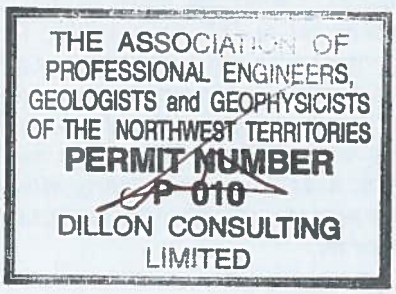
Hamlet of Aklavik - Solid Waste Site Evaluation

Final Report

March 2009



Hamlet of Aklavik Solid Waste Site Evaluation

Hamlet of Aklavik

08-9461-2010

Colin Joyal, P.Eng. - Project Manager

Submitted by

Dillon Consulting Limited

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(In reply, please refer to)
Our File: 08-9461-2010

March 10, 2009

Hamlet of Aklavik
Box 88
Aklavik, NWT X0E 0A0

Attention: Mrs. Evelyn Storr

Aklavik Solid Waste Site Evaluation Final Report

Dear Mrs. Storr:

We are pleased to provide you with the final report entitled "Hamlet of Aklavik Solid Waste Site Evaluation - Final Report". This report is submitted in accordance with our proposal dated May 13, 2008.

The report outlines the solid waste management needs for the community, regulatory requirements and evaluation of five system options. The five system options along with order of magnitude cost estimates are presented for comparative purposes and further consideration by the community.

If you have any questions, please do not hesitate to call me at 1-867-920-4555 ext. 4103 or cjoyal@dillon.ca.

Yours sincerely,

DILLON CONSULTING LIMITED

Colin Joyal, P.Eng.
Project Manager

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EXECUTIVE SUMMARY

Aklavik's existing solid waste disposal facility has been experiencing operational problems in recent years, in particular related to the frequently occurring floods and drainage issues around the community. The landfill site is reported to be nearing its capacity. In 2008 the Hamlet of Aklavik retained Dillon Consulting Limited to complete a work program to evaluate the current landfill site and to identify opportunities and limitations of the existing site and what requirements need to be fulfilled for the siting of a new landfill based on the community's twenty-year requirements.

We participated in a community meeting at the start of the project and key points brought forward in this meeting related to the solid waste issues were:

- Existing Water Licence is coming up for renewal. Landfill O&M Manual is still outstanding;
- Community wants alternate landfill sites to be identified;
- Concerns raised with the existing system:
    - Spread of garbage spreading beyond the area and into small creeks;
    - Maintenance of the facility; and
    - Control of waste being deposited;

A site investigation was completed by Dillon along with the Hamlet Foreman on June 3, 2008. This information along with site survey data, mapping, INAC inspection reports and relevant regulations and guidelines were reviewed.

Several significant issues related to the existing site are identified in the report. The most significant issues relate to the protection of public health and the environment. Rehabilitating the existing site to comply with the current relevant regulations would be very challenging and not feasible where regulations address site location requirements. It is recommended that the community investigate a new site for solid waste disposal and discontinue operation of this facility allowing site closure to proceed as soon as possible.

Several actions should be implemented immediately to improve site conditions and meet regulatory requirements where possible;

1. Develop an Operations and Maintenance Manual for the site;
2. Segregate incoming waste materials into separate areas such as; domestic waste, bulky waste, and household hazardous wastes;
3. Discontinue accepting hazardous wastes such as contaminated soil without proper testing and storage and treatment facilities;
4. Develop a proper household hazardous waste (HHW) storage and handling program to deal with HHW such as empty propane cylinders, waste batteries, paint containers etc.;

1 INTRODUCTION AND BACKGROUND

The Hamlet of Aklavik is located on the Peel channel of the Mackenzie River Delta, 113 km south of the Arctic Coast. According to the 2006 Census, the population is 594, of which 545 are aboriginal. Traditionally, Gwich'in and Inuvialuit gathered in Aklavik to trade goods. In 1912, the Hudson's Bay Company set up a post across the channel to trade for furs. Today, Aklavik is accessible by air, barge or winter ice roads.

Aklavik's existing solid waste disposal facility has been experiencing operational problems in the recent years, in particularly related to the frequently occurring floods and drainage issues around the community. The landfill site is reported to be nearing its capacity. In May 2008, Aklavik retained Dillon Consulting Limited (Dillon) to evaluate the current landfill site and to identify opportunities and limitations of the existing site or what requirements need to be fulfilled for the siting of a new landfill based on the community's twenty-year requirements.

In June 2008, Dillon completed a site visit and a topographical survey to assess the suitability of the existing site and collect site data. This report summarizes legislative landfill site requirements, site development constraints and the current site condition. It also presents five (5) system options for consideration by the community.

1.1 Scope of Work

Currently, the solid waste disposal site in Aklavik is reportedly nearing its design capacity. This study is intended to investigate the current capacity of the site, to evaluate the site, and look into the potential to expand the site along with reviewing the requirements for siting a new landfill based on the Community's twenty-year requirements.

The scope of work for the Solid Waste Site Evaluation includes the following:

- Complete a site visit and provide site inspection report;
- Identify requirements needed to apply for permits from the water board (if required);
- Identify whether a topographic and/or geotechnical survey is required and, if required, include costing information;
- Recommend if the current site is to be expanded or a new site is required; and,
- Recommend solutions to deal with current solid waste site issues and provide alternatives where required.

  - Community Plan (1997);
  - Zoning Map (1997); and,
  - Aklavik Street Name Map.
- The Aklavik Road and Drainage Report, October 2005, by DoT;
- Baseline hydraulic inventory;
- Northwest Territories Water Licence No. N3L3-0570 (effective June 30, 1999; expires June 30, 2009);
- INAC Water Licence Inspection Reports (2004, 2005, 2007); and,
- Anecdotal information regarding problem areas and historic drainage patterns derived from interviews with community representatives.

1.4 Community Meeting

A meeting with Dillon and members of the Hamlet council and staff was held on June 3, 2008. The minutes to this meeting are included in Appendix A. Key points brought forward in this meeting related to the solid waste issues were:

- Existing Water Licence is coming up for renewal. Landfill O&M Manual is still outstanding;
- Community wants alternate landfill sites to be identified;
- Concerns raised with the existing system:
  - Garbage spreading beyond the area and into small creeks;
  - Maintenance of the facility;
  - Control of waste being deposited; and,
  - Approval for Dillon to collect additional survey data for the existing site.

B, Item 8, and in the *Guidelines for Planning, Design, Operations and Maintenance of Modified Solid Waste Sites* has not been prepared for the site.

Residents have complained about smoke from the open burning of waste. This practice was stopped in 2002 and reportedly only wood, clean paper and cardboard is burned. However, residents continuously complain about issues regarding the dirtiness and accumulation of waste piles at the site.

Groundwater and surface water monitoring is not required for the solid waste site as part of the water licence requirements.

Indian and Northern Affairs Canada (INAC) conducts inspections at the site. During the last inspection in October 2007 (INAC, 2007) the following concerns were noted in the report:

- Burning of non-segregated waste is no longer allowed;
- An updated O&M manual has not been submitted to the regulator;
- Signage is present, but additional signage is needed;
- Spillage of used oil was noticed in the waste oil storage area;
- Hazardous waste areas are becoming permanent storage areas;
- Berm for honey bag pit should be lengthened and maintained so it surrounds the whole pit; and,
- A sheen was noticed on the water in the wetland area and ditch along the road outside of the berm on the east side of the bulky metal waste area.

