site may also be considered.

If transfer to the an external facility is considered, the partner communities would need to meet with the Board of Directors to ensure they would be willing to accept their wastes and negotiate partnership costs, which may be based on population. It is currently not known how they would account for the RMNP in their cost negotiations. RSWARF may wish to have this meeting before funds are spent on geotechnical investigation of the transfer stations.

Typical transfer stations are often comprised of elevated retaining walls in which users can drop off wastes into lower bins. The size requirement is approximately 5,000 m^2 or 0.5 ha. A brief overview of transfer stations is presented in the sections which follow.

4.4.1.1 Very Small Transfer Station

A simple transfer station which can be used for a small site would involve on grade open end roll off bins, in which the residents would place their waste. It would only be applicable for very small community drop off sites with low volumes, such as Newdale, or if other locations wish to incorporate a transfer station. When the bins are sufficiently full and waste can no longer be placed in the bins, they are closed and hauled to the ultimate disposal site (the Community Site, Evergreen, or some other alternative).

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Costs involve supply of bins and some site grading only. The existing Newdale site, if used, already has infrastructure for sorting and baling recyclables.

It should be noted that two roll off trucks would be required to haul the waste to the disposal site. It is assumed that the roll off trucks would be shared between all communities and is therefore included under common costs. We were informed that some of the First Nation communities have trucks which could be used, keeping the costs in the community.

4.4.1.2 Small Transfer Station

The general concept involves an elevated ramp/platform in which residents can drive up and deposit their waste into roll-off bins. When the roll-off bins are full, they are hauled to the ultimate disposal site.

The basic concept would involve:

- Grading and site rework to construct the elevated platform
- Retaining walls
- Purchase of bins
- Other site infrastructure (note: not needed if existing sites are converted to a transfer station)

4.4.1.3 Large Transfer Station

The main difference between a small transfer station and a large transfer station is that a large transfer station includes compaction equipment. A compactor bin can hold 20 tonnes whereas a typical rolloff bin holds about 4 to 5 tonnes. Compaction of waste reduces the number of trips involved for the haulage vehicle and in many cases decreases costs (since haulage is a primary cost). The basic concept may involve:

- Stationary compactors with an exterior (outside) elevated ramp (with coverall structure – existing pole barn may suffice) which compacts waste into a self-evacuating long haul trailer or specially designed bin.
- A stationary compactor located inside a building which compacts waste and loads into a self-evacuating long haul trailer or specially designed bin. The trailer would be parked outside, coupled with the compactor and the compactor would push the waste through the wall into the trailer. The advantage of this over the earlier option is that there is less litter (windblown debris) and odour.
- A push pit design, which generally is comprised of a two level building with a below grade or at grade pit with a grade separation of 4.3 to 4.5 m. The waste is unloaded onto the ‘tip floor’, and then pushed into open top trailers. The transfer station or trailers utilize compactors for additional capacity. This increases the amount of waste put into the vehicle in a controlled manner.

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One of the concerns expressed during the kick-off meeting was for the condition of roads in the communities (particularly Harrison Park). It was noted that the preferred alternative should attempt to limit road damage. We believe that spring roads are restricted as follows:

- A1 roads: 55,000 pounds (or 25 tonnes) total vehicle weight
- B1 roads: 40,000 pounds (or 20 tonnes) total vehicle weight

A large transfer station would need to run reduced (half or 3/4) loads in the spring if trucks need to drive along an A1 or B1 class road. This may not be an issue during early years of the system planning period. Even in later years, spring load restrictions may not cause significant issues for the transfer of waste.

4.4.2 Advantages/Disadvantages

The advantages of exporting waste out of the Community are as follows:

- Long-term waste is not in the community, which means that there is less likelihood of environmental impacts.
- Site selection and permitting process should be considerably less onerous than other options.

The disadvantages are as follows:

- There is a concern that the residents are transferring their “problems” elsewhere.
- Reduced loads in the spring
- Large transfer stations in which the waste is compacted may have trouble with waste freezing in the bins, making it difficult to tip at the ultimate disposal location. Given the relatively short distances, the suppliers felt this may not be a significant problem, but still suggested it be considered when making the selection.

4.4.3 Proposed Sites for Transfer Stations

Conversion of existing landfills to transfer stations is often the best option for these communities for the following reasons:

- The site is already classified as a waste site, making it generally unsuitable for other use.
- Greenfield lands remain available for other opportunities.
- The community is accustomed to disposing of waste in that location.
- Infrastructure (roads, fences and buildings) are already in place.
- The land is already owned by the R.M. or FN community.
- Some costs associated with landfill closure can be deferred.

According to The Environment Act, Regulation 37/2016:

> *The site of a transfer station at the time the transfer station is established must be at least*

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(a) 30 metres from any building;

(b) 30 metres from any surface water; and

(c) 30 metres from any potable water well.

Use of the existing landfills as transfer stations would be acceptable within these criteria.

4.4.4 Partnership with Evergreen

A partnership with Evergreen was explored several years ago by Clanwilliam Erickson. At that time, the cost was $100 per person (based on population) to enter the partnership (it is not clear how this would be calculated for the RMNP). The annual cost would be the tipping fee per tonne of waste, (tonnes placed divided by operating cost) which is currently $75 per tonne, plus the $10 levee. In addition, waste would need to be trucked to the site, so there would be a haulage cost.

On the basis of $100 per capita, the cost to become a partner would likely be about $400,000, plus ongoing operational costs.

It should be noted that Evergreen at this time may not agree to accept other partners. Consultation with Evergreen is needed.

4.4.5 Direct Drive of Wastes

Direct drive involves hauling waste from the home or site to the ultimate disposal site (no transfer station). Since only a small percentage of the towns within the communities have collection, this would mean that individual homeowners may need to drive upwards of an hour each trip to dispose of their waste. This could lead to illegal dumping of wastes.

However, it may be feasible to offer curbside collection of waste to all households and then the waste is driven to the ultimate disposal site by the collection vehicle. Therefore, the impact on the residents would be minor (service would actually be improved for many homeowners). Curbside collection has been shown to be cost effective for individual members of the community when you consider the tax increase (or other funding) versus the cost of driving to the site. Furthermore, collection of waste reduces greenhouse gas emissions. This was discussed at the Options Meeting on December 8, 2016, and it was generally agreed that the communities are too sparsely populated to offer collection to all community members.

4.5 Mechanical Treatment

4.5.1 Overview

Mechanical treatment involves technology to process the waste into a stable product that will not decompose further. Examples include incineration, anaerobic digestion and gasification. The main advantage of mechanical treatment is that it reduces the volume

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of waste that requires landfilling by between 75 and 95 percent while meeting provincial air regulations and standards. Certain technologies have the advantage of generation of power, which is beneficial to the community. Power generation is not considered feasible at the annual tonnage estimated for RSWARFC.

The char, bottom ash, fly ash and non-burnable waste would still need disposal at a landfill or exporting to a site out of the community.

4.5.2 Advantages/Disadvantages

The advantages of a mechanical/thermal treatment system are as follows:

- Significantly smaller amount of residual waste to manage
- The community is generally viewed as a leader and innovator among other communities

The disadvantages of mechanical treatment include the following:

- Although this technology reduces the waste which requires ultimate disposal, it does not eliminate it. A landfill or exporting of waste is still required. Generally, the compounds going into this landfill will be more toxic than standard waste. The ash may be hazardous depending on the quality of the feedstock.
- Does have potential to impact air, if not operated correctly or does not meet design.
- There has been no indication during any of the interviews or during the ToR that this is desirable within the communities (although it was discussed during the November 28, 2016 teleconference).

This is generally considered the most costly option and is mainly feasible when there is a shortage of land or a strong community desire to be innovative. This option is not feasible in the five partner communities for the following reasons:

- Population base is too small to support an incinerator. Additional partner communities would be needed.
- Waste quantities fluctuate over the year, making operation difficult. Stockpiling of waste may be needed, which is operationally quite difficult.
- Being innovative with waste was generally not expressed as a strong desire within the partner communities.

4.5.3 Cost

On previous projects, the capital costs associated with an incinerator were in the 4 to 6 million dollar range. During consultation, if incineration is something viewed favourably by the communities, additional assessment can proceed. For now, Mechanical Treatment will not be considered further.

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4.6 Increased Diversion

The increased diversion of waste (recycling and composting) would extend existing landfill life. Funding is available from the Federation of Canadian Municipalities if recycling rates can reach 60% Diversion is viewed favourably by the community, and generally considered to be the right thing to do.

Additionally, diversion provides opportunities to limit environmental liabilities of disposal sites. Diverting compostable and hazardous wastes (like paint or electronics) helps minimize contaminants that may be released during waste decomposition in a landfill. This can protect groundwater, surface water and air resources.

4.6.1 Cardboard

We contacted the current recyclable receiver (Portage & District Recycling) and they confirmed that they do accept cardboard and will pay for cardboard if received baled and dry. It should be noted that to participate in the MMSM rebates, communities must recycle cardboard. The main issues with cardboard appear to be:

- Storage space (although regular baling and removal may eliminate that)
- Haulage costs, which likely out-weigh the profit made from the cardboard.

We suggest that with the capital costs allocated for this project, a dedicated trailer be installed at the facility or the South Mountain Recycling Depot for storage of cardboard and money be allocated on annual basis for the haulage of cardboard.

4.6.2 Glass

Through discussions with Portage & District Recycling it has been confirmed that they will also accept glass with a charge of $100 per tonne.

We estimate approximately 200 m^3 of glass (70 tonnes)[2] is stockpiled at the RMNP site. The existing stockpile should be removed and future glass be shipped to the receiver until a suitable project is obtained in the RMNP which can recycle the glass.

It is assumed that 3 tonnes[3] of glass will be generated per year.

4.6.3 Electronics

Electronic Products Recycling Association (EPRA) will accept both residential and commercial electronics from the communities , provided the material is stored in a lockable seacan or suitable container and the electronics must be loaded on a pallet and wrapped in plastic or secured in a bag supplied by EPRA. The organization pays $185

[2] Loose glass bottles weigh approximately 350 kg/m^3.

[3] Based on 30% of the waste stream being recyclables and 3% of recyclables being glass.

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per tonne for electronics which equates to approximately $2,000 for each full Seacan container and there is no cost to the communities, except maintaining the site. EPRA will also assist in setting up the depot and community education.

4.6.4 Hazardous Substances (Paint, Propane Tanks)

Registration should be made with the Stewards which accept paint and propane tanks (Product Care and Prairie Propane) and dedicated Seacans or appropriate containers/storage facilities should be purchased and placed at an appropriate location for storage of these materials. Product Care (the Stewardship company) has indicated that provided the site includes a Seacan container or suitable trailer, Product Care will supply bins, tubs, spill kits, training, collection, haulage and disposal free of charge. Prairie Propane has indicated that they will accept propane tanks free of charge. The community would need to be educated (included in budget) for the proper handling of these materials.

4.6.5 Mercury containing thermometers

A Stewardship organization available in Manitoba is the Thermostat Recovery Program (TRP) at http://www.hrai.ca/trp. Program registration and participation is free. Collection pails and shipping of full and empty pails are provided by the stewardship fund.

Participants are to ensure that only thermostats (either mercury or electronic) that control heating or cooling systems are placed in the program pails; and to also ensure that they place the entire thermostat in the pails and are not clipping out the mercury vials or taking them apart. This is necessary because the plastics, metals and all materials of the entire thermostat are recycled. This is also important because the costs of the program are fully paid for by the thermostat manufacturers; therefore, by keeping the thermostats intact they are able to verify the manufacturer who made it and this allows for the appropriate manufacturer to be charged for its end of life collection and processing.

4.6.6 Kitchen Organics

A centralized composting site (outdoor windrow site) was discussed with the partner communities during the interviews. Green Manitoba provides rebates for centralised composting facilities of between $10 and $25 per tonne at drop off. However, there was a great deal of concern regarding attracting bears to the community and therefore a centralized composting facility was not viewed upon favourably with members from RMNP or Clanwilliam Erickson.

Composting can have significant positive impact on the health of the community. By composting organic material, up to 40% of the waste stream can be diverted. The finished compost is a valuable resource that can improve soil ecology by returning nutrients to the earth.

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It was generally agreed that composting may be introduced at a small level at some of the sites, but generally the preferred approach would be some form of backyard composting trial run (typical backyard composters avoid meat and focus mainly on kitchen scraps and other organics). This would involve:

- Making available backyard composters at a reduced charge or free
- Educating the community on how to undertake the composting. The Manitoba Green Action Center offers programs and training sessions which can be coordinated for the communities.
- Continuing to promote backyard composters through ongoing education

If a regional composting facility is part of the final preferred alternative, this will be included at one of the landfill sites.

4.6.7 Reuse Depot

Within the cost modeling scenario, there is no way to tell whether the reuse depot would be cost effective (e.g., we cannot predict that the depot will save a certain amount of money or divert a certain quantity of waste). This is because the quantity of waste diverted cannot be estimated based on the information available. To this end, we suggest that the reuse depot be tried on a trial basis, and if successful, implemented at the full scale.

This will involve:

- For initial operations, it is envisioned that this would comprise several portable trailers or old haulage trucks, but if ongoing operation is feasible a permanent facility will be needed. Eventually, it may be necessary for construction of a re-use depot (lockable building) at the landfill or large transfer station, preferably near Onanole.
- Equip the building with shelves, storage racks and bins.
- Hiring of staff to operate the facility

Generally, there is a tendency for people to place materials in these facilities which are broken, damaged or can't be reused, under the impression that someone may be able to fix it and use it. If not properly screened, the facility may become littered with garbage. Staff are needed to review the waste, log incoming materials, ensure that product is well maintained (and disposed of when necessary), and assist the community in finding materials they need.

Costing of the reuse depot is shown in Appendix E.

4.6.8 First Nation Considerations

Under the current system, the First Nations do not need to pay the $10 per tonne Waste Reduction and Recycling Support (WRARS) Levy. However, once they begin use of an off reserve site, they will be required to pay the levy. Although a cost to the communities, this also gives them access to a large range of recycling opportunities at

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no cost, including paper, cardboard, electronics and other products. It is important that the First Nation begins use of these services.

It is recognized that there is already considerable interest in Rolling River and Keeseekoowenin First Nation in recycling. Some members are using the neighbouring Elphistone site or hoarding recycling materials until a suitable site is available. The new transfer stations will include bins and Seacans (trailers) to accept the waste. It is recommended that dedicated First Nations staff work at each of the facilities to ensure that the sites are used properly and maintained.

4.7 Site Closures

Site closures are envisioned to involve the following:

4.7.1 Keeseekoowenin

Closure would involve:

- Covering the active trench (it is assumed former trenches are covered)
- General site cleanup
- Removal of scrap metal (ongoing)
- Signage and fencing
- Well decommissioning – to occur several years (or decades) after the site stops receiving waste
- Undertaking any remediation which is required (currently none required)

4.7.2 Rolling River

Closure would involve

- Covering the active trench (it is assumed former trenches are covered)
- General site cleanup
- Removal of scrap metal (ongoing)
- Signage and fencing
- Well decommissioning – to occur several years (or decades) after the site stops receiving waste
- Undertaking any remediation which is required (currently none required), although there was discussion about a berm to prevent surface water contamination.

4.7.3 Municipality Of Clanwilliam-Erickson,

Closure would involve

- Covering the active trench (it is assumed former trenches are covered)
- Removal of scrap metal (ongoing)
- Signage and gate

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- Site grading
- Removal of infrastructure (pole barn)
- Undertaking any remediation which is required (currently none required)

4.7.4 Onanole Landfill

Closure would involve

- Covering the mound
- Removal of scrap metal (ongoing)
- Signage and gate
- Site grading
- Removal of infrastructure (pole barn)
- Undertaking any remediation which is required (currently none required)

4.7.5 Sandy Lake Landfill

Closure would involve

- Covering the active trench (it is assumed former trenches are covered)
- Removal of scrap metal (ongoing)
- Signage and gate
- Undertaking any remediation which is required (currently none required)

4.7.6 Newdale Landfill

Closure would involve

- Covering the active trench (we assume former trenches are covered)
- Removal of scrap metal (ongoing)
- Signage and gate
- Undertaking any remediation which is required (current none required)

4.7.7 New Regional Landfill

After the site life is complete (30 years) the new regional landfill will likely need to be closed (although expansion may be a possibility). Closure would involve:

- Application of final cover, comprising clay, topsoil and vegetation
- Final grading
- Site cleanup and building removal (as required)

Following landfill closure, ongoing monitoring of the site will be required until the site reaches natural conditions (assumed 20 years).

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4.7.8 The Riding Mountain National Park (RMNP) sites

Although there is no landfill site in RMNP, there are several sites which need to be cleaned up. These include:

- The glass stockpile – There is approximately 200 m^3 of glass stockpiled at the works yard. The glass can be ground up and used for roadbase, but it appears that there is currently an over-abundance of glass. The cost for grinding the glass is included in the estimates.
- The tin stockpile – requires removal and should be sent off on a regular basis

4.8 Service Agreement

To establish a Service Agreement, it was assumed that the initial capital cost is $150,000. This cost would address legal expenses for initial set-up, administration expenses, and other associated expenses.

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5.0 Cost Associated with Various Scenarios

The final solution will involve a combination of options outlined above (e.g., if a landfill is selected, there will be the need for closures and perhaps transfer stations). Within the possibilities, there are literally hundreds of different combinations. Of these potential combinations, there are certain scenarios which seem logical when the needs are considered. These are discussed below:

5.1 Scenario 1: New Landfill – No Transfer Stations

5.1.1 Overview

The initial scenario involves a new landfill in the communities, with all partners hauling their waste directly to the new landfill. It is envisioned that the new landfill would be central to the communities, around Sandy Lake. All existing landfills would be closed.

The distance to which a transfer station becomes economical is approximately 45 km. Provided the final disposal site is within 45 km of these communities, it may be feasible for these communities to haul their wastes directly to the site without the need of a transfer station. However, it would likely be viewed as a decrease in services.

5.1.2 Costs

The cost is summarized as follows (refer to Appendix E for a detailed breakdown and explanation of the calculations):

Capital Costs

New Landfill (Construction)	$4,082,000
Setting Up a Service Agreement	$150,000
Common Capital Costs	$275,000
Keeseekoowenin landfill closure	$31,000
Rolling River landfill closure	$31,000
Erickson landfill closure	$172,000
Onanole landfill closure	$275,000
Sandy Lake landfill closure	$90,000
Newdale landfill closure	$90,000
RMNP site clean-up	$21,000
Total Capital Costs	**$5,220,000**

Annual Operations Cost

Landfill Operations	$387,000
WRARS Levy	$33,000
WRARS Rebate	$(8,000)
Common Costs	$93,500
Annual Maintenance of Closed Sites @ $2000 per site	$12,000

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Total Annual Operations Costs $517,500

Landfill Closure Costs in 30 years $456,500
Landfill Post Closure Monitoring (30 years to 50 years)..... $11,000

TOTAL LIFE CYCLE COST @ 4% $14,400,000

The Total Life cycle Cost assumes that communities with existing waste collection and hauling services will continue their existing practices.

5.1.3 Comparison to Goals

Based on interviews and discussion during the Options Meeting on December 8, 2016, several system goals were developed (refer to Section 4.0). The ability to meet the goals is expressed below

Table 5-1: Scenario 1: Comparison to Goals

Protective of the environment	■/□	A properly designed and operated landfill can be protective of the environment. However, if not properly maintained there is a potential for impacts. Therefore, this has been ranked as meeting goal, with potential to not meet goal.
Comparable level of service	X	Does not meet goal. Using this strategy, residents currently without waste collection would be required to drive their wastes to the landfill themselves. Providing waste collection service for these residents could be considered, but would be an extra cost.
Keeps jobs in the community.	□	It is estimated that the landfill would employ approximately 5 full time staff. This is less than some of the other options.
Impact to Roads	■	Haulage is mostly by private vehicle or small collection vehicle. Therefore, this meets the goals.
Cost effective	■	One of the lowest cost options. Therefore, this meets the goal.

■ Meets Goal
□ Somewhat Meets Goal
X Does not meet goal

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5.2 Scenario 2: New Landfill – Four Small Transfer Stations

5.2.1 Overview

Under scenario 1, residents would effectively have services decreased, since they currently have a local disposal site and now they have to drive further; perhaps up to 1 hour round trip. This may result in people finding a way to avoid proper disposal.

The second scenario involves a new landfill in the communities, with small transfer stations located at Onanole, Newdale, Erickson and Keeseekowenin. Except for the Keeseekoowenin site, these sites already have facilities for recycling. Captial costs at Keeseekoowenin will include bins and equipment for placing recyclables. It is assumed that the site would be close to Sandy Lake (central to the community) and therefore a transfer station would not be needed for Sandy Lake. RMNP would haul directly to the landfill (haulage to Onanole would mean double handling). The Rolling River works staff would use the Erickson transfer station which is very close to their existing site. Depending on the final location of the landfill, it may be more economical for Keeseekoowenin First Nation to haul directly to the site.

5.2.2 Costs

The cost is summarized as follows (refer to Appendix E for a detailed breakdown and explanation of the calculations):

Capital Costs

New Landfill	$4,082,000
Setting Up a Waste Management Authority	$150,000
Common Capital Costs	$275,000
Transfer Truck	
Roll off trucks (2)	$500,000
Keeseekoowenin landfill (small transfer station)	$431,000
Rolling River landfill (landfill closure)	$31,000
Erickson landfill (construct small transfer station)	$431,000
Onanole landfill (construct small transfer station)	$431,000
Sandy Lake landfill (landfill closure)	$90,000
Newdale landfill (construct very small transfer station)	$42,000
RMNP site clean up	$21,000
Partial Landfill Closure (final cover at Erickson and Onanole)	$454,000
Total Capital Costs	**$6,481,000**

Annual Operations Cost

Landfill Operations	$387,000
WRARS Levy	$33,000
WRARS Rebate	$(8,000)
Common Costs	$94,000

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Annual Maintenance of Closed Sites @ $2000 per site..... $4,000
Keeseekoowenin (Haulage by Roll-off truck)..... $30,000
Erickson (Haulage by Roll-off truck)..... $51,000
Onanole (Haulage by Roll-off truck)..... $119,000
Sandy Lake (site closed, haulage by community).....
Newdale (Haulage by Roll-off truck)..... $29,000
RMNP site haulage by Parks Canada to new site .....
Total Operations Costs $737,000

Landfill Closure Costs in 30 years..... $457,000
Transfer Station Closure in 30 years $114,000
Landfill Post Closure Monitoring (30 years to 50 years) $11,000

TOTAL LIFE CYCLE COST @ 4% $19,430,000

5.2.3 Comparison to Goals

The ability to meet the goals is expressed below

Table 5-2: Scenario 2: Comparison to Goals

Protective of the environment	■/□	A properly designed and operated landfill can be protective of the environment. However, if not properly maintained there is a potential for impacts. Therefore, this has been ranked as meeting goal, with potential to not meet goal.
Comparable level of service	■	Meets goal. The level of service is comparable.
Keeps jobs in the community.	■	It is estimated that the landfill would employ approximately 5 full time staff, 4 full time staff would be needed for the transfer stations, 1 full time driver for the roll off trucks. The total employees would be 10.
Impact to Roads	■	Haulage is mostly by small roll off truck or small collection vehicle. Therefore, this meets the goals.
Cost effective	**X**	Highest cost option. Therefore, this does not meet the goal.

■ Meets Goal
□ Somewhat Meets Goal
X Does not meet goal

5.3 Scenario 3 - New Landfill – Two Large Transfer Stations and Two Small Transfer Stations

5.3.1 Overview

The third scenario is similar to the second scenario, except large transfer stations (with compactors) are installed at the Erickson and Onanole sites and small transfer stations at Keeseekoowenin First Nation and Newdale. Rolling River would use the Erickson transfer station and Sandy Lake and RMNP would direct haul their wastes to one of the sites. Depending on the site location, Keeseekoowenin may haul their wastes directly to the landfill (which may reduce costs).

5.3.2 Costs

The cost is summarized as follows (refer to Appendix E for a detailed breakdown and explanation of the calculations):

Capital Costs

New Landfill	$4,082,000
Setting Up a Waste Management Authority	$150,000
Common Capital Costs	$275,000
Transfer Truck	$150,000
Roll off trucks (2)	$500,000
Keeseekoowenin landfill (construct small transfer station)	$431,000
Rolling River landfill (landfill closure)	$31,000
Erickson landfill (construct large transfer station)	$726,000
Onanole landfill (construct large transfer station)	$726,000
Sandy Lake landfill (landfill closure)	$90,000
Newdale landfill (construct very small transfer station)	$42,000
RMNP site clean up	$21,000
Partial Landfill Closure	$454,000
Total Capital Costs	**$7,221,000**

Annual Operations Cost

Landfill Operations	$387,000
WRARS Levy	$33,000
WRARS Rebate	$(8,000)
Common Costs	$94,000
Annual Maintenance of Closed Sites @ $2000 per site	$4,000
Keeseekoowenin (Haulage by Roll-off truck)	$30,000
Erickson (Haulage by Roll-off truck)	$41,000
Onanole (Haulage by Roll-off truck)	$73,000
Sandy Lake (site closed, haulage by community)	
Newdale (Haulage by Roll-off truck)	$29,000

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RMNP site haulage by Parks Canada to new site .....
Total Annual Operations Costs $680,000

Landfill Closure Costs in 30 years $457,000
Transfer Station Closure in 30 years $114,000
Landfill Post Closure Monitoring (30 years to 50 years) $11,000

TOTAL PRESENT VALUE COST @ 4% $19,190,000

Scenario 3 has a slightly higher capital (initial) cost, and slightly lower operating costs. The overall lifecycle costs are slightly higher.

5.3.3 Comparison to Goals

The ability to meet the goals is expressed below

Table 5-3: Scenario 3: Comparison to Goals

Protective of the environment	■/□	A properly designed and operated landfill can be protective of the environment. However, if not properly maintained there is a potential for impacts. Therefore, this has been ranked as meeting goal, with potential to not meet goal.
Comparable level of service	■	Meets goals. Services are similar to that currently used in the community.
Keeps jobs in the community.	■	It is estimated that the landfill would employ approximately 5 full time staff, 6 full time staff would be needed for the transfer stations, and 1 full time driver for the roll off trucks. The total employees would be 12.
Impact to Roads	□	Haulage is mostly by roll off truck or small collection vehicle. Trucks will be heavier than the other options, and therefore this is considered somewhat meeting the goal.
Cost effective	**X**	Second highest cost option. Therefore, this does not meet the goal.

■ Meets Goal
□ Somewhat Meets Goal
X Does not meet goal

5.4 Scenario 4- Exporting to Evergreen – Two Large Transfer Stations

5.4.1 Overview

Under scenario 4, there is no new landfill in the community. Two large transfer stations are constructed at Erickson and Onanole and the rest of the communities haul their

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wastes either directly to Evergreen or to one of these transfer stations. Rolling River would haul wastes to the Erickson site, as the site is very close. RMNP would be hauling their wastes to Onanole, so that it could be bulked and hauled more efficiently to the final disposal location.

5.4.2 Costs

The costs are as follows (refer to Appendix E for a breakdown and explanation of the calculations):

Capital Costs

Partnership fees	$400,000
Common Capital Costs	$275,000
Loader	$150,000
Roll off trucks (2)	$500,000
Keeseekoowenin landfill (close)	$31,000
Rolling River landfill (close)	$31,000
Erickson landfill (construct large transfer station)	$726,000
Onanole landfill (construct large transfer station)	$726,000
Sandy Lake landfill (close)	$90,000
Newdale landfill (close)	$90,000
RMNP site (clean-up)	$21,000
Preliminary Landfill Closure (final cover at Transfer Stations)	$402,000
TOTAL CAPITAL COSTS	**$3,040,000**

Operations

WRARS Levy	$33,000
WRARS Rebate	$(8,000)
Common Costs	$94,000
Annual Maintenance of Closed Sites @ $2000 per site	$8,000
Keeseekoowenin - site closed, hauled by community to Erickson	
Erickson - Haulage by Roll off truck	$97,000
Onanole - Haulage by Roll off truck	$356,000
Sandy Lake - site closed, haulage by community to Erickson	
Newdale - site closed, haulage by community to Erickson	
RMNP site – site closed, haulage by PC to Onanole	
Total Operations Costs	**$579,000**

Transfer Station Closure in 30 years (building removal)	$45,000
TOTAL LIFE CYCLE COST @ 4%	**$13,097,000**

Again, there is the perception of decreased services as a significant portion of the community's population will have a longer distance to drive. Similar to Scenario 3, caution is needed to ensure that road damage does not occur.

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5.4.3 Comparison to Goals

Based on interviews and discussion during the Options Meeting on December 8, 2016, several system goals were developed (refer to Section 4.0). The ability to meet the goals is expressed below

Table 5-4: Scenario 4: Comparison to Goals

Protective of the environment	■	The waste is not in the community and therefore this is protective of the local environment. It therefore meets the goal.
Comparable level of service	**X**	Does not meet goal. Community members would need to travel considerably further to dispose of their wastes
Keeps jobs in the community.	□	It is estimated that each transfer stations would employ 4 full time staff and at least 2 truck drivers would be needed. Therefore, the total employees would be 6.
Impact to Roads	□	Haulage is mostly by roll off truck or small collection vehicle. Trucks will be heavier than the other options, and therefore this is considered somewhat meeting the goal.
Cost effective	■	One of the lowest cost options.

■ Meets Goal
□ Somewhat Meets Goal
X Does not meet goal

5.5 Scenario 5 - Exporting to Evergreen – Network of Small Transfer Stations

5.5.1 Overview

In scenario 4, there are many areas of the community which will have decreased services because they now need to haul their waste a longer distance. Under scenario 5, there will be small transfer stations set up in all the communities.

5.5.2 Costs

The costs are as follows:

Capital Costs

Partnership fees	$400,000
Common Capital Costs	$275,000
Roll off trucks (2)	$500,000

Keeseekoowenin landfill (construct small transfer station) $431,000
Rolling River landfill (close)..... $31,000
Erickson landfill (construct small transfer station)..... $431,000
Onanole landfill (construct small transfer station)..... $431,000
Sandy Lake landfill (construct small transfer station)..... $431,000
Newdale landfill (construct very small transfer station $42,000
RMNP site (clean-up)..... $21,000
Partial Closure Costs (final cover at transfer stations)..... $525,000
Total Capital Costs $2,993,000

Annual Operations Cost

WRARS Levy..... $33,000
WRARS Rebate..... $(8,000)
Common Costs $94,000
Annual Maintenance of Closed Sites @ $2000 per site..... $2,000
Keeseekoowenin $41,000
Erickson..... $117,000
Onanole $437,000
Sandy Lake..... $50,000
Newdale..... $33,000
RMNP site (haulage by PC to Onanole).....
Total Operations Costs $799,000

Transfer Station Closure in 30 years (building removal)..... $132,000
TOTAL LIFE CYCLE COST @ 4% $17,130,000

5.5.3 Overview with Respect to Goals

The ability to meet the goals is expressed below:

Table 5-5: Scenario 5: Comparison to Goals

Protective of the environment	■	The waste is not in the community and therefore this is protective of the local environment. It therefore meets the goal.
Comparable level of service	■	Meets goals. There is comparable service to what there is now.
Keeps jobs in the community.	□	It is estimated that 4 full time staff and at least 2 truck drivers would be needed. Therefore, the total employees would be 6.
Impact to Roads	■	Haulage is mostly by small roll off truck or small collection vehicle. Therefore, this meets the goals.
Cost effective	■	One of the lowest cost options. Therefore, this meets the goal.

