

FSC File: 20100100

May 27, 2010

Mackenzie Valley Land and Water Board
7th Floor - 4810 50th Avenue
P.O. Box 2130
Yellowknife, NT
X1A 2P6

Attn: Tyree Mullaney

Re: Hamlet of Enterprise Water Licence MV2008L3-0004

Dear Ms. Mullaney

On behalf of my client, the Hamlet of Enterprise, FSC has completed the four (4) documents required by water Licence Number MV2008L3-0004.

- Operation and Maintenance Plan
- Phase 1 Environmental Site Assessment
- Interim Closure and Reclamation Plan
- Longevity Report for the Solid Waste Facility

Please find them attached.

If you have any questions please feel free to contact me.

Sincerely,

FSC ARCHITECTS & ENGINEERS



Ron Kent, P.Eng.
Environmental Engineering.

Cc: Scotty Edgerton, SAO, Hamlet of Enterprise.



**Hamlet of Enterprise Solid Waste Site
Planning Study**

*Draft Version 1.1
Created April 2010*

Project # 2010-0100

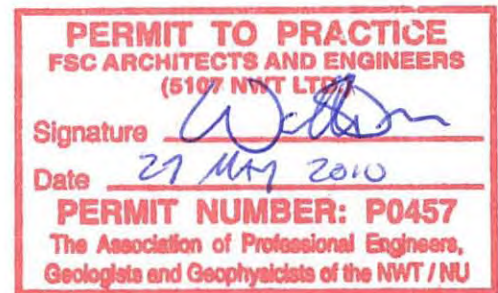


Prepared for:

Hamlet of Enterprise
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Enterprise, NT.
X0E 0R1

Prepared by:

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LISTEN. DESIGN. MANAGE.





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1 EXECUTIVE SUMMARY

In August 2009 the Hamlet of Enterprise was issued Water Licence Number MV2008L3-0004, by the Mackenzie Valley Land and Water Board (MVLWB). This licence was issued for a five (5) year period commencing August 27, 2009 to August 26, 2014. A requirement of that licence is a Planning Study the Solid Waste Disposal Site. The following examines the purpose of this study:

- The identification of a 20-year needs assessment for the solid waste facility.
- The identification of ways to reduce both costs and environmental concerns associated with a solid waste site.
- Provide a cost effective analysis and feasibility study for identified potential improvements.
- Provide mapping showing past, existing and potential sites.
- The examination of existing sites.
- Community consultation.
- Consultation with Municipal and Community Affairs representatives.
- Cost analyses for reclaiming the existing sewage / solid waste sites.
- Development of a comprehensive report.

When the Settlement of Enterprise was incorporated in 1988, the present solid waste site and the sewage lagoon were built. The only previous waste disposal facility in the area is an abandoned solid waste site identified in the 2002 Planning study¹.

During the 2002 Planning study, the current sewage lagoon, the current solid waste site, the abandoned solid waste site and the quarry were identified, mapped and researched. The map can be found in Appendix A. This planning study will build on and improve the previous planning study.

1.1 SOLID WASTE

The current facility could be operational until 2030.

The current active cell is approximately 60% full. The current active cell should last until the end of 2011. At this point a new cell will be dug adjacent to the current active cell.

The goal of the Hamlet of Enterprise is to keep the Solid Waste Facility in the current spot and maximize its effectiveness through planning and management. There are several ways to achieve this goal.

1. Minimize incoming waste.
2. Investigate ways of removing incompatible waste.
3. Organize operational space.
4. Build "up" through utilizing available building material

¹ Enterprise Sewage / Solid Waste Site Planning Study, Ferguson Simek Clark, Engineers & Architects, September 23, 2002.



2 INTRODUCTION

2.1 PROJECT UNDERSTANDING

In August 2009 the Hamlet of Enterprise was issued Water Licence Number MV2008L3-0004, by the Mackenzie Valley Land and Water Board (MVLWB). This licence was issued for a five (5) year period commencing August 27, 2009 to August 26, 2014. A requirement of that licence is a Planning Study the Solid Waste Disposal Site. The following examines the purpose of this study:

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- Provide mapping showing past, existing and potential sites.
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- Cost analyses for reclaiming the existing sewage / solid waste sites.
- Development of a comprehensive report.

2.2 COMMUNITY INFORMATION

2.2.1 Location

Enterprise is located at the junction of the Mackenzie Highway and the highway to Yellowknife, 43 km south of Hay River. The Hay River Canyon is immediately east of the community.