Other notable concerns from past reports include:

- Considerable wind blow debris is escaping the site (INAC, 2004) (INAC, 2005)
- Poor segregation of materials (INAC, 2004)
- Numerous lead acid batteries are disposed in various areas at the site. (INAC, 2004)
- Asbestos containing materials were buried at the site. This location has been marked. (INAC, 2004)(INAC, 2005)
- Open burning was occurring at the site (INAC, 2004)

2.3 Landfill Operation

Residential waste from the community is collected three times per week Monday, Wednesday and Friday and disposed at the landfill site. Wastes are generally not inspected, weighed or segregated. Currently, the site is filled above ground using the area method. There is no evidence if below grade landfilling was used in the past. The waste is pushed three times per week but not compacted. There is no evidence of cover usage. Equipment available for the waste management operation are one loader, one dozer, one grader and two dump trucks. Waste materials disposed at the site include the following:

Table 2.1: Summary of Issues Related to Existing Landfill Site

ISSUE	TYPE	COMMENTS
Potential flooding of landfill and site access road	Operational	GNWT Guidelines recommend site development beyond 1 in 200 year return levels
Proximity to Airport -Site is approximately 1.5 km from the airport	Regulatory	Minimum recommended setback for siting a new facility is 3 km from landfill to airport (Soberman, 1990)
Proximity to surface water	Regulatory (Environmental Protection Act)	The landfill is very close to a number of water bodies including Clearing Lake Sewage Lagoon, and Pump Lake (which potentially has connectivity to surface water ditches within the Hamlet). Flood levels would overtop the landfill. The required setback of 30 m from high water level of fish bearing waters is not met.
Inadequate signage and clear segregation of materials	Operational	Issue identified in 2007 INAC inspection report
Landfill contains improperly disposed hazardous waste materials	Regulatory (Environmental Protection Act)	Inspection report (INAC, 2004) references asbestos waste materials deposited in the landfill
Current Water Licence will expire shortly	Regulatory	NTWB Licence No. N3L3-0570 expires June 30, 2009
Landfill includes the disposal of honey bags	Regulatory	Bagged toilet waste disposal is permitted in the water licence however the berm required maintenance.
No updated O&M Manual	Regulatory	Issue identified in 2007 INAC inspection report and required in Water Licence.
Complaints of open burning	Regulatory (NWT Fire Protection Act & Regulations)	Controlled burning of clean wood and paper only is permitted
Complaints of dirtiness and waste accumulation	Operational	

covering an area approximately 50m by 100m wide. Placing a 1.5m thick lift of waste in this area would provide space for a volume of approximately 7,500 m^3. Using the waste generation estimates described in section 3.2, this would provide capacity for approximately 6 years of waste (from the date of survey in June 2008).

Once a new facility is operational, the existing site must be closed to ensure the long term protection of the environment. Site closure includes development of a closure plan for approval by the water board (at least 6 months prior to closure) and should include the following information

- Future land use;
- Leachate prevention and monitoring;
- An implementation schedule;
- Mapping which shows all disturbed areas, borrow materials areas, and site facilities;
- Consideration of altered drainage patterns;
- Type and source of cover materials;
- Identification and removal of hazardous wastes including waste oil; and
- Contaminated site remediation

(GNWT, 2003)

The site should be capped with 600 mm of material and graded to ensure positive drainage. While development of a closure plan is not part of the scope of this assignment, the footprint of the site is estimated to be 13,000m^2 thus requiring approximately 7,800 m^3 of cover material (clayey material).

2.6 Recommendations for Existing Landfill Site

As outlined above, there are several significant issues related to the existing site. The most significant issues relate to the protection of public health and the environment. Rehabilitating the existing site to comply with the current relevant regulations would be very challenging and not feasible where regulations address site location requirements. It is recommended that the community investigate a new site for solid waste disposal and discontinue operation of this facility and initiate site closure as soon as possible.

Several actions should be implemented immediately to improve site conditions and meet regulatory requirements where possible;

1. Develop an Operations and Maintenance Manual for the site;
2. Segregate incoming waste materials into separate areas such as; domestic waste, bulky waste, and household hazardous wastes. This can be achieved through effective use of signage, regular site maintenance and public education;
3. Discontinue accepting hazardous wastes such as contaminated soil without proper testing and storage and treatment facilities;

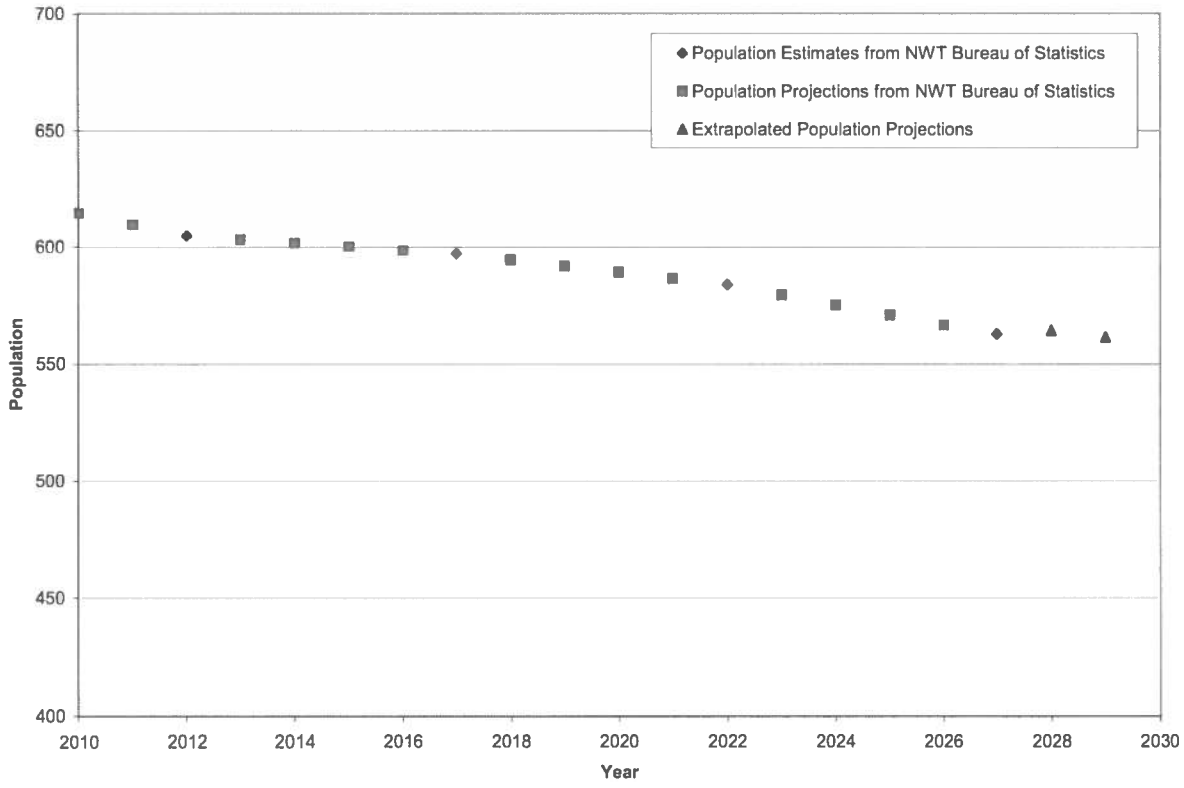
3 SOLID WASTE SYSTEM REQUIREMENTS

Solid waste management system requirements have been evaluated for the Hamlet of Aklavik to develop waste management requirements for a 20 year planning horizon.

3.1 Population Projections

Predicted population values were attained from the NWT Bureau of Statistics (Appendix D) and are illustrated in Figure 3-1. The solid waste management system is to be designed for a 20-year planning horizon. Population projections were available up to 2021; therefore values extrapolated from this data were used to estimate the population up to 2029.

Figure 3-1: Population Projections for Aklavik, NT



The population of Aklavik has been declining over the past years. Based on the recent numbers, the bureau of statistics has projected that the population will steadily decrease. Population projections from the Community of Aklavik Community Plan (Aklavik, 1997) indicate different population trends than the

3.3 Solid Waste Facility Operations

To minimize public health and environmental hazards, a solid waste landfill is used for land disposal of refuse. This is done by periodically spreading the refuse into thin layers, compacting the refuse, and then applying granular cover material. A sanitary landfill requires daily cover of compacted refuse. A modified landfill decreases the frequency of cover placement to once a month or even once a year. In northern climates where covering of refuse daily is impractical due to severe winter weather and in small communities that do not have staff and equipment dedicated to disposal operations, a modified landfill operation is the generally accepted standard. Operations for northern community landfills are recommended as follows:

- Compaction rates of 1:3 or better are achieved by working appropriate heavy equipment over the waste 3 – 5 times;
- Compaction is undertaken once a week or with collection frequency;
- Intermediate cover material is applied in 100 mm thick layers in the spring and fall (or more often if feasible); and,
- Final cover material is applied in a 600 mm thick layer on top of the landfill for closure.