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■ Meets Goal
□ Somewhat Meets Goal
X Does not meet goal

5.6 Scenario 6 – Exporting to Evergreen – Combination of Transfer Stations

5.6.1 Overview

In this scenario, there are large transfer stations set up at Erickson and Onanole and small transfer stations at Newdale, Sandy Lake and Keeseekoowenin. Rolling River would haul wastes to the Erickson landfill, as the site is very close.

5.6.2 Cost

The cost is as follows:

Capital Costs

Partnership fees	$400,000
Common Capital Costs	$275,000
Loader	$150,000
Roll off trucks (2)	$500,000
Keeseekoowenin landfill (construct small transfer station)	$431,000
Rolling River landfill (close)	$31,000
Erickson landfill (construct large transfer station)	$726,000
Onanole landfill (construct large transfer station)	$726,000
Sandy Lake landfill (construct small transfer station)	$431,000
Newdale landfill (construct very small transfer station	$42,000
RMNP site (clean-up)	$21,000
Partial Closure Costs (final cover at transfer stations)	$525,000
Total Capital Costs	**$3,733,000**

Annual Operations Cost

WRARS Levy	$33,000
WRARS Rebate	$(8,000)
Common Costs	$94,000
Annual Maintenance of Closed Sites @ $2000 per site	$2,000
Keeseekoowenin	$41,000
Erickson	$97,000
Onanole	$331,000
Sandy Lake	$50,000
Newdale	$33,000
RMNP site (haulage by PC to Onanole)	
Total Operations Costs	$673,000

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Transfer Station Closure in 30 years (building removal)..... $132,000
TOTAL LIFE CYCLE COST @ 4% $15,650,000

Instead of their own transfer station, the Keeseekoowenin First Nation may prefer to use the Sandy Lake Transfer station, as the sites are very close (13 km).

Although the capital costs are higher than scenario 5, the overall life cycle cost is lower because the site operation is lower. It would take approximately 6 years for the higher capital costs to be recovered.

5.6.3 Overview with Respect to Goals

The ability to meet the goals is expressed below

Table 5-6: Scenario 6: Comparison to Goals

Protective of the environment	■	The waste is not in the community and therefore this is protective of the local environment. It therefore meets the goal.
Comparable level of service	■	Meets goal.
Keeps jobs in the community.	□	It is estimated that each transfer station would employ 6 full time staff and at least 2 truck drivers would be needed. Therefore, the total employees would be 8.
Impact to Roads	□	Haulage is mostly by small roll off truck or small collection vehicle. Therefore, this meets the goals.
Cost effective	■	One of the lowest cost options. Therefore, this meets the goal.

■ Meets Goal
□ Somewhat Meets Goal
X Does not meet goal

5.7 Scenario 7 – Haulage to Another Site

In this scenario, we looked at just the increase to the operating costs if a further site was used. The Brandon site is located approximately 50 km further than the Evergreen site. The operational cost is summarised in the table which follows:

WRARS Levy..... $33,000
WRARS Rebate..... $(8,000)
Common Costs..... $94,000
Annual Maintenance of Closed Sites @ $2000 per site..... $2,000
Keeseekoowenin $44,000
Erickson..... $101,000

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Onanole	$350,000
Sandy Lake	$55,000
Newdale	$35,000
RMNP site (haulage by Parks Canada to Onanole)	
Total Operations Costs	**$706,000**

On this basis, the additional annual cost is estimated to be 33,000 ($706,000-$673,000) per year for an additional 50 kilometers travel. We do not know what partnership costs would be with these other landfills.

It should be noted that this is provided for reference only, and is not carried forward in the summary tables which follow.

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6.0 Summary

The following are the advantages and disadvantages of the various scenarios:

Table 6-1: Advantages and Disadvantages of Options

	Advantages	Disadvantages
Scenario 1: New Landfill – No transfer Stations	• Community has total control over their own wastes • Relatively low cost	• Siting is difficult. There may be no suitable sites available. • Some members of the community may have a long distance to drive to dispose of their wastes • If the site is not operated properly, there is a potential for environmental impact. • There is long term environmental liability associated with operating a landfill site.
Scenario 2: New Landfill and 4 Small Transfer Stations	• Convenience • Community has total control over their own wastes	• Siting is difficult. There may be no suitable sites available. • If the site is not operated properly, there is a potential for environmental impact. • There is long term environmental liability associated with operating a landfill site. • Highest lifecycle costs and overall high capital cost

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Scenario 3: New Landfill, 2 Large Transfer Stations and 2 Small Transfer Stations	• Convenience • Community has total control over their own wastes	• Siting is difficult. There may be no sites available. • Potential for road damage as haulage is done using larger trucks. • If the site is not operated properly, there is a potential for environmental impact. • There is long term environmental liability associated with operating a landfill site. • Highest capital costs and second highest overall costs
Scenario 4: Exporting to Evergreen Landfill using 2 Large Transfer Stations	• Long-term waste is not in the community, which means that there is less likelihood of environmental impacts. • Site selection and permitting process should be considerably less onerous than other options • Lowest cost	• Unknown whether a partner landfill could be found • Community does not have total control over their own wastes • Potential for road damage as haulage is done using larger trucks.
Scenario 5 Exporting to Evergreen Landfill with Network of Small Transfer Stations	• Convenience • Long-term waste is not in the community, which means that there is less likelihood of environmental impacts. • Site selection and permitting process should be considerably less onerous than other options	• Unknown whether a partner landfill could be found • Community does not have total control over their own wastes

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Scenario 6: Exporting to Evergreen Landfill with 2 large transfer Stations and Network of small transfer Stations	• Convenience • Long-term waste is not in the community, which means that there is less likelihood of environmental impacts. • Site selection and permitting process should be considerably less onerous than other options • Lowest cost option which still offers service comparable to current system	• Unknown whether a partner landfill could be found • Community does not have total control over their own wastes • Potential for road damage as haulage is done using larger trucks.

The costs as presented above are summarised in the following table. For discussion purposes, we have sorted the costs from lowest life cycle costs to highest lifecycle costs:

Table 6-2: Cost comparison

	Total Capital Costs	Annual Operation Costs	Closure Costs (in 30 yrs)	Post Closure Costs (30-50 yrs)	Life cycle Costs
4- Exporting to Evergreen – 2 Large Transfer Stations	$3,040,000	$579,000	$ 45,000		$ 13,097,000
1: New Landfill – No transfer Stations	$ 5,220,000	$ 517,500	$ 456,500	$ 11,000	$ 14,400,000
6 – Exporting to Evergreen - 2 large transfer Stations and Network of small transfer Stations	$3,733,000	$673,000	$ 132,000		$ 15,650,000
5 - Exporting to Evergreen – Network of Small Transfer Stations	$2,993,000	$799,000	$ 132,000		$ 17,130,000
2: New Landfill – 4 Small Transfer Stations	$6,481,000	$737,000	$571,000	$ 11,000	$ 19,430,000
3 - New Landfill – 2 Large Transfer	$7,221,000	$680,000	$ 571,000	$ 11,000	$ 19,190,000

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Stations and 2 Small Transfer Stations					

The following table shows how the options compare when evaluated with respect to the goals.

Table 6-3: Comparison to Goals

	Environment	Level of Service	Jobs	Roads	Cost
Scenario 1:New Landfill – No transfer Stations	■/□	X	□	■	■
Scenario 2: New Landfill and 4 Small Transfer Stations	■/□	■	■	■	X
Scenario 3: New Landfill, 2 Large Transfer Stations and 2 Small Transfer Stations	■/□	■	■	□	X
Scenario 4: Exporting to Evergreen Landfill using 2 Large Transfer Stations	■	X	□	□	■
Scenario 5: Exporting to Evergreen Landfill with Network of Small Transfer Stations	■	■	□	■	□
Scenario 6: Exporting to Evergreen Landfill with 2 large transfer Stations and Network of small transfer Stations	■	■	□	□	□

■ Meets Goal
□ Somewhat Meets Goal
X Does not meet goal

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7.0 Preferred Alternative

On the basis of the analysis presented above, a new landfill with a network of small transfer station is the best option in terms of meeting goals and objectives. However, it is one of the most expensive options. A suitable option would be exporting to Evergreen with a network of small transfer stations.

Table 7-1: Cost of Preferred Alternative

	Total Capital Costs	Annual Operation Costs	Closure Costs (in 30 yrs)	Post Closure Costs (30-50 yrs)	Life cycle Costs
2: New Landfill – 4 Small Transfer Stations	$6,481,000	$737,000	$571,000	$ 11,000	$ 19,430,000
5 - Exporting to Evergreen – Network of Small Transfer Stations	$2,993,000	$799,000	$ 132,000		$ 17,130,000

Table 7-2: Preferred Alternative compared to Goals

	Environment	Level of Service	Jobs	Roads	Cost
Scenario 2: New Landfill and 4 Small Transfer Stations	■/□	■	■	■	**X**
Scenario 5: Exporting to Evergreen Landfill with Network of Small Transfer Stations	■	■	□	■	□

■ Meets Goal
□ Somewhat Meets Goal
X Does not meet goal

7.1 Preliminary Design

The preliminary landfill design is shown on Figure 8. The landfill has been sized for a final volume of 360,000 m^3 which is capable of holding 130,000 tonnes of waste

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(projected volumetric requirements for a 30 year study period). The landfill would be constructed 2 m below grade and 7 m of fill above grade. This increases site capacity per area, allows for cover material to be extracted during cell construction and stockpiled for later use in daily operations, while balancing visibility of the site and minimizing leachate production associated with increased footprint size.

The liner of the site would comprise a heavy duty plastic (HDPE) liner at base of landfill (note: based on site conditions, it may be possible to use a recompacted clay base liner only. However, given that this is not known, it is conservative to assume an HDPE liner to ensure adequate protection of groundwater. The cost savings if a clay liner can be used are included in the cost section.) A leachate collection system would be installed over the liner with a gravel layer and subsurface piping network to an evaporative lagoon for leachate management. This would be located within site buffer area to accommodate future potential expansions. Leachate management via the evaporation pond(s) would include active aeration.

The site footprint would be divided into 5 cells each lasting approximately 6 years which reduces initial construction costs and leachate production. Therefore the initial capital expenses would only be for 1/6 of the cell construction (However, the rest of the infrastructure, such as building and road construction would be a capital cost).

Stormwater pond will be installed for non-impacted effluent (rainwater) which is diverted away from the open cell. Stormwater perimeter ditching and ponds will also be installed to prevent clean water from entering waste area, and in the event of a leachate breakout would allow for spill containment.

There would be a weighscale and office facilities. There would also be an on-site garage structure for storage and light maintenance of site equipment (compactor, loader, site pickup, roll-off, lawnmower, snow removal etc.).

We have included a public drop off area at the site, which consists of an elevated platform with a retaining wall in a saw-tooth configuration. Residents place wastes within roll-off bins which when full are transferred back to the tipping face by a roll off truck, or trailer. This provides diversion opportunities for various wastes which can impact the landfill life and leachate characteristics and worker safety in not handled properly including:

- Recycling
- e-waste
- White goods (appliances)
- Tires
- Hazardous wastes (propane cylinders, paint, oil, antifreeze, etc.)
- Yard and wood waste

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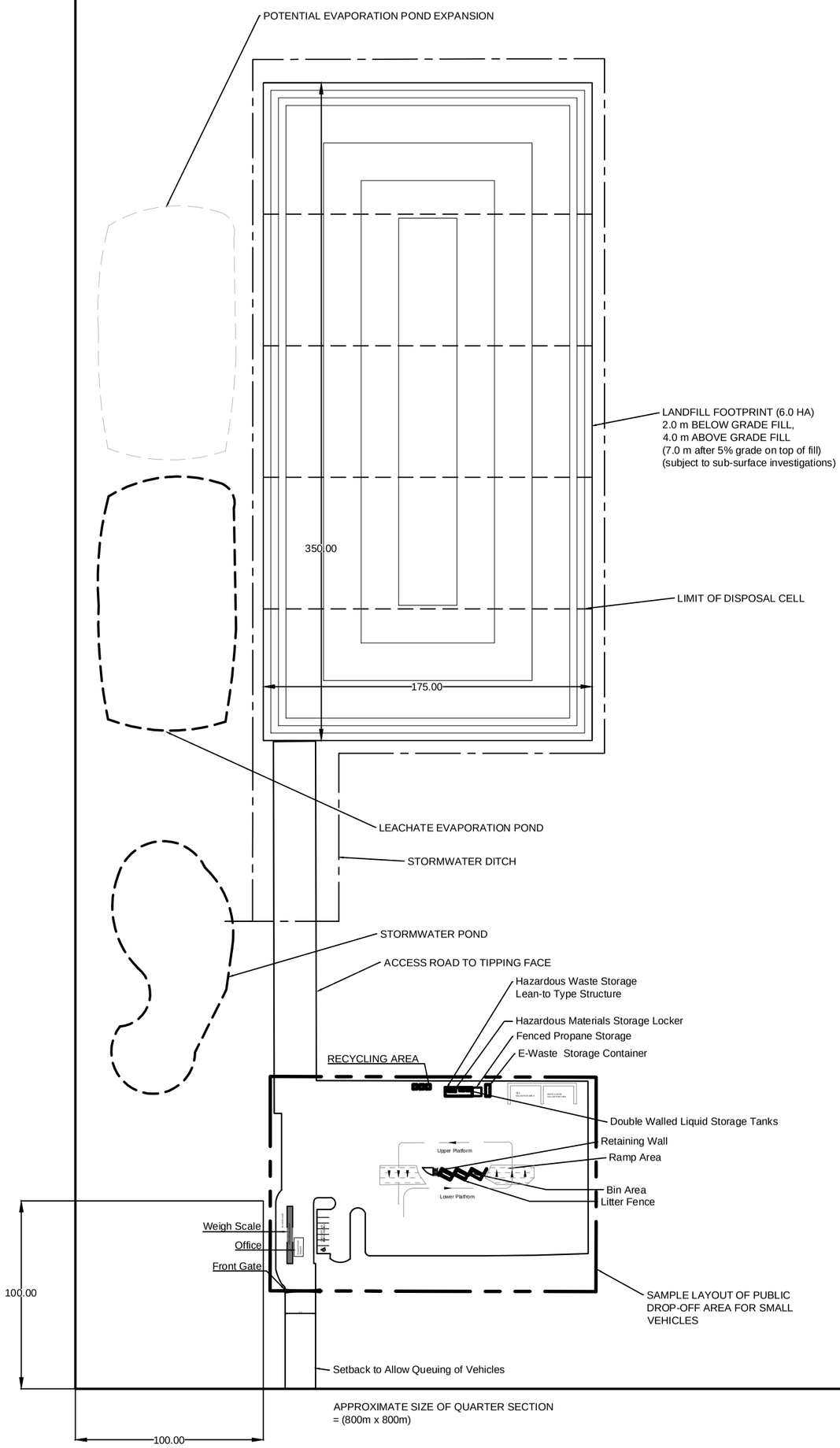

N

0 50 100 150 200

Metres

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Client

RSWARFIC

Figure Title

SOLID WASTE MANAGEMENT OPTIONS FEASIBILITY STUDY

CONCEPTUAL DESIGN

Drawn	Checked	Date	Figure No.
AE	KH	16/12/15	**8**
Scale		Project No.	
1:2500		30039698	

It is noted that existing landfills such as Onanole and Erickson currently use shredding of waste to reduce waste volume by eliminating air space and increasing the ability to compact. Evergreen bales waste to increase compaction therefore reducing waste volume. Evergreen also reported more rapid waste degradation when the waste was baled. A review of the environmental impacts of shredding (potential for odours etc.) would be undertaken as part of the detailed design to assess whether shredding is suitable for the new design.

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8.0 Next Steps

The next steps are outlined as follows:

1. A flier or information sheet will be prepared for distribution to the community.
2. Conversations should be held with Evergreen or other neighbouring sites to determine if exporting is still viable.
3. When weather permits, soil investigation of selected sites should commence.
4. The Communities should discuss and agree on the preferred option, and agreements should be developed.
5. Detailed design and permitting of the preferred solution should commence.

The following are important contacts which can be reached out to for collection and pick up of materials:

Name	**Organization**	**Phone**	**Services**
James Bolton	Portage District Recycling	204-856-5520	Can arrange to pick up cardboard and paper at no charge. Can pick up glass and electronics, with a charge. Can supplies bins and receptacles.
Dennis Neufeld	EPRA	204-415-5947	Will arrange to pick up both commercial and residential electronics provided it is stored properly at the site or depot.
John Paul	Prairie Propane	204-999-2146	Will pick up empty propane cylinders at no charge.
	Green Action Center	204-925-3777	Assists with backyard composting programs in community.
Randy Webber	Product Control	204-477-0741	Will drop off containers for hazardous waste. Will collect hazardous waste. Will perform education in community.

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9.0 References

- CLAW Environmental Services. Phase I ESA, Keeseekoowenin First Nation, Waste Disposal Site. March 2013 (CIDM # 1113311)
- CLAW Environmental Services. Waste Audit Study Report, Keeseekoowenin First Nation, Waste Disposal Site. March 2013. (CIDM 1144650)
- Aski Geoscientists. Phase I ESA, Keeseekoowenin Ojibway First Nation, March 2013. (CIDM 1124804)
- Neegan Burnside. Solid Waste Disposal Site Assessment, Keeseekoowenin First Nation. March 2010 (CIDM # 786588)
- INAC. Environmental Issues Inventory, Waste Disposal Facility, Solid Waste/Landfill Site. May 1993
- Stantec. Phase II/III ESA, Rolling River First Nation, Waste Disposal Site. March 2016 (CIDM # 1113311)
- KGS. Rolling River First Nation, Solid Waste Management Program (Waste Audit) March 2016. (CIDM 1144650)
- Neegan Burnside. Solid Waste Disposal Site Assessment, Rolling River First Nation. March 2010 (CIDM # 786642)
- JR Cousin & Earthbound Environmental, South Mountain Waste Management Study, February 1994

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Appendix A

Minutes and Meeting Information

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Appendix A-1
Kick-off Meeting

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Neegan Burnside Ltd. 307 Commerce Drive Winnipeg MB R3P 1B3 CANADA
telephone (204) 949-7110 **fax** (204) 949-7111 **web** www.neeganburnside.com

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Minutes of Meeting

Meeting Date: October 12, 2016 **Project No.:** 300039698.0000

Project Name : Solid Waste Management Options Feasibility Study for the RSWARFIC

Meeting Subject: Project Initiation Meeting

Meeting Location: Teleconference

Date Prepared: October 14, 2016

Those in attendance were:

Elvin Huntinghawk	Rolling River First Nation	ehuntinghawk@rrfn.net
Don Huisman	Municipality of Clanwilliam-Erickson	huismanathome@gmail.com ericksonadmin@ericksonmb.ca
Iain Edye	Municipality of Clanwilliam-Erickson	ericksonacao@mymts.net
Lloyd Ewashko	Municipality of Harisson Park	admin@harrisonpark.ca
Kevin Bachewich	Riding Mountain Field Unit	kevin.bachewich@pc.gc.ca
Tebesi Mosala	INAC	Tebesi.Mosala@aandc-aadnc.gc.ca
Dieter Duester	INAC	Dieter.Duester@aandc-aadnc.gc.ca
Heather MacKenzie	Neegan Burnside Limited	Heather.mackenzie@neeganburnside.com
Mike Harris	Neegan Burnside Limited	mike.harris@neeganburnside.com
Kent Hunter	Neegan Burnside Limited	kent.hunter@neeganburnside.com

Regrets

Norman Bone	Keeseekoowenin First Nation	bone1953@outlook.com
Barry Bone	Keeseekoowenin First Nation	barrylbone@outlook.com

The following items were discussed	Action by

1. Purpose

1.1 Tebesi stated purpose of call was to:

- Ensure everyone was on the same page regarding the project
- Allow clients to express expectations regarding project and final product
- Provide consultant with a chance to ask questions

2. Expectations

2.1 Each client representative expressed expectations

2.1.1 Don

- Several existing sites – not all in compliance
- Seeking potential location for new site
- Need to improve recycling
- Need to look at available government programs and implement in communities if appropriate
- Solution must be cost effective
- Study to assess 3 potential locations
- Consider fluctuating populations from base of about 4000 to peak of 15000 during summer months
- May consider regional landfill at Evergreen if exporting considered
- Possible study may indicate that existing systems are fine and don't need to be changed, but he doubts that

2.1.2 Iain

- In addition, solution must consider bears and wildlife

2.1.3 Lloyd

- In addition, solution must consider transportation
  - Roads are a concern
  - Spring restrictions
  - Choice of roads should be considered
  - Consultant to be mindful of cost of road reconstruction

2.1.4 Elvin

- Solution must be cost effective
- Would appreciate 15 days notice before activities in community, although it is recognized that given aggressive time frame for the project this may not always be possible. Nevertheless, advance

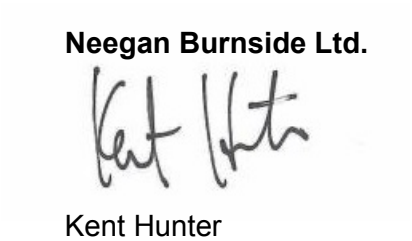
The following items were discussed		Action by
	notice is necessary	
3.	**Contact Information**	
3.1	Heather asked about contact information • Elvin – Rolling River FN • Iain – Clanwilliam-Erickson • Lloyd – Harrison Park • Kevin – Riding Mountain • Norman/Barry – Keeseekoowenin	
4.	**Technical Discussion**	
4.1	Kent asked if weigh in records were available to assist in estimating population changes. Don indicated they were, but were dated. This would be provided.	
4.2	Waste types were discussed • Building demolition waste – this ends up in waste sites, and can account for a large amount • Deadstock – this is not an issue, but should be considered in plan • Agricultural waste (herbicide pesticide containers) – generally accepted, but it is recognized that management methods could be better Study to look at future trends of waste too. Elvin stated that an audit of waste types was completed. Will ensure that Neegan Burnside gets a copy (*note: complete*).	
4.3	Composting needs to be looked at, although it should be recognized that resources are limited.	
4.4	Kent indicated that new guidelines will have major impacts on potential site locations. • Water shed resources were then discussed. It was recommended that Neegan Burnside contact the Little Saskatchewan River Conservation District. Executive Director is Collen Culvelier at 566-2292. • May also want to consider South Mountain Planning District, as they may have some restrictions, including zoning setbacks.	KH
4.5	Kent asked If Solid Waste Management Plan for West Region Tribal Council could be obtained. It was stated that this may not be too	

The following items were discussed		Action by
	helpful, but would be provided.	
5.	**Site Visits**	
5.1	Kent said that we are tentatively planning that the site visits will occur the week of October 24, with a tentative plan to meet on Tuesday, Wednesday and Thursday of that week.	
5.2	Elvin asked that the timeline be provided in writing. Heather said that would not be a problem (*note: complete*).	HM
5.3	Lloyd requested that if the meetings are that week, his meetings be earlier in the week (Tuesday).	
5.4	Tebesi pointed out that Keeseekoowenin was not on the call, and their availability will need to be confirmed.	HM
5.5	It was requested that Neegan Burnside provide a list of questions, so that the stakeholders were better prepared during the meeting. Kent indicated that this would not be problem, but it should be recognized that questions will change during the meeting as things come up or are observed.	KH
5.6	Kent asked about the possibility of also visiting the Evergreen site. The team agreed that this would not be an issue. If exporting waste out of the community is considered, Evergreen would likely be a better alternative than Brandon.	
5.7	Heather indicated that we should also see site equipment during the inspections (loaders, compactors etc.)	
5.8	The need for a meeting with the entire team was discussed. It was agreed that this could be done at a later time, perhaps during the project meeting visit 2.	

The preceding are the minutes of the meeting as observed by the undersigned. Should there be a need for revision, please advise Burnside within seven days of issuance. In the absence of notification to the contrary, these minutes will be deemed to be an accurate record of the meeting.

Minutes prepared by:

Neegan Burnside Ltd.



Kent Hunter
Senior Technical Lead
KH:

Distribution:

All Attendees

Norman Bone	Keeseekoowenin	Via: Email
Barry Bone	Keeseekoowenin	Via: Email

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Appendix A-2
Gap Teleconference 1

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telephone (204) 949-7110 **fax** (204) 949-7111 **web** www.neeganburnside.com

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Notes of Teleconference 1

Meeting Date: November 24, 2016 **Project No.:** 300039698.0000

Project Name : Solid Waste Management Options Feasibility Study for the RSWARFIC

Meeting Subject: Summary of Current and Future Solid Waste Management Needs/Information Gaps/Workplan to Address Gaps and Needs

Meeting Location: Teleconference

Date Prepared: December 1, 2016

Those in attendance were:

Iain Edye	Municipality of Clanwilliam-Erickson	ericksonacao@mymts.net
Lloyd Ewashko	Municipality of Harisson Park	admin@harrisonpark.ca Lloyd@inethome.ca
Kevin Bachewich	Riding Mountain Field Unit	kevin.bachewich@pc.gc.ca
Dieter Duester	INAC	Dieter.Duester@aandc-aadnc.gc.ca
Heather MacKenzie	Neegan Burnside Limited	Heather.mackenzie@neeganburnside.com
Kent Hunter	Neegan Burnside Limited	kent.hunter@neeganburnside.com
Richard Bolton	CIER	RBolton@yourcier.org
Peigi Wilson	CIER	peigiwilson04@gmail.com

Regrets

Tebesi Mosala	INAC	Tebesi.Mosala@aandc-aadnc.gc.ca
Barry Bone	Keeseekoowenin First Nation	barrylbone@outlook.com
Elvin Huntinghawk	Rolling River First Nation	ehuntinghawk@rrfn.net
Don Huisman	Municipality of Clanwilliam-Erickson	huismanathome@gmail.com ericksonadmin@ericksonmb.ca

The following items were discussed	Action by

1. Background

1.1 Neegan Burnside is preparing a Waste Management Strategy for the 5 partner communities making up the RSWARFC

Neegan Burnside had developed a data gap assessment for the Solid Waste Management Plan, and gap investigation developed to obtain enough information for the detailed design. The Memorandum was provided on November 17, 2016.

2. Purpose

2.1
- To discuss the gap assessment and gap assessment investigation program
- To provide a project update

3. Format

3.1 Neegan Burnside provided dial in numbers and screen sharing. The presentation is included as Attachment A.

4. Overview

- Completed to Date
  - Reviewed documents
  - Visited Sites
  - Meet staff and stakeholders
  - Teleconferences
  - Data Assessment
- Needs
  - Disposal capacity
  - Landfill area
  - Recycling diversion
- Options Overview
  - Option: Landfill for Partner Communities
    - capital costs around $4 Million
    - Gaps: Permission, Reconnaissance, Soil information (Standards say minimum 9 boreholes), Other data needed for permitting (biology, social)
  - Option: Exporting
    - Gaps: Meeting with Evergreen Board of Directors, Determine feasibility, Need Geotechnical properties of soils for retaining walls and features

The following items were discussed		Action by
	• Costs – Environmental – Total Environmental Cost (9 boreholes per 3 sites)..... $102,410 – Geotechnical – Total Cost for Geotechnical at 5 sites .....$27,130 – TOTAL.....$129,540 • Potential Cost Savings – Drilling in phased approach - May reduce costs – Select options first • Next Steps – Soil investigation – decision – Landowner meeting – Options Study – Meeting regarding Options Study (December 8) – Ideally include site reconnaissance	
5.	**Discussion**	
	• Lloyd stated that he would like input from Sustainable Development before progressing too far • Lloyd would need to talk to Council about approaching landowners • Lloyd expressed concern that the land for the site may be too small. • Iain stated that the R.M. currently does not have budget for this program • Dieter stated that we would need to discuss with Tebesi and see what his thoughts were	
6.	**Action**	
6.1	Neegan Burnside to set up teleconference with Sustainable Development	KH
6.2	Follow up teleconference with Tebesi (INAC) and FN groups not present on the call to be scheduled.	KH
6.3	Lloyd to begin discussions with Council on approaching landowners.	
6.4	Kevin, Lloyd and Iain are meeting separately regarding other issues and will discuss meeting with Evergreen.	KB/LE/IE
6.5	Meeting on December 8 was discussed. INAC to determine location and time.	TM

The preceding are the minutes of the meeting as observed by the undersigned. Should there be a need for revision, please advise Burnside within seven days of issuance. In the absence of notification to the contrary, these minutes will be deemed to be an accurate record of the meeting.

Minutes prepared by:

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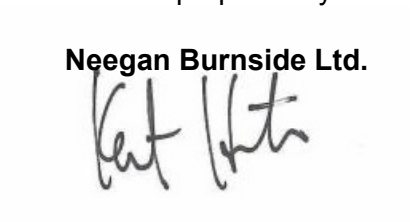

Kent Hunter
Senior Technical Lead
KH:

Distribution:

All Attendees and those of regrets list

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1

Summary of Current and Future Solid Waste Management Needs/Information Gaps/Workplan to Address Gaps and Needs

Kent Hunter/Heather Mackenzie
Neegan Burnside Ltd.

November 24, 2016
(makeup November 28, 2016)

2

Purpose of Teleconference

- Discuss progress to date
- Discuss Gap Analysis
- Discuss Gap Analysis Investigation Program
- Determine next steps

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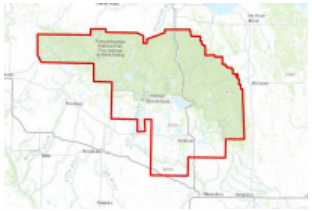
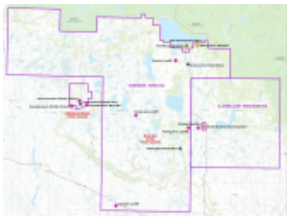
3

Objective of Study

- Consultant to determine options to meet the long-term (30 year) waste management needs for the communities.





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4

Completed to Date

- Reviewed documents
- Visited Sites
- Meet staff and stakeholders
- Teleconferences
- Data Assessment

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5

Needs

- Disposal Capacity (quarter quarter section)
- Recycling diversion capacity
- Options Report will contain more specifics
  - More specifics on recycling
  - Equipment
  - Composting
  - Reuse Depot
  - Waste Management Authority

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6

Options Overview

- Landfill for Partner Communities
- Advantages/Disadvantages
- capital costs around $4 Million
  - broken out in options report

SCHEDULE B
(Section 29)

LANDFILL REQUIREMENTS

Location requirements
1 The site of a landfill at the time it is established must be at least

(a) 100 metres from any railway or public road, other than the access road to the landfill;

(b) 400 metres from the property boundary of any cemetery;

(c) 400 metres from any potable water well;

(d) 100 metres from a natural gas pipeline or an underground utility corridor;

(e) 400 metres from any building; and

(f) 1 kilometre from any surface water.