2.2.2 Geology and Terrain

The terrain is flat at the settlement but generally slopes down towards the Hay River from the north to the east. Course, sandy material dominates the top 1.5 m of soil, which is underlain by fractured Devonian limestone.

The water table is quite high in this area. Enterprise is in the discontinuous permafrost zone, but no permafrost conditions encountered at the site have adversely affected development.

Surficial materials are generally less than 2 m of sand with minor gravel overlaying lacustrine clay or the basal clay till. Till thickness averages 3 m.

The bedrock underlying the lacustrine and basal deposits consist of Upper Devonian interbedded shale and limestone of the Hay River Formation. The formation is in excess of 150 m thick, underlain by Middle Devonian limestone and dolomite. The bedrock stratum is well exposed along the banks of the Hay River below Enterprise.



2.2.3 Vegetation

The forest surrounding the Community is characterized by its stunted appearance. Black spruce, jack pine, poplar, hardy brush, mosses, and grasses mature at a slower rate than their southern counterparts do.

2.2.4 Climate

Weather data is taken from the Hay River Airport Station. Enterprise receives an average of 203 mm of rainfall and 125 cm of snowfall each year. Annual precipitation totals 320 mm a year. July mean high and low temperatures are 21.1°C and 10.6°C. January mean high and low temperatures are -18.4°C and -27.6°C.

2.2.5 Community History and Economy

Two service stations were initially built at this location to take advantage of the highway trade. A subdivision was surveyed in 1963 in anticipation of the development of the site as a cargo transfer point and overnight stop. CN Railways did construct railway siding and loading facilities to the west of the settlement soon after. However, most of the freight for northern points is still handled at Hay River. The projected development at Enterprise did not occur. The economy is based on the community being a service centre link on the Mackenzie Highway System.

Enterprise gained Settlement Corporation status on July 1, 1988.

Enterprise was incorporated as a Hamlet on October 29, 2007

2.2.6 General Demographic Information

Enterprise was incorporated as a Hamlet on October 29, 2007

The NWT Bureau of Statistics has a population count for the Hamlet of Enterprise in 2007 at 109. The average annual growth rate between 1996 and 2007 was 0.2 %. See figure 1.1 for population increase

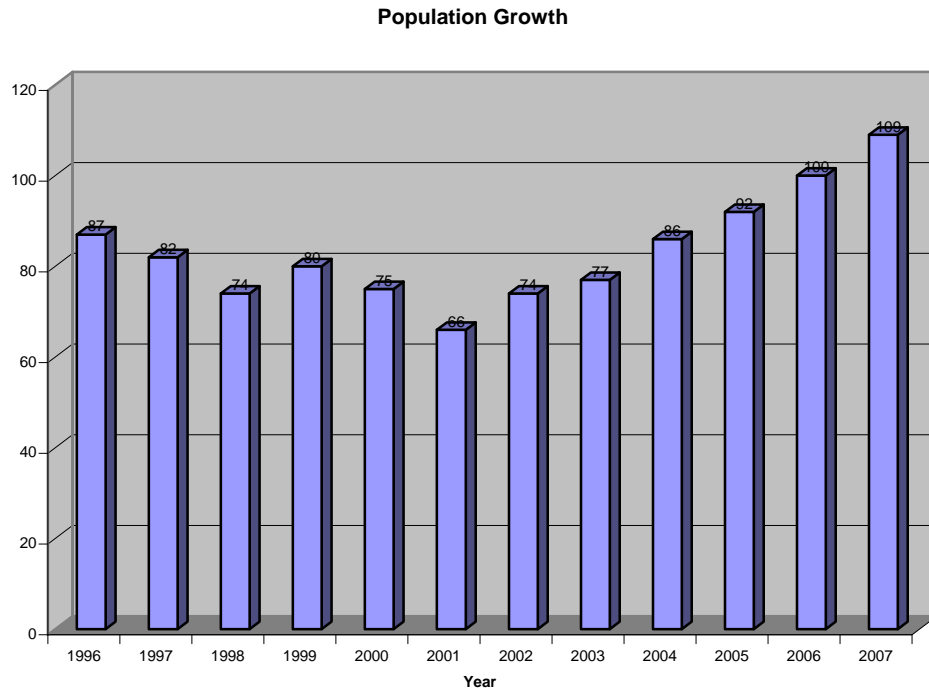


Figure 1.1 Population Increase in the Settlement of Enterprise

2.2.7 Transportation and Access

Enterprise is located at a critical juncture in the centre of the Mackenzie Highway at the turnoff for the Town of Hay River.