The following three landfilling methods are commonly utilized in northern communities:

- The Area Method;
- The Depression Method; and,
- The Trench Method.

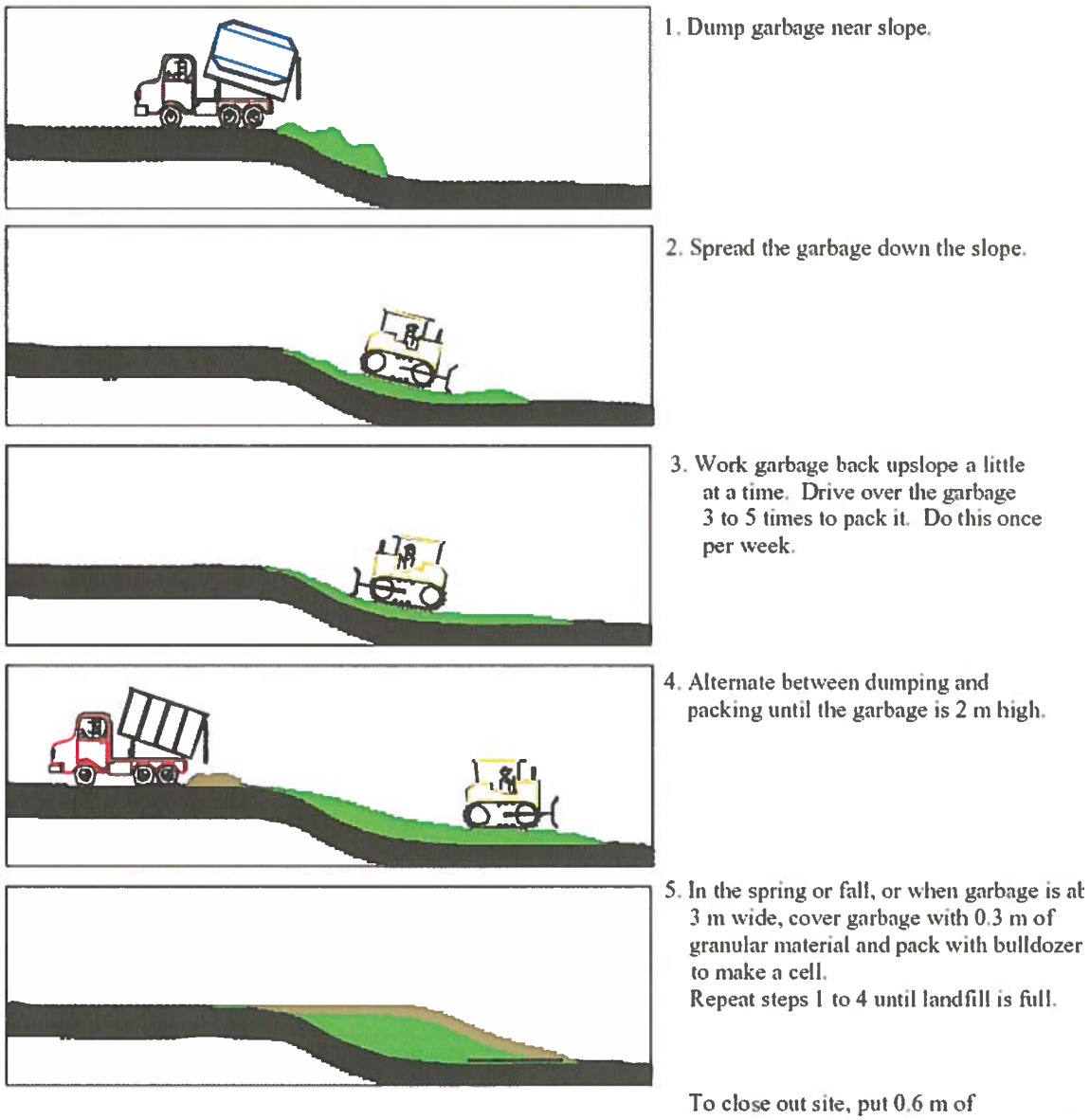
Area Method

The area method is selected where rock, a high water table, or permafrost prevents the excavation of trenches. Wastes are disposed directly on the ground, worked with heavy equipment such as a bulldozer, and packed against a constructed berm. In the area method, waste is emptied out of collection vehicles at the bottom of a short berm. The berm should be 2 m high. Wastes are worked and compacted against the berm. In the spring or fall, or when the compacted garbage is 3 m wide, the compacted wastes are covered with 300 mm of granular material. Dry, sandy material is preferred where available. The process is repeated until the landfill is full.

Depression Method

A variation of the area method, the depression method uses a natural slope. Wastes are disposed directly on the ground, worked with heavy equipment such as a bulldozer, and packed against the slope. Soil is added as required and available to provide suitable cover.

Figure 3-3: Depression Method (GNWT, 2003)



3.4 RECOMMENDED FACILITY OPERATIONS

Given the high water table in the area around Aklavik, it is deemed that the trench method will not be well suited for use in the area. Similarly, there are not any natural depressions in the area so the depression method is not likely to be used. This leaves the area method as a suitable landfilling method. It is estimated that landfill area approximately 65 m x 100 m is required to accommodate the 20-year disposal need for the Hamlet of Aklavik.

	Composite	Concerns	At Risk	Pathway
C	Wildlife Conflicts	• birds • animals	humans (plane traffic, nuisance) humans (human / bear conflict) bears (destroyed as a nuisance)	atmosphere direct contact direct contact
D	Transportation	• accidents • noise • dust	humans (health) humans (aesth.) humans (aesth.)	transportation route atmosphere atmosphere
E	Social	• site aesthetics • compatible land use	adjacent land owners adjacent land owners	reduced enjoyment of life reduced enjoyment of life
F	Economic	• waste transport/transfer • capital cost • operating cost • life and capacity • land value • availability of cover	taxpayers taxpayers taxpayers taxpayers adjacent land owners taxpayers	reduced income reduced income reduced income reduced income reduced net worth reduced income

4.1 Solid Waste Facility Siting Regulations

A community wishing to develop a new landfill, a lateral expansion or landfill closure must undergo the regulatory process as described in the Guidelines for the Planning, Design, Operation and Maintenance of Modified Solid Waste Sites in the NWT (GNWT, 2003), and submit a project description. Based on the Guidelines, the regulations, criterions and stipulations for the siting of a new landfill are summarized in Table 4.2.

Table 4.2: Landfill Siting Checklist (GNWT, 2003)

Criterion	Stipulation	Reference
Landfills should be design for a minimum 20-year design life with planning considerations for at least a 40-year life	Solid waste volume model given in guidelines	MACA guidelines
Areas in flood plain	Restricted beyond 1 in 200 year return	MACA guidelines
Climatic conditions of region; geological and terrain conditions of site	Consider and take in account	MACA guidelines
Cover material availability	Where possible, in a location where cover material is readily available	MACA guidelines

4.2 Landfill Constraints

The solid waste siting constraints for a future site as outlined in Table 4.2 are displayed on the constraint map shown in Appendix B. The constraint map is a useful visual tool for demonstrating areas that may be suitable for development of a landfill site.

Aklavik is known to experience severe flooding conditions. The Community Plan specifies the following:

> "Aklavik has been formally designated as a flood risk area under the Canada – NWT Flood Damage Reduction and Flood Risk Mapping Agreement *May 2, 1979. Council and the Government of the NWT encourage all developers to be aware of flood hazards in the community and to build in accordance with the Agreement" (Aklavik, 1997)

Taking this into consideration, along with the recommendation for the landfill to be situated beyond the 1 in 200 year flood zone, essentially eliminates all potential locations within the Hamlet boundaries. Further options outside of the Hamlet boundaries are identified below.

easier to handle and transport using readily available transfer vehicle (such as gravel trucks from the periodic gravel haul).