Groundwater table
2 A landfill cell must be located on land where the seasonal high groundwater table is at least one metre below the lowest point of the cell.

Flood elevation and protection
3(1) Unless authorized by the director, a landfill must be located at an elevation at which, on average, a flood is expected to occur no more than once in 100 years.

ANNEXE B
(article 29)

EXIGENCES APPLICABLES AUX DÉCHARGES

Emplacement
1 Les décharges sont aménagées à un minimum :

a) de 100 m des voies ferrées ou des chemins publics, exception faite de la voie d'accès aux établissements en question;

b) de 400 m des limites des cimetières;

c) de 400 m des puits d'eau potable;

d) de 100 m des gazoducs ou des couloirs réservés aux canalisations de services publics;

e) de 400 m des bâtiments;

f) de 1 km des eaux de surface.

Nappe aquifère
2 Il doit exister une marge d'au moins 1 m entre le point le plus bas des alvéoles et le niveau supérieur de la nappe pendant la saison des crues.

Protection contre les inondations
3(1) Sauf autorisation contraire du directeur, les décharges sont situées à une hauteur où, en moyenne, les inondations surviennent uniquement aux 100 ans.

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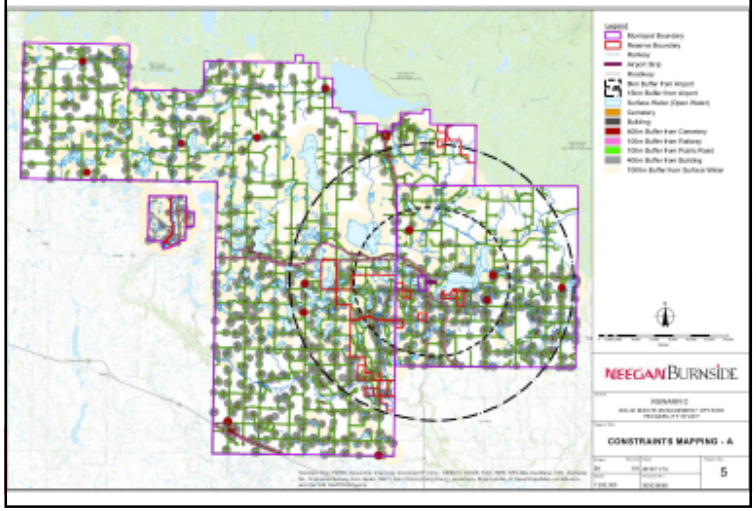
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CONSTRAINTS MAPPING - A
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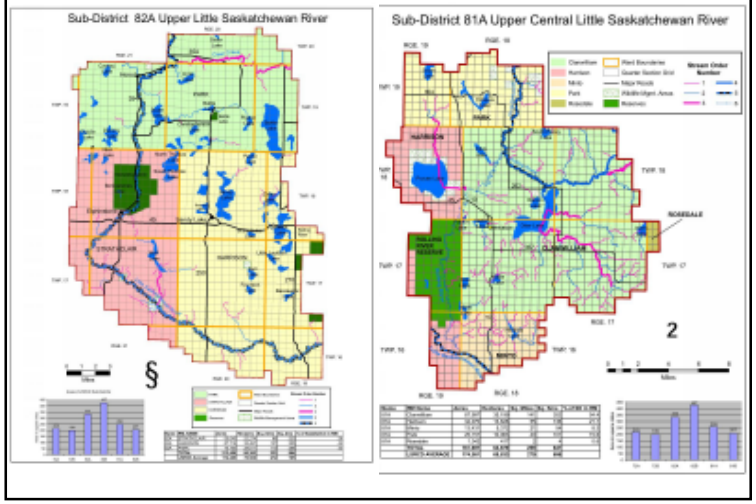
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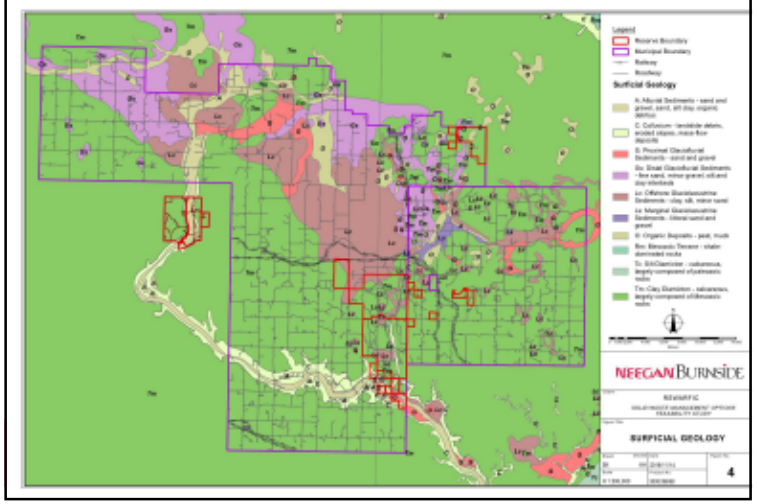
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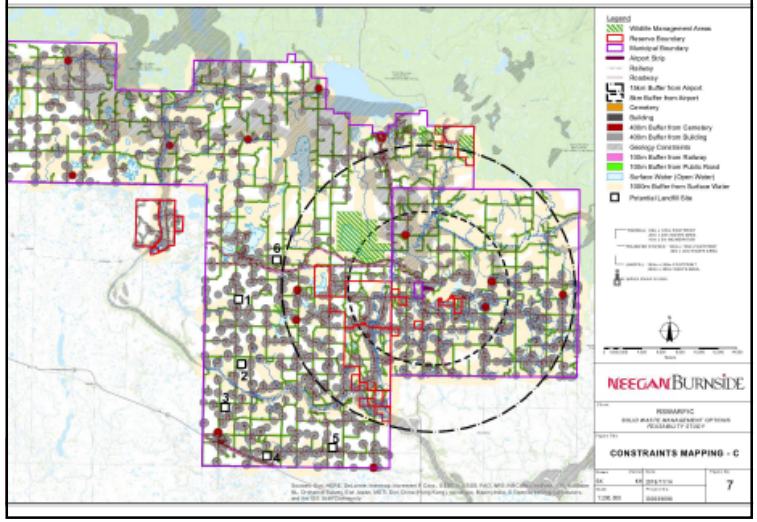

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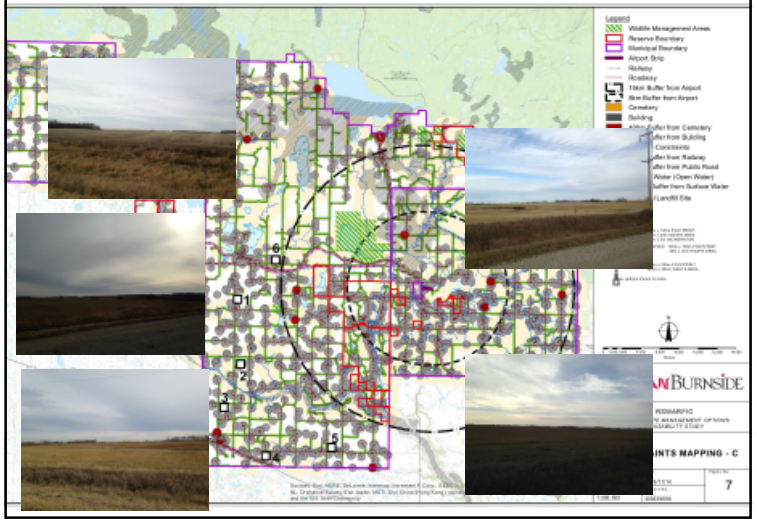


Manitoba

STANDARDS FOR LANDFILLS IN MANITOBA

DEPARTMENT OF SUSTAINABLE DEVELOPMENT

2016

3.3.1 Test Hole Requirements

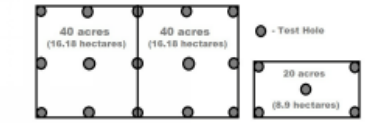
During subsurface investigation, test holes must be evenly distributed and drilled to a minimum depth of 10 metres below the proposed base of the active area unless auger refusal is reached before this depth. The minimum test hole density is listed in Table 5.

Table 5 - Minimum Test Hole Density

AREA		NUMBER OF TEST HOLES
(acres)	(hectares)	
20	8	5
40	16	9
80	32	15

The test holes may be arranged in the grid patterns illustrated in Figure 1.

Figure 1 – Suggested Test Hole Grid Patterns



Based on the results from the subsurface investigation, additional test holes should be added if warranted by site conditions.

17

Gaps

- Permission
- Reconnaissance (done in conjunction with Options Presentation?)
- Soil information (Standards say minimum 9 boreholes)
- Other data needed for permitting (biology, social)

Follow-up from teleconference: Lloyd and Kent to have teleconference with Manitoba Conservation and confirm they are okay with approach. Kent has called, but nothing set up yet.

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Option: Exporting

- Sending waste to another community
- Cheaper
- Not self sufficient
- Would generally require a transfer station in the community
  - On landfill or off site

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Direct Drive Haulage

- No infrastructure
- More trips
- (community collection)

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20

Haulage with Roll off truck(non compacted)

- More trips to disposal site
- Less infrastructure cost

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21

Haulage Option: Compaction Trailer

- Less trips to disposal site
- Higher infrastructure cost
- Involves "push pit" structure

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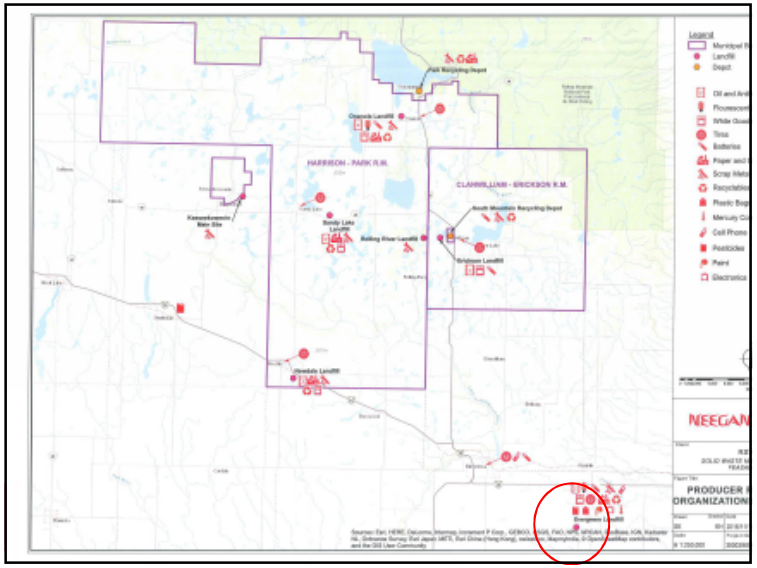

23

Gaps

- Meeting with Evergreen Board of Directors
  - Determine feasibility
- Need Geotechnical properties of soils for retaining walls and features

Follow-up from teleconference: Kevin, Lloyd and Iain are meeting separately regarding other issues and are going to discuss meeting with Evergreen

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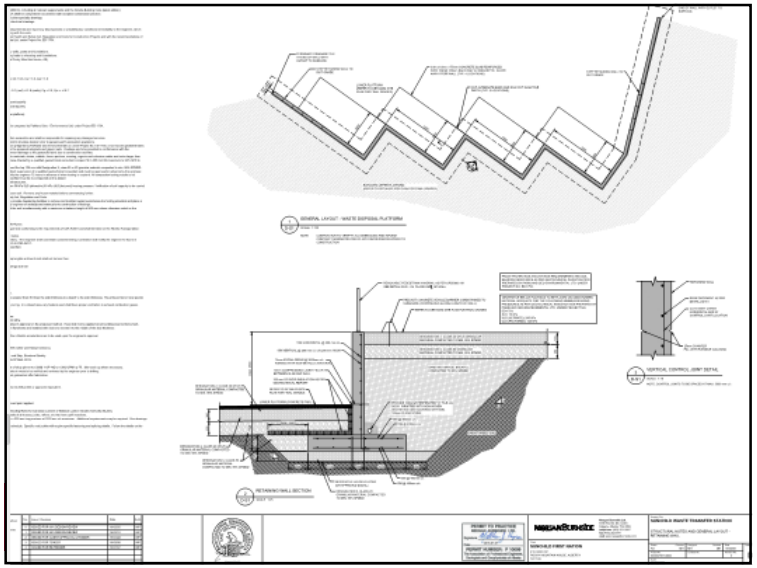

25

Costing

- Drillers quote
- Geotechnical quotes
- (Contingency added to drilling)
- No groundwater analysis
- Additional work needed for permitting

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Paddock Drilling Ltd.

GEOTECHNICAL AND ENVIRONMENTAL INVESTIGATIONS

COR

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Costs

Environmental	
Cost for Subcontractors	$50,246
Subcontractor contingency	$9,671
Cost Neegan Burnside	$33,553
Cost for supplies	$8,940
Total Environmental Cost	**$102,410**
Geotechnical	
Cost for one site	$8,690
Cost for additional sites ($4,610 X 4)	$18,440
Total Cost for Geotechnical at 5 sites	**$27,130**
TOTAL	**$129,540**

Follow-up from teleconference: R.M. would not have budget for more work at this time.

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Potential Cost Savings

- Drilling in phased approach
  - May reduce costs
- Select options first
  - (e.g., if landfill is suddenly not feasible based on cost estimates, no need for soil drilling, if exporting to Evergreen not going to be approved by Board, no need for geotechnical)

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Summary

- Landfill
  - Landowner permission
  - Site Reconnaissance
  - Soil investigation
  - Buildings – trailers or design/build
- Transfer Stations
  - Geotechnical

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Next Steps

- Soil investigation – decision
  - Landowner meeting
- Options Study
- Meeting regarding Options Study
  - (December 8)
    - Ideally include site reconnaissance
    - combine with landowner meetings

Follow-up from teleconference: Time and location. Will there be community meetings?

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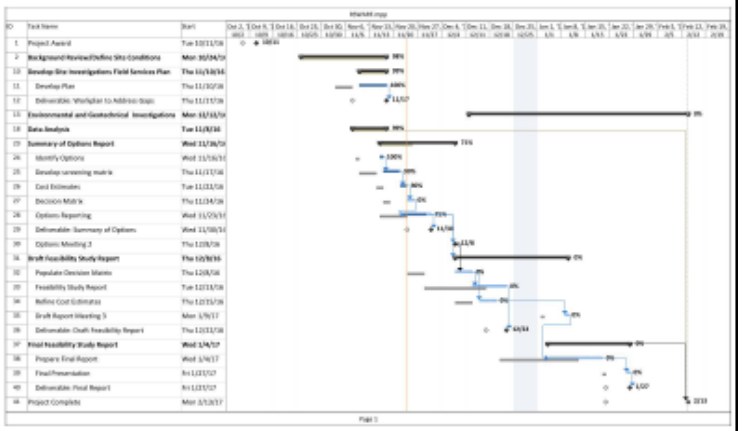
Schedule



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QUESTIONS?

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Appendix A-3
Gap Teleconference 2

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telephone (204) 949-7110 **fax** (204) 949-7111 **web** www.neeganburnside.com

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Notes of Teleconference 2

Meeting Date: November 28, 2016 **Project No.:** 300039698.0000

Project Name : Solid Waste Management Options Feasibility Study for the RSWARFIC

Meeting Subject: Summary of Current and Future Solid Waste Management Needs/Information Gaps/Workplan to Address Gaps and Needs

Meeting Location: Teleconference

Date Prepared: December 1, 2016

Those in attendance were:

Tebesi Mosala	INAC	Tebesi.Mosala@aandc-aadnc.gc.ca
Elvin Huntinghawk	Rolling River First Nation	ehuntinghawk@rrfn.net
Don Huisman	Municipality of Clanwilliam-Erickson	huismanathome@gmail.com ericksonadmin@ericksonmb.ca
Kent Hunter	Neegan Burnside Limited	kent.hunter@neeganburnside.com
Richard Bolton	CIER	RBolton@yourcier.org
Peigi Wilson	CIER	peigiwilson04@gmail.com

Regrets

Iain Edye	Municipality of Clanwilliam-Erickson	ericksonacao@mymts.net
Lloyd Ewashko	Municipality of Harisson Park	admin@harrisonpark.ca Lloyd@inethome.ca
Norman Bone	Keeseekoowenin First Nation	bone1953@outlook.com
Barry Bone	Keeseekoowenin First Nation	barrylbone@outlook.com
Kevin Bachewich	Riding Mountain Field Unit	kevin.bachewich@pc.gc.ca
Dieter Duester	INAC	Dieter.Duester@aandc-aadnc.gc.ca

Heather MacKenzie Neegan Burnside Limited Heather.mackenzie@neeganburnside.com

The following items were discussed	Action by

1. Background

1.1 This teleconference was a makeup teleconference because quite a few team members could not attend the earlier call. Please refer to Notes of Teleconference 1 (November 24) for background and overview

2. Discussion

2.1 Tebesi clarified that the purpose of the investigation was for site selection and preliminary design, and not for detailed design as stated in some parts of the ToR. Neegan Burnside had been developing the investigation on the understanding that it was to obtain enough information for detailed design for all sites.

Neegan Burnside to revise investigation program to obtain preliminary data only.

The team is still hopeful that some work can be done this year.

2.2 The partner communities made the following recommendations for the options report:

- Include discussion of incineration or other technologies, although it is recognized these may not be suitable based on the population
- Assess entire systems (e.g., if transfer stations are needed in conjunction with the landfill, they should be costed as such)
- Consider life cycle costs
- Consider exporting to sites further than Evergreen

3. Options Meeting

The options meeting is set for December 8 in the morning but Tebesi still needs to confirm time and location.

Following the options meeting, there will be a separate meeting with the Centre for Indigenous Environmental Resources to discuss the partnership approach. Neegan Burnside does not need to attend this meeting.

Neegan Burnside to assess doing the site reconnaissance on the 7th (the day before the meeting).

The following items were discussed		Action by
4.	**Action**	
4.1	Neegan Burnside to set up teleconference with Sustainable Development	KH
4.2	Neegan Burnside to revise the investigation costs	KH
4.3	Meeting on December 8 was discussed. INAC to determine location and time.	TM

The preceding are the minutes of the meeting as observed by the undersigned. Should there be a need for revision, please advise Burnside within seven days of issuance. In the absence of notification to the contrary, these minutes will be deemed to be an accurate record of the meeting.

Minutes prepared by:

Neegan Burnside Ltd.

Kent Hunter
Senior Technical Lead
KH:

Distribution:

All Attendees and those of regrets list

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Appendix A-4
Sustainable Development Teleconference

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Notes of Sustainable Development Teleconference

Meeting Date: November 30, 2016 **Project No.:** 300039698.0000

Project Name : Solid Waste Management Options Feasibility Study for the RSWARFIC

Meeting Subject: Comment from Sustainable Development

Meeting Location: Teleconference

Date Prepared: December 12, 2016

Those in attendance were:

Cory Switser	Sustainable Development	Cory.Switzer@gov.mb.ca
Siobhan Ross	Sustainable Development	Siobhan.BurlandRoss@gov.mb.ca
Lloyd Ewashko	Municipality of Harisson Park	admin@harrisonpark.ca Lloyd@inethome.ca
Heather MacKenzie	Neegan Burnside Limited	Heather.mackenzie@neeganburnside.com
Kent Hunter	Neegan Burnside Limited	kent.hunter@neeganburnside.com

The following items were discussed	**Action by**

1. Background

It had been requested that Neegan Burnside obtain comment from Sustainable Development regarding site selection and keep Sustainable Development informed on the progress.

2. Discussion

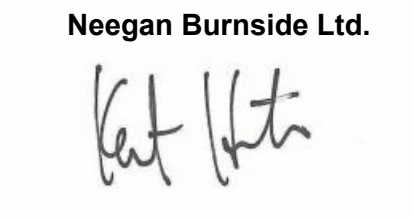
Kent used screen sharing to present some slides to explain the site selection process undertaken to date (slides are included as Appendix A). Significant points of conversation are summarized in the bullets which follow:

The following items were discussed	Action by
• The 5 partners making up the Regional Solid Waste and Recycling Facility Communities (RSWARFC) comprise Keeseekoowenin First Nation, Rolling River First Nation, Rural Municipality (R.M.) Of Clanwilliam-Erickson, R.M. of Harrison Park and The Riding Mountain National Park (RMNP). • They have retained Neegan Burnside to assist them in development options for solid waste management, which includes considering a landfill in the community. • The site selection process was reviewed. It is generally following Manitoba Standards. • It was suggested that the 1 km setback from surface water is be assessed on a site by site basis, and may not necessary need to apply if the surface water body is small seasonal sloughs or potholes. Cory stated that this approach would be considered, provided a proper assessment was done. • The next steps involve talking to homeowners and council. **3. Conclusion** Sustainable Development saw no issues with the approach or work undertaken to date.	

The preceding are the minutes of the meeting as observed by the undersigned. Should there be a need for revision, please advise Burnside within seven days of issuance. In the absence of notification to the contrary, these minutes will be deemed to be an accurate record of the meeting.

Minutes prepared by:

Neegan Burnside Ltd.



Kent Hunter

Senior Technical Lead
KH:
161130 Sustainable Development teleconference 39698.docx 12/12/2016 10:33 AM

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Solid Waste Management Study South of Park - RSWARFC

Kent Hunter
Neegan Burnside Ltd.

November 30, 2016

2

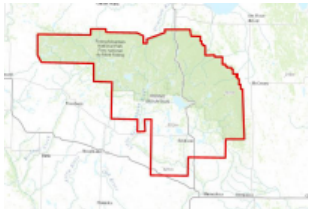
Purpose of Teleconference

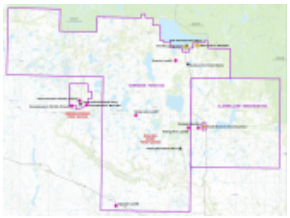
- Provide update to Sustainable Development
- Obtain preliminary comments from Sustainable Development to allow us to move forward

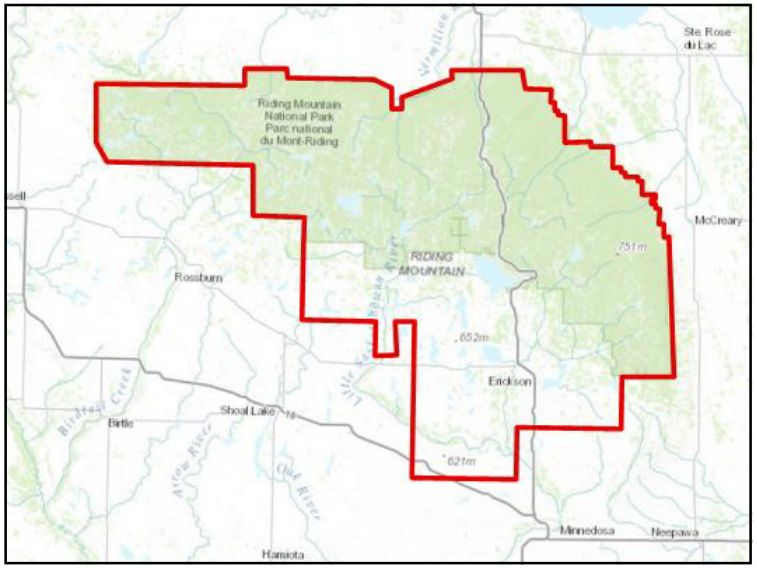
3

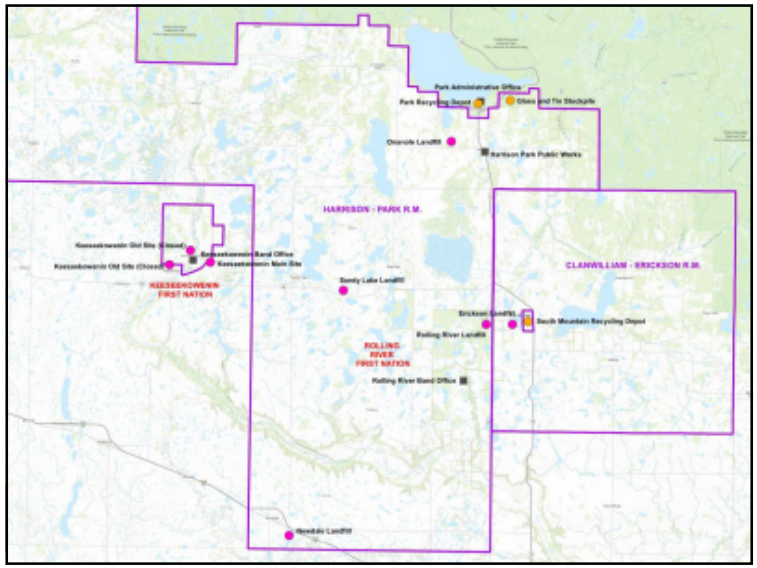
Objective of Study

- Neegan Burnside to determine options to meet the long-term (30 year) waste management needs for the communities.









SCHEDULE B
(Section 29)

LANDFILL REQUIREMENTS

Location requirements
1 The site of a landfill at the time it is established must be at least

(a) 100 metres from any railway or public road, other than the access road to the landfill;

(b) 400 metres from the property boundary of any cemetery;

(c) 400 metres from any potable water well;

(d) 100 metres from a natural gas pipeline or an underground utility corridor;

(e) 400 metres from any building; and

(f) 1 kilometre from any surface water.

Groundwater table
2 A landfill cell must be located on land where the seasonal high groundwater table is at least one metre below the lowest point of the cell.

Flood elevation and protection
3(1) Unless authorized by the director, a landfill must be located at an elevation at which, on average, a flood is expected to occur no more than once in 100 years.

ANNEXE B
(article 29)

EXIGENCES APPLICABLES AUX DÉCHARGES

Emplacement
1 Les décharges sont aménagées à un minimum :

a) de 100 m des voies ferrées ou des chemins publics, exception faite de la voie d'accès aux établissements en question;

b) de 400 m des limites des cimetières;

c) de 400 m des puits d'eau potable;

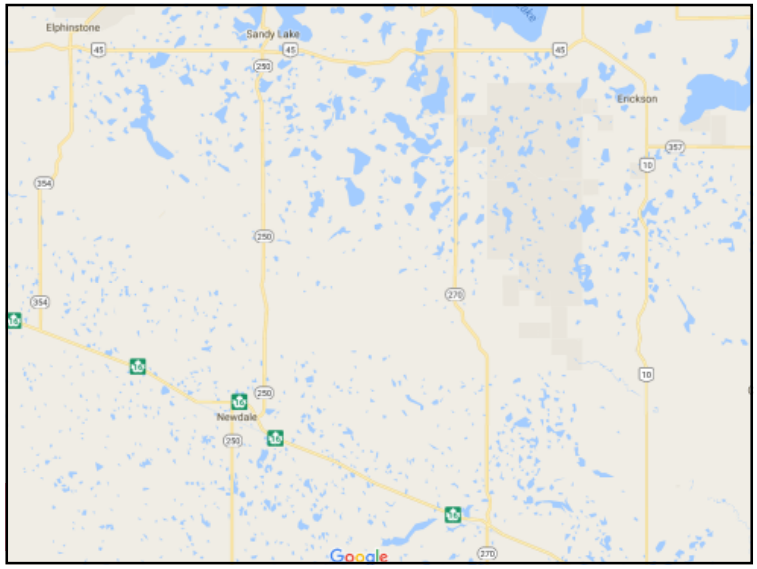
d) de 100 m des gazoducs ou des couloirs réservés aux canalisations de services publics;

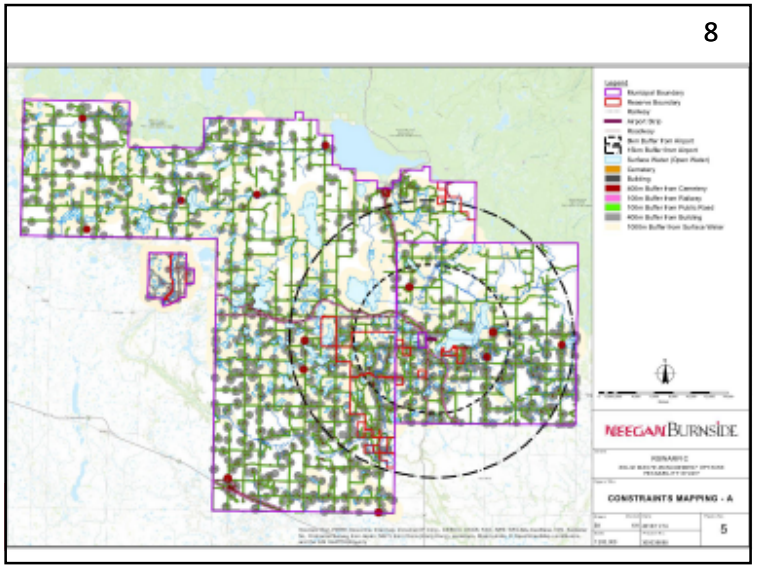
e) de 400 m des bâtiments;

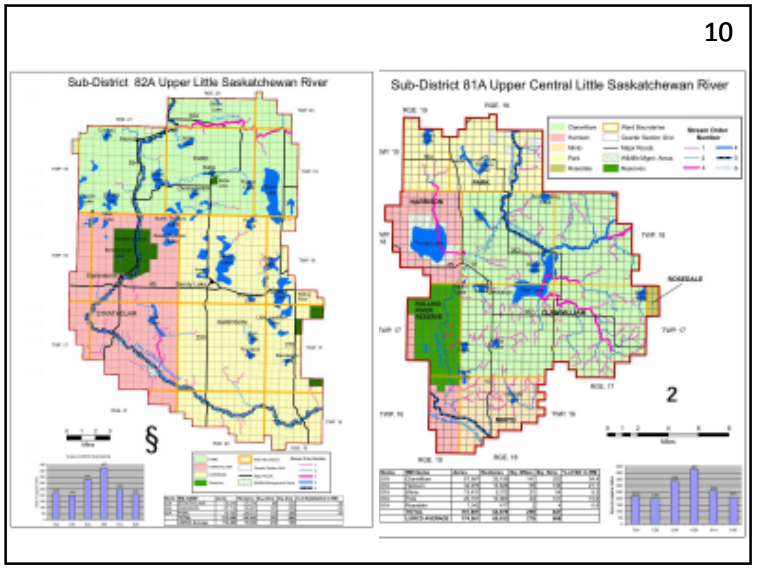
f) de 1 km des eaux de surface.

Nappe aquifère
2 Il doit exister une marge d'au moins 1 m entre le point le plus bas des alvéoles et le niveau supérieur de la nappe pendant la saison des crues.

Protection contre les inondations
3(1) Sauf autorisation contraire du directeur, les décharges sont situées à une hauteur où, en moyenne, les inondations surviennent uniquement aux 100 ans.