The economy of Enterprise is generally dependent on those who travel the highway in the form of the fuel, food and services purchased. Bus connections are available to both Yellowknife and points southward. Long-haul trucking services are also available.



3 SOLID WASTE FACILITY

3.1 SITE CONDITIONS MARCH 29 2010

The entrance road for the solid waste facility is gated and limits access but the actual solid waste facility is neither fenced nor gated. The Gate is locked with a warning sign for the public. The gate is only open Tuesday's and Friday's between the hours of 8:30 am and 6:00 pm. During this time dumping is not regulated but signs have been posted to direct garbage disposal.

The existing landfill has an active trench for household garbage with a snow fence on either side of the trench to limit windblown debris. The trench is located on the east side of the facility right as you drive into solid waste site. This trench was dug in 2007 and is approximately 60% full.

Behind this trench is a heaped pile of bulky or commercial waste. This heaped pile runs to the north and is approximately 140 m long

Surrounding the site is intermittent fencing but this fence is not complete and thus ineffective in preventing scavenging animals from entering the site and windblown material from leaving the site.

There are two piles of soil that could potentially be used for cover on the North and east sides of the facility. These piles of soil look like they were pushed up when the site was originally cleared.

During the planning study of 2002² test pits were dug to estimate the life expectancy of the solid waste site. The test pits were dug with a backhoe to determine if the areas were used for trenches and what areas are still available for waste disposal. It was determined that the north half of the solid waste facility had been previously used for trench disposal. See location of test pits in drawing SK 1 in Appendix A.

The 2002 planning study identified an abandoned solid waste site on the west side of the access road.

The existing landfill is laid out in segregated areas, as per drawing SK-1 in Appendix A. The waste is segregated by either household waste or large bulky waste. Metals and wood are also separated and placed in different areas. Hazardous waste is not accepted at this facility

² Enterprise Sewage / Solid Waste Site Planning Study, Ferguson Simek Clark Engineers & Architects, September 23, 2002.



Table 1.1 Test Pit Sites

| Test Pit Name | Test Pit Depth | Material Found in Test Pit |
|---------------|----------------|---------------------------------------|
| 1 | <0.5 m | garbage |
| 2 | 0.5 m | Bedrock |
| 3 | 0.5 m | garbage |
| 4 | <0.5 m | metal and wood waste |
| 5 | 0.5 m | metal and bags of garbage |
| 6 | <0.5 m | garbage |
| 7 | 0.5 m | garbage bags |
| 8 | 1 m | small quantity of garbage |
| 9 | 0.5 m | garbage bags |
| 10 | 0.5 m | garbage bags (water at bottom of pit) |
| 11 | <0.5 | waste metal and garbage |
| 12 | <0.5 | bedrock |
| 13 | <0.5 | bedrock |

3.1.1 Abandoned Solid Waste Site

In 2002 the abandoned solid waste site was identified and appeared to be relatively flat with sporadic vegetation. It appeared that it has been closed out and requires no further work.

3.2 COMMUNITY CONCERNS

While interviewing SAO Scotty Edgerton he expressed the concerns of the community and they are listed below.

1. Limit the amount of commercial/industrial garbage entering the facility; phase the acceptance of this material out.
2. Keep the existing facility in operation as long as possible.
3. Dispose of the large amount of industrial garbage presently located within the facility.

3.3 ORGANIZATION OF THE CURRENT FACILITY

The best course of action is to organize and manage the current solid waste facility to keep the current location in operation as long as possible. The reasons are as follows.

1. Limit the contamination zone. The current solid waste facility is already contaminated and will always be classified as a contaminated site.



2. This would be the most cost effective method.
3. Keeping the current facility operational would give the Hamlet time to plan out what they would like to see in their community for the future of their solid waste site.

To maximize the current operational potential of the current facility some organization and planning would take place.

Phase I – 1 to 2 years

- Current Active cell should last until late summer 2011;
- As required Dig new Active Trench;
- This should immediately provide 3-5 years of garbage disposal capacity for the Hamlet;
- Limit large commercial waste from coming to site;
- Fence new active trench as per water licence requirements;

Phase II – 3 to 5 years

- Look into removing large commercial waste through shredding and segregation;
- What is left bury, remove or segregate;
- Organize available cover into one location;
- Clear trees to boundary line;

Phase III 5-20 years

- Plan on building berms around the south end in preparation of receiving garbage there and building “up”; and
- Collect uncontaminated waste soil at the site in preparation of building up.