Costs of this option would be proportional to the amount of waste generated within the community for disposal. Costs could be reduced and controlled by implementing community procurement, recycling, composting and public education programs. Recyclable materials such as cardboard, metal, tires, cans etc would be segregated from the waste stream and stockpiled separately for shipping to recycling markets when sufficient quantities are present. An evaluation of the economics of the system would also indicate if the operation of a waste baler to decrease the volume of wastes and recyclables for hauling would be advantageous.

Figure 5-1: Example Waste Baler (Kindersley, Saskatchewan)

5.3 Option 1B - Storage and Transfer Haul - New Landfill

Similar to Option 1A, a storage and transfer haul option could also be set up with final disposal at a new landfill site. One of the main challenges in siting a landfill for Aklavik is to locate an area that can have reliable access and be outside of the flood zone. The constraint map in Appendix B indicates that the entire area within the Hamlet of Aklavik Municipal Boundary is designated as a flood risk area. Looking beyond the immediate vicinity of the community for a site that is outside of the flood risk area leads to the Mount Gifford area of the Richardson Mountains to the west of the community. There is currently a winter road to this area which is used to access gravel resources approximately 17 km from the Hamlet as shown in Figure 3 in Appendix B.

Road routing and construction would be extremely and challenging and expensive. This road traverses soft terrain with many small lakes and streams and would be subject to flooding and erosion. Planning should include allowances for periods of time when the road is not passable. Waste would have to be stored for periodic transfer hauling to the facility when the access road is passable. The temporary storage site would be relatively small and would be sized to accommodate sufficient waste for the required storage period and would be sited in accordance with the siting requirements. Similar to Option 1A, the need for a waste baler would also be reviewed. Although a specific location for the landfill has

- Waste storage and feed preparation;
- Waste pre-processing;
- Combustion producing hot gases;
- Waste heat or electricity generation (if desired);
- Air-pollution control (if needed); and,
- Residue (ash) handling.

Incinerators occupy relatively little space and are generally housed in a steel building sited relatively close to the community. A by-product of the incineration process is the production of ash. An effective waste screening program is essential to ensure that emissions standards are met and waste ash quality is not compromised.

5.7 Evaluation of Waste Management System Options

The advantages and disadvantages of the five (5) waste management system options are presented in Table 5.1.

Table 5.1: Waste Management System Options – Advantages and Disadvantages

	Advantages	Disadvantages
Option 1A - Storage and Transfer Haul – Regional Approach	• Eliminates the need for the construction and operation of a landfill • Eliminates the long term liabilities of landfill ownership • Provides incentive for waste reduction and recycling programs • Utilizes existing backhauls	• Requires negotiation with and approval from other regions • Issue of waste storage must be addressed • Potentially required a waste baler which adds to operating cost

Table 5.2: Summary Evaluation of Waste Management System Options

	OPTION 1A – STORAGE AND TRANSFER HAUL - REGIONAL APPROACH	OPTION 1B – STORAGE AND TRANSFER HAUL - NEW LANDFILL	OPTION 2 - NEW LANDFILL WITH FLOOD PROTECTION	OPTION 3 - EXISTING SITE WITH FLOOD PROTECTION	OPTION 4 – WASTE INCINERATION
Capital Cost	**Low - Moderate** dependent on waste volume, back haul rate, baler requirement & fees.	**Moderate - High:** >$7.5 million, dependent on access road condition and upgrades required.	**Moderate:** >$5 million	**Moderate:** >$5 million	**Moderate:** >$5 million
Operating Cost	**Low - Moderate** level of complexity dependent on system requirements (baler).	**High** O&M cost to cover maintenance and large waste haul distance.	**Moderate**	**Moderate**	**High** O&M cost for fuel, operation, maintenance, & ash disposal.
System complexity	**Moderate** level of complexity for baler operation & management of system logistics. Offloads regulatory compliance on host municipality.	**High** level of complexity in access rd construction and design in unfavorable conditions. **Low** level of operating complexity.	**Low** level of complexity. Construction could be completed with local equipment and staff.	**Low** level of complexity. Construction could be completed with local equipment and staff.	**High** level of system complexity requiring specialized operator and external maintenance.
Regulatory Consider-ations	Approval required for temporary waste storage facility, and waste acceptance at host landfill.	Would be sited to meet all regulatory requirements; however land use approvals are required as it will be outside of the municipal boundary.	Located in flood plain. Approval would be required on flood protection. Land use approvals are required as it will be outside of the municipal boundary.	Will **not** meet all regulatory requirements.	Non-standard solution. Challenges to meet emissions standards and potential for ash to be classified as hazardous.
Sustainability	Incentive to promote waste reduction programs	Large amount of road upgrading. Road will be subject to washouts.	Protecting against flood conditions is challenging.	Potential connectivity to water in community. Protecting against flood conditions is challenging.	Requires waste ash disposal.

Five (5) waste management system options are presented for consideration by the Hamlet. These options are as follows:

- Option 1A – Storage and Transfer Haul – Regional Approach;
- Option 1B – Storage and Transfer Haul – New Landfill;
- Option 2 - New Landfill with Flood Protection;
- Option 3 - Existing Site with Flood Protection; and,
- Option 4 - Waste Incineration.

Not all of the options presented can meet all of the regulatory requirements identified. The options along with their costs, effectiveness and long term implications should be reviewed. A comparative evaluation of the options is presented in a summary table in Section 5.7. At the meeting with the Municipal Service Committee on January 19, 2009 it was indicated that a new landfill outside of the floodplain in the area of the Richardson Mountains (option 1B) is the preferred option to be further evaluated by the community. This option includes the construction of approximately 17 kilometres of access road at an estimated cost of $5,000,000 dollars. It is understood that the community has other needs for an access road to the Richardson Mountains, namely for access to granular materials. The overall value for the community must be considered before undertaking a challenging, and costly project such as this.

APPENDIX A

CORRESPONDENCE

Municipal Service Committee Meeting
June 03, 2008
12Noon

In Attendance: Mayor, Knute Hansen
Deputy Mayor, Jerome Gordon
Councilor Eddie Greenland
Councilor Dave McLeod
Councilor Don Storr
Councilor Greg Wilson
Staff: SAO, Evelyn Storr
Foreman Dean Arey

MACA: Lori Fyfe

Dillon Contracting: Colin Joyal
Lance

Mayor Knute Hansen called the committee meeting to order at 12:25 pm

Motion by Don Storr Seconded by Eddie Greenland
To approve the agenda as presented.

Colin of Dillon Contracting gave the committee information as to what they will be doing during their time in the community.

He advises the committee that the surveyor Lance will be in the community till Saturday.

Colin talked about the landfill site and the responsibilities that the Hamlet has that pertains to their water license and that the water license is coming up for renewal. He advises the committee that there should be an operations and maintenance manual for the landfill site. SAO was has not come across one in the office. Lori will check with INAC on this.

Councilor Don Storr asked about the gravel requirements for the work that will come from the outcome of the plan for the drainage and solid waste site.

Colin asked about the funds that are available for gravel sources and he was advised that all this information is in the Capital Plan and SAO will provide him with that information.

Foreman and Colin will go out after the meeting and look at the source of the gravel that we get.

Hamlet of Aklavik – Solid Waste Facility
Site Investigation

1. GENERAL INFORMATION

Community: Hamlet of Aklavik

Facility name: Solid Waste Facility

Address: _____

Interview conducted by: Colin Joyal – Dillon Consulting Limited

Interview with: Dean Arey - Foreman

Other participants: _____

Briefly describe the location of the facility in terms of access roads and nearby landmarks:

North West of the Hamlet, past the tank farm, adjacent to the Lagoon truck dump. Access from The Hamlet along the airport road parallel to the river bank.

Legal land description: _____

Ownership of property: Within Hamlet of Aklavik Municipal Boundary

❑ Leased ☒ Owned by municipality ❑ Owned by operator ❑ Other arrangement (describe below)

Is there a site plan of the facility? ❑ Yes ☒ No

3. LANDFILL LOCATION AND SITING

Describe the access road to the landfill. (e.g. gravel, all weather, distance from public road)

Access along airport road parallel to the river. Road is gravel and subject to flooding as it quite close to the river (approx 30m at the nearest point during summer water levels). The road also services the tank farm and lagoon. After the tank farm, there is a gate to close off assess to the landfill and lagoon.