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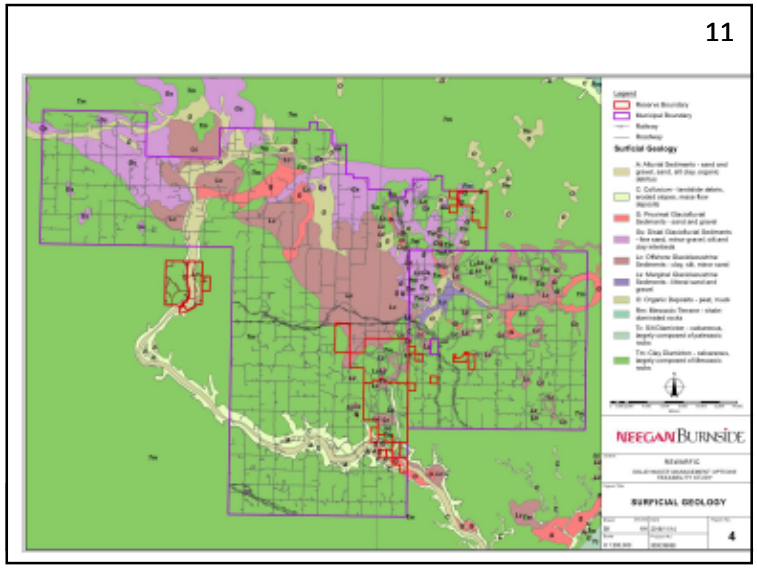
Sub-District 82A Upper Little Saskatchewan River
Sub-District 81A Upper Central Little Saskatchewan River
2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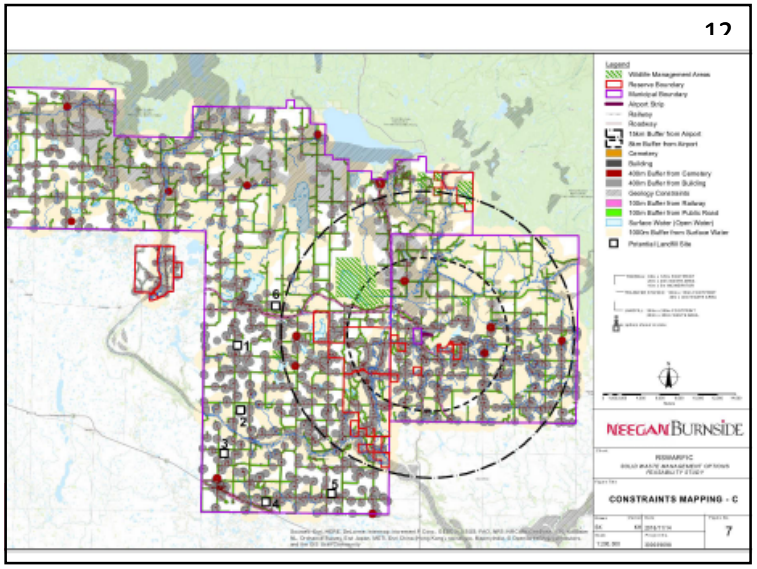
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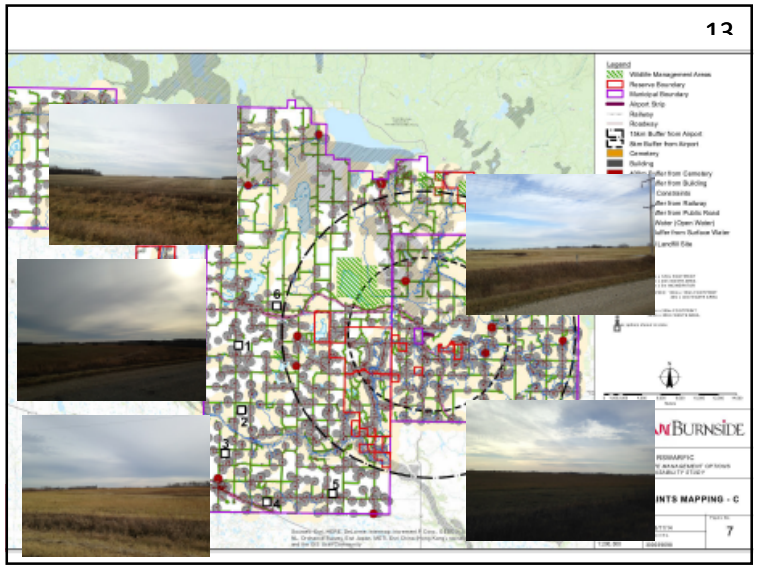

Next Steps

- Council discussion
- Homeowner discussion
- Site reconnaissance
- Subsurface investigation
- Preliminary Design
- Permitting/Detailed Design

Sustainable Development Comment

- Seeking comment from Conservation that this would be considered

QUESTIONS?

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Appendix A-5
Options Meeting

DRAFT

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Options Meeting Notes

Meeting Date: December 8, 2016 **Project No.:** 300039698.0000

Project Name : Solid Waste Management Options Feasibility Study for the RSWARFC

Meeting Subject: Options Presentation

Meeting Location: Elkhorn Resort - Onanole

Date Prepared: December 12, 2016

Those in attendance were:

Barry Bone	Keeseekoowenin First Nation	barrylbone@outlook.com
Elvin Huntinghawk	Rolling River First Nation	ehuntinghawk@rrfn.net
Don Huisman	Municipality of Clanwilliam-Erickson	huismanathome@gmail.com ericksonadmin@ericksonmb.ca
Elgin Hall	Municipality of Clanwilliam-Erickson	
Jackie Greavett	Municipality of Clanwilliam-Erickson	Jackie.greavett@ericksonmb.ca
Iain Edye	Municipality of Clanwilliam-Erickson	acao@ericksonmb.ca
Lloyd Ewashko	Municipality of Harisson Park	admin@harrisonpark.ca Lloyd@inethome.ca
Kevin Bachewich	Riding Mountain Field Unit	kevin.bachewich@pc.gc.ca
Tebesi Mosala	INAC	Tebesi.Mosala@aandc-aadnc.gc.ca
Richard Bolton	CIER/FCM	RBolton@yourcier.org
Peigi Wilson	FCM	peigiwilson@fcm.ca
Anita Olsen Harper	FCM	alharper@fcm.ca
Rebekah Wilson	FCM	rwilson@fcm.ca

Heather MacKenzie	Neegan Burnside Limited	Heather.mackenzie@neeganburnside.com
Kent Hunter	Neegan Burnside Limited	kent.hunter@neeganburnside.com

The following items were discussed	**Action by**

1. Introductions

1.1 The attendees introduced themselves. Due to challenging weather conditions, several were late and were introduced as they arrived. The sign in sheet is included as Attachment A.

2. Presentation

2.1 Kent presented the Options Report, which was sent out by email on December 1 (slides for the presentation are included as Attachment B). This presentation walked the attendees through the report, although it should be recognized that there are many more details in the report. Significant points of conversation are summarized in the bullets which follow:

- Baseline conditions at all sites were discussed
- It was acknowledged that cardboard was burned, which may disqualify the R.M.s from funding from MMSM. Don stated that they were aware of that. Kent indicated that ceasing to burn cardboard and shipping off to their current receiver (who accepts cardboard) would be included as a recommendation in the report, and asked if additional direction is needed. Don stated that it should be pointed out that cardboard should be recycled.
- It will be a recommendation in the report that glass also be recycled.
- It was requested that more clarity be provided in the report on what to do with Electronic Waste. They have issues because the waste is not just residential. Kent to call the Electronics Stewardship and develop an action plan.
- Report to include clear recommendations on management of propane tanks.
- Kent indicated that the current recycling is only about 3% of the total waste stream, based on the data reported to Green Manitoba. It was acknowledged that there may be flaws in the data, but it was recognized that there was definitely room for improvement.

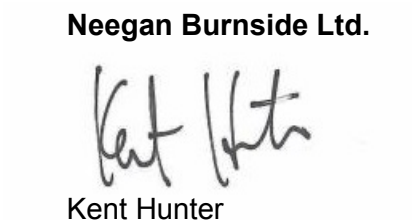
The following items were discussed	Action by
• Waste projections were reviewed. A quarter section was recommended as the land required for a landfill.	
• Options were discussed. These included Landfilling, exporting and incineration.	
• It was noted that a meeting with Evergreen would be needed to determine whether partnering was possible. Don has contacted them and hopes to hear back soon.	DH
• It was noted that other sites, such as Brandon, could be considered. Don will contact Brandon to determine if there are partnering possibilities.	DH
• The cost of land to purchase a landfill was discussed. Kent had allowed $150,000. This was felt to be too low, and should be closer to $250,000. Kent was to rerun the projections with this higher cost.	KH
• Kent discussed incineration and said it would be discussed in the report, but would not be included as a recommendation.	
• Closure of landfill sites was discussed. Kent indicated that if the landfill was converted to a transfer station, the closure cost had been deferred. After some discussion, Kent indicated that costing would be revised so that part of the closure (landfill cover and grading) would happen upon closure, and the remainder (building removal) would happen in 30 years.	KH
• Offering collection throughout all the R.M. was discussed as a way to remove the needs for a transfer station. It was felt that this would not be feasible. It will be discussed, but will not be a recommendation in the report.	
• Kent asked if there was any strong preference for any options. It was indicated that a R.M. landfill would keep employment in the area, so would be a preference, if all things were equal. Landfills in the FN communities or the Park would not be possible. It was stated that any new system should have comparable service to that being offered now.	
3. Investigation	
3.1 Kent indicated that although Neegan Burnside could do the soil investigation now, it would be more expensive due to weather conditions and may not yield ideal results.	
3.2 Don was concerned that if the investigation was not done now, it would delay the project by a year.	
3.3 Lloyd expressed that the public would need to be notified before any	

The following items were discussed		Action by
	sites could be investigated. This process has not been started yet and must be handled appropriately.	
3.4	Kent stated that the costs for the landfill could be based on assumptions that a suitable site would be present within the community and provide enough preliminary design information to allow for decisions to be made.	KH
3.5	It was agreed by all that the drilling would be delayed and Neegan Burnside would state assumptions and develop a conceptual design report.	
3.6	Don requested confirmation that the costing would be detailed so it could be reviewed. Kent stated that this would be done.	KH
4.	**Community Meeting**	
4.1	The need for a community meeting or meetings was discussed. It was expressed that the public will need to be informed.	
4.2	Kevin suggested that a flier could be put together outlining the program and distributed to the community with utility bills or put on websites. All agreed that this was a reasonable approach.	
4.3	Neegan Burnside to begin work on the flier, with the understanding that some of the finer points will be added by the RSWARFC as the program advances.	KH
4.4	Kent clarified that the budget to produce the flier would come from the money allocated for the community meeting. Tebesi said this was okay, as long as the communities do not come back later and also want a public meeting. Lloyd and Don stated that they would not be coming back and asking for a community meeting at a later date.	
5.	**Action Items**	
5.1	Kent to follow up with Electronic Stewardship and rework costs based on suggestions made during meeting.	KH
5.2	Don to contact Evergreen and Brandon and report back to Kent on whether these options are feasible.	DH
5.3	Kent to finalize report, with recommended options and an accompanying memorandum.	KH
5.4	Drilling will be deferred to the spring.	

The preceding are the minutes of the meeting as observed by the undersigned. Should there be a need for revision, please advise Neegan Burnside within seven days of issuance. In the absence of notification to the contrary, these minutes will be deemed to be an accurate record of the meeting.

Minutes prepared by:

Neegan Burnside Ltd.



Kent Hunter
Senior Technical Lead
KH:

Distribution:

All Attendees

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BURNSIDE

Date | File No. | Name

Project

Name	Company	Email
Elvin Hunterhawk	Rolling River	Elvinterhawk@rrfn.net.
Kent Hunter	Neegan Burnside	kent.hunter@neeganburnside.com
ELGIN HALL	Municipality of Clanwilliam - Erickson	
Don Huisman.	M of Clanwilliam Erickson	huismanathome@gmail.com
LLOYD TWASHKO	HARRISON PARK	lloyd o inethome.ca
Kevin Bachewich	Parks CANADA	Kevin.bachewich@pc.gc.ca
Iain Edye	Clanwilliam-Erickson	acao@ericksonmb.ca
Jackie Greavett	Clanwilliam-Erickson	jackie.greavett@ericksonmb.ca
Barry Bone	Keeseekoowenin	barrylbone@outlook.com
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Feigi Wilson	FCM, Ottawa	fwilson@fcm.ca

Page of

1

Options Report

Kent Hunter/Heather MacKenzie
Neegan Burnside Ltd.

December 8, 2016

2

Purpose of Meeting

- Walk-through Options Report
  - (highlights)
- Discuss Options and obtain preliminary feedback
  - Use in Feasibility Report
- Determine next steps

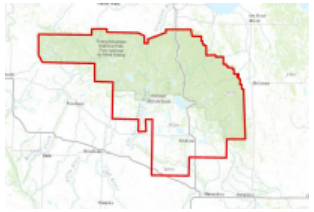
3

Introduction

4

Objective of Study

- Consultant to determine options to meet the long-term (30 year) waste management needs for the communities.



Completed to Date

5

- Reviewed documents
- Visited Sites
- Meet staff and stakeholders
- Teleconferences
- Data Assessment

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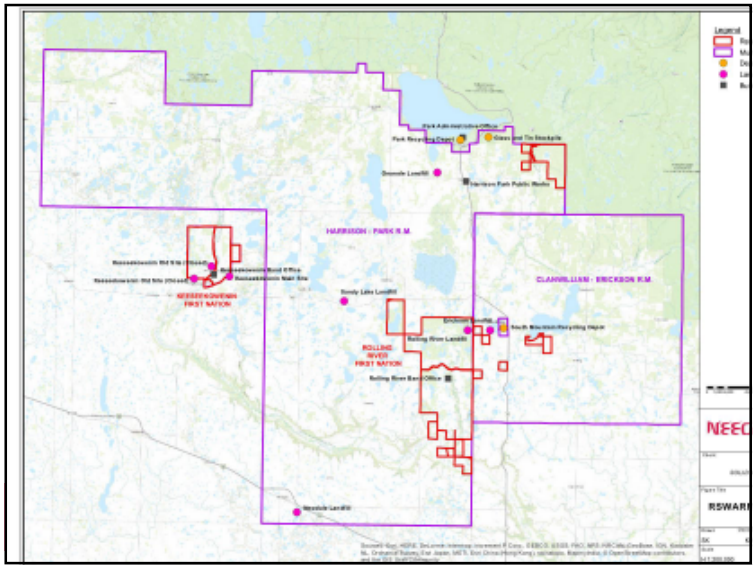
6

Baseline Conditions



Keeseekoowenin Landfill

Rolling River




Erickson Landfill




Sandy Lake Landfill – Harrison Park




Newdale Landfill- Harrison Park




Onanole Landfill – Harrison Park

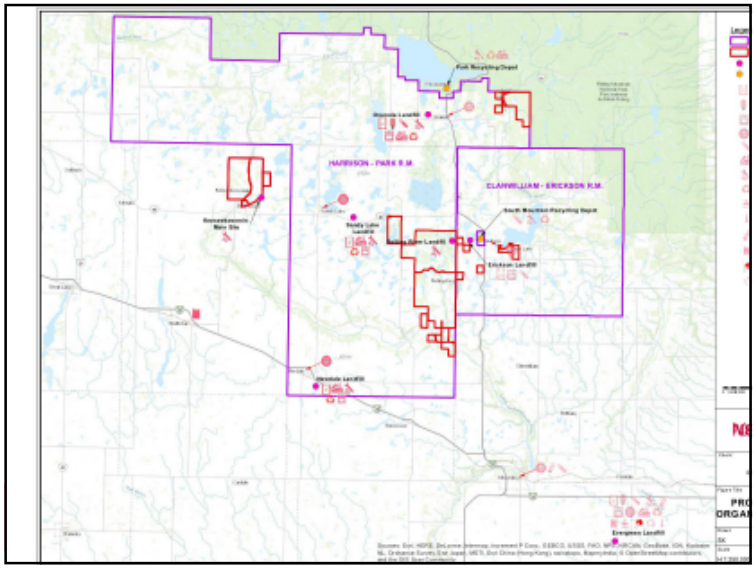



Riding Mountain National Park




South Mountain Recycling – Clanwilliam -Erickson



Diversion

17

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Recycling Rates

Clanwilliam-Erickson

C. Waste Reported:

	2013		2014		2015		2016
	Jan-June	Jul-Dec	Jan-June	Jul-Dec	Jan-June	Jul-Dec	Jan-June
Total Reported Waste Disposed (Tonnes/Year)	0.000	0.000	0.000	0.000	297.330	297.330	297.330
WRARS Levy Paid	0.000	0.000	0.000	0.000	2,973.300	2,937.300	2,973.300
Per Capita Waste	0.000	0.000	0.000	0.000	0.330	0.330	0.330

D. Recycling Reported:

	2011		2012		2013		2014		2015		2016
	Jan - June	Jul - Dec	Jan - June	Jul - Dec	Jan - June	Jul - Dec	Jan - June	Jul - Dec	Jan - June	Jul - Dec	Jan - June
Total Reported Recycling (Tonnes/Year)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3,020	3,955	11,045
Per Capita Recycling Rate	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.004	0.013
Recycling Rebate Paid	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	353.27	364.09	1,032.81

Recycling Rates

Harrison Park
(Onanole and Sandy Lake)

C. Waste Reported:

	2013		2014		2015		2016
	Jan-June	Jul-Dec	Jan-June	Jul-Dec	Jan-June	Jul-Dec	Jan-June
Total Reported Waste Disposed (Tonnes/Year)	0.000	0.000	0.000	0.000	481.110	481.110	481.110
WRARS Levy Paid	0.000	0.000	0.000	0.000	4,811.100	4,811.100	4,811.100
Per Capita Waste	0.000	0.000	0.000	0.000	0.330	0.330	0.330

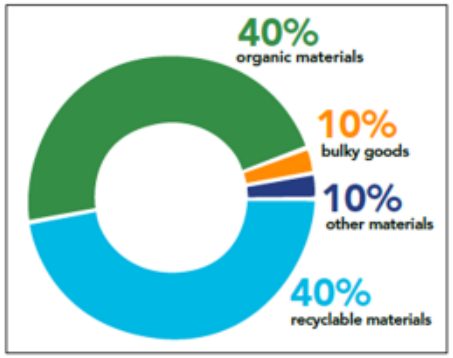
1822 (own data)

D. Recycling Reported:

	2011		2012		2013		2014		2015		2016
	Jan - June	Jul - Dec	Jan - June	Jul - Dec	Jan - June	Jul - Dec	Jan - June	Jul - Dec	Jan - June	Jul - Dec	Jan - June
Total Reported Recycling (Tonnes/Year)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	55,574
Per Capita Recycling Rate	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.01
Recycling Rebate Paid	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4,929.41

20

TYPICAL CONTENT OF RESIDENTIAL WASTE IN CANADA



FCM, Getting to 50% and Beyond (2009)

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Needs

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Needs

- Disposal Capacity
- Recycling - diversion capacity
- Weighscales
- Composting
- Reuse Station
- Service Agreement

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Waste Generation

	Rate (tonnes per year)	Growth Rate (based on population growth)
Keeseekoowenin First Nation	90	3.7%
Rolling River First Nation	90	6.0%
Clanwilliam-Erickson	595	1.0%
Harrison Park		
Sandy Lake	170	
Newdale	44	
Onanole	2283	
Subtract RMNP (included)	-675*	
TOTAL	1822	1.0%
RMNP	675*	2.0%

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Total Waste (30 years)

- 3,300 tonnes per year (current)
- 5,200 tonnes per year (30 year projection)
- 130,000 tonnes total

- Estimate 16 ha – larger area for contingency

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Diversion

25

- Manitoba diversion rate = 15%
- Target about 30 to 50%
- Composting

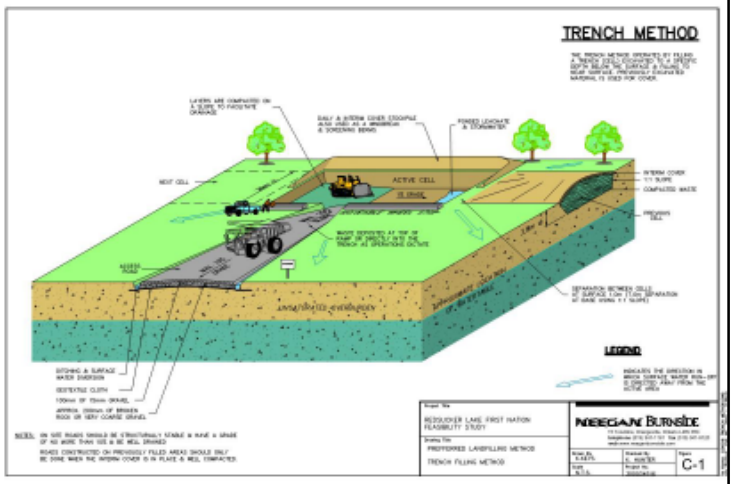
Waste Management Options

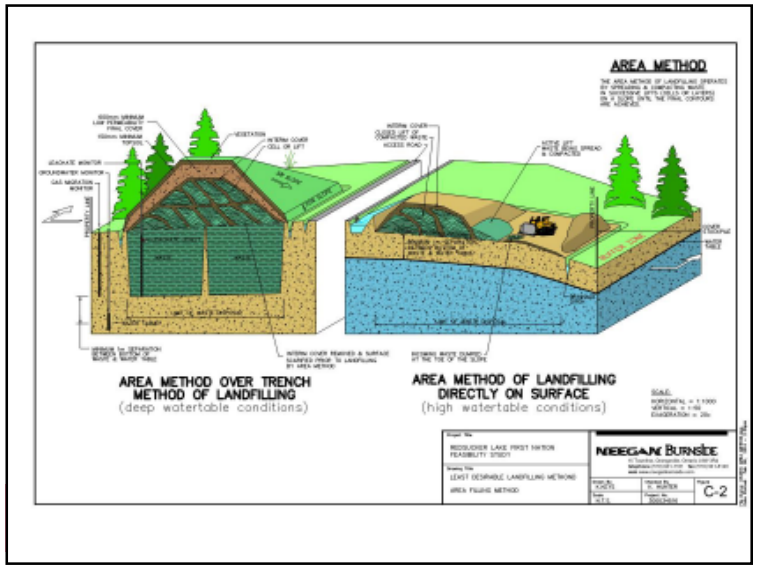
26

Options Overview

27

- Landfill for Partner Communities
- Advantages/Disadvantages
- capital costs around $4 Million




AREA METHOD
AREA METHOD OVER TRENCH METHOD OF LANDFILLING
(deep watertable conditions)
AREA METHOD OF LANDFILLING DIRECTLY ON SURFACE
(high watertable conditions)
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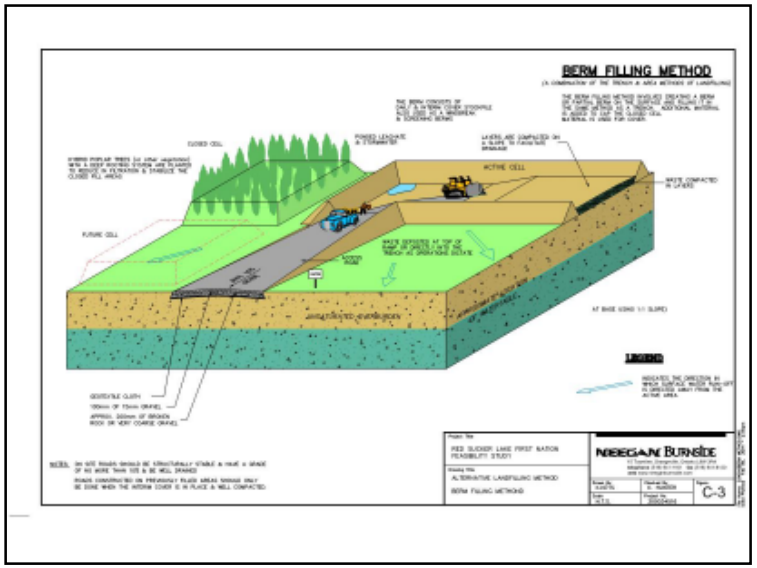
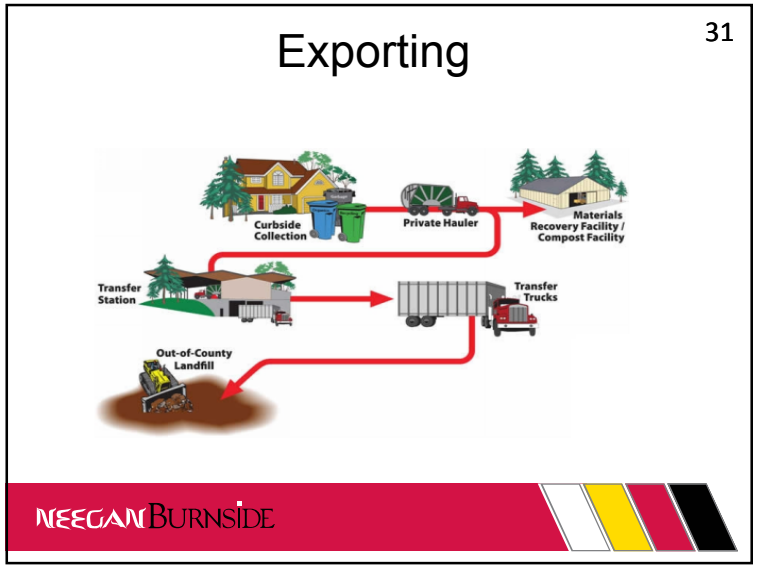
C-2


BERM FILLING METHOD
NEEGAN BURNSIDE
C-3


Exporting
31
Curbside Collection
Private Hauler
Materials Recovery Facility / Compost Facility
Transfer Station
Transfer Trucks
Out-of-County Landfill
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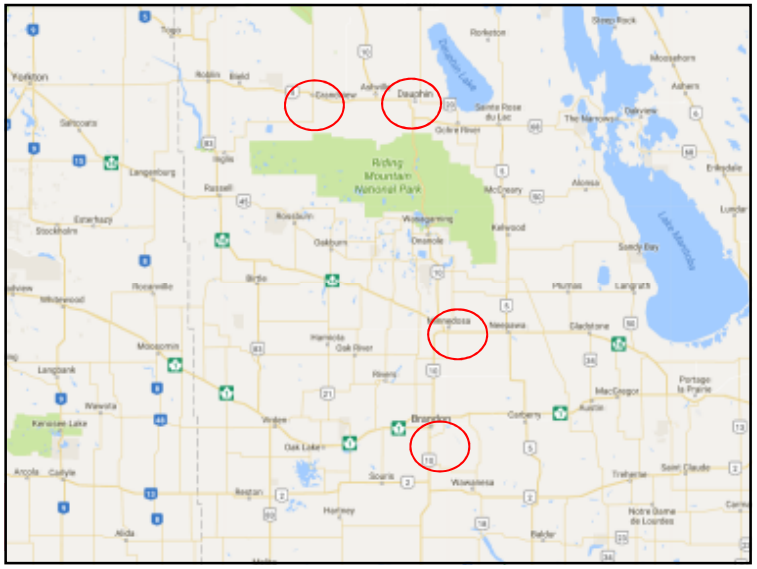
Riding Mountain National Park

Direct Drive Haulage

33

- No infrastructure
- More trips
- (community collection)

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On grade design

Elevated Platform

Transfer Station – Elevated Platform

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- More trips to disposal site
- Less infrastructure cost

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Haulage Option: Compaction

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- Less trips to disposal site
- Higher infrastructure cost
- Involves compaction (truck, stationary, pit)

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Compaction

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4 tonnes	20 tonnes	35 tonnes
967 trips per year	193 trips per year	110 trips per year

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OPTION: TECHNOLOGY

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- Examples include
  - incineration,
  - anaerobic digestion, and
  - gasification.
- Reduces the volume of waste that requires landfilling
- Byproduct produced which still needs to be managed.

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Similar Unit

12.4 AMEC – DeBeers Victor Diamond Project

This is a Model 500 incinerator, operating at a remote diamond mine in northern Ontario, Canada. It is used to incinerate any camp waste that is generated at the site.

Also included with this unit is a scrubber, Siemens PLC and HMI, and a comprehensive continuous emissions monitoring system. Approximate equipment replacement cost for the entire incineration system is $2,500,000 CAD.