4 SOLID WASTE INFORMATION

4.1 SOLID WASTE COLLECTION

Municipal solid waste accepted at the solid waste facility consists primarily of residential waste from the community. Some waste from the surrounding campgrounds is also brought to the site.

Solid Waste is collected every Wednesday by the Hamlet of Enterprise and disposed of at the solid waste facility.

Domestic municipal waste is the primary type of waste entering the solid waste site. Medical services are provided by Hay River, therefore there are no health centre wastes. Enterprise does not use Honey bags so none are disposed of at the solid waste site.

Large bulky wastes are not collected by the Hamlet but are brought by individuals to the solid waste site for disposal.

Over the past 5 years large commercial and industrial waste accepted at the solid waste facility has been limited to a few small businesses in town. No tires or vehicles have been accepted during this time.

4.1.1 Solid Waste Disposal

The solid waste facility is located approximately 6 kilometres east of Enterprise and has been in operation for approximately 22 years. Solid household waste is disposed by the trench method, in the current Active cell. The active cell had an approximate volume of 1500 cubic meters and is currently approximately 60% full. The cell is nearing the end of its operational lifespan and will be full sometime in 2011.

The site is partially fenced but does not restrict animals from scavenging the site. A requirement of Water Licence Number MV2008L3-0004 is that fencing be installed around the site to prevent wildlife encounters. Fencing options have been developed and fencing is planned to be installed during the summer of 2010.

Bulky wastes and metal wastes are stored on site. These areas are segregated from the rest of the waste.

No hazardous waste are accepted at the facility

4.1.2 Solid Waste Site Operation and Maintenance

A requirement of Water Licence number MV2008L3-0004 is that a operation and maintenance plan be developed for the solid waste facility. This will be a stand alone document and will be submitted to the MVLWB separately.



4.2 CLASSIFICATION OF WASTES

Waste Classification Table

Table 4.1

| Major Waste Types | Waste Description |
|--|---|
| Garbage (also known as domestic garbage or domestic waste) | Wastes from homes, offices, schools, and some businesses. |
| Commercial wastes | Non-hazardous wastes from businesses that are not domestic garbage. |
| Construction wastes | Non-hazardous wastes from the construction or demolition of buildings or houses. |
| Recyclable materials | Materials that should be separated from the garbage as they may be useful to someone |
| Bulky wastes | Wastes such as trucks, skidoos, stoves, refrigerators. |
| Honey bags | Bagged human excrement. |
| Hazardous wastes | Wastes such as oil, solvents, acids, automotive batteries, cleaners, and others. Hazardous wastes are not accepted. |

4.3 SOLID WASTE VOLUME CALCULATIONS

The following assumptions were made to determine the volume of waste entering the site:

- The population used in the estimates are the Census numbers from 2007
- Solid waste compaction ratio of 2:1.
- The following table shows the solid waste volume projection to 2028.