Is the landfill visible to local residents? ☐ Yes ☒ No

How far is the landfill located from the following
(all measurements approximate, taken from Google Earth 2008 Tele Atlas) :

Housing:	1,280m in S-E direction
Airport:	1,425m
Public roads:	325m to public access road at tank farm
Right of ways:	
Surface water:	60m to Pump Lake 320m to Peel Channel
Firebreak:	
Other (e.g. railway):	184 to tank farm

Is the facility located downwind of the community? ☐ Yes ☐ No

Has the landfill received any odor or smoke complaints? ☐ Yes ☒ No
If yes, describe.

Only when burning garbage. This practice has been stopped since approx 2002. Now only clean wood, clean paper, cardboard is burned and there are no longer complaints.

5. OPERATIONS

Describe how waste is delivered to the landfill.

Residential waste in the community is collected 3 times per week on Monday, Wednesday and Fridays. There is approximately 2-3 loads per day.

Describe the procedure to check and approve what type of waste is brought to the landfill.

Wastes are not inspected

Describe the procedure to track the amount of waste brought to the landfill.

Waste quantities are not measured.

List the different companies that bring waste for disposal to the landfill. (e.g. Company X, Company Y)

- All waste in the Community is collected by the community 3 times per week.
- No other companies bring waste to the site

Are the different sources of waste listed above mixed together when disposed in the landfill?

☒ Yes ☐ No

If no, describe how the waste is disposed separately.

What equipment is used for on-site landfill operations? (e.g. bulldozer, pick-up truck, etc.)

- Loader 250 WA Komatsu
- Cat D6 (rented from K&B as and when)
- Grader 710A Champion
- Dump truck 6m3
- Dump truck (rented from K&B as and when)

Describe the landfill design. (e.g. area method, depression method, trench method)

The site is currently being filled using the area method. It is unclear if trenches were used in the past. There are not any trenches or depressions used at the site.

generally seeps by fall.

A berm was constructed around the bulky metals area in 2007. Aside from this, there is no evidence of management of surface water or snow at the site. There is ponding of water in the waste areas.

Describe how the landfill operates in winter conditions.

How many employees work at the landfill?

The community foreman is responsible for the landfill operation and is supported by one operator.

What facilities are provided for employees at the site? (e.g. office, washroom, etc.)

- none

Who is responsible for worker safety at the site?

- SAO

Describe any worker training/qualification programs that are provided.

No
First Aid
Heavy Equipment Operator Training (MACA SOCG)

Describe the emergency response procedure and equipment available at the site (e.g. fire extinguishers, communications, etc.). Please provide a copy of any documentation.

- none

Describe the procedure for reporting accidents or emergency situations.

- There is no Landfill O&M manual or Community emergency plan
- Fire department supports staff in case of fire.
-

7. MONITORING AND INSPECTIONS

Describe the monitoring and reporting programs conducted at the site as part of the landfill due diligence program.

Is ground water monitoring required at the site? ☐ Yes ☒ No

Is surface water monitoring required at the site? ☐ Yes ☒ No
If yes, describe the monitoring program.

Which regulatory agencies conduct inspections at the landfill and how often is this done?

- Indian and Northern Affairs Canada conducts inspections. The last inspection was on October 19, 2007.

Has the facility received any violations from regulatory agencies? ☒ Yes ☐ No
If yes, please explain.

The 2007 Inspection report noted the following

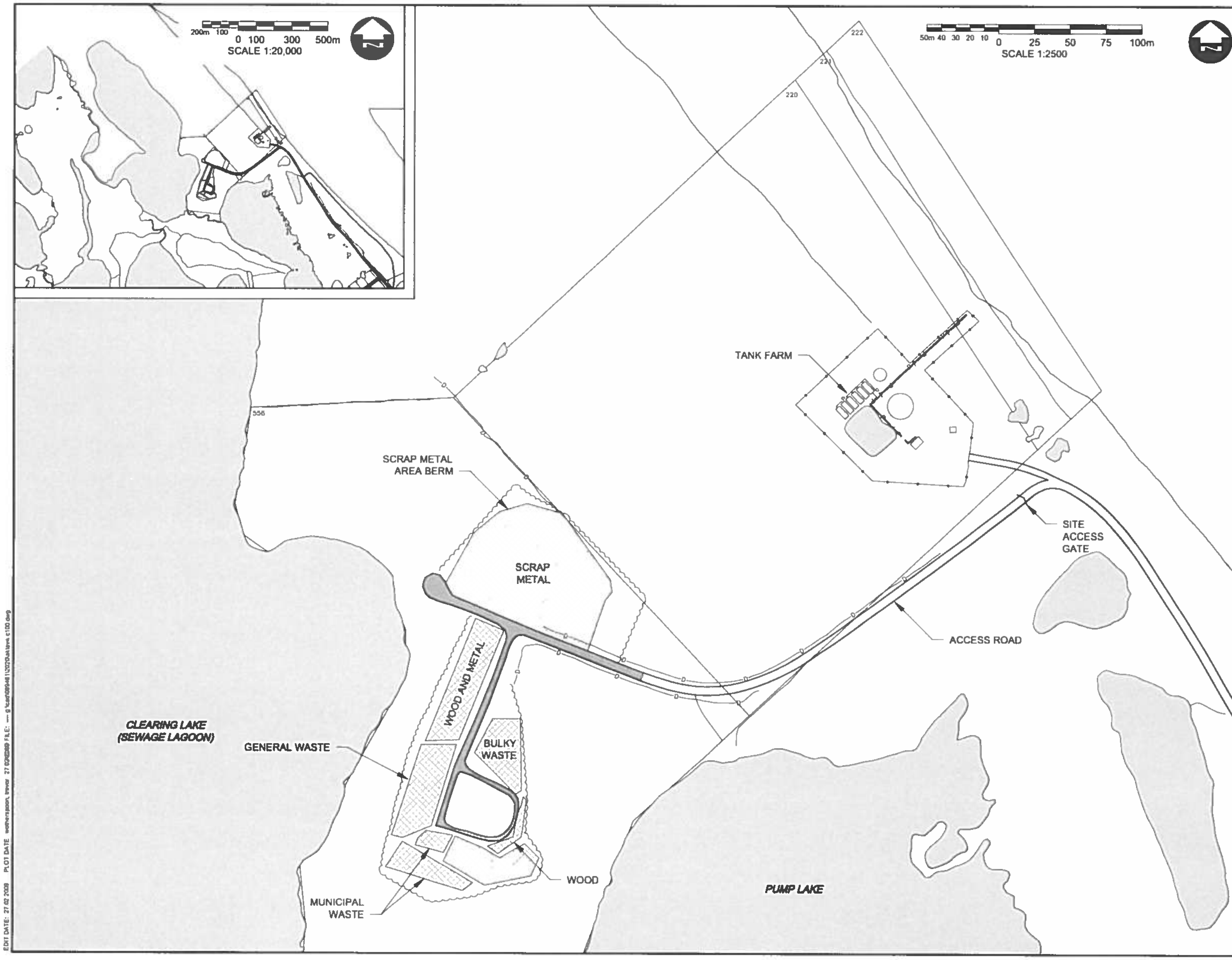
- Burning of non-segregated waste is no longer allowed.
- An updated O&M manual has not been submitted to the regulator.
- Signage is present, but additional signage is needed.
- Spillage of used oil was noticed in the waste oil storage area.
- Hazardous waste areas are becoming permanent storage areas.
- Berm for honey bag pit should be lengthened and maintained so it surrounds the whole pit.
- A sheen was noticed on the water in the wetland area and ditch along the road outside of the berm on the East Side of the Bulky metal waste area.

Has the facility received any complaints or concerns from the public over the last three years?
☒ Yes ☐ No
If yes, please explain and describe how concerns are addressed by the facility.

Many residents do complain about the dirtiness of the site and how much the waste is piling up.