12.4.1 Reference

Infratech job		03-304
Contact	Name	Abdol Faorooghi, P.Eng
	Position	Sr. Process Engineer
	Phone	905-829-5400
	e-mail	abdol.forooghi@amec.com
Completion date		July 2006

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Diversion

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- Cardboard, glass, electronic waste can be accepted at your current receiver
  - Requirement MMSM
- Hazardous Waste – Contract can be established at no cost

MMSM
Multi-Material Stewardship Manitoba

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Costs Associated with Various Scenarios

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Scenarios

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- Draft report outlines a few different scenarios – but there are many more
- Input from the RSWARFC may lead to additional needs

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Scenario 1

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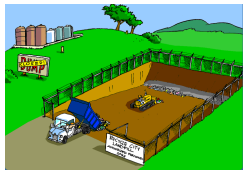
- New Landfill (Construction)
- Setting Up a Service Agreement
- Miscellaneous Capital Costs
- Keeseekoowenin landfill closure
- Rolling River landfill closure
- Erickson landfill closure
- Onanole landfill closure
- Sandy Lake landfill closure
- Newdale landfill closure
- RMNP site clean-up
- Landfill Operations
- WRARS Levy
- Annual Maintenance of Closed Sites



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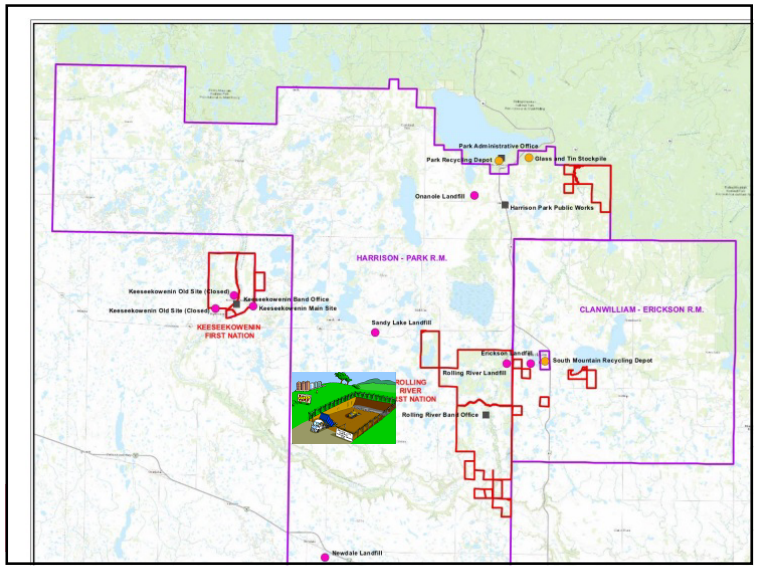

50

Scenario 2

- New Landfill
- Setting Up a Service Agreement
- Miscellaneous Capital Costs
- Roll off trucks (2)
- Keeseekoowenin landfill (**construct small transfer station**)
- Rolling River landfill (landfill closure)
- Erickson landfill (construct small transfer station)
- Onanole landfill (construct small transfer station)
- Sandy Lake landfill (landfill closure)
- Newdale landfill (construct very small transfer station)
- RMNP site clean up
- Landfill Operations
- Annual Maintenance of Closed Sites
- Keeseekoowenin (Haulage by Roll-off truck)
- Erickson (Haulage by Roll-off truck)
- Onanole (Haulage by Roll-off truck)
- Sandy Lake (site closed, haulage by community)
- Newdale (Haulage by Roll-off truck)
- RMNP site haulage by Parks Canada to new site

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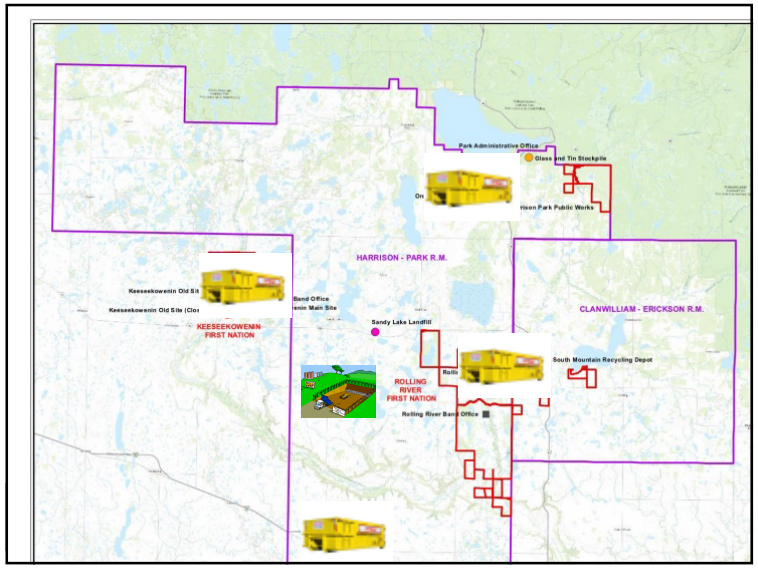

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Scenario 3

- New Landfill
- Setting Up a Service Agreement
- Common Capital Costs
- Roll off trucks (2)
- Keeseekoowenin landfill (construct small transfer station)
- Rolling River landfill (landfill closure)
- Erickson landfill (construct **large** transfer station)
- Onanole landfill (construct large transfer station)
- Sandy Lake landfill (landfill closure)
- Newdale landfill (construct very small transfer station)
- RMNP site clean up
- Total Capital Costs
- Landfill Operations
- WRARS Levy
- Annual Maintenance of Closed Sites
- Keeseekoowenin (Haulage by Roll-off truck)
- Erickson (Haulage by Roll-off truck)
- Onanole (Haulage by Roll-off truck)
- Sandy Lake (site closed, haulage by community)
- Newdale (Haulage by Roll-off truck)
- RMNP site haulage by Parks Canada to new site

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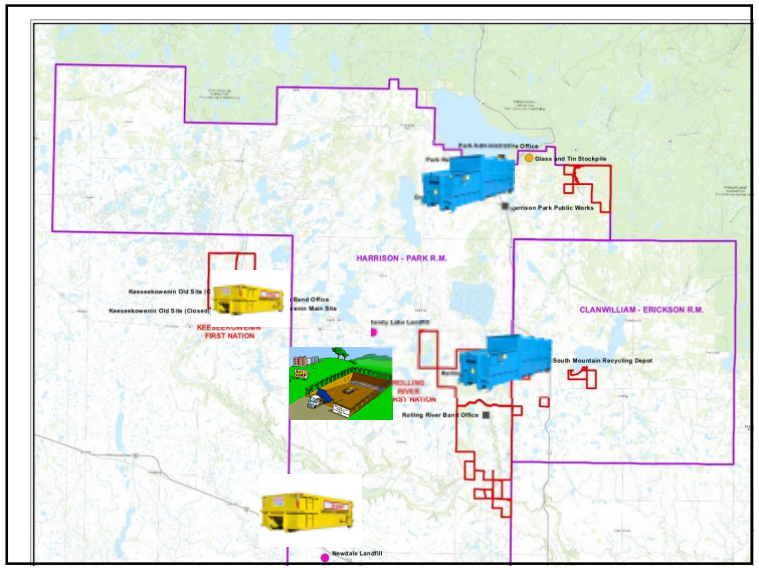

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Scenario 4

- Partnership fees
- Common Capital Costs
- Loader
- Roll off trucks (2)
- Keeseekoowenin landfill (close)
- Rolling River landfill (close)
- Erickson landfill (construct large transfer station)
- Onanole landfill (construct large transfer station)
- Sandy Lake landfill (close)
- Newdale landfill (close)
- RMNP site (clean-up)
- WRARS Levy
- Annual Maintenance of Closed Sites
- Erickson - Haulage by Roll off truck
- Onanole - Haulage by Roll off truck
- RMNP site – site closed, haulage by PC to Onanole

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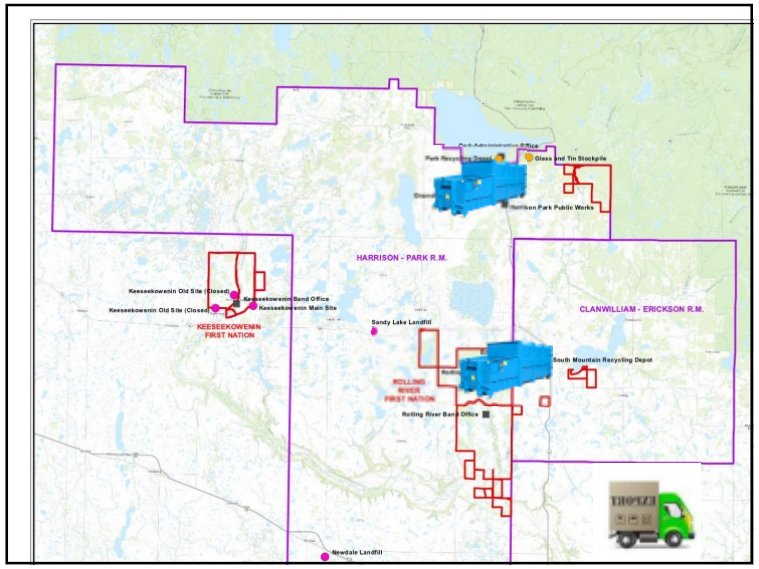

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Scenario 5

- Partnership fees
- Common Capital Costs
- Roll off trucks (2)
- Keeseekoowenin landfill (construct small transfer station)
- Rolling River landfill (close)
- Erickson landfill (construct small transfer station)
- Onanole landfill (construct small transfer station)
- Sandy Lake landfill (construct small transfer station)
- Newdale landfill (construct very small transfer station
- RMNP site (clean-up)
- WRARS Levy
- Annual Maintenance of Closed Sites
- Haulage by all sites
- RMNP site (haulage by PC to Onanole)

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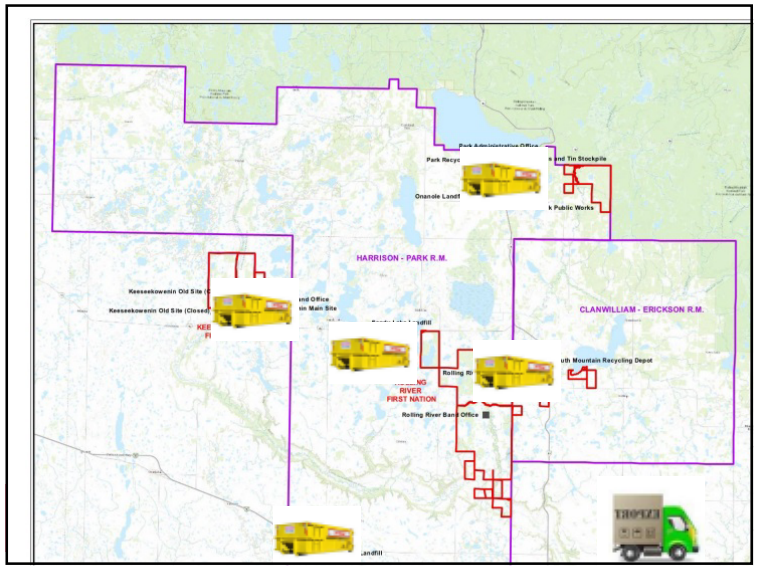

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Scenario 6

- Partnership fees
- Common Capital Costs
  - Roll off trucks (2)
- Keeseekoowenin landfill (construct small transfer station)
- Rolling River landfill (close)
- Erickson landfill (construct large transfer station)
- Onanole landfill (construct large transfer station)
- Sandy Lake landfill (construct small transfer station)
- Newdale landfill (construct very small transfer station
- RMNP site (clean-up)
- WRARS Levy
- Annual Maintenance of Closed Sites
- Haulage

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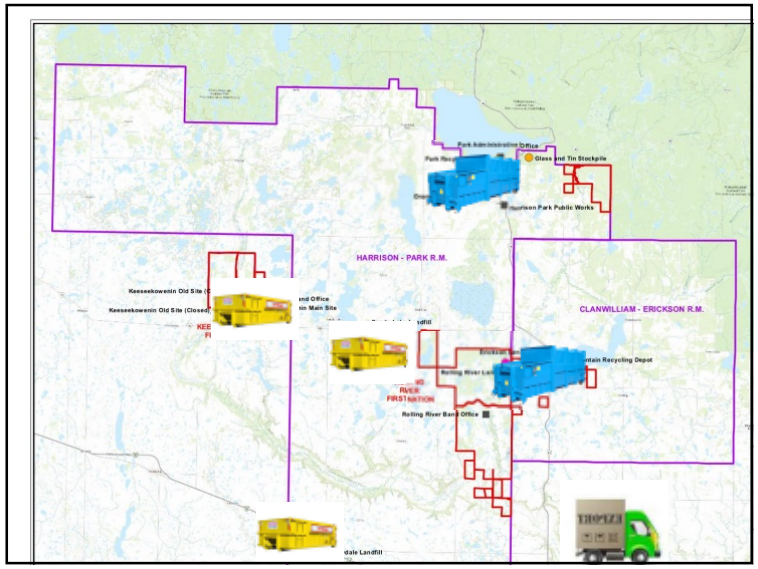

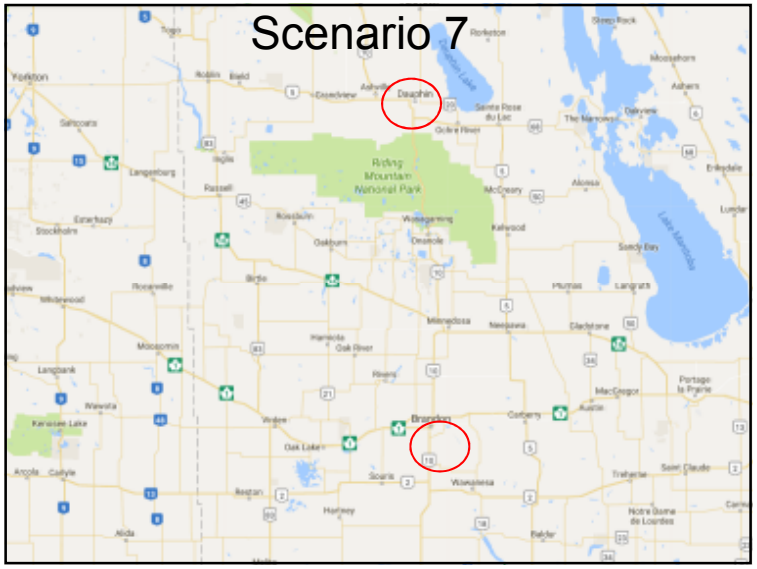

Scenario 8

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- Direct haul
- (Offering collection throughout RSWARFC)

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Composting

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- Windrow
- In-vessel
- Backyard composting

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Re-use Center

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Summary

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Landfill

- Advantages
  - Convenience
  - Community has control over their own wastes
  - Local job creation
  - Generally less traffic on roads than a transfer station, meaning less road damage
- Disadvantages
  - Siting is difficult and controversial. There may be no sites available.
  - More costly than other options.
  - If the site is not operated properly, there is a potential for environmental impact.
  - There is long term environmental liability associated with operating a landfill site.

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Exporting

- Advantages
  - Long-term waste is not in the community, which means that there is less likelihood of environmental impacts.
  - Site selection and permitting process should be considerably less onerous than other options.
- Disadvantage
  - There is a concern that the residents are transferring their "problems" elsewhere.
  - Reduced loads in the spring
  - Operational could be difficult in cold

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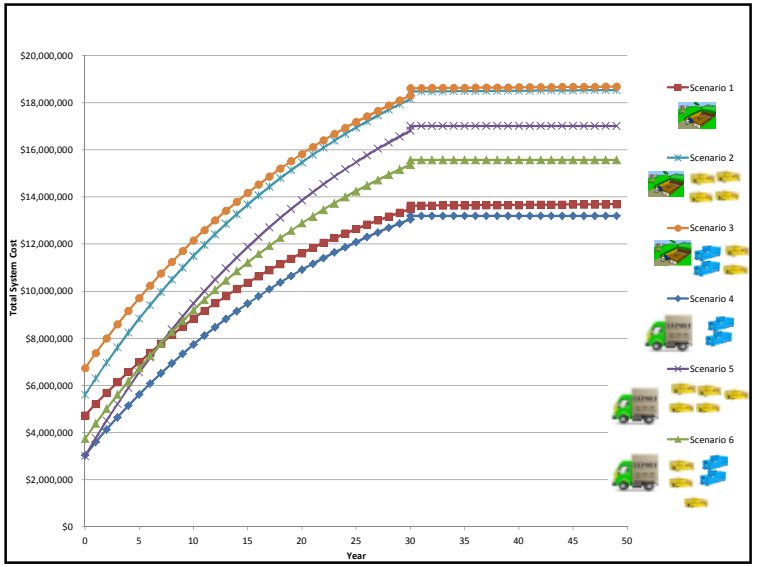
Incineration

- Advantages
  - Significantly smaller amount of residual waste to manage
  - The community is generally viewed as a leader and innovator among other communities
- Disadvantage
  - Although this technology reduces the waste which requires ultimate disposal, it does not eliminate it. A landfill or exporting of waste is still required.
  - Generally, the compounds going into this landfill will be more toxic than standard waste.
  - Does have potential to impact air, if not operated correctly or does not meet design.
  - There has been no indication during any of the interviews or during the ToR that this is desirable within the communities (although it was discussed during the November 28, 2016 teleconference).
  - Cost

	Total Capital Costs	Annual Operation Costs	Closure Costs (in 30 yrs)	Post Closure Costs (30-50 yrs)	Life cycle Costs
4- Exporting to Evergreen – 2 Large Transfer Stations	$3,040,000	$579,000	$447,000	$-	$13,216,000
1: New Landfill – No transfer Stations	$4,730,000	$506,500	$456,500	$11,000	$13,700,000
6 – Exporting to Evergreen - 2 large transfer Stations and Network of small transfer Stations	$3,733,000	$673,000	$656,000	$-	$15,810,000
5 - Exporting to Evergreen – Network of Small Transfer Stations	$2,993,000	$799,000	$656,000	$-	$17,280,000
2: New Landfill – 4 Small Transfer Stations	$5,601,000	$726,000	$1,024,000	$11,000	$18,500,000
3 - New Landfill – 2 Large Transfer Stations and 2 Small	$6,730,000	$669,000	$1,024,000	$11,000	$18,640,000



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Discussion

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Site Investigation

- 4 borehole/Monitoring wells per site
- Water levels
- Soil analysis
- Additional work will be needed for permitting

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Costs

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Environmental

Cost for Subcontractors	$37,775
Cost Neegan Burnside	$23,734
Cost for supplies	$5,988
Total Environmental Cost	**$69,497**

Next Steps

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RSWARF

- Evergreen Meeting
- Gap Investigation
- Site Permission

Neegan Burnside

- Finalize Options Report (??)
- Feasibility Report

Schedule

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- Feasibility Study
  - Selected Options (December 22)
- Investigation

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QUESTIONS?

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Appendix B

Summary of Current and Future Solid Waste Management Needs/Information Gaps/Workplan to Address Gaps and Needs

DRAFT

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Appendix B-1
Gap Memorandum 1

DRAFT

Neegan Burnside Ltd. 307 Commerce Drive Winnipeg MB R3P 1B3 CANADA
telephone (204) 949-7110 **fax** (204) 949-7111 **web** www.neeganburnside.com

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Technical Memorandum 1

Summary of Current and Future Solid Waste Management Needs/Information Gaps/Workplan to Address Gaps and Needs

Date: November 16, 2016 **Project No.:** 300039698.820

Project Name: Solid Waste Feasibility Study

Client Name: RSWARF

Submitted To:

Chief Norman Bone	Keeseekoowenin First Nation	Bone1953@outlook.com
Barry Bone	Keeseekoowenin First Nation	barrylbone@outlook.com
Elvin Huntinghawk	Rolling River First Nation	ehuntinghawk@rrfn.net
Don Huisman	Municipality of Clanwilliam-Erickson	huismanathome@gmail.com ericksonadmin@ericksonmb.ca
Iain Edye	Municipality of Clanwilliam-Erickson	ericksonacao@mymts.net
Lloyd Ewashko	Municipality of Harisson Park	admin@harrisonpark.ca
Kevin Bachewich	Riding Mountain Field Unit	kevin.bachewich@pc.gc.ca
Tebesi Mosala	INAC	Tebesi.Mosala@aandc-aadnc.gc.ca
Dieter Duester	INAC	Dieter.Duester@aandc-aadnc.gc.ca

Submitted By: Kent Hunter

Reviewed By: Heather MacKenzie, P. Eng.

Neegan Burnside Ltd. (Neegan Burnside) was retained to provide professional engineering consulting services for the completion of a Solid Waste Management Feasibility Study. The Study is being completed for the Regional Solid Waste and Recycling Facility Initiative Committee (RSWARFIC) who wish to construct a facility to service the five member communities. These five communities are collectively known as the Regional Solid Waste and Recycling Facility Communities (RSWARFC). The RSWARFC is comprised of the following communities:

- Keeseekoowenin First Nation,
- Rolling River First Nation,
- Municipality Of Clanwilliam-Erickson,
- Municipality Of Harrison Park and
- The Riding Mountain National Park (RMNP).

The partner communities are shown on Figure 1.

Neegan Burnside has completed the following work:

- Reviewed background information,
- Inspected existing landfills and recycling centers. A site plan showing these is included as Figure 2.
- Interviewed project partner members and other relevant stakeholders (will be summarized in the Options Report)
- Performed a drive-by assessment of potential sites.
- Undertaken a GAP Assessment to determine where additional data is needed

This memorandum presents the results of the Gap Assessment, the proposed workplan to address the Gaps and relative background information needed to support the workplan. It is considered Deliverable 1 and 2. It should be noted that the proposed workplan to investigate the gaps is on the critical schedule path. If additional subsurface data is required, investigation needs to commence soon before severe winter conditions arrive and so that the data can be incorporated into the final report.

1.0 Current and Future Solid Waste Needs

1.1 Disposal Capacity

Deliverable number 3 (the Options Report) will provide an overview of the background information and detailed waste generation rates. However, a rough sizing is needed for determining the number of boreholes required. For planning purposes, it is estimated that the landfill size will be approximately 16 ha (quarter of a quarter section).

1.2 Recycling/Diversion Capacity

With the exception of the First Nation communities, all communities use recycling, but perhaps not as effectively as possible. The locations of the depots are shown on Figure 3. Through meetings with the RSWARFC, it is recognized that there are a shortage of recycling facilities within the partner communities. Improved recycling and diversion facilities are needed. Specifics on where improvements are required will be included in the Options Report.

1.3 Composting

Currently, there is no appreciable composting ongoing in the communities. Diversion of organics from the landfill would increase life and provide a usable product (compost). Some form of organic diversion is viewed as a need for the communities. This will be further discussed in the Options Report.

1.4 Additional Needs

Additional needs, such as equipment, bins, collection will be included in the Options Report. There is sufficient information available at this time to address these items.

2.0 Options (Overview)

The Options Report will contain more specific information and detailed costing for the options that are discussed below, plus others which may become relevant during the further assessment. However, as previously mentioned, the proposed workplan to investigate the gaps is on the critical schedule path, and general concepts on options are necessary to determine where the gaps are. We have limited the information in this memorandum to that which is needed to define the gaps. Furthermore, it is recommended that the RSWARFC put some consideration into the options they prefer prior to undertaking the workplan to investigate the gaps, as there may be options which they are not interested in which do not warrant further investigation. Options applicable to the five partner communities of the RSWARFC and relevant to this Gap Assessment include the following:

2.1 New Regional Landfill for 5 Partner Communities

2.1.1 Overview

A new landfill could be designed and installed in the study area for the 5 partner communities. Based on quantity assessment undertaken to date, approximately 16 ha (quarter of a quarter section) will be required (detailed calculations will be included in the Options Report). The landfill method would involve waste placement within a mound and regular cover (waste may be shredded or bailed). Leachate would be collected and managed in evaporative lagoons.

Generally, as a rule of thumb, if the travel distance from the Centroid (weighted center) of the waste to the landfill is greater than 45 km a transfer station becomes cost effective. If it is closer

than 45 km, direct drive of the waste is preferable. Depending on the final location of the site, transfer stations may be needed. Gap Investigation of transfer stations is further discussed in Section 2.4.5.

2.1.2 Advantages/Disadvantages

The advantages of a new landfill are as follows:

- Convenience
- Community has control over their own wastes
- Local job creation

The disadvantages are as follows:

- Siting is difficult. There may be no sites available.
- More costly than other options.
- If the site is not operated properly, there is a potential for environmental impact.
- There is long term environmental liability associated with operating a landfill site.

2.1.3 Costing

Detailed costing has not been completed to date, but will be undertaken in the Options Report. As the work program to investigate the gaps was on the critical path in order to complete the project on time, rough budgetary costs for the landfill were developed so that the partner communities can decide if they wish to pursue this option further (by means of the Gap Investigation).

Since our Options Report is not complete, we will rely on existing data to project the cost. The study undertaken in 1993 projected that a Regional Site would cost about $564,900 for a 1,400 tonne per year (tpy) facility (or $400 per tonne per year). The current waste generated is approximately 3000 tpy. Accounting for inflation, the cost of a new landfill would be in the range of $2 M to $4 M. This is consistent with costs seen in other communities.

2.1.4 Proposed Sites

Prior to any investigation, selection and confirmation of the sites is necessary. A preliminary screening of RSWARFC land base was completed to eliminate those areas considered as not suitable for a landfill site. According to the Manitoba Environment Act, Regulation 37/2016:

> *The site of a landfill at the time it is established must be at least*
>
> *(a) 100 metres from any railway or public road, other than the access road to the landfill;*
> *(b) 400 metres from the property boundary of any cemetery;*
> *(c) 400 metres from any potable water well;*
> *(d) 100 metres from a natural gas pipeline or an underground utility corridor;*
> *(e) 400 metres from any building; and*
> *(f) 1 kilometre from any surface water.*

Additional constraints which were also considered during the first assessment are as follows:

> *(g) 15,000 m from airport – As specified in the Transport Canada Sharing the Skies Study (2004)*

Generally speaking, clayey soils are preferable over sandy soils. Geological mapping is shown on Figure 4. The following soil types are considered unsuitable for the landfill development (refer to Figure 4):

- A: Alluvial Sediments - sand and gravel, sand, silt clay, organicdetritus
- C: Colluvium - landslide debris ,eroded slopes, mass-flow deposits
- G: Proximal Glaciofluvial Sediments - sand and gravel
- Gs: Distal Glaciofluvial Sediments- fine sand, minor gravel, silt and clay interbeds
- O: Organic Deposits - peat, muck

The following soil types are considered suitable for landfill development:

- Lc: Offshore Glaciolacustrine Sediments - clay, silt, minor sand
- Ls: Marginal Glaciolacustrine Sediments - littoral sand and gravel
- Rm: Mesozoic Terrane - shale-dominated rocks
- Tc: Silt Diamicton - calcareous, largely composed of Paleozoic rocks
- Tm: Clay Diamicton - calcareous, largely composed of Mesozoic rocks

These areas are also included on the constraint mapping (Figures 5, 6 and 7).

Traditional hunting areas, traditional plant harvesting or ceremonial grounds have not been identified in this preliminary screening. This was discussed with First Nations communities and none of significance was identified.

Figures 5 and 6 show the communities with the constraint mapping based on all the water bodies in the community. Condition A shows all constraints (1000 m from surface water as identified on GIS mapping as “blue”). Condition B shows constraints with the surface water buffer reduced to 500 m only.

Generally speaking, if these constraints are used, there are no potential sites within a reasonable distance from the communities. However, the landfill standards[1] state the following:

Upon written request from the proponent, a variance, with or without conditions, may be issued with regard to the above setback requirements. Variances will only be considered *if suitable alternatives are not available, and the variance does not result in unacceptable degradation of the environment.*

We suggest that consideration be given to modification of the constraint criteria because many pockets being mapped as a water body are seasonal, shallow and likely not significant (referred to as potholes by Harrison Park Reeve Lloyd Ewashko). If including these depressions in the

[1] Department of Sustainable Development, *Standards for Landfills in Manitoba*, 2016

constraint mapping, it is extremely difficult to find three suitable sites. We suggest that the surface water buffer be based on recognised lakes and streams as mapped by regulators. Mapping was obtained from the Little Saskatchewan River Conservation District and through conversations with the authority and on the website. This revised constraint mapping is shown on Figure 7 as Condition C.

As previously mentioned, within Condition A and B there are no potential locations which are considered feasible. However, within Condition C there are sites available. Interviews with the partners indicated the following:

- Constraint mapping (Condition C) was reviewed with Keeseekoowenin Chief Norman Bone and members of the Health Services Staff. The Chief was somewhat supportive of the idea of using land on the reserve for the landfill site, in that it may mean jobs and revenue for the community. Potential sites were discussed. However, no site of suitable size could be identified based on the knowledge of the persons who were interviewed. We understand that it is the preference of Indigenous and Northern Affairs Canada (INAC) to no longer have landfill sites on reserve lands. Therefore, no potential site on the Keeseekoowenin reserve boundaries will be further explored.

- No sites of suitable size were identified on the Rolling River reserve.

- Constraint mapping (Condition C) was reviewed with Mr. Don Huisman and Mr. Iain Edye of the Rural Municipality (R.M.) of Clanwilliam Erickson. No potential sites were identified within the R.M.

- Federal regulations do not allow landfills within National Parks. Therefore, there are no potential sites within the RMNP.

- Constraint Mapping (Condition C) was discussed with Lloyd Ewashko of R.M. of Harrison Park. There were several potential sites which were identified of sufficient size to meet the requirements for a landfill within Constraint Condition C.

2.1.5 Gap Assessment

The Terms of Reference (ToR) indicated that the Gap Investigation should include environmental and geotechnical testing and the data collected should be adequate to complete the detailed design. Generally, at the conceptual stage, this is a higher level of investigation than normally required. The gaps are identified in the sections which follow:

2.1.5.1 Gap 1-1: Reports and Data Needs

The landfill approval process was discussed with Cory Switzer of Manitoba Conservation on November 3, 2016. It should be noted that for permitting and licensing there must be an assessment of wildlife, forestry, vegetation, socio economic impacts, aesthetics and other natural environment elements. As specified in the ToR, permitting/licensing is not included in this phase of work.

2.1.5.2 Gap 1-2: Detailed Site Reconnaissance and Desktop Study

It should be noted that 6 potential sites (five new sites and one expansion site which would essentially be treated as a new site) have been selected. The intention would be to narrow this down to 3 based on the following procedures:

undertaken along roadways and on R.M. lands to narrow the site selection down prior to well installation.

- A desktop study of the sites would be undertaken as part of the Options Report. This would involve a review of records of licensed groundwater wells in the area of the site. Potential locations for boreholes and monitoring wells would be identified.
- A detailed reconnaissance should be undertaken of the sites once approval from the landowner is obtained. This would entail walking the sites, looking for wetlands or other features which may impede permitting, and roughing out a conceptual layout of the site.

2.1.5.3 Gap 1-3: Subsurface Information at Proposed Sites

Subsurface information is needed for the following purposes:

- To determine if sites are suitable (adequate soil type and adequate depth to water)
- To select the preferred site
- To undertake detailed design of the sites (not required as part of this study, but the ToR specifies that data must be collected to advance the detailed design).

The Manitoba Landfill Standards provides guidelines for the number of testholes needed for a landfill site. Based on these standards, 9 testholes to 30 feet (10 m) below the base of the proposed landfill must be installed, 3 of which are completed as monitoring wells. Therefore, if all 3 sites are to be assessed, a total of 27 boreholes, 9 of which are installed as monitoring wells must be drilled. Additional details on the investigation are included in Section 3.0.

2.1.5.4 Gap 1-4: Topographical Survey

Additional topographical survey will be needed at the 3 selected sites for the following purposes:

- To survey the wells installed at the sites
- To undertake detailed design of the sites (not required as part of this study, but the ToR specifies that data must be collected to advance the detailed design).

It should be noted that the topographical survey of the sites was included as part of our scope of work.

2.2 Expansion of Existing Site

Expansion of an existing site is often viewed as a preferable alternative. The community is familiar and has already accepted the landfill location. Limiting the site to a brownfield site (former landfill) conserves the land base for future use and farmland is not used. Land is expensive in the area, and using the existing site can be cost effective. The potential to expand existing sites is considered as follows:

2.2.1 Expansion of Onanole Site

It has been expressed by the partner communities (specifically Harrison Park and RMNP) that expansion of the Onanole site is not a preference. This is because of the proximity to the

National Park, downgradient (e.g., potential groundwater impacts) proximity to Clear Lake and the potential for the landfill to create nuisance bears. Therefore, this option is not considered further. We believe that the other communities would be supportive of excluding expansion of this site.

2.2.2 Expansion of Erickson Site

The Erickson landfill is not considered suitable for expansion. It is too close to surface water receptors and you can see it from the Townsite (which is not desirable). Based on regional geological maps, soil types may not be acceptable. Therefore, this option is not considered further.

2.2.3 Expansion of Sandy Lake Site

Expansion of the Sandy Lake Site, north of the highway is a potential option which should be assessed. The site is small and the cost to expand the site would likely be comparable to that of a new site.

The site is at the following location:

Site 6: North of Sandy Lake Landfill
Latitude: 50°31'26.91"
Longitude: 100° 7'20.67"W

2.2.4 Expansion of Newdale Site

There appears to be insufficient space to expand the Newdale Site. The site is close to surface water and not considered suitable for expansion.