Table 4.2 20-year Solid Waste Projection

| Census Population | 109 | | | | | | | | |
|--------------------------|--------------------|------------------|----------------------|------------------------|------------------------|-------------------------|-------------------------|---------------|----------------|
| Census Year | 2007 | | | | | | | | |
| % Population Increase | 0.2 | | | | | | | | |
| Estimate per capita rate | 0.014m3/person/day | | | | | | | | |
| % Per Capita Increase | 1 | | | | | | | | |
| conversion m3 to tonnes | 0.099 | | | | | | | | |
| Planning Year | Calendar Year | Total Population | Projected Daily Rate | Projected Daily Volume | Projected Daily Weight | Projected Annual Volume | Projected Annual Weight | Running Total | Compaction 2:1 |
| | | | (m3pcd) | (m3/day) | (tonnes) | (m3/year) | (tonnes) | (m3) | (m3) |
| | 2007 | 109 | 0.014 | 1.5 | 0.2 | 557 | 55 | 557 | 278 |
| 0 | 2008 | 109 | 0.014 | 1.5 | 0.2 | 564 | 56 | 1121 | 560 |
| | 2009 | 109 | 0.014 | 1.6 | 0.2 | 570 | 56 | 1691 | 846 |
| | 2010 | 110 | 0.014 | 1.6 | 0.2 | 577 | 57 | 2268 | 1134 |
| | 2011 | 110 | 0.015 | 1.6 | 0.2 | 584 | 58 | 2853 | 1426 |
| | 2012 | 110 | 0.015 | 1.6 | 0.2 | 591 | 59 | 3444 | 1722 |
| 5 | 2013 | 110 | 0.015 | 1.6 | 0.2 | 598 | 59 | 4042 | 2021 |
| | 2014 | 111 | 0.015 | 1.7 | 0.2 | 606 | 60 | 4648 | 2324 |
| | 2015 | 111 | 0.015 | 1.7 | 0.2 | 613 | 61 | 5261 | 2630 |
| | 2016 | 111 | 0.015 | 1.7 | 0.2 | 620 | 61 | 5881 | 2941 |
| | 2017 | 111 | 0.015 | 1.7 | 0.2 | 628 | 62 | 6509 | 3254 |
| 10 | 2018 | 111 | 0.016 | 1.7 | 0.2 | 635 | 63 | 7144 | 3572 |
| | 2019 | 112 | 0.016 | 1.8 | 0.2 | 643 | 64 | 7787 | 3893 |
| | 2020 | 112 | 0.016 | 1.8 | 0.2 | 651 | 64 | 8437 | 4219 |
| | 2021 | 112 | 0.016 | 1.8 | 0.2 | 658 | 65 | 9096 | 4548 |
| | 2022 | 112 | 0.016 | 1.8 | 0.2 | 666 | 66 | 9762 | 4881 |
| 15 | 2023 | 113 | 0.016 | 1.8 | 0.2 | 674 | 67 | 10436 | 5218 |
| | 2024 | 113 | 0.017 | 1.9 | 0.2 | 682 | 68 | 11119 | 5559 |
| | 2025 | 113 | 0.017 | 1.9 | 0.2 | 691 | 68 | 11810 | 5905 |
| | 2026 | 113 | 0.017 | 1.9 | 0.2 | 699 | 69 | 12508 | 6254 |
| | 2027 | 113 | 0.017 | 1.9 | 0.2 | 707 | 70 | 13216 | 6608 |
| 20 | 2028 | 114 | 0.017 | 2.0 | 0.2 | 716 | 71 | 13932 | 6966 |

4.4 LIFESPAN OF CURRENT SITE

The remaining available area for the Enterprise Solid Waste Site is shown in SK-2. These 5 cells have an approximate volume of 20,000 m3.

If this area is properly organized and managed correctly there could be at least five more trenches dug that could accept household garbage. This plan could hold the projected 6966 cubic meters that the



Hamlet of Enterprise is projected to accumulate over the next 20 years. With a compaction ratio of 2:1 this facility can accept household garbage well beyond 2030. An improved compaction ration will extend the life further.

4.5 ABANDONED QUARRY SITE

The abandoned quarry, as identified by the 2002 Report is a possible option for the relocation of the solid waste facility. The Hamlet strongly feels that keeping the solid waste facility at the present location for as long as possible would be in their best interest. When the present location can no longer be used then the abandoned quarry could be considered as an alternative site.

4.6 ABANDONMENT PLAN FOR THE EXISTING SOLID WASTE SITE

As per the requirements of Water Licence Number MV2008L3-0004 an Interim Closure and Reclamation Plan has been developed and will be submitted to the Mackenzie Valley Land and Water Board for approval. Abandonment of the solid waste site is dependent on whether or not the community decides to maintain the existing solid waste site for storage of bulky and hazardous waste or if the community wishes to close the site completely and move all the bulky and hazardous waste to the new site³. These considerations have been taken into the plan and if the solid waste site is to be closed a Final closure and Reclamation Plan will be developed.