APPENDIX B

DRAWINGS



LEGEND

- TREE LINE / LIMIT OF SITE
- DEFINED WASTE PILES
- BOUNDARY OF DUMP AND ROAD

CHANGE	DATE	DESCRIPTION	CHECK
2.	02/25/09	PRELIMINARY ISSUE	
1.	11/04/08	ISSUED FOR CLIENT REVIEW	

REVISIONS

DESIGN	DRAWN	CHECKED	DATE
CEJ	AJM	-	FEB 2009

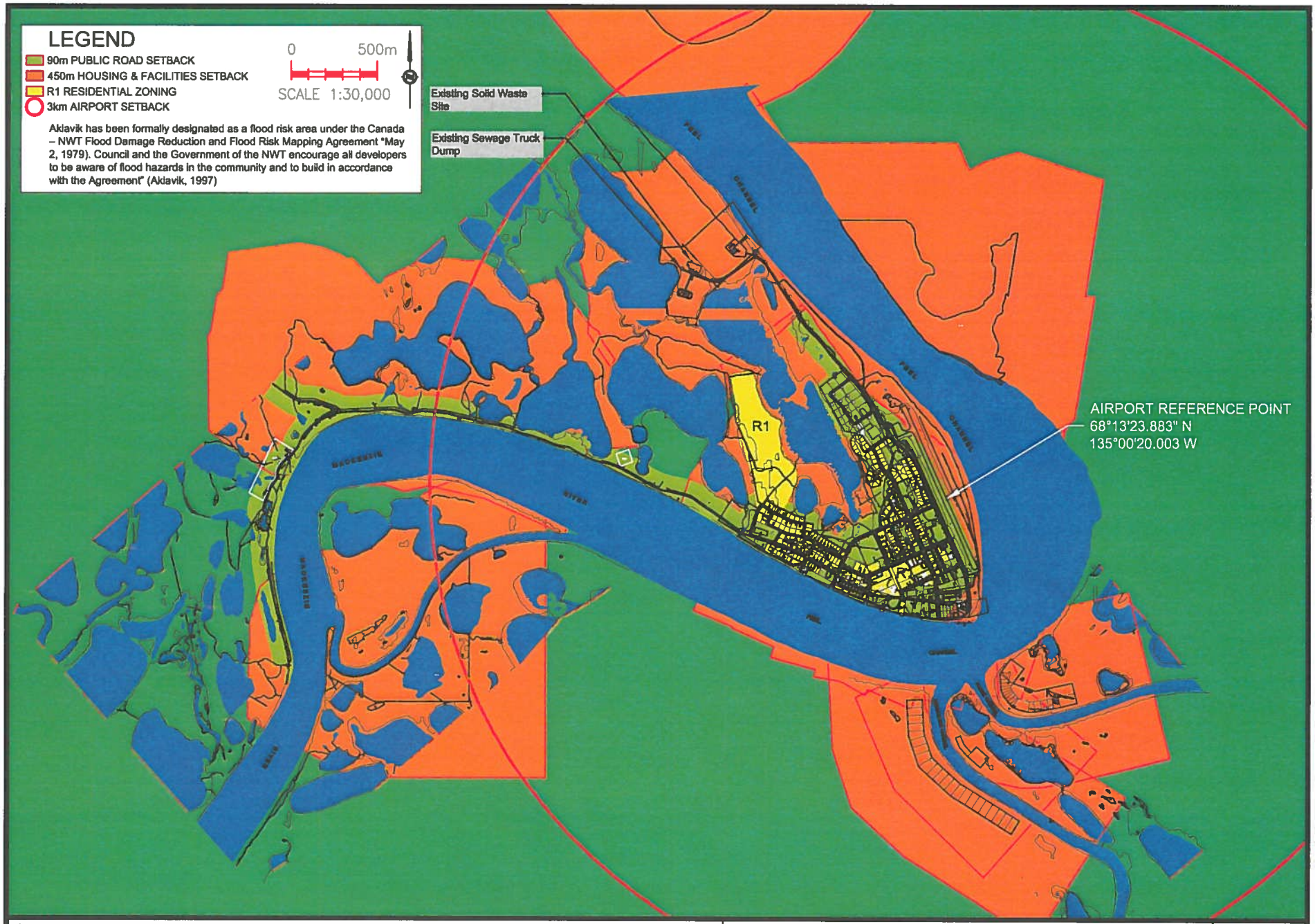
PROJECT
AKLAVIK SOLID WASTE SITE

TITLE
SITE LOCATION PLAN

DILLON CONSULTING

SCALE	AS SHOWN
DILLON PROJECT NUMBER	08-9461-2020
CLIENT PROJECT NUMBER	AKOP01
DRAWING NUMBER	C100

EDIT DATE: 27.02.2009 PLOT DATE



DILLON CONSULTING

AKLAVIK SOLID WASTE SITE STUDY

DILLON FILE NO. 08-9461

DATE FEB 2009

SCALE 1:30 000

HAMLET OF AKLAVIK, NT

DRAWING NO. 1

1000m 500 0 1000 1500 2500m

SCALE 1:75,000

EDIT DATE 27.02.2009 PLOT DATE 27.02.2009 ACAD FILE 41pw g:\ca\08\9461\figures\aklavik.dwg

DILLON CONSULTING

PROJECT
Aklavik Solid Waste Site Study
Aklavik, Northwest Territories

TITLE
Option 1B - Potential Solid Waste Site Location

PROJECT NUMBER 08-9461

DATE February 2009

FIGURE NUMBER Figure 3

APPENDIX C

WATER LICENCE

NORTHWEST TERRITORIES WATER BOARD

WATER REGISTER: N3L3-0570

June 30, 1998

Ms, Nellie Gruben
Senior Administrative Officer
Hamlet of Aklavik
P.O. Box 88
AKLAVIK, NT X0E 0A0

Dear Ms. Gruben:

ISSUANCE OF A "B" TYPE LICENCE

Attached is a duplicate of Licence No. N3L3-0570 granted to Hamlet of Aklavik by the Northwest Territories Water Board in accordance with the *Northwest Territories Water Act*. The other original of this Licence has been filed with the Department of Indian Affairs and Northern Development in Yellowknife, Northwest Territories.

Also attached are general procedures for the administration of licences in the Northwest Territories. I request that you review these and address any questions to the Board's office.

In conclusion, please be advised that this letter with attached procedures, all inspection reports, and correspondence related thereto are part of the public Water Register, and are intended to keep all interested parties informed of the manner in which the Licence requirements are being met. All Water Register material will be considered when the Licence comes up for renewal or amendment.

The full cooperation of Hamlet of Aklavik is anticipated.

Sincerely,

for Gordon Wray
Chairman
N.W.T. Water Board

Attachments (2)

P.O. Box 1500, Yellowknife, NT, X1A 2R3, 2nd Floor Goga Cho Building
Phone: (867) 669-2772 Fax: (867) 669-2719

6. Specific clauses of your Licence make reference to the Board, Analyst or Inspector. The contact person, address, phone and fax number of each is:

BOARD: Executive Assistant
Northwest Territories Water Board
Box 1500
YELLOWKNIFE, NT X1A 2R3

Phone No: (867) 669-2772
Fax No: (867) 669-2719

ANALYST: Analyst
Water Laboratory
Northern Affairs Program
Department of Indian Affairs
and Northern Development
Box 1500
4601 - 52nd Avenue
YELLOWKNIFE, NT X1A 2R3

Phone No: (867) 669-2780
Fax No: (867) 669-2718

INSPECTOR: Inspector
North Mackenzie/Inuvik District Office
Northern Affairs Program
Department of Indian Affairs
and Northern Development
P.O. Box 2100
INUVIK, NT X0E 0T0

Phone No: (867) 777-3361
Fax No: (867) 777-2090

PART A: GENERAL CONDITIONS

1. **Scope**:

a) This Licence allows for municipal waste disposal at the Hamlet of Aklavik, Northwest Territories. This Licence is issued subject to the conditions contained herein with respect to the depositing of waste of any type in any waters or in any place under any conditions where such waste or any other waste that results from the deposit of such waste may enter any waters.

b) Whenever new Regulations are made or existing Regulations are amended by the Governor in Council under the *Northwest Territories Waters Act*, or other statutes imposing more stringent conditions relating to the quantity or type of waste that may be so deposited or under which any such waste may be so deposited this Licence shall be deemed, upon promulgation of such Regulations, to be automatically amended to conform with such Regulations; and

c) Compliance with the terms and conditions of this Licence does not absolve the Licensee from responsibility for compliance with the requirements of other Federal, Territorial or Municipal legislation.