2.2.5 Expansion of First Nation Sites

Expansion of the First Nations Sites was discussed, and not considered feasible at this time. There is insufficient suitable land around the sites. The Rolling River site is located adjacent to a water body and the Keeseekoowenin site is located adjacent to a stream. We understand that it is the preference of INAC to remove on reserve landfills. Therefore, expansion of the First Nation sites will not be further explored.

2.2.6 Gap Assessment

The Gap Assessment for the Sandy Lake essentially follows the procedures of a new site (described in Section 3.0).

2.3 A New Regional Site for a Larger Community Base

A new Regional Site could be developed within or outside of the study area for the 5 partner communities and additional communities who opt into the program. We understand from discussions with Don Huisman that there may be 11 communities interested in participating. At

this time, the study area is limited to the 5 partner communities so this option will not be explored further by us.

2.4 Exporting Waste to Facility Located Outside of Partner Communities

2.4.1 Overview

A feasible option involves a network of transfer with ultimate disposal out of community. Ultimate disposal locations could be the Evergreen Landfill located in Minnedosa. Although Minnedosa is the closest landfill, the Brandon Landfill or Dauphin Site may also be considered.

If transfer to the Evergreen Facility is considered, the partner communities would need to meet with the Evergreen Landfill Board of Directors to ensure they would be willing to accept their wastes and negotiate partnership costs. It is currently not known how they would account for the RMNP in their cost negotiations. RSWARF may wish to have this meeting before funds are spent on geotechnical investigation of the transfer stations.

Typical transfer stations are often comprised of elevated retaining walls in which users can drop off wastes into lower bins. Compaction equipment may be installed, based on a cost benefit analysis (to be completed as part of the Options Report). The size requirement is approximately 5,000 m^2 or 0.5 ha.

2.4.2 Advantages/Disadvantages

The advantages of exporting waste out of the Community are as follows:

- Long-term waste is not in the community, which means that there is less likelihood of environmental impacts.
- Site selection and permitting process should be considerably less onerous than other options.

The disadvantages are as follows:

- There is a concern that the residents are transferring their “problems” elsewhere.
- Stockpiled waste may have some of the same liabilities of a landfill site.

2.4.3 Costing

Purchasing a partnership with Evergreen was explored several years ago by Clanwilliam Erickson. At that time, the cost was $100 per person (based on population) to enter the partnership (it is not clear how this would be calculated for the RMNP). The annual cost would be the tipping fee per tonne of waste, (tonnes placed divided by operating cost) which is currently $75 per tonne, plus the $10 levee. In addition, waste would need to be trucked to the site, so there would be a haulage cost.

On the basis of $100 per capita, the cost to become a partner would likely be about $400,000. In addition, transfer stations would be needed within the communities. The operational costs would comprise transfer station operation, haulage, levy and disposal per tonne.

We were informed that some of the First Nation communities have trucking companies. Perhaps on a partnership basis this may divert some of the haulage costs if a preferred rate can be negotiated. This will be further explored in the Options Report.

It should be noted that Evergreen at this time may not agree to accept other partners, so if this option is selected by the RSWARFC it may not be viable.

2.4.4 Proposed Sites for Transfer Stations

Generally speaking, conversion of existing landfills to transfer stations is often the most effective way to manage sites for the following reasons:

- The site is already classified as a waste site, and generally unsuitable for other use and therefore the site is used while greenfield land remains open for other opportunities.
- The community is accustomed to disposing of waste in that location, so there is not a high educational component involved in getting them familiar with the site.
- Infrastructure (roads and buildings) are frequently already in place.
- Some costs associated with landfill closure can be deferred.

According to The Environment Act, Regulation 37/2016:

> *The site of a transfer station at the time the transfer station is established must be at least*
>
> *(a) 30 metres from any building;*
> *(b) 30 metres from any surface water; and*
> *(c) 30 metres from any potable water well.*

Use of the existing landfills as transfer stations would be acceptable within these criteria.

2.4.5 Gap Analysis

2.4.5.1 Gap 3-1: Reports and Data Needs

On October 21, Neegan Burnside spoke with Monty Pekover who sits on the board of the Evergreen Landfill Board of Directors. He indicated that the Evergreen Board of Directors are open to accepting new partners under certain conditions. It was recommended that if the RSWARFC are interested in pursuing this option, they attend a board meeting and discuss the conditions. The gaps are therefore as follows:

- Is it feasible to carry the exporting to the Evergreen site as an alternative?
- What would the cost implications be for the partner communities (so that a comparison to other options can be made)?

We suggest as well that even though the Brandon Landfill and Dauphin Landfill are further than the Evergreen site, they could be considered if the Evergreen site is not feasible and we will carry these sites forward in the Options Report. Although the haulage distance is further, a better rate may be able to be negotiated and haulage can be reduced by way of compaction and using more efficient vehicles.

2.4.5.2 Gap 3-2: Geotechnical Analysis at Transfer Stations

If Transfer Stations are advanced at each of the sites, geotechnical assessment and a topographical survey would be needed for each site to facilitate the design of the retaining wall. Geotechnical assessments would be needed at the following existing landfill sites (where transfer stations will be located):

1. Keeseekoowenin
2. Onanole
3. Sandy Lake
4. Newdale
5. Erickson

A geotechnical assessment would not be needed at Rolling River, as that is very close to the Erickson site and it is assumed that the First Nation community could use the Erickson site. The Erickson site has a better road infrastructure and is just slightly a greater distance than the Rolling River site.

During the Options Study, it may be determined that some sites do not require transfer stations.

The geotechnical assessment would include a minimum of 2 geotechnical boreholes per site and assessment as per geotechnical standards. Specifically, for detailed design of the transfer stations, the following information needs to be known.

- The safe bearing capacity of the different types of soil, at various depths and the anticipated settlements along with capacities for Serviceability and Ultimate Limit States.
- Minimum depths at exterior footings for frost protection.
- Earth pressure co-efficient for cantilever retaining walls, and unit density of backfill material.
- Internal angle of friction of backfill material, and for the material below foundations subject to lateral pressure such as retaining walls; or alternately the coefficient of friction to be used in the calculation of sliding resistance of the foundations. In cohesive soils under retaining structures, the effective cohesion of the native material.
- Suitability of excavated material for use as backfill around walls and under paved areas.
- Possible effects of ground water during construction and recommendations for design of water drainage around and under the retaining wall.
- Recommendations for protecting below grade structures from moisture in the ground.
- Soil properties affecting excavation conditions to be carried out using conventional open cut procedures.

It should be noted that even if exporting is not selected as an option, geotechnical assessment may still be needed at some of the sites as a landfill within the community may still require transfer stations within the community to support it.

2.4.5.3 Gap 3-3: Topographical Analysis of the Transfer Stations

Additional topographical survey will be needed at the 5 selected sites for the following purposes:

- To survey the wells installed at the sites
- To undertake detailed design of the sites (not required as part of this study, but the ToR specifies that data must be collected to advance the detailed design).

2.5 Mechanical Treatment

2.5.1 Overview

Mechanical treatment involves technology to process the waste into a stable product that will not decompose further. Examples include incineration, anaerobic digestion and gasification. The main advantage of mechanical treatment is that it reduces the volume of waste that requires landfilling by between 75 and 95 percent while meeting provincial air regulations and standards. Certain technologies have the advantage of generation of power, which is beneficial to the community. This may not be feasible at the sizes estimated.

The byproduct (ash etc.) would still need disposal at a landfill or exporting to a site out of the community.

2.5.2 Advantages/Disadvantages

The advantages of a mechanical/thermal treatment system are as follows:

- Significantly smaller amount of residual waste to manage
- Employment

The disadvantages of mechanical treatment include the following:

- Although this technology reduces the waste which requires ultimate disposal, it does not eliminate it. A landfill or exporting of waste is still required. Generally, the compounds going into this landfill will be more toxic than standard waste. The ash may be hazardous depending on the quality of the feedstock.
- Does have potential to impact air, if not operated correctly or does not meet design.
- There has been no indication during any of the interviews or during the ToR that this is desirable within the communities.

This is generally considered the most costly option and is mainly feasible when there is a shortage of land or a strong community desire to be innovative. This option is not feasible in the five partner communities for the following reasons:

- Population base is too small to support an incinerator

- Waste quantities fluctuate over the year, making operation difficult. Stockpiling of waste may be needed, which is operationally quite difficult.
- Being innovative with waste was generally not expressed as a desire within the partner communities.

On previous projects, the capital costs associated with an incinerator were in the $5 to 7 M range. During consultation, if it in fact becomes obvious that this is something which may be viewed upon favourably within the communities, additional assessment can proceed.

2.6 Increased Diversion

As mentioned above, the increased diversion of waste (recycling and composting) would extend landfill life, generally be viewed favourably by the community, and generally be the right thing to do. At this time, it is assumed that this would involve contracts with each of the various waste receivers with depots established at each transfer station, landfill or other community locations.

A centralized composting site (outdoor windrow site) was discussed with the partner communities during the interviews. There was a great deal of concern regarding accustoming bears with the community and therefore a centralized composting facility was not viewed upon favourably with members of the RMNP or Clanwilliam Erickson. An in-vessel system will be explored in the Options Report. It was generally agreed that composting may be introduced at a small level at some of the sites, but generally the preferred approach would be some form of backyard composting trial run. If a regional composting facility is part of the final preferred alternative, this will be included at one of the landfill sites.

Recycling and composting will be further fleshed out in the final report. As the purpose of this memorandum is to identify gaps, there are no Gaps which require additional investigation or reports from the RSWARFC.

3.0 Soil Investigative Program to Assess Gaps

It should be noted that the Preferred Alternative has not been selected to date. Ideally, the preferred option would be selected by the partner communities prior to commencing with a Detailed Investigation, so that the investigation can be tailored to the solution. For instance, if the preferred option is exporting to the Evergreen landfill, then the field investigation of the new landfill sites would not be required. Furthermore, phasing of the investigations may limit the amount of work required.

The program outlined below is meant to address the gaps for options during one field investigation. It is suggested that this be reviewed by the partner communities and additional discussions be had as to the best way to proceed.

3.1 New Landfill

3.1.1 Task I – Landowner permission

As previously mentioned, none of the properties are on R.M. lands. Landowner permission is required prior to drilling any monitoring wells on private lands. We suggest that this involves an initial meeting between the landowner and members of the R.M. to gauge concerns and interest, followed by a more technical meeting with the landowner, and the R.M. Neegan Burnside could be present to respond to technical issues, although our attendance is not necessary. It should be noted that this was not included in the ToR or original proposal and would be considered extra to the work program unless it can be done in conjunction with the Options Presentation or community consultation.

If the partner communities do not wish to contact the landowners at this early stage of the program, they may elect to drill a limited number of boreholes and wells along road allowances and R.M. lands to narrow down the selection options. Additional site work would still be required, but this preliminary drilling would allow the partner communities to narrow down options. It should be noted that using this method would not allow for detailed design.

3.1.2 Task II - Soil Investigation

If landowner access to the sites is granted, a minimum of 9 test holes will be drilled on each site in accordance to the Manitoba Landfill Standards. The location of the test holes will be selected by Neegan Burnside during the desktop study of the sites and plotted on available satellite imagery. However, locations may be adjusted or restricted later if access to the sites or parts of a site is limited. If the landowner agreement is not obtained, drilling locations will be restricted to road allowances and the number of location reduced.

Prior to drilling, Neegan Burnside will need to stake out the borehole locations. In order to avoid a double mobilization charge, this could be done during the site visit for Options Study meeting. However, please note that if a separate site visit is needed this will be an extra to the project.

The locations of the boreholes will need to be cleared of buried utilities. This may require the services of a private locator and has been included in the program.

The initial test holes will be drilled to a maximum depth of 12 m unless auger refusal is reached. This is based on the Manitoba Standards of 10 m below the proposed base of the active area. We have assumed a based 2 m below ground.

The soils from the borehole investigation will be logged (Visual Classification) on site by Neegan Burnside staff. Up to three representative samples per site will be submitted for laboratory analysis. This will include Particle Size and Atterberg Limits (fine grained soils). The soil classification (USCS) will be assessed based on the information collected. This information will be used to assess relative hydraulic conductivity of the soil strata encountered at each site and to identify the presence of potential shallow aquifers.

Groundwater Investigation

During the subsurface investigation, small diameter monitoring wells will be installed in three (3) of the boreholes. The depth of the wells will be determined on site and will depend on the final depth of the borehole, the soil encountered and the depth water is found.

It should be noted that the wells will remain in place and will need to be sampled from the selected site for permitting purposes. Since water quality is not needed for detailed design, water sampling of the 9 wells is not included in this program.

The wells should remain in place until they are no longer needed for site selection. If they will not be needed for future monitoring, the wells should be decommissioned. Decommissioning the wells is not within the scope of this work program.

Borehole logs will be prepared and the data will be plotted as required.

The cost for this work is shown on Table 1, and is summarised as follows. A driller quote is provided as Appendix A:

Cost for Subcontractors (no markup as specified)	$50,246
Subcontractor contingency	$9,671
Cost Neegan Burnside	$33,553
Cost for supplies	$8,940
Total cost	**$102,410**

Note: There are currently too many unknowns for the subcontractors to provide a lump sum cost for this work. Our budgetary estimate includes the drillers costs without markup, plus a 20% contingency to minimize costs risk due to bad weather, poor drilling conditions, site unknowns and unforeseen circumstances. This contingency will only be used to cover additional costs which may be incurred by the Subcontractor. Original subcontractor invoices will be included with the invoice.

3.2 Exporting Waste

3.2.1 Task I - Geotechnical Assessment

A quote from a geotechnical contractor is included as Attachment B. Basically, the quote includes the following:

- Clearing of underground utility services.
- A test hole drilling and soil sampling program consisting of drilling a total of two (2) test holes to 5.0 m below existing grade at each of the five (5) sites. All test holes will be drilled using 125 mm diameter solid stem augers and/or 200 mm hollow stem augers with soil samples collected off the auger flights at select depths and Shelby tubes and/or split spoons on an as required basis, and retained for testing in ENG-TECH's Winnipeg laboratory. The soil stratigraphy will be recorded at the time of drilling and the consistency

of the cohesive soils will be assessed in field using a Pocket Penetrometer and/or Torvane and SPT's for sandy soils.

- A laboratory testing program per site consisting of moisture content analysis (10), and Atterberg Limits and/or particle size analysis and/or unconfined compressive strength tests (2).
- Survey of the test hole UTM coordinates obtained by means of a hand held GPS unit.
- An engineering report (1 copy) outlining the geotechnical investigation. The report will include a site plan showing the test hole locations and UTM coordinates, test hole summary logs, laboratory test results, and recommendations as outlined in the introduction.

The cost to undertake this work is as follows:

Cost for one site	$8,690
Cost for additional sites ($4,610 X 4)	$18,440
Total Cost for Geotechnical at 5 sites	**$27,130**

Please note that no markup has been applied to this cost.

It should be noted that a Geotechnical Assessment is not required to determine whether this option is feasible and is not required to develop cost estimates for this option (unlike the landfill where the drilling results may have significant impact on the option and the costs). The Geotechnical Assessment is being added because the ToR indicates that all data shall be collected to facilitate the detailed design. In the event that the partner communities elect to defer this option, these costs may be saved if transfer station option is not selected.

4.0 Summary

The complete Gap analysis is summarized as follows:

Environmental Investigation (3 sites- 27 testholes)	$102,410
Geotechnical Investigation (5 sites)	$27,130
TOTAL	**$129,540**

These costs may be reduced in the following ways:

- Preliminary screening of options by the RSWARF may reduce investigative program
- Conducting the work over several phases may reduce the costs, as it may be possible that sites can be ruled out with just one borehole
- Geotechnical assessment can be done in later phases of the program

The above is presented for information purposes only. If RSWARF wishes to move forward with these programs, a Change Order will be prepared. We trust this information meets your current requirements. If you have any questions or concerns, please contact the undersigned.

Neegan Burnside Ltd.

Kent Hunter
Lead Technical Specialist (Landfills)
KH:cg

Heather Mackenzie, P.Eng.
Project Manager

Enclosure(s) in Appendix
Eng-Tech Proposal for Geotechnical Investigation for RM of Harrison Park
Paddock Drilling Quote for RM of Harrison Park
Feasibility Study Figures
Cost Estimate

Other than by the addressee, copying or distribution of this document, in whole or in part, is not permitted without the express written consent of Neegan Burnside Ltd..

NEEGAN BURNSIDE

Appendix A

Geo Technical Investigation Proposals R M of Harrison Park

6 – 854 Marion Street, Winnipeg, Manitoba R2J 0K4
Phone: (204) 233-1694 Fax: (204) 235-1579
E-mail: eng_tech@mts.net
www.eng-tech.ca

Engineering and Testing Solutions That Work for You

November 10, 2016 Proposal No.: 16-459

Neegan Burnside Ltd.
17345 Leslie Street, Suite 200
Newmarket, Ontario
L3Y 0A4

ATTENTION: Kent Hunter, P. Eng.

RE: Geotechnical Investigation – R.M. of Harrison Park

Introduction

ENG-TECH Consulting Limited (ENG-TECH) is pleased to submit our proposal to complete a geotechnical investigation for the proposed retaining walls at the above location. ENG-TECH understands that there will be five sites to complete evaluation and confirm existing retaining walls are constructed in a safe and stable manner. The purpose of the investigation is to provide s as outline in the RFP provided.

Scope of Work

Based on the above ENG-TECH proposes the following scope of work:

- Clearing of underground utility services.

- A test hole drilling and soil sampling program consisting of drilling a total of two (2) test holes to 5.0 m below existing grade t each of the five (5) sites. All test holes will be drilled using 125 mm diameter solid stem augers and/or 200 mm hollow stem augers with soil samples collected off the auger flights at select depths and Shelby tubes and/or split spoons on an as required basis, and retained for testing in ENG-TECH's Winnipeg laboratory. The soil stratigraphy will be recorded at the time of drilling and the consistency of the cohesive soils will be assessed in field using a Pocket Penetrometer and/or Torvane and SPT's for sandy soils.

- A laboratory testing program per site consisting of moisture content analysis (10), and Atterberg Limits and/or particle size analysis and/or unconfined compressive strength tests (2).

- Survey of the test hole UTM coordinates obtained by means of a hand held GPS unit.

- An engineering report (1 copy) outlining the geotechnical investigation. The report will include a site plan showing the test hole locations and UTM coordinates, test hole summary logs, laboratory test results, and recommendations as outlined in the introduction.

Costs

Site 1

Fees	Cost ($)
Clear Public and Private Services, Travel, Drilling, Drafting, Assessment and Report	4,980.00
Expenses	
Vehicle & Supplies & Hotel/Sustenance	1,050.00
Laboratory Testing	260.00
Drill Rig (Cost Plus 5%)	2,400.00
	3,710.00
Total Estimated Project Cost	**$8,690.00**

Sites 2 to 5
(when completed as at the same time as Site 1 and a report per site**)**

Fees per Additional Site	Cost ($)
Clear Public and Private Services, Travel, Drilling, Drafting, Assessment and Report	3,430.00
Expenses per Additional Site	
Vehicle & Supplies	240.00
Laboratory Testing	260.00
Drill Rig (Cost Plus 5%)	680.00
	1,180.00
Total Estimated Project Cost per Additional Site	**$4,610.00**

ENG-TECH's fees and internal expenses are fixed lump sum prices to complete the geotechnical investigation, whereas the cost of the drill rig will be invoiced at cost plus 5%. The above cost includes all fees and expenses associated with completing the geotechnical investigation and engineering report as detailed above. The above costs do not include the Goods and Service Tax (GST). Neegan Burnside Ltd will be responsible to ensure access to the sites.

Schedule and Invoicing

ENG-TECH could schedule the work immediately upon acceptance of this proposal. ENG-TECH will invoice on a monthly basis for the work completed that month, with each invoice being due next 15 days. A 2% interest charge will apply on all monies owed past 30 days of invoice date.

Authorization

ENG-TECH will start the project upon receipt of Project Authorization.

Closure

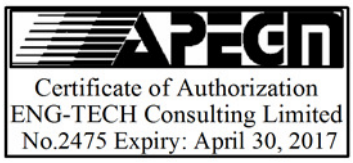
ENG-TECH trusts this proposal is satisfactory. If you have any questions or require additional information, please contact the undersigned.

Sincerely,
ENG-TECH Consulting Limited

Via Email

Clark Hryhoruk, M.Sc., P.Eng.
President

CDH/cmd



15-Nov-16

Paddock Drilling Ltd.

GEOTECHNICAL AND ENVIRONMENTAL INVESTIGATIONS
4100 Richmond Ave. East Tel: 1-800-339-4908
Brandon, Manitoba Tel: 1-204-725-0657
R7A 7P8 Fax: 1-204-727-4926
email: martin.hogue@paddockdrilling.ca
web: http://www.paddockdrilling.ca

Neegan Burnside

Estimate re: RM of Harrison Park (3 communities)
18 - 40' Hollow Stem Auger Boreholes
9 - 40' Hollow Stem Auger Monitoring Wells
Assumes Track Drill Access

			40' HSA BH		40ft HSA MW			
Mob	**Rate**	**Unit**	**Q**	**Total**	**Q**	**Total**	**Item Total**	**Item Cost**
Acker SX	$ 295.00	Hr					4.00	$1,180.00
Fuel Surcharge	$0.30	km					300.00	$90.00
Subtotal								**$1,270.00**
Time & Drilling								
Acker SX	$ 295.00	hr	4	$1,180.00	4.5	$1,327.50	112.50	$33,187.50
Meals Per Diem	$ 50.00	man/day	0.8	$40.00	0.9	$45.00	22.50	$1,125.00
Rooms Per Diem	$ 120.00	man/day	0.8	$96.00	0.9	$108.00	22.50	$2,700.00
Crew Travel	$ 180.00	hr		$0.00		$0.00	0.00	$0.00
Water Tank 200 gal	$ 65.00	day		$0.00		$0.00	0.00	$0.00
Honda Pump 2"	$ 65.00	day		$0.00		$0.00	0.00	$0.00
Casing Advancer Tools	$ 1.50	ft/day		$0.00		$0.00	0.00	$0.00
Coring Tools	$ 1.50	ft/day		$0.00		$0.00	0.00	$0.00
Air Hammer Tools	$ 3.00	ft/day		$0.00		$0.00	0.00	$0.00
Subtotal				**$1,316.00**		**$1,480.50**		**$37,012.50**
Materials								
2" PVC Sch 40 Riser	$ 45.00	10 ft		$0.00	3.25	$146.25	29.25	$1,316.25
2" PVC Sch 40 Screen	$ 60.00	10 ft		$0.00	1	$60.00	9.00	$540.00
2" PVC Sch 40 Coupler	$ 2.50	ea		$0.00		$0.00	0.00	$0.00
2" PVC Sch 40 Slip Cap	$ 2.00	ea		$0.00	1	$2.00	9.00	$18.00
2" PVC Sch 40 THD Cap	$ 12.00	ea		$0.00	1	$12.00	9.00	$108.00
Silica Sand	$ 22.00	50#		$0.00	8	$176.00	72.00	$1,584.00
Enviroplug Med. Bentonite	$ 18.00	50#	3	$54.00	10	$180.00	144.00	$2,592.00
Flush Cover 7" Bolt Down	$ 90.00	ea		$0.00		$0.00	0.00	$0.00
Above Ground Cover 4" x 5'	$ 105.00	ea		$0.00	1	$105.00	9.00	$945.00
Enviroplug Grout	$ 28.00	50#		$0.00		$0.00	0.00	$0.00
Portland Cement	$ 15.00	50#		$0.00		$0.00	0.00	$0.00
Casagrande Tip	$ 45.00	ea		$0.00		$0.00	0.00	$0.00
.75" PVC Sch 40 Riser	$ 22.00	10 ft		$0.00		$0.00	0.00	$0.00
1" PVC Sch 40 Riser	$ 30.00	10 ft		$0.00		$0.00	0.00	$0.00
Asphalt Cold Patch	$ 25.00	bag		$0.00		$0.00	0.00	$0.00
Soil Bag	$ 55.00	ea	2	$110.00	2	$110.00	54.00	$2,970.00
Shelby Tube	$ 31.00	ea		$0.00		$0.00	0.00	$0.00
Subtotal				**$164.00**		**$791.25**		**$10,073.25**
Cost per Borehole				**$1,480.00**		**$2,271.75**		
Number of Boreholes				18		9	27	
Total Cost				**$26,640.00**		**$20,445.75**		**$48,355.75**

NEEGAN BURNSIDE

Appendix B-2
Gap Memorandum 2

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NEEGAN BURNSIDE

Technical Memorandum 2

Revised Workplan to Address Gaps and Needs

Date: December 01, 2016 **Project No.:** 300039698.820

Project Name: Solid Waste Management Feasibility Study

Client Name: RSWARF

Submitted To:

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Submitted By: Kent Hunter, P. Eng.

Reviewed By: Heather MacKenzie, P. Eng.

As discussed during our teleconference of November 28, Neegan Burnside Ltd. (Neegan Burnside) has revised the work program to provide preliminary site information and to assist with site selection at the Regional Solid Waste and Recycling Facility Communities (RSWARFC).

None of the suggested sites are on R.M. lands. Therefore, landowner permission is required prior to drilling any monitoring wells on private lands. We understand that this is being looked after by others.

The revised workplan comprises the following:

1.0 Work Program

1.1 Task I – Site Reconnaissance

The first task will involve a desktop study of the sites. This will include a review of groundwater wells in the area of the site recorded in the provincial well database. Potential locations for boreholes and monitoring wells would be identified and a detailed reconnaissance undertaken of the sites. This would entail walking the sites, looking for wetlands, structures or other features which may impede permitting, and roughing out a conceptual layout of the site. The location of the boreholes will be selected by Neegan Burnside during the desktop study of the sites and confirmed during the site reconnaissance. However, locations may be adjusted or restricted later if access to the sites or parts of a site is limited.

1.2 Task II - Soil Investigation

Prior to drilling, Neegan Burnside will get underground utility locations cleared. This may require the services of a private locator and has been included in the program.

A total of 4 boreholes will be drilled on each site. Three of the boreholes will be drilled to the water table, assumed to be reached by 6 m. The fourth borehole will be drilled to a maximum depth of 12 m unless auger refusal is reached. This is based on the Manitoba Standards that require boreholes to a depth of 10 m below the proposed base of the active area. We have assumed a landfill base 2 m below ground.

The soils from the borehole investigation will be logged (Visual Classification) on site by Neegan Burnside staff. Up to three representative samples per site will be submitted for laboratory analysis. This will include Particle Size and Atterberg Limits (fine grained soils). The soil classification (USCS) will be assessed based on the information collected. This information will be used to assess relative hydraulic conductivity of the soil strata encountered at each site and to identify the presence of potential shallow aquifers.

1.3 Groundwater Investigation

During the subsurface investigation, small diameter monitoring wells will be installed in all of the boreholes. The depth of the wells will be determined on site and will depend on the final depth of the borehole, the soil encountered and the depth water is found.

Water levels will be measured in the wells one time prior to site selection to evaluate water table depth and shallow groundwater flow direction.

It is our expectation that the wells will remain in place to be used in the permitting process, and if possible, become part of the monitoring network. It should be noted that once the site is selected, additional boreholes and monitoring wells will be needed for permitting and detailed design. Water quality testing has not been included in this program as it is not needed for preliminary site evaluation. However, water sampling of the monitoring wells will eventually be needed for permitting purposes.

2.0 Costs

We have assumed 3 days of work per site. We have prorated the drillers quotes based on the scope at the site. The cost for this work is shown on Table 1, and is summarised as follows:

Cost for Subcontractors (no markup as specified)	$39,775
Cost Neegan Burnside	$23,734
Cost for supplies	$5,988
Total cost	**$69,497**

As per the Terms of Reference, a markup has not been applied to the driller or laboratory subconsultants.

Due to the unknowns inherent in this task, such as weather, drilling conditions, permission, we recommend that this portion of this work be done on a time and material basis.

If RSWARF wishes to move forward with these programs, a Change Order will be prepared. We trust this information meets your current requirements. If you have any questions or concerns, please contact the undersigned.

Neegan Burnside Ltd.