³ Interim Closure and Reclamation Plan for the Hamlet of Enterprise, April 2010

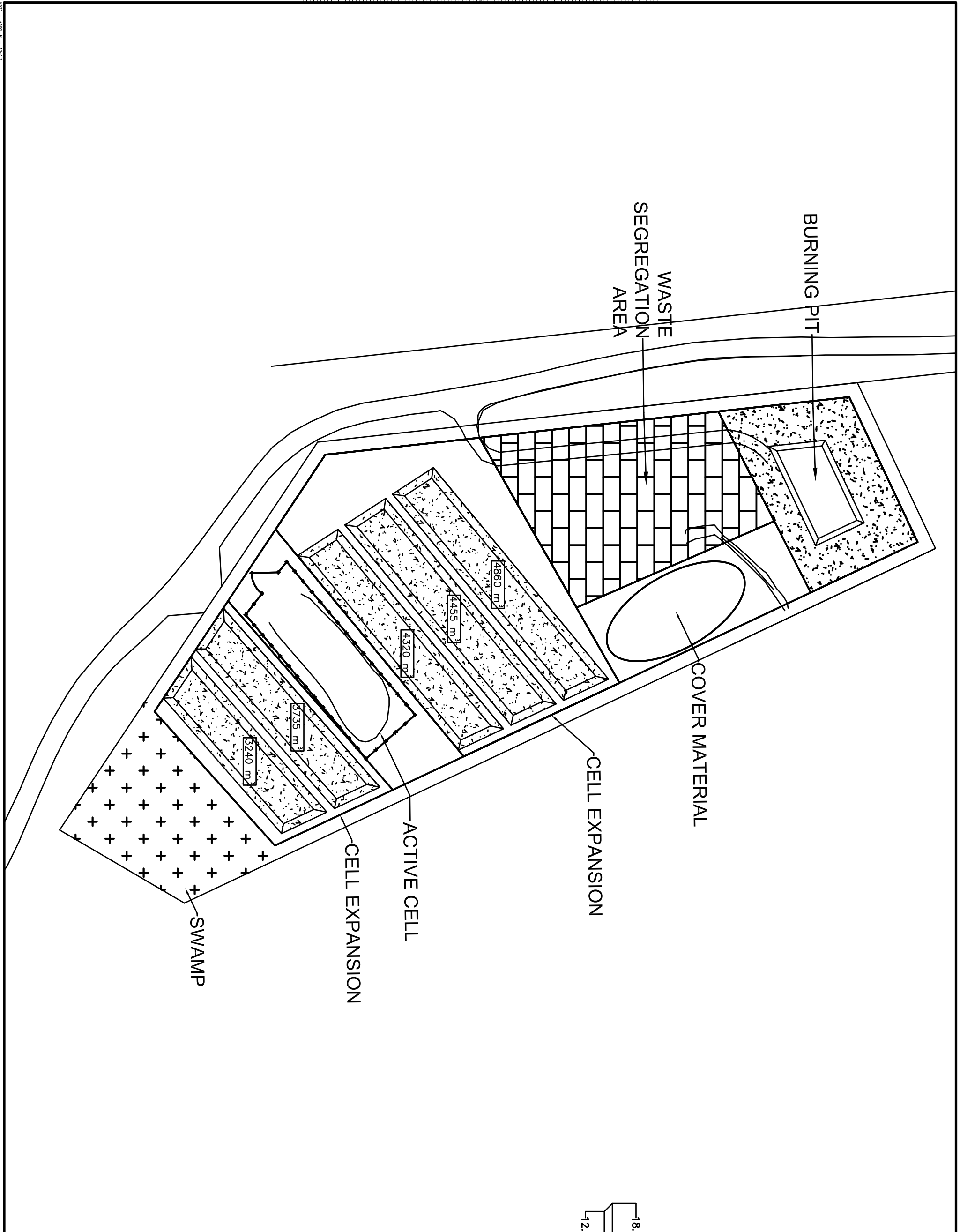


5 CONCLUSIONS

1. When the Settlement of Enterprise became incorporated in 1988, the present solid waste site was built. The only previous waste disposal facility in the area is an abandoned solid waste site observed during the 2002 site visit.
2. The current solid waste facility has been in operation for 22 years. With proper management and organization, this facility should last past 2030.
3. To keep the current facility up and running in the current location would be the most cost effective method for the hamlet of enterprise. The current facility should be used as long as possible to maximize its potential.
4. The current active cell would be full by the end of 2011. A new cell needs to be dug during the summer of 2011.
5. The large pile of Industrial Garbage should be separated into burnable and shredable material. The burnable material should be burned in the burn disposal area). The shredable material should be shredded and buried on the north end of the facility.



Appendix A: Maps



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NOT FOR CONSTRUCTION



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ENTERPRISE
SOLID WASTE
FACILITY

LOCATION: ENTERPRISE, NT.
 DRAWING TITLE: POSSIBLE LAYOUT OPTION

| | | | |
|-----------------|-----------|--------------------|-----|
| DRAWN BY | CP | SCALE | NTS |
| CHECKED BY | RK | CLIENT PROJECT NO. | - |
| FSC PROJECT NO. | 2010-0100 | | |
| DRAWING NO. | SK2 | | |