2. **Definitions**:

In this Licence: **N3L3-0570**

"**Act**" means the *Northwest Territories Waters Act*;

"**Regulations**" mean Regulations proclaimed pursuant to Section 29 of the *Northwest Territories Waters Act*;

"**Board**" means the Northwest Territories Water Board established under Section 10 of the *Northwest Territories Waters Act*;

"**Licensee**" means the holder of this Licence;

"**Inspector**" means an inspector designated by the Minister under Section 35(1) of the *Northwest Territories Waters Act*;

5. The Surveillance Network Program and compliance dates specified in the Licence may be modified at the discretion of the Board.

6. The Licensee shall use waste volume measurement procedures as approved by the Inspector. The procedure to be followed shall be implemented to the satisfaction of the Inspector.

7. The Licensee shall immediately report to the Inspector via the 24 Hour Spill Report Line (867 920-8130) any spills of toxic materials which are reported to, or observed by, the municipality within the municipal boundaries or in the area of the waste disposal facilities. A detailed report of each such event shall be submitted to the Inspector not later than fourteen (14) days after the spill is detected.

8. The Licensee shall, within sixty (60) days of the issuance of this Licence, post and maintain the necessary signs to identify the stations of the Surveillance Network Program to the satisfaction of the Inspector.

9. The Licensee shall, within sixty (60) days of the issuance of this Licence, post signs in the area of the waste disposal facilities to advise the public that these areas are being used for the disposal of municipal wastes. All postings shall be located and maintained to the satisfaction of the Inspector.

10. The Licensee shall carry out a reclamation program on all facilities associated with the depositing of waste as it relates to this Licence. This is to be done in a manner that is satisfactory to the Board upon termination of the Licence or renewals of the Licence, upon abandonment of each facility after its use has terminated, or upon abandonment of the operation as a whole. If, during the period of this Licence or renewals thereof, an unauthorized deposit of waste occurs, a reclamation program shall be undertaken.

9. The Licensee shall implement the plan specified in Part B, Item 7, upon receiving approval from the Board.

PART C: CONDITIONS APPLYING TO MODIFICATIONS

1. The Licensee may, without written consent from the Board, carry out modifications to the waste disposal facilities provided that such modifications are consistent with the terms of this Licence and the following requirements are met:

   a) the Licensee has notified the Board in writing of such proposed modifications at least sixty (60) days prior to the beginning of the modifications;

   b) such modifications do not place the Licensee in contravention of either the Licence or the *Act*;

   c) the Board has not, during the sixty (60) days following notification of the proposed modifications, informed the Licensee that review of the proposal will require more than sixty (60) days; and

   d) the Board has not rejected the proposed modifications.

2. Modifications for which all of the conditions referred to in Part C, Item 1, have not been met, can be carried out only with written consent from the Board.

3. The Licensee shall provide as-built plans and drawings of the modifications referred to in this Licence within ninety (90) days of completion of the modification. These plans and drawings shall be submitted to the Inspector on material that will reproduce with the use of a standard printer.

NORTHWEST TERRITORIES WATER BOARD

Witness

Chairman

4. All analyses shall be performed in a laboratory approved by the Board.

C. Flow Measurement and Recording Requirements

1. The Licensee shall measure and record the monthly quantity of sewage discharged to the Clearing Lake Sewage Lagoon.

D. Reports

1. The Licensee shall submit all of the information generated by Part B and Part C of the Surveillance Network Program annually as specified in Part A, Item 3 of the Licence.

NORTHWEST TERRITORIES WATER BOARD

Witness

Chairman

APPENDIX D

STATISTICAL PROFILE

	Aklavik	Northwest Territories
Family Structure (2006)		
Total Family Structure	145	10,875
Husband-Wife	45	5,555
Common-law	45	2,990
Lone Parent	55	2,330
% Couple Families	62.1	78.6
Tenure (2006)		
Total	220	14,235
Owned	75	7,520
Rented	145	6,565
% Owned	34.1	52.8
% of Households in Core Need		
1996	23.9	19.7
2000	32.7	20.3
2004	32.3	16.3

CRIME

	Aklavik	Northwest Territories
Violent Crimes		
1999	51	2,042
2000	54	1,984
2001	61	2,000
2002	48	2,375
2003	57	2,848
2004	70	2,942
2005	51	2,715
2006	71	2,717
2007	62	3,015
Property Crimes		
1999	70	2,376
2000	80	2,395
2001	51	2,135
2002	55	2,527
2003	81	3,053
2004	62	3,187
2005	62	2,899
2006	64	2,680
2007	35	2,471
Other Criminal Code		
1999	103	5,584
2000	126	7,153
2001	143	8,352
2002	121	8,576
2003	138	10,012
2004	175	11,933
2005	188	12,914
2006	193	12,076
2007	167	13,173
Federal Statutes		
1999	-	477
2000	6	415
2001	7	432
2002	3	655
2003	9	595
2004	9	632
2005	11	742
2006	5	534
2007	6	657
Traffic		
1999	12	398
2000	6	327
2001	6	441
2002	5	547
2003	5	633
2004	7	759
2005	8	881
2006	7	829
2007	8	865
Violent Crime Rate (per 1,000 persons)		
1999	71.8	50.2
2000	76.5	49.0
2001	89.4	49.0
2002	71.3	57.2
2003	88.9	67.4
2004	112.7	68.7
2005	81.2	63.5
2006	114.3	64.1
2007	98.6	70.7
Property Crime Rate (per 1,000 persons)		
1999	98.6	58.4
2000	113.3	59.1
2001	74.8	52.3
2002	81.7	60.9
2003	126.4	72.3
2004	99.8	74.4
2005	98.7	67.9
2006	103.1	63.2
2007	55.6	58.0

INCOME SUPPORT

	Aklavik	Northwest Territories
Beneficiaries (monthly average)		
2000	156	3,040
2001	102	2,425
2002	77	2,200
2003	102	2,152
2004	101	2,073
2005	87	1,924
2006	98	1,925
2007	111	2,035

	Aklavik	Northwest Territories
Labour Force Profile (2006)		
% Gov't, Health, Social Serv, Educ	50	37
% Goods Producing	15	17
% Other Industries	33	44
Annual Work Pattern (2005)		
% Worked	64	81
% Worked More than 26 weeks	54	76

PERSONAL INCOME

Total Income ($000)		
1996	8,157	822,773
1997	8,050	827,162
1998	8,422	852,225
1999	8,828	886,962
2000	8,928	921,079
2001	10,127	1,058,019
2002	10,306	1,148,300
2003	8,780	1,199,686
2004	9,368	1,246,589
2005	9,953	1,297,842
2006	10,675	1,384,602
% Change in Total Inc. (1999-2006)	20.9	56.1
Average Personal Income ($)		
1996	20,393	33,693
1997	19,167	33,666
1998	21,055	34,378
1999	22,070	35,650
2000	22,320	36,220
2001	24,700	39,186
2002	25,137	42,047
2003	24,389	42,572
2004	26,022	44,080
2005	25,521	46,170
2006	27,372	48,396
Employment Income ($000)		
1996	6,043	710,374
1997	5,833	713,328
1998	6,033	724,431
1999	6,514	772,452
2000	6,692	805,159
2001	7,999	935,854
2002	7,915	1,016,653
2003	6,470	1,058,922
2004	6,858	1,101,853
2005	7,427	1,145,168
2006	7,947	1,208,376
% Change in Emp. Inc. (1999-2006)	22.0	56.4