Kent Hunter, P. Eng.
Lead Technical Specialist (Landfills)

Heather MacKenzie, P.Eng.
Project Manager

KH:cg

Enclosure(s) Revised Cost Estimate

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Table 1 - Cost Estimate
Manitoba Environmental Soil Investigation - 3 sites
300039698

Tasks	Project Manager	Lead Technical Specialits	Senior Hydrogeologist	Field Techincian	Field Techincian						
	Heather MacKenzie	Kent Hunter	Joy Rutherford	Matt Valeriote	Mike Harris	CAD	Clerical	Total Fees	Expenses	Sub-Consultant	Subtotals
	$190	$168	$125	$80	$86	$88	$89				
Field Program Preparation											
Contact with client, driller, scheduling		2		2				$496			$496
Select drilling locations		2	8			3		$1,600			$1,600
Preliminary Field Reconnaissance (2 hours per site)- done during Options Meeting	8	8				3		$3,128	$760		$3,888
General field prep/locates			10	7				$1,810			$1,810
TRAVEL (general)				8				$640	$500		$1,140
Subtotal Hours	*8*	*12*	*18*	*17*		*6*					*$8,934*
Subtotal Costs	*$1,520*	*$2,016*	*$2,250*	*$1,360*		*$528*		*$7,674*	*$1,260*		*$8,934*
Boreholes and Monitoring Wells											
Drilling supervision, soil logging, well installation details											
First Site (includes mob/demob)		1	1	52				$4,453	$1,314	$14,895	$20,662
Second Site		1	1	39				$3,413	$964	$11,495	$15,872
Third Site		1	1	39				$3,413	$964	$11,495	$15,872
Water Monitoring											
Water levels - one visit					20			$1,720	$760		$2,480
field supplies									$725		$725
lab (soil testing)										$1,890	$1,890
Subtotal Hours		*3*	*3*	*130*	*20*						
Subtotal Costs		*$504*	*$375*	*$10,400*	*$1,720*			*$12,999*	*$4,728*	*$39,775*	*$57,502*
Preparation of Borehole logs and data entry											
Draft		2	5	10			5	$2,206			$2,206
Final		2	2	2			5	$1,191			$1,191
Subtotal Hours		*4*	*7*	*12*			*10*				*$3,397*
Subtotal Costs		*$672*	*$875*	*$960*			*$890*	*$3,397*			*$3,397*
Total Hours	**8**	**17**	**28**	**159**	**20**	**6**	**10**	**248**			**$69,833**
Total Cost	**$1,520**	**$2,856**	**$3,500**	**$12,720**	**$1,720**	**$528**	**$890**	**$23,734**	**$5,988**	**$39,775**	**$69,497**

Burnside Fees	**$23,734**
Burnside Expenses	**$5,988**
Total Burnside	**$29,722**
Total Sub-Consultant	**$39,775**
Total Upset Limit	**$69,497**

NEEGAN BURNSIDE

Appendix C

Photographs

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Photo 1: Keeseekoowenin Landfill Waste Trench

Photo 2: Keeseekoowenin Landfill showing stockpiled metal waste

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Photo 3: Rolling River Landfill Waste Trench

Photo 4: Rolling River Landfill – General Site Overview

Photo 5: Erickson Landfill Active Disposal Trench

Photo 6: Erickson Landfill Pole Barn (similar pole barn is at Onanole Landfill)

Photo 7: Erickson Landfill – Waste Metal Storage

Photo 8: Waste Pit at Sandy Lake Landfill

Photo 9: Overall Site Layout at Sandy Lake Landfill

Photo 10: Waste Pit at Newdale Landfill

Photo 11: Depot at Newdale Landfill

Photo 12: Waste Mound at Onanole Landfill

Photo 13: Burn Pit at Onanole Landfill

P

Photo 14: South Mountain Recycling Depot

Photo 15: Bailer at South Mountain Recycling Depot

Photo 16: Recycling Depot at RMNP

Photo 17: Stockpiled Glass at RMNP

Photo 18: Potential Site 1

Photo 19: Potential Site 2

Photo 20: Potential Site 3

Photo 21: Potential Site 4

Photo 22: Potential Site 5

NEEGAN BURNSIDE

Appendix D

Related Mapping Information

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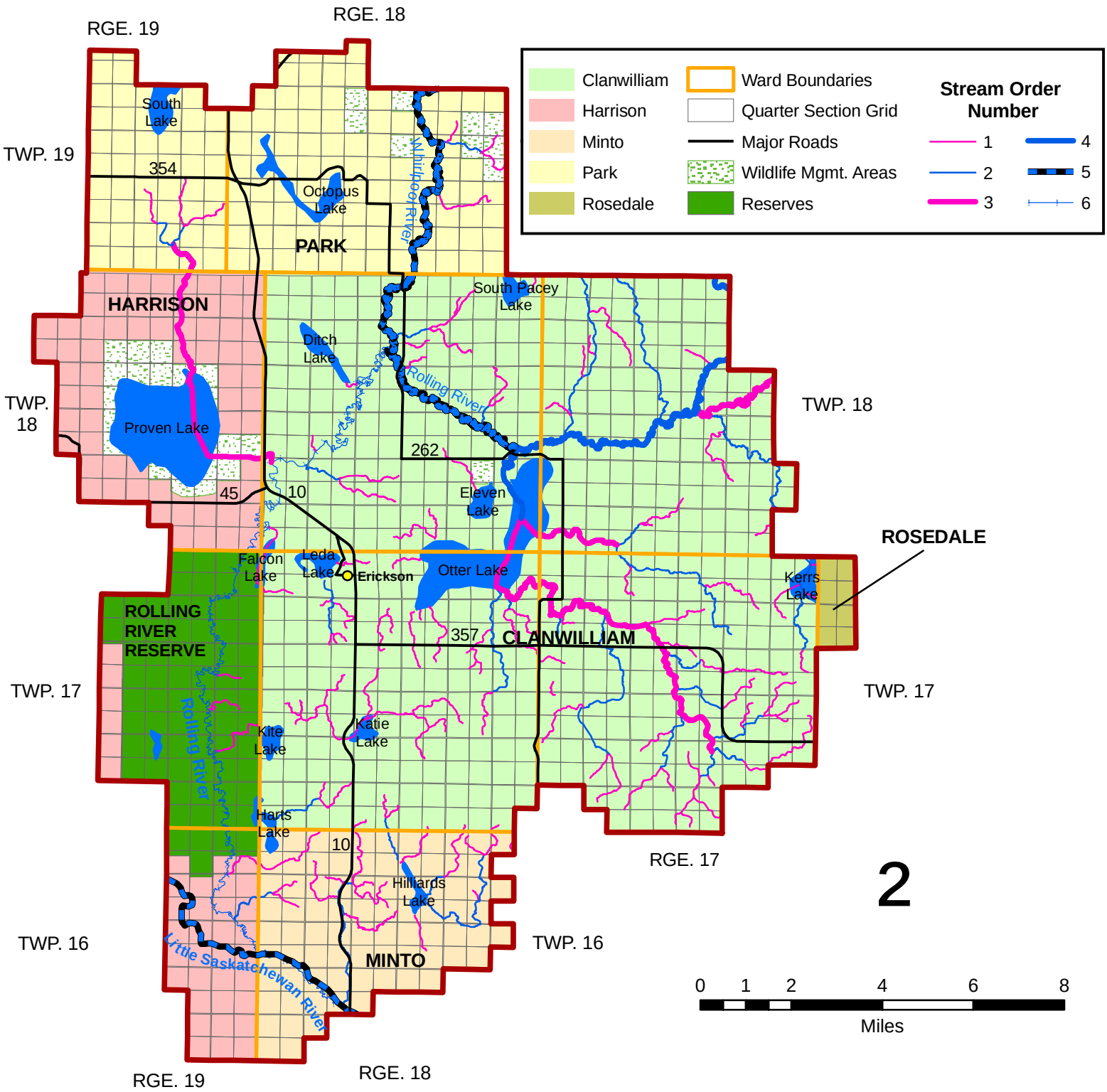
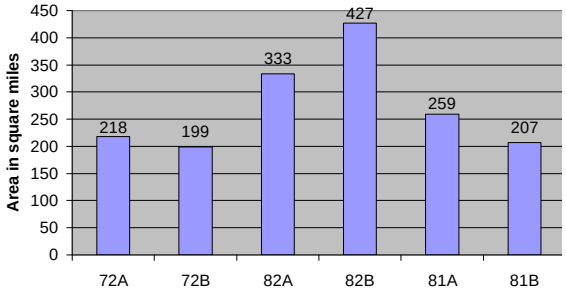
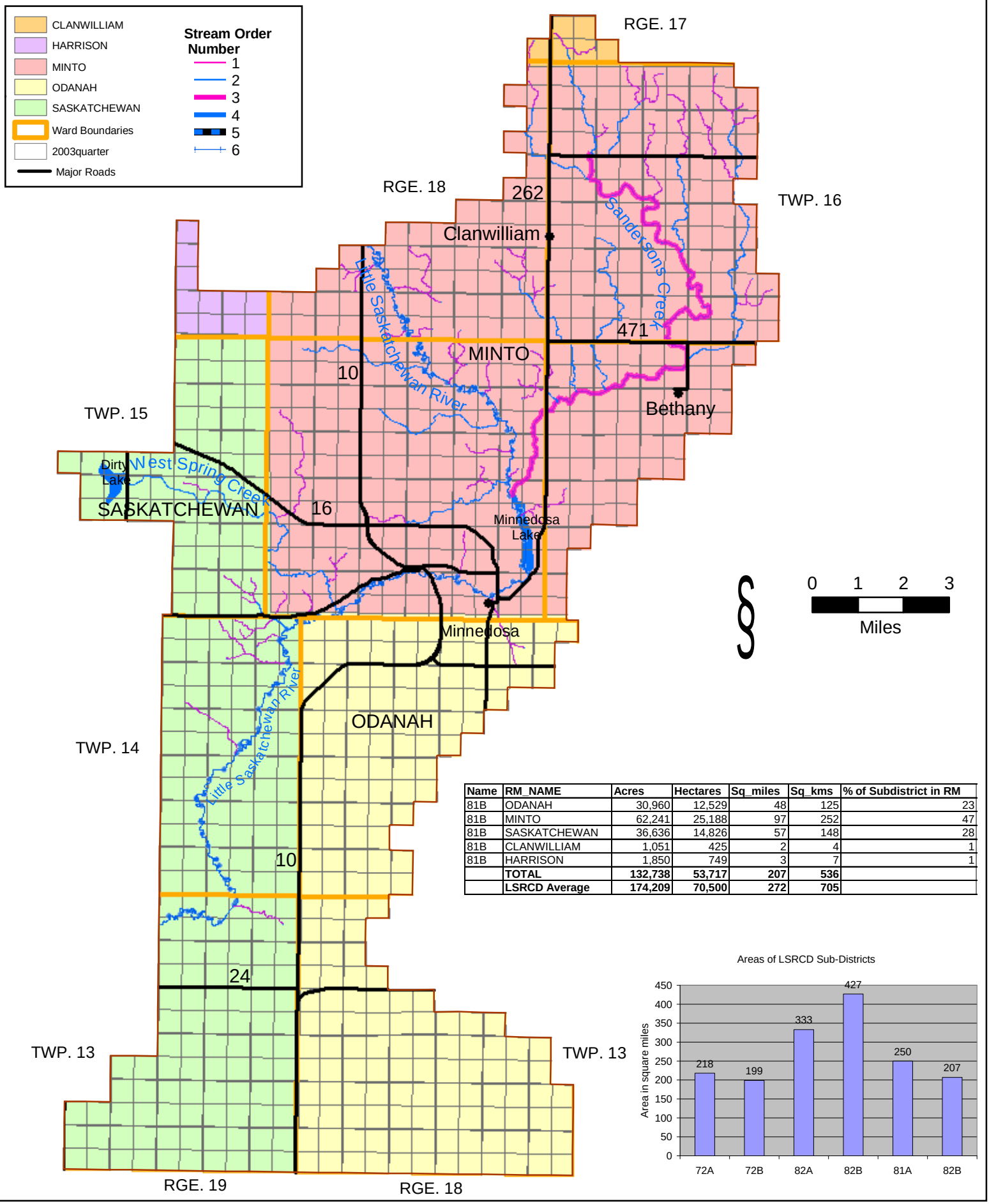
Sub-District 81A Upper Central Little Saskatchewan River



Name	RM Name	Acres	Hectares	Sq. Miles	Sq. Kms	% of SD in RM
81A	Clanwilliam	87,997	35,199	141	352	54.4
81A	Harrison	34,070	13,628	55	136	21.1
81A	Minto	13,431	5,372	21	54	8.3
81A	Park	25,157	10,063	40	101	15.6
81A	Rosedale	1,042	417	2	4	0.6
	TOTAL	**161,697**	**64,679**	**259**	**647**	
	LSRCD AVERAGE	**174,581**	**69,833**	**279**	**698**	

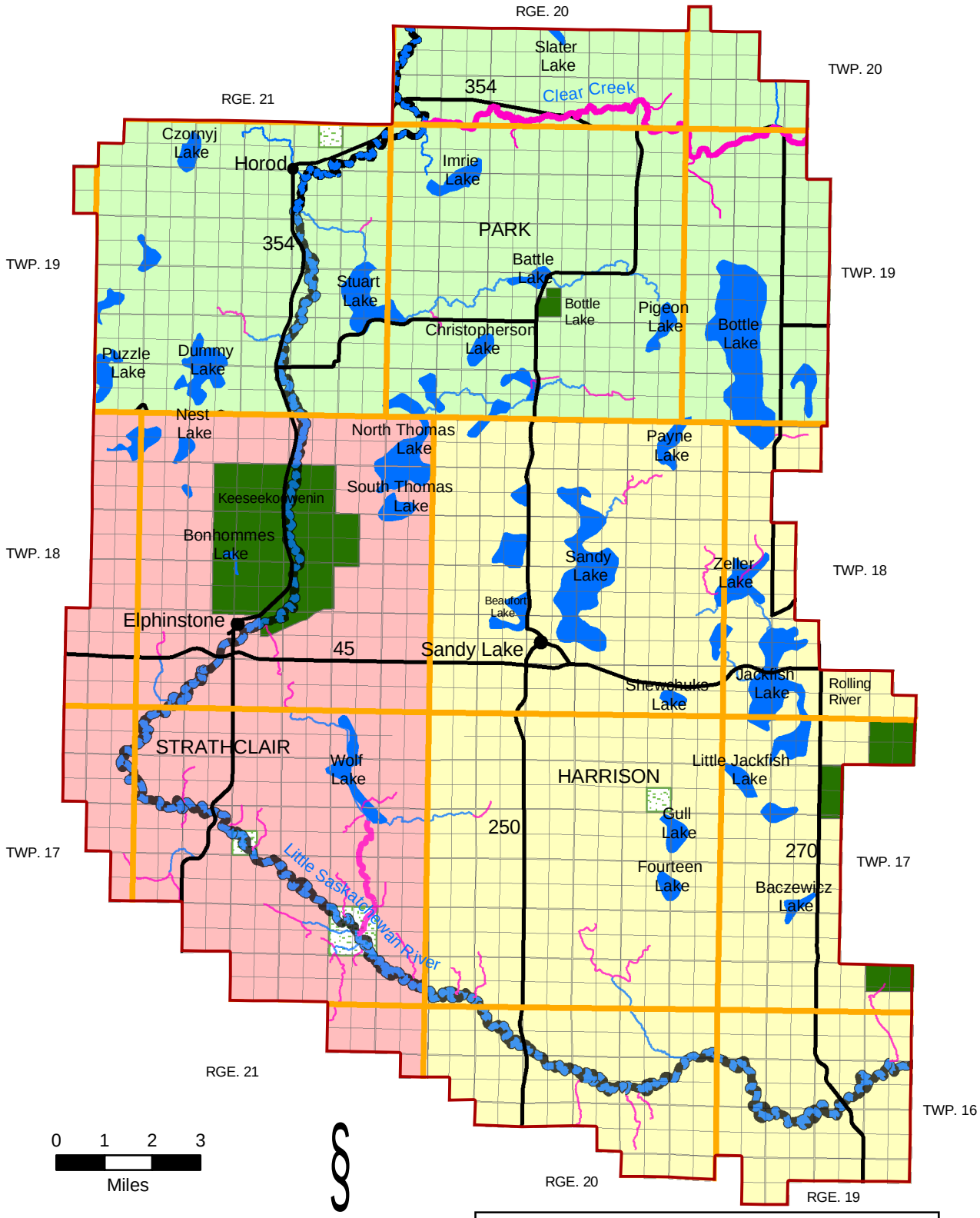


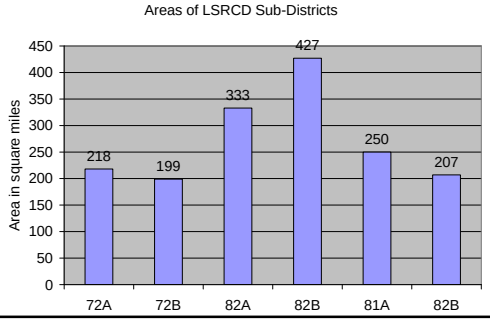
Sub-District 81B Lower Central Little Saskatchewan River



Name	RM_NAME	Acres	Hectares	Sq_miles	Sq_kms	% of Subdistrict in RM
81B	ODANAH	30,960	12,529	48	125	23
81B	MINTO	62,241	25,188	97	252	47
81B	SASKATCHEWAN	36,636	14,826	57	148	28
81B	CLANWILLIAM	1,051	425	2	4	1
81B	HARRISON	1,850	749	3	7	1
	TOTAL	**132,738**	**53,717**	**207**	**536**	
	LSRCD Average	**174,209**	**70,500**	**272**	**705**	

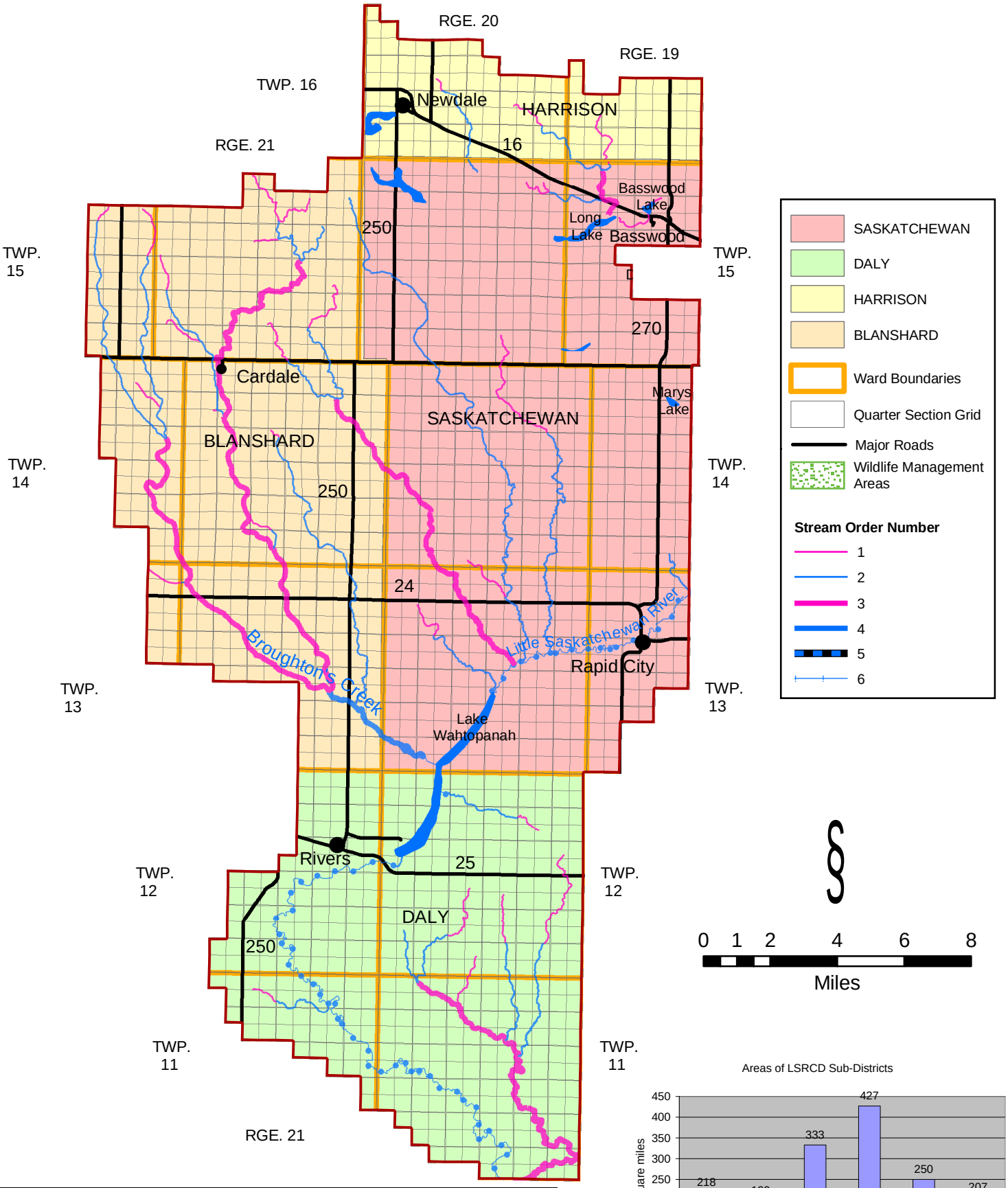
Sub-District 82A Upper Little Saskatchewan River



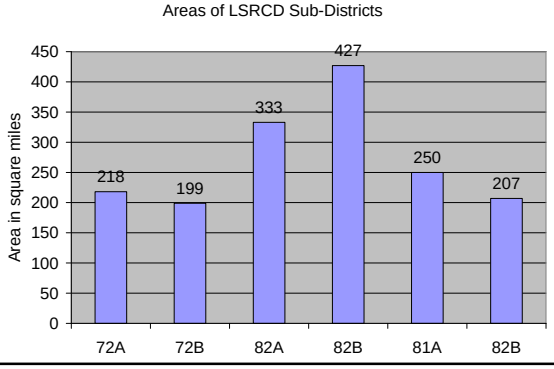


Name	RM_NAME	Acres	Hectares	Sq_miles	Sq_kms	% of Subdistrict in RM
82A	STRATHCLAIR	55,040	22,274	86	223	26
82A	HARRISON	87,716	35,497	137	355	42
82A	PARK	70,700	28,611	110	286	33
	TOTAL	**213,456**	**86,383**	**333**	**864**	
	LSRCD Average	**174,209**	**70,500**	**272**	**705**	

Sub-District 82B Lower Little Saskatchewan River



Name	RM_NAME	Acres	Hectares	Sq_miles	Sq_kms	% of Subdistrict in RM
82B	DALY	67,919	27,486	107	275	25
82B	SASKATCHEWAN	106,751	43,201	167	432	39
82B	BLANSHARD	78,106	31,608	122	316	29
82B	HARRISON	19,594	7,929	31	79	7
	TOTAL	**272,370**	**110,224**	**427**	**1,102**	
	LSRCD Average	**174,209**	**70,500**	**272**	**705**	



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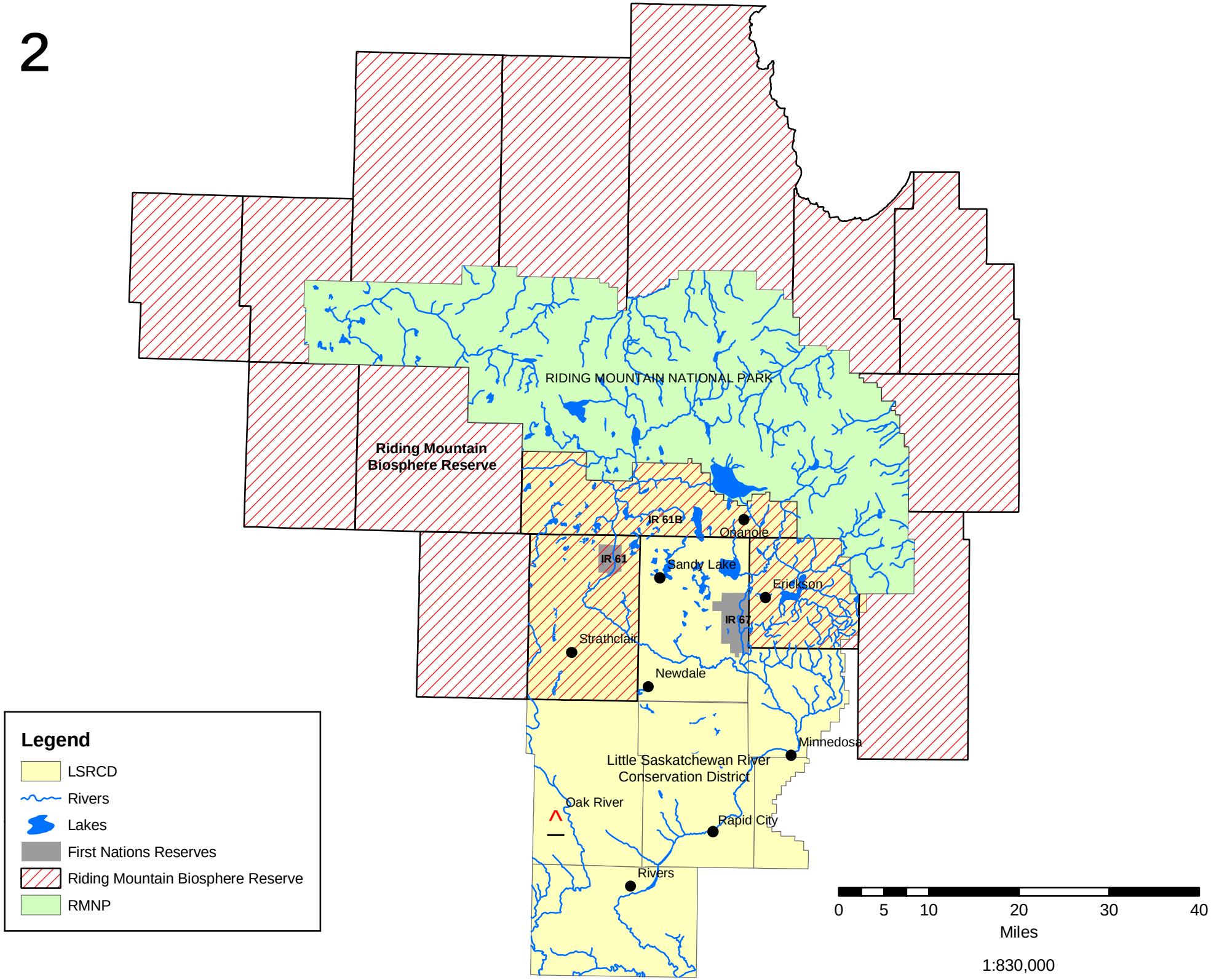
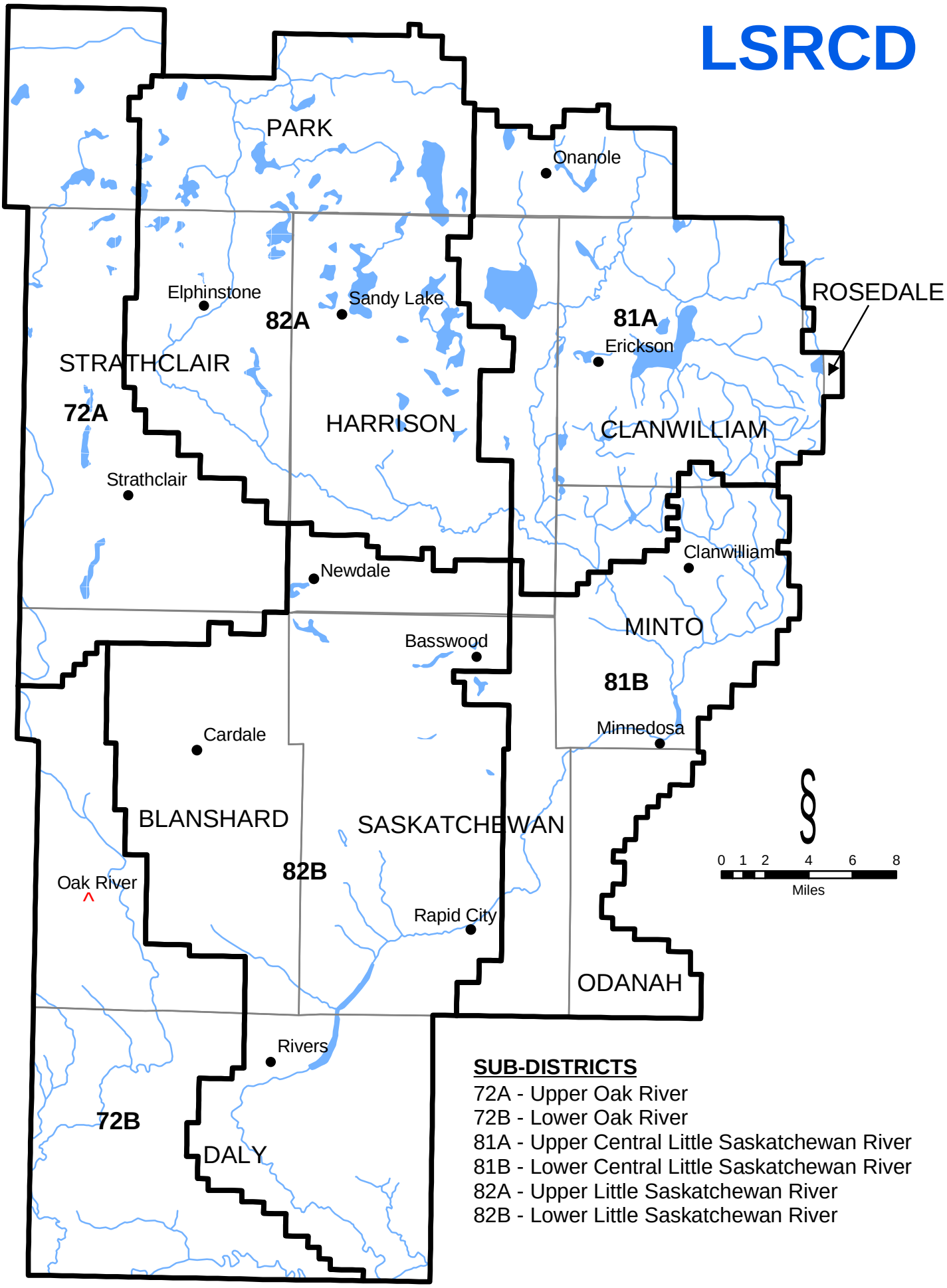

RIDING MOUNTAIN NATIONAL PARK
Riding Mountain
Biosphere Reserve
IR 61B
Onanole
IR 61
Sandy Lake
Erickson
IR 67
Strathclair
Newdale
Minnedosa
Little Saskatchewan River
Conservation District
Oak River
Rapid City
Rivers
Legend
LSRCD
Rivers
Lakes
First Nations Reserves
Riding Mountain Biosphere Reserve
RMNP
0 5 10 20 30 40
Miles
1:830,000


LSRCD
PARK
Onanole
Elphinstone
Sandy Lake
82A
81A
Erickson
ROSEDALE
STRATHCLAIR
72A
HARRISON
CLANWILLIAM
Strathclair
Clanwilliam
Newdale
MINTO
Basswood
81B
Minnedosa
Cardale
BLANSHARD
SASKATCHEWAN
82B
Oak River
Rapid City
ODANAH
Rivers
72B
DALY
0 1 2 4 6 8
Miles
SUB-DISTRICTS
72A - Upper Oak River
72B - Lower Oak River
81A - Upper Central Little Saskatchewan River
81B - Lower Central Little Saskatchewan River
82A - Upper Little Saskatchewan River
82B - Lower Little Saskatchewan River

NEEGAN BURNSIDE

Appendix E

Cost Estimates

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TABLE E-1
New Landfill Capital Costs

	Quantity	Unit	Unit Price	Item Cost	Subtotal
Preliminary Work and Activities					
Land Acquisition	1.0	LS	$ 250,000	$ 250,000	
Contractor Mobilization/Demobilization (entire project)	1	LS	$ 29,850	$ 29,850	
					$279,850
Initial Infrastructure Construction					
Supply, Place & Compact Granular Road Material	33,936	m2	$ 15	$ 509,040	
Earthworks	4,000		$ 25	$ 100,000	
Supply & Place Road Cross Culverts	50	m(l)	$ 250	$ 12,500	
Gate	1	LS	$ 2,000	$ 2,000	
Supply & Install Post & Wire Fence	1,400	m(l)	$ 15	$ 21,000	
Construct Monitoring Wells	20	EA	$ 3,000	$ 60,000	
Supply & Install Signage	10	EA	$ 500	$ 5,000	
Weighscales	1	LS	$ 150,000	$ 150,000	
Main building	600	SM	$ 300	$ 180,000	
Secondary building	200	SM	$ 300	$ 60,000	
Supply Hazardous Waste Storage Trailer	3	unit	$ 50,000	$ 150,000	
Utilities	1	LS	$ 50,000	$ 50,000	
Stormwater Pond	1	m3	$ 20,000	$ 20,000	
Subtotal					**$1,339,540**
Cell Construction (5 year cell)					
Clearing and Grubbing	15,000	sq. m.	$ 0.1	$ 1,500	
Cell Excavation	30,000	m3	$ 10.0	$ 300,000	
Install granular material for liner	4,500	m3	$ 12	$ 54,000	
HDPE for liner	16,500	m2	$ 20	$ 330,000	
Leachate collection piping	250	lm	$ 100	$ 25,000	
Leachate collection header	100	m3	$ 150	$ 15,000	
Subtotal					**$725,500**
Leachate Management					
Forcemain piping	100	lm	$ 150	$ 15,000.00	
Leachate pumping station	1	units	$ 50,000	$ 50,000.00	
Flow monitoring	1	units	$ 25,000	$ 25,000.00	
Aerators	5	units	$ 6,000	$ 30,000.00	
Electrical	1	units	$ 100,000	$ 100,000.00	
Evaporation Pond	45,000	m3	$ 10	$ 450,000	
					$670,000
Equipment					
Loader	1	ea	$ 250,000	$ 250,000.00	
Subtotal					**$250,000**
Estimating Allowance	10%				$326,489.04
Engineering	15%				$489,733.56
TOTAL CAPITAL COSTS					**$4,081,113**

Neegan Burnside
File: 161212 RSWARF Cost Estimates_LANDFILL.xlsx
Sheet: New Landfill Cap
Date: 12/20/2016

Annual Costs

Table E-2
New Landfill Operational Costs

Operations	Quantiy		Unit price		
Cell excavation (annual allowance - only excavated every 5 years)	1	LS	$ 121,000	$ 121,000	
Site Maintenance (allowance)	1	LS	$ 45,000	$ 45,000	
Loader (annual allowance for upkeep and replacement)	1000	/hour	$ 50	$ 50,000	
Shredding	2	LS	$ 30,000	$ 60,000	
Labour	2	staff	$ 30,000	$ 60,000	
Reporting (per CofA)	1	/report	$ 10,000	$ 10,000	
Leachate Pump Operation	1	LS	$ 5,000.0	$ 5,000	
Subtotal					**$351,000**
Contingency	**10%**			**$ 351,000**	**$35,100**
TOTAL OPERATING COSTS					**$386,100**

CLOSURE COSTS

Closure Plan	1	/report	$ 10,000	$ 10,000	
Final cover and closure	75,000.00	m2	5	$ 375,000	
Well decommissioning	$100	unit	300	$ 30,000	
Subtotal					**$415,000**
Contingency	**10%**			**$ 415,000**	**$41,500**
TOTAL CLOSURE COSTS					**$456,500**

Post Closure Costs

Reporting and Closure Monitoring	1	/report	$ 10,000	$ 10,000	
Subtotal					**$10,000**
Contingency	**10%**			**$ 10,000**	**$1,000**
TOTAL POST CLOSURE COSTS					**$11,000**

Neegan Burnside
File: 161212 RSWARF Cost Estimates_LANDFILL.xlsx
Sheet: New Landfill Operations
Date: 12/20/2016

TABLE E-3
Very Small Transfer Station Capital Costs

	Quantity	Unit	Unit Price	Item Cost	Subtotal
Initial Infrastructure Construction					
Supply, Place & Compact Granular Road Material	250	m (l)	$ 60	$ 15,000	
Subtotal					**$15,000**
Equipment					
Supply Roll Off Bins	2	units	$ 9,000	$ 18,000.00	
Subtotal					**$18,000**
Estimating Allowance	10%				$3,300.00
Engineering	15%				$5,445.00
TOTAL CAPITAL COSTS					**$41,745**

Neegan Burnside
File: 161212 RSWARF Cost Estimates_LANDFILL.xlsx
Sheet: Very Small transfer Station
Date: 12/20/2016

TABLE E-4
Small Transfer Station Capital Costs

	Quantity	Unit	Unit Price	Item Cost	Subtotal
Preliminary Work and Activities					
Contractor Mobilization/Demobilization (entire project)	1	LS	$ 3,413	$ 3,413	
					$3,413
Initial Infrastructure Construction					
General cut and Fill	5,000	m3	$ 30	$ 150,000	
Supply & Place Road Cross Culverts	6	m(l)	$ 250	$ 1,500	
Supply, Place & Compact Granular Road Material	5,000	sm	$ 15	$ 75,000	
Supply & Install Signage	10	EA	$ 100	$ 1,000	
Supply and construct retaining walls	123	m2	$ 600	$ 73,800	
Install safety barrier	54	lm	$ 50	$ 2,700	
Supply and install litter fence	21	m2	$ 250	$ 5,250	
Subtotal					**$309,250**
Equipment					
Tractor		ea	$ 75,000		
Supply Roll Off Bins	4	units	$ 8,000	$ 32,000.00	
Subtotal					**$32,000**
Estimating Allowance	10%				$34,466.25
Engineering	15%				$51,699.38
TOTAL CAPITAL COSTS					**$430,828**

Neegan Burnside
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TABLE E-5
Large Transfer Station Capital Costs

	Quantity	Unit	Unit Price	Item Cost	Subtotal
Preliminary Work and Activities					
Contractor Mobilization/Demobilization (entire project)	1	LS	$ 5,746	$ 5,746	
					$5,746
Initial Infrastructure Construction					
General cut and Fill	5,000	m3	$ 30	$ 150,000	
Supply & Place Road Cross Culverts	6	m(l)	$ 250	$ 1,500	
Supply, Place & Compact Granular Road Material	5,000	sm	$ 15	$ 75,000	
Supply and construct retaining walls	10	EA	$ 100	$ 1,000	
Install safety barrier	123	m2	$ 600	$ 73,800	
Supply and install litter fence	54	lm	$ 50	$ 2,700	
Supply bunker	21	m2	$ 250	$ 5,250	
Supply precast curbs	18	lm	$ 20	$ 360	
Subtotal					**$309,610**
Installation of a Stationary Compactor					
Concrete Work	100	m2	$ 750	$ 75,000.00	
Stationary Compactor	1	units	$ 150,000	$ 150,000.00	
					$225,000
Equipment					
Tractor		ea	$ 75,000		
Supply Roll Off Bins	4	units	$ 10,000	$ 40,000.00	
Subtotal					**$40,000**
Estimating Allowance	10.0%				$58,035.61
Engineering	15%				$87,053.42
TOTAL CAPITAL COSTS					**$725,445**

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TABLE E-6
Closure Costs

CLOSURE COSTS			Keeseekoowenin	Rolling River	Erickson	Onanole	Sandy Lake	Newdale	RMNP
Closure Plan	$5,000	/report	1	1	1	1	1	1	
General Site Clean Up		LS	10000	10000	10000	10000	10000	10000	
Placement of Final Cover	$30	/m2	300	300	1000	4000	300	300	
Well decommissioning	$100	/m	4	8					
Infrastructure removal		LS			$ 100,000	$ 100,000	$ 50,000	$ 50,000	
Signage	$2,000	LS	1	1	1	1	1	1	
Material Removal		LS			$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 17,500
Subtotal									
Estimating Allowance	**10%**		$2,640	$2,680	$14,900	$23,900	$7,800	$7,800	$1,750
Engineering	**15%**		$3,960	$4,020	$22,350	$35,850	$11,700	$11,700	$2,625
TOTAL CLOSURE COSTS			$30,360	$30,820	$171,350	$274,850	$89,700	$89,700	$20,125

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TABLE E-7
Common Costs

Common Capital Costs						
Implement Backyard Composting	1.0	LS	$	50,000	$ 50,000	
Public Education and Promotion	1.0	LS	$	20,000	$ 20,000	
Tractor	1.0	LS	$	75,000	$ 75,000	
Reuse Center	1.0	LS	$	75,000	$ 75,000	
Estimating Allowance					$ 22,000	
Engineering					$ 33,000	
Subtotal						**$275,000**

Common Operational Costs						
Public Education and Promotion	1.0	LS	$	10,000	$ 10,000	
Diversion (glass, electronics etc.)	1.0	LS	$	20,000	$ 20,000	
Reuse Center Operation	0.6	staff	$	50,000	$ 30,000	
Administration	0.5	staff	$	50,000	$ 25,000	
Contingency					$8,500	
Subtotal						**$93,500**

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TABLE E-8
Haulage costs for Keeseekoowenin to Central Landfill

Annual Costs - 2017							
Haulage - Keeseekowenin - using a very small transfer station							
Travel - 30 km trip - at 3 tonnes per trip and 32 trips per year	1920	km	$	1.16	$	2,227	
Community tipping fees (assumed)	96	tonne(s)			$	-	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.4	daily	$	50,000	$	20,000	
Contingency					$	2,723	
SUBTOTAL							**$29,950**
Haulage - Keeseekowenin - using a small transfer station							
Travel - 30 km trip - at 4 tonnes per trip and 24 trips per year	1440	km	$	1.16	$	1,670	
Community tipping fees (assumed)	96	tonne(s)			$	-	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.4	daily	$	50,000	$	20,000	
Contingency					$	2,667	
SUBTOTAL							**$29,337**
Haulage - Keeseekowenin - using a large transfer station							
Travel - 30 km trip - at 20 tonnes per trip and 5 trips per year	288	km	$	1.16	$	334	
Community tipping fees (assumed)	96	tonne(s)			$	-	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.4	daily	$	50,000	$	20,000	
Contingency					$	2,533	
SUBTOTAL							**$27,867**

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TABLE E-9
Haulage costs for Erickson to Central Landfill

Annual Costs - 2017							
Haulage - Erickson - using a very small transfer station							
Travel - 30 km trip - at 3 tonnes per trip and 215 trips per year	12900	km	$	1.16	$	14,964	
Community tipping fees (assumed)	645	tonne(s)			$	-	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.6	daily	$	50,000	$	30,000	
Contingency					$	4,996	
SUBTOTAL							**$54,960**
Haulage - Erickson - using a small transfer station							
Travel - 30 km trip - at 4 tonnes per trip and 161 trips per year	9675	km	$	1.16	$	11,223	
Community tipping fees (assumed)	645	tonne(s)			$	-	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.6	daily	$	50,000	$	30,000	
Contingency					$	4,622	
SUBTOTAL							**$50,845**
Haulage - Erickson - using a large transfer station							
Travel - 30 km trip - at 20 tonnes per trip and 32 trips per year	1935	km	$	1.16	$	2,245	
Community tipping fees (assumed)	645	tonne(s)			$	-	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.6	daily	$	50,000	$	30,000	
Contingency					$	3,724	
SUBTOTAL							**$40,969**

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TABLE E-10
Haulage costs for Onanole to Central Landfill

Annual Costs - 2017							
Haulage - Onanole - using a very small transfer station							
Travel - 40 km trip - at 3 tonnes per trip and 761 trips per year	60880	km	$	1.16	$	70,621	
Community tipping fees (assumed)	2283	tonne(s)			$	-	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	1	daily	$	50,000	$	50,000	
Contingency					$	12,562	
SUBTOTAL							**$138,183**
Haulage - Onanole - using a small transfer station							
Travel - 40 km trip - at 4 tonnes per trip and 571 trips per year	45660	km	$	1.16	$	52,966	
Community tipping fees (assumed)	2283	tonne(s)			$	-	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	1	daily	$	50,000	$	50,000	
Contingency					$	10,797	
SUBTOTAL							**$118,762**
Haulage - Onanole - using a large transfer station							
Travel - 40 km trip - at 20 tonnes per trip and 114 trips per year	9132	km	$	1.16	$	10,593	
Community tipping fees (assumed)	2283	tonne(s)			$	-	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	1	daily	$	50,000	$	50,000	
Contingency					$	6,559	
SUBTOTAL							**$72,152**

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TABLE E-11
Haulage costs for Newdale to Central Landfill

Annual Costs - 2017							
Haulage - Newdale - using a very small transfer station							
Travel - 30 km trip - at 3 tonnes per trip and 15 trips per year	880	km	$	1.16	$	1,021	
Community tipping fees (assumed)	44	tonne(s)			$	-	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.4	daily	$	50,000	$	20,000	
Contingency					$	2,602	
SUBTOTAL							**$28,623**
Haulage - Newdale - using a small transfer station							
Travel - 30 km trip - at 4 tonnes per trip and 11 trips per year	660	km	$	1.16	$	766	
Community tipping fees (assumed)	44	tonne(s)			$	-	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.4	daily	$	50,000	$	20,000	
Contingency					$	2,577	
SUBTOTAL							**$28,342**
Haulage - Newdale - using a large transfer station							
Travel - 30 km trip - at 20 tonnes per trip and 2 trips per year	132	km	$	1.16	$	153	
Community tipping fees (assumed)	44	tonne(s)			$	-	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.4	daily	$	50,000	$	20,000	
Contingency					$	2,515	
SUBTOTAL							**$27,668**

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TABLE E-12
Haulage costs for Sandy Lake to Central Landfill

Annual Costs - 2017							
Haulage - Sandy Lake - using a very small transfer station							
Travel - 0 km trip - at 3 tonnes per trip and 57 trips per year	0	km	$	1.16	$	-	
Community tipping fees (assumed)	170	tonne(s)			$	-	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.4	daily	$	50,000	$	20,000	
Contingency					$	2,500	
SUBTOTAL							**$27,500**
Haulage - Sandy Lake - using a small transfer station							
Travel - 0 km trip - at 4 tonnes per trip and 43 trips per year	0	km	$	1.16	$	-	
Community tipping fees (assumed)	170	tonne(s)			$	-	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.4	daily	$	50,000	$	20,000	
Contingency					$	2,500	
SUBTOTAL							**$27,500**
Haulage - Sandy Lake - using a large transfer station							
Travel - 0 km trip - at 20 tonnes per trip and 9 trips per year	0	km	$	1.16	$	-	
Community tipping fees (assumed)	170	tonne(s)			$	-	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.4	daily	$	50,000	$	20,000	
Contingency					$	2,500	
SUBTOTAL							**$27,500**

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TABLE E-13
Haulage costs for Keeseekoowenin to Central Transfer Station

Annual Costs - 2017							
Haulage - Keeseekowenin - using a very small transfer station							
Travel - 30 km trip - at 3 tonnes per trip and 32 trips per year	1920	km	$	1.16	$	2,227	
Community tipping fees (assumed)	96	tonne(s)			$	-	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.4	daily	$	50,000	$	20,000	
Contingency					$	2,723	
SUBTOTAL							**$29,950**
Haulage - Keeseekowenin - using a small transfer station							
Travel - 30 km trip - at 4 tonnes per trip and 24 trips per year	1440	km	$	1.16	$	1,670	
Community tipping fees (assumed)	96	tonne(s)			$	-	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.4	daily	$	50,000	$	20,000	
Contingency					$	2,667	
SUBTOTAL							**$29,337**
Haulage - Keeseekowenin - using a large transfer station							
Travel - 30 km trip - at 20 tonnes per trip and 5 trips per year	288	km	$	1.16	$	334	
Community tipping fees (assumed)	96	tonne(s)			$	-	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.4	daily	$	50,000	$	20,000	
Contingency					$	2,533	
SUBTOTAL							**$27,867**

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TABLE E-14
Haulage costs for Erickson to Regional Landfill (Evergreen)

Annual Costs - 2017							
Haulage - Erickson - using a very small transfer station							
Travel - 60 km trip - at 3 tonnes per trip and 215 trips per year	25800	km	$	1.16	$	29,928	
Community tipping fees (assumed)	645	tonne(s)	$	75	$	48,375	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.6	daily	$	50,000	$	30,000	
Contingency					$	11,330	
SUBTOTAL							**$124,633**
Haulage - Erickson - using a small transfer station							
Travel - 60 km trip - at 4 tonnes per trip and 161 trips per year	19350	km	$	1.16	$	22,446	
Community tipping fees (assumed)	645	tonne(s)	$	75	$	48,375	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.6	daily	$	50,000	$	30,000	
Contingency					$	10,582	
SUBTOTAL							**$116,403**
Haulage - Erickson - using a large transfer station							
Travel - 60 km trip - at 20 tonnes per trip and 32 trips per year	3870	km	$	1.16	$	4,489	
Community tipping fees (assumed)	645	tonne(s)	$	75	$	48,375	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.6	daily	$	50,000	$	30,000	
Contingency					$	8,786	
SUBTOTAL							**$96,651**

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TABLE E-15
Haulage costs for Onanole to Regional Landfill (Evergreen)

Annual Costs - 2017							
Haulage - Onanole - using a very small transfer station							
Travel - 70 km trip - at 3 tonnes per trip and 1075 trips per year	150453	km	$	1.16	$	174,526	
Community tipping fees (assumed)	3224	tonne(s)	$	75	$	241,800	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	1	daily	$	50,000	$	50,000	
Contingency					$	47,133	
SUBTOTAL							**$518,458**
Haulage - Onanole - using a small transfer station							
Travel - 70 km trip - at 4 tonnes per trip and 806 trips per year	112840	km	$	1.16	$	130,894	
Community tipping fees (assumed)	3224	tonne(s)	$	75	$	241,800	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	1	daily	$	50,000	$	50,000	
Contingency					$	42,769	
SUBTOTAL							**$470,464**
Haulage - Onanole - using a large transfer station							
Travel - 70 km trip - at 20 tonnes per trip and 161 trips per year	22568	km	$	1.16	$	26,179	
Community tipping fees (assumed)	3224	tonne(s)	$	75	$	241,800	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	1	daily	$	50,000	$	50,000	
Contingency					$	32,298	
SUBTOTAL							**$355,277**

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TABLE E-16
Haulage costs for Newdale to Central Transfer Station

Annual Costs - 2017							
Haulage - Newdale - using a very small transfer station							
Travel - 45 km trip - at 3 tonnes per trip and 15 trips per year	1320	km	$	1.16	$	1,531	
Community tipping fees (assumed)	44	tonne(s)	$	75	$	3,300	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.4	daily	$	50,000	$	20,000	
Contingency					$	2,983	
SUBTOTAL							**$32,814**
Haulage - Newdale - using a small transfer station							
Travel - 45 km trip - at 4 tonnes per trip and 11 trips per year	990	km	$	1.16	$	1,148	
Community tipping fees (assumed)	44	tonne(s)	$	75	$	3,300	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.4	daily	$	50,000	$	20,000	
Contingency					$	2,945	
SUBTOTAL							**$32,393**
Haulage - Newdale - using a large transfer station							
Travel - 45 km trip - at 20 tonnes per trip and 2 trips per year	198	km	$	1.16	$	230	
Community tipping fees (assumed)	44	tonne(s)	$	75	$	3,300	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.4	daily	$	50,000	$	20,000	
Contingency					$	2,853	
SUBTOTAL							**$31,383**

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TABLE E-17
Haulage costs for Sandy Lake to Central Transfer Station

Annual Costs - 2017							
Haulage - Sandy Lake - using a very small transfer station							
Travel - 20 km trip - at 3 tonnes per trip and 57 trips per year	2267	km	$	1.16	$	2,629	
Community tipping fees (assumed)	170	tonne(s)			$	-	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.4	daily	$	50,000	$	20,000	
Contingency					$	2,763	
SUBTOTAL							**$30,392**
Haulage - Sandy Lake - using a small transfer station							
Travel - 20 km trip - at 4 tonnes per trip and 43 trips per year	1700	km	$	1.16	$	1,972	
Community tipping fees (assumed)	170	tonne(s)			$	-	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.4	daily	$	50,000	$	20,000	
Contingency					$	2,697	
SUBTOTAL							**$29,669**
Haulage - Sandy Lake - using a large transfer station							
Travel - 20 km trip - at 20 tonnes per trip and 9 trips per year	340	km	$	1.16	$	394	
Community tipping fees (assumed)	170	tonne(s)			$	-	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.4	daily	$	50,000	$	20,000	
Contingency					$	2,539	
SUBTOTAL							**$27,934**

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TABLE E-18
Haulage costs for Keeseekoowenin to Regional Landfill (Evergreen)

Annual Costs - 2017							
Haulage - Keeseekowenin - using a very small transfer station							
Travel - 90 km trip - at 3 tonnes per trip and 32 trips per year	5760	km	$	1.16	$	6,682	
Community tipping fees (assumed)	96	tonne(s)	$	75	$	7,200	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.4	daily	$	50,000	$	20,000	
Contingency					$	3,888	
SUBTOTAL							**$42,770**
Haulage - Keeseekowenin - using a small transfer station							
Travel - 90 km trip - at 4 tonnes per trip and 24 trips per year	4320	km	$	1.16	$	5,011	
Community tipping fees (assumed)	96	tonne(s)	$	75	$	7,200	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.4	daily	$	50,000	$	20,000	
Contingency					$	3,721	
SUBTOTAL							**$40,932**
Haulage - Keeseekowenin - using a large transfer station							
Travel - 90 km trip - at 20 tonnes per trip and 5 trips per year	864	km	$	1.16	$	1,002	
Community tipping fees (assumed)	96	tonne(s)	$	75	$	7,200	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.4	daily	$	50,000	$	20,000	
Contingency					$	3,320	
SUBTOTAL							**$36,522**

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TABLE E-19
Haulage costs for Erickson to Regional Landfill (Evergreen)

Annual Costs - 2017							
Haulage - Erickson - using a very small transfer station							
Travel - 60 km trip - at 3 tonnes per trip and 215 trips per year	25800	km	$	1.16	$	29,928	
Community tipping fees (assumed)	645	tonne(s)	$	75	$	48,375	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.6	daily	$	50,000	$	30,000	
Contingency					$	11,330	
SUBTOTAL							**$124,633**
Haulage - Erickson - using a small transfer station							
Travel - 60 km trip - at 4 tonnes per trip and 161 trips per year	19350	km	$	1.16	$	22,446	
Community tipping fees (assumed)	645	tonne(s)	$	75	$	48,375	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.6	daily	$	50,000	$	30,000	
Contingency					$	10,582	
SUBTOTAL							**$116,403**
Haulage - Erickson - using a large transfer station							
Travel - 60 km trip - at 20 tonnes per trip and 32 trips per year	3870	km	$	1.16	$	4,489	
Community tipping fees (assumed)	645	tonne(s)	$	75	$	48,375	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.6	daily	$	50,000	$	30,000	
Contingency					$	8,786	
SUBTOTAL							**$96,651**

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TABLE E-20
Haulage costs for Onanole to Regional Landfill (Evergreen)

Annual Costs - 2017							
Haulage - Onanole - using a very small transfer station							
Travel - 70 km trip - at 3 tonnes per trip and 986 trips per year	138040	km	$	1.16	$	160,126	
Community tipping fees (assumed)	2958	tonne(s)	$	75	$	221,850	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	1	daily	$	50,000	$	50,000	
Contingency					$	43,698	
SUBTOTAL							**$480,674**
Haulage - Onanole - using a small transfer station							
Travel - 70 km trip - at 4 tonnes per trip and 740 trips per year	103530	km	$	1.16	$	120,095	
Community tipping fees (assumed)	2958	tonne(s)	$	75	$	221,850	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	1	daily	$	50,000	$	50,000	
Contingency					$	39,694	
SUBTOTAL							**$436,639**
Haulage - Onanole - using a large transfer station							
Travel - 70 km trip - at 20 tonnes per trip and 148 trips per year	20706	km	$	1.16	$	24,019	
Community tipping fees (assumed)	2958	tonne(s)	$	75	$	221,850	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	1	daily	$	50,000	$	50,000	
Contingency					$	30,087	
SUBTOTAL							**$330,956**

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TABLE E-21
Haulage costs for Newdale to Regional Landfill (Evergreen)

Annual Costs - 2017							
Haulage - Newdale - using a very small transfer station							
Travel - 45 km trip - at 3 tonnes per trip and 15 trips per year	1320	km	$	1.16	$	1,531	
Community tipping fees (assumed)	44	tonne(s)	$	75	$	3,300	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.4	daily	$	50,000	$	20,000	
Contingency					$	2,983	
SUBTOTAL							**$32,814**
Haulage - Newdale - using a small transfer station							
Travel - 45 km trip - at 4 tonnes per trip and 11 trips per year	990	km	$	1.16	$	1,148	
Community tipping fees (assumed)	44	tonne(s)	$	75	$	3,300	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.4	daily	$	50,000	$	20,000	
Contingency					$	2,945	
SUBTOTAL							**$32,393**
Haulage - Newdale - using a large transfer station							
Travel - 45 km trip - at 20 tonnes per trip and 2 trips per year	198	km	$	1.16	$	230	
Community tipping fees (assumed)	44	tonne(s)	$	75	$	3,300	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.4	daily	$	50,000	$	20,000	
Contingency					$	2,853	
SUBTOTAL							**$31,383**

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TABLE E-22
Haulage costs for Sandy Lake to Regional Landfill (Evergreen)

Annual Costs - 2017							
Haulage - Sandy Lake - using a very small transfer station							
Travel - 70 km trip - at 3 tonnes per trip and 57 trips per year	7933	km	$	1.16	$	9,203	
Community tipping fees (assumed)	170	tonne(s)	$	75	$	12,750	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.4	daily	$	50,000	$	20,000	
Contingency					$	4,695	
SUBTOTAL							**$51,648**
Haulage - Sandy Lake - using a small transfer station							
Travel - 70 km trip - at 4 tonnes per trip and 43 trips per year	5950	km	$	1.16	$	6,902	
Community tipping fees (assumed)	170	tonne(s)	$	75	$	12,750	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.4	daily	$	50,000	$	20,000	
Contingency					$	4,465	
SUBTOTAL							**$49,117**
Haulage - Sandy Lake - using a large transfer station							
Travel - 70 km trip - at 20 tonnes per trip and 9 trips per year	1190	km	$	1.16	$	1,380	
Community tipping fees (assumed)	170	tonne(s)	$	75	$	12,750	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.4	daily	$	50,000	$	20,000	
Contingency					$	3,913	
SUBTOTAL							**$43,043**

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TABLE E-23
Haulage costs for Keeseekoowenin to Regional Landfill (Brandon)

Annual Costs - 2017

Haulage - Keeseekowenin - using a very small transfer station							
Travel - 140 km trip - at 3 tonnes per trip and 32 trips per year	8960	km	$	1.16	$	10,394	
Community tipping fees (assumed)	96	tonne(s)	$	75	$	7,200	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.4	daily	$	50,000	$	20,000	
Contingency					$	4,259	
SUBTOTAL							**$46,853**
Haulage - Keeseekowenin - using a small transfer station							
Travel - 140 km trip - at 4 tonnes per trip and 24 trips per year	6720	km	$	1.16	$	7,795	
Community tipping fees (assumed)	96	tonne(s)	$	75	$	7,200	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.4	daily	$	50,000	$	20,000	
Contingency					$	4,000	
SUBTOTAL							**$43,995**
Haulage - Keeseekowenin - using a large transfer station							
Travel - 140 km trip - at 20 tonnes per trip and 5 trips per year	1344	km	$	1.16	$	1,559	
Community tipping fees (assumed)	96	tonne(s)	$	75	$	7,200	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.4	daily	$	50,000	$	20,000	
Contingency					$	3,376	
SUBTOTAL							**$37,135**

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TABLE E-24
Haulage costs for Erickson to Regional Landfill (Brandon)

Annual Costs - 2017							
Haulage - Erickson - using a very small transfer station							
Travel - 110 km trip - at 3 tonnes per trip and 215 trips per year	47300	km	$	1.16	$	54,868	
Community tipping fees (assumed)	645	tonne(s)	$	75	$	48,375	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.6	daily	$	50,000	$	30,000	
Contingency					$	13,824	
SUBTOTAL							**$152,067**
Haulage - Erickson - using a small transfer station							
Travel - 110 km trip - at 4 tonnes per trip and 161 trips per year	35475	km	$	1.16	$	41,151	
Community tipping fees (assumed)	645	tonne(s)	$	75	$	48,375	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.6	daily	$	50,000	$	30,000	
Contingency					$	12,453	
SUBTOTAL							**$136,979**
Haulage - Erickson - using a large transfer station							
Travel - 110 km trip - at 20 tonnes per trip and 32 trips per year	7095	km	$	1.16	$	8,230	
Community tipping fees (assumed)	645	tonne(s)	$	75	$	48,375	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.6	daily	$	50,000	$	30,000	
Contingency					$	9,161	
SUBTOTAL							**$100,766**

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TABLE E-25
Haulage costs for Onanole to Regional Landfill (Brandon)

Annual Costs - 2017							
Haulage - Onanole - using a very small transfer station							
Travel - 120 km trip - at 3 tonnes per trip and 986 trips per year	236640	km	$	1.16	$	274,502	
Community tipping fees (assumed)	2958	tonne(s)	$	75	$	221,850	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	1	daily	$	50,000	$	50,000	
Contingency					$	55,135	
SUBTOTAL							**$606,488**
Haulage - Onanole - using a small transfer station							
Travel - 120 km trip - at 4 tonnes per trip and 740 trips per year	177480	km	$	1.16	$	205,877	
Community tipping fees (assumed)	2958	tonne(s)	$	75	$	221,850	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	1	daily	$	50,000	$	50,000	
Contingency					$	48,273	
SUBTOTAL							**$530,999**
Haulage - Onanole - using a large transfer station							
Travel - 120 km trip - at 20 tonnes per trip and 148 trips per year	35496	km	$	1.16	$	41,175	
Community tipping fees (assumed)	2958	tonne(s)	$	75	$	221,850	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	1	daily	$	50,000	$	50,000	
Contingency					$	31,803	
SUBTOTAL							**$349,828**

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TABLE E-26
Haulage costs for Newdale to Regional Landfill (Brandon)

Annual Costs - 2017							
Haulage - Newdale - using a very small transfer station							
Travel - 95 km trip - at 3 tonnes per trip and 15 trips per year	2787	km	$	1.16	$	3,233	
Community tipping fees (assumed)	44	tonne(s)	$	75	$	3,300	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.4	daily	$	50,000	$	20,000	
Contingency					$	3,153	
SUBTOTAL							**$34,686**
Haulage - Newdale - using a small transfer station							
Travel - 95 km trip - at 4 tonnes per trip and 11 trips per year	2090	km	$	1.16	$	2,424	
Community tipping fees (assumed)	44	tonne(s)	$	75	$	3,300	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.4	daily	$	50,000	$	20,000	
Contingency					$	3,072	
SUBTOTAL							**$33,797**
Haulage - Newdale - using a large transfer station							
Travel - 95 km trip - at 20 tonnes per trip and 2 trips per year	418	km	$	1.16	$	485	
Community tipping fees (assumed)	44	tonne(s)	$	75	$	3,300	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.4	daily	$	50,000	$	20,000	
Contingency					$	2,878	
SUBTOTAL							**$31,663**

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TABLE E-27
Haulage costs for Sandy Lake to Regional Landfill (Brandon)

Annual Costs - 2017							
Haulage - Sandy Lake - using a very small transfer station							
Travel - 120 km trip - at 3 tonnes per trip and 57 trips per year	13600	km	$	1.16	$	15,776	
Community tipping fees (assumed)	170	tonne(s)	$	75	$	12,750	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.4	daily	$	50,000	$	20,000	
Contingency					$	5,353	
SUBTOTAL							**$58,879**
Haulage - Sandy Lake - using a small transfer station							
Travel - 120 km trip - at 4 tonnes per trip and 43 trips per year	10200	km	$	1.16	$	11,832	
Community tipping fees (assumed)	170	tonne(s)	$	75	$	12,750	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.4	daily	$	50,000	$	20,000	
Contingency					$	4,958	
SUBTOTAL							**$54,540**
Haulage - Sandy Lake - using a large transfer station							
Travel - 120 km trip - at 20 tonnes per trip and 9 trips per year	2040	km	$	1.16	$	2,366	
Community tipping fees (assumed)	170	tonne(s)	$	75	$	12,750	
Site Maintenance	1	unit	$	5,000	$	5,000	
Staff	0.4	daily	$	50,000	$	20,000	
Contingency					$	4,012	
SUBTOTAL							**$44,128**

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