	Aklavik	Northwest Territories
Average Employment Income ($)		
1996	20,143	33,556
1997	18,816	33,364
1998	20,803	33,476
1999	21,013	35,450
2000	22,307	36,187
2001	23,526	38,497
2002	23,985	41,428
2003	23,107	41,904
2004	25,400	43,969
2005	24,757	45,843
2006	27,403	47,856
Percent Taxfilers Less than $15,000		
1996	55.0	34.9
1997	57.1	34.8
1998	52.5	34.1
1999	52.5	32.8
2000	50.0	32.0
2001	46.3	28.8
2002	43.9	27.6
2003	44.4	28.0
2004	47.2	27.3
2005	48.7	26.0
2006	46.2	24.9
Percent Taxfilers More than $50,000		
1996	10.0	25.6
1997	9.5	25.6
1998	10.0	25.3
1999	12.5	28.1
2000	12.5	28.2
2001	14.6	31.4
2002	14.6	34.4
2003	13.9	35.1
2004	16.7	36.5
2005	17.9	38.3
2006	17.9	39.9

FAMILY INCOME

Average Family Income		
1996	36,222	65,506
1997	36,478	66,367
1998	41,044	68,948
1999	42,625	70,463
2000	44,781	71,864
2001	51,606	80,225
2002	51,141	87,143
2003	50,371	88,244
2004	50,387	91,362
2005	53,140	96,171
2006	55,813	101,622

SOURCES & NOTES

Population

Population and Historical Population: Bureau of Statistics, GNWT. Estimates are calculated by allocating the demographic components of growth, down to a community level. Sex, age and ethnicity estimates developed by Bureau of Statistics.

Average Annual Growth Rate: Bureau of Statistics, GNWT. Average annual growth rate (AAGR) is calculated as:

$$AAGR = \left(\sqrt[11]{\frac{Pop_{2007}}{Pop_{1996}}} - 1 \right) * 100$$

Population Projections: Bureau of Statistics, GNWT. Population projections incorporate assumptions regarding fertility, mortality & migration patterns. These assumptions are reflective of historical patterns, as well as recent trends observed for the Northwest Territories.

Vital Stats

Number of Births: Health Statistics Division, Statistics Canada

Teen Births: Health Statistics Division, Statistics Canada. Refers to births to women between the ages of 13 to 19.

Number of Deaths: Health Statistics Division, Statistics Canada

Cause of Deaths: Health Statistics Division, Statistics Canada. Injury deaths are deaths due to accidents, homicide and suicides.

Household & Families

Percent of Households with more than 6 People: Census, Statistics Canada (1981, 1986, 1991, 1996, 2001 & 2006); Bureau of Statistics, GNWT (2004). A household refers to an occupied private dwelling.

Family Structure: Census, Statistics Canada. Refers to the classification of census families into husband-wife couples, common-law couples, and lone parent families.

Tenure: Bureau of Statistics, GNWT. Refers to whether some member of the household owns or rents the dwelling.

Percent of Households in Core Need: Bureau of Statistics, GNWT. If a household has any one housing problem (suitability, adequacy, or affordability) or a combination of housing problems, *and* the total household income is below the Community Core Need Income Threshold, the household is considered to be in core need. The core need income threshold is an income limit for each community that represents the amount of income a household must have to be able to afford the cost of owning and operating a home or renting in the private market without government assistance.

Crime

Incidents in a particular detachment may include incidents from surrounding communities.

Violent Crimes: Canadian Center for Justice Statistics, Statistics Canada. Refers to incidences of homicides, attempted murder, assaults (including sexual assaults), abduction and robbery.

Property Crimes: Canadian Center for Justice Statistics, Statistics Canada. Includes but is not limited to incidences of breaking & entering, theft, position of stolen goods and fraud.

Other Criminal Code: Canadian Center for Justice Statistics, Statistics Canada. Includes but is not limited to incidences of offensive weapons, bail violation, disturbing the peace and mischief (property damage).

Federal Statutes: Canadian Center for Justice Statistics, Statistics Canada. Includes but is not limited to incidences of possession and trafficking of drugs.

Traffic: Canadian Center for Justice Statistics, Statistics Canada. Includes but is not limited to incidences of dangerous operation of motor vehicle and impaired operation of motor vehicle.

Violent Crime Rates (per 1,000 persons): Bureau of Statistics, GNWT. Rates are determined using population estimates developed by the Bureau of Statistics.

Property Crime Rates (per 1,000 persons): Bureau of Statistics, GNWT. Rates are determined using population estimates developed by the Bureau of Statistics.

Income Support

Note: Due to program changes in 2007, data prior to this year is not directly comparable.

Beneficiaries (monthly average): Department of Education Culture & Employment, GNWT. Refers to the monthly average number of recipients of income support and their dependents, if any, over the year.

Cases (monthly average): Department of Education Culture & Employment, GNWT. Refers to the monthly average number of people requesting and receiving social assistance over the year.

Payments ($000): Department of Education Culture & Employment, GNWT. Refers to the total amount of payments over the year. Payments are recorded for the month for which assistance was received.

Traditional Activities

Hunted & Fished (%): Bureau of Statistics, GNWT. Refers to the percent of people 15 years of age or older that hunted or fished during the year.

Trapped (%): Bureau of Statistics, GNWT. Refers to the percent of people 15 years of age or older that trapped during the year.

Households Consuming Country Food: Bureau of Statistics, GNWT. Refers to the percent of households reporting that most or all (75% or more) of the meat or fish consumed is harvesting in the NWT.

Aklavik - Statistical Profile

POPULATION

	Aklavik	Northwest Territories
Population (2007)		
Total	629	42,637
Males	349	21,951
Females	280	20,686
0 - 4 Years	50	3,310
5 - 9 Years	41	3,201
10 - 14 Years	57	3,546
15 - 24 Years	130	6,972
25 - 44 Years	159	14,060
45 - 59 Years	96	7,898
60 Yrs. & Older	96	3,650
Aboriginal	598	21,617
Non-Aboriginal	31	21,020
Historical Population		
1996	754	41,748
1997	742	41,635
1998	737	40,816
1999	710	40,654
2000	706	40,499
2001	682	40,822
2002	673	41,489
2003	641	42,231
2004	621	42,822
2005	628	42,724
2006	621	42,401
2007	629	42,637
Ave. Annual Growth Rate (96-07)		
Total Population	-1.6	0.2
< 15 Yrs.	-5.2	-1.5
60 Yrs. & Older	2.8	4.4
Population Projections		
2012	605	44,878
2017	597	47,038
2022	584	48,919

VITAL STATS

	Aklavik	Northwest Territories
Number of Births		
1996	12	814
1997	14	722
1998	13	678
1999	2	659
2000	7	673
2001	12	613
2002	11	635
2003	6	701
2004	8	698
2005	13	712
Teen Births		
1996	3	96
1997	3	86
1998	2	82
1999	-	83
2000	-	84
2001	1	70
2002	3	72
2003	2	72
2004	1	86
2005	6	68
Number of Deaths		
1996	3	152
1997	6	138
1998	5	146
1999	5	162
2000	6	156
2001	11	163
2002	5	169
2003	6	202
2004	5	153
2005	5	148
Cause of Death		
Injury Deaths (inc. suicides)		
1996	1	34
1997	1	24
1998	-	24
1999	2	36
2000	1	31
2001	2	31
2002	-	24
2003	-	36
2004	1	23
2005	-	21
Suicides		
1996	1	4
1997	1	6
1998	-	7
1999	2	15
2000	1	7
2001	2	8
2002	-	8
2003	-	10
2004	-	11
2005	-	4

HOUSEHOLDS & FAMILIES

	Aklavik	Northwest Territories
% of Households with more than 6 people		
1981	27.3	13.9
1986	21.1	11.5
1991	16.3	9.8
1996	14.0	8.6
2001	9.1	7.2
2004	10.5	7.0
2006	6.8	6.2

APPENDIX E

PHOTOGRAPHS

Photo 1: Looking Southeast from Fuel Tank

Photo 2: Access Road Looking West

Photo 3: Scrap Metal Area Looking Northeast

Photo 4: East Edge of Scrap Metal Area Looking North (Note: Berm and Standing Water)

Photo 5: Example of Windblown Litter

Photo 6: Litter on Shore of Clearing Lake

Photo 7: Standing Water in Landfill #1

Photo 8: Standing Water in Landfill #2

West

Photo 10: Akest to north)

North

Photo 11: Ak orth to east)