TEMAGAMI FIRST NATION

FINAL

CAPITAL PLANNING STUDY

- JUNE 2011 -

TEMAGAMI FIRST NATION

TEME AUGAMA ANISHNABAI

FIRST NATIONS ENGINEERING SERVICES LTD.

Reference No.: 25075

EXECUTIVE SUMMARY

First Nations Engineering Services Ltd. (FNESL) was retained by Temagami First Nation to develop a Capital Planning Study (CPS). This study is intended to serve as a guideline for future planning and development over the next 20 years.

This document reviews existing assets, assesses biophysical characteristics, makes population projections, determines housing requirements and develops a land use plan. Based on these assessments and population projections, the 20 year needs of the community are determined. The base year of this study is 2005. Alternatives have been analyzed and cost estimates prepared for the following:

- Water supply, treatment and distribution
- Fire protection
- Sewage collection, treatment, and disposal
- Solid waste management
- Roads & drainage
- Residential development
- Electrical power requirements

Background Information

The total study area consists of Bear Island and portions of the mainland, where the island consists of 288 hectares (712 acres) of land base. The entire Temagami First Nation is located on Bear Island, with potential for development on the mainland known as Shinningwood Bay.

The island does not have a scheduled ferry service, private boats and snow machines can be considered the main transportation to and from the mainland. Water taxis are also available. A barge is available to transport vehicles and large equipment from the mainland to Bear Island.

Topographical Analysis

The terrain is rugged with large amounts of rock outcrops. The island has varying slope steepness with elevations that range up to 80 meters above the normal water levels. It has been determined that 80% of the shoreline are too steep or prohibitive for development. Vertical bedrock scarps are common and slopes greater than 10% dominate the landscape.

A biophysical analysis of the study area revealed through a development capability map that within the study area:

- up to 80% of the land has high development capability,
- 5% to 10% of the land has moderate development capability, and
- more than 10% of the land has low development capability.

Population Projections

The on-reserve population was reported by Temagami First Nation to be 241, as of October 2006. An initial adjustment to the population for late unregistered children increased the 0 to 4 year old cohort by 5 people. The total base population used in the CPS is 246. Thorough analysis suggests an Average Annual Growth Rate (AAGR) of 3.25% be utilized for the 20 year and 50 year population projections. Therefore the 20 year population is projected to be 466 and the 50 year projected population is 1,217.

Water Supply, Treatment and Distribution

Water supply is currently obtained through a water treatment plant and a distribution system that services the developed community. The raw water intake collects water from Lake Temagami, where the lake levels are controlled using a dam. A low lift station delivers the raw water to the water treatment plant using a duty standby pumping system. The water treatment system consists of a Zenon Environmental Inc "ZeeWeed" microfiltration system. The total rated design capacity of the water treatment system is 251.4 m^3/day (2.91 L/s). Water storage is provided through two (2) below grade reservoirs each with a capacity of 140 cubic meters and 120 cubic meters for a total of 260 cubic meters, with an additional 225.9 cubic meters for fire, equalization and emergency services. The distribution system was installed in 1998 and consists of 2,120 meters of 150mm watermain.

Based on the original design criteria the water treatment plant has a remaining capacity of 2.905 L/sec - 1.85 L/sec = 1.055 L/sec or 36.3% of original design capacity. The remaining capacity of the water treatment plant would service approximately 30 more homes. It has been determined that 86 new homes are required over the 20 year planning period with 65 of these to be within an interior urban development on communal servicing and the remaining 21 built on the shoreline with individual servicing.

The 20 year water needs of the community will require a maximum day demand of 4.11 L/s or 355,506 L/day. To meet this need two alternatives were examined. The recommended alternative consists of expanding the existing water treatment plant and below grade reservoir.

Fire Protection

The community has fire fighting capability of 32 L/s that is drawn from the below ground reservoirs using a volume of 115.2 cubic meters. The 20 year fire flows are assumed to use sprinklers, which drastically reduce the storage volumes. The 20 year storage will require a 75.2 cubic meter expansion and a new fire pump for the 20 year planning period.

Sewage Collection, Treatment, and Disposal

The southern portion of the island has wastewater services that consist of collection and pumping to a two celled sewage lagoon. The collection system accepts both grey water and sewage from the residential homes within the area. All waste is directed to a pumping station where it is forced to the lagoon for treatment. The current capacity of the lagoon system is 91,250 L/day (1.06 L/s) and the estimated 20 year future flows are 157,491 L/day (1.82 L/s). To meet the increased wastewater, three (3) alternatives were analyzed; the first was individual septic systems; the second option was a communal wastewater servicing, and the last was to construct a new facility on the main land (Shinningwood Bay). It was recommended that the existing facultative lagoon system be upgraded to an aerated lagoon.

Solid Waste Management

The community's existing landfill site has been previously recommended to be decommissioned. Currently residents are required to haul their waste to the barge landing where it is collected and disposed of in the Briggs Landfill site. It is recommended that the First Nation purchase a garbage truck and provide weekly garbage collection for the residents of the island. The garbage truck would take the waste to the barge for transport mainland landfill. The expansion of the Briggs Landfill is currently in works, therefore FNESL recommends that a solid waste management study be undertaken to explore options for future solid waste disposal.

Island Roads

The First Nation's entire road network can be classified as poor when compared to MTO standards. Emergency vehicle operators find it difficult to maneuver the roadways when they meet another vehicle. Over the past few years, residents appear to be bringing more cars and trucks to the island

for transportation. The existing roads are very narrow and will require upgrades if this trend continues. It is also recommended that all existing roads be upgraded to meet MTO standards as the island development occurs. In the interim, FNESL recommends a detailed study and design be conducted for the road upgrades.

Residential Development

The CPS base housing count for the 246 members living in the community is 94. A current housing density of 2.6 people/house was calculated. It is projected that the number of new homes required to accommodate the anticipated future growth is 86 homes. It has been estimated that approximately 75 % of the new residential development will occur in an urban style subdivision, with the remaining homes being constructed in rural areas by individual homeowners along the shoreline. This results in 65 new homes in the subdivision and 21 constructed by individuals.

Before new residential lot developments, infilling and filling of vacant lots would occur. Therefore, the following residential phasing is recommended:

Phase I (Years 1 to 5)	16 units
Phase II (Years 6 to 10)	16 units
Phase III (Years 11 to 15)	16 units
Phase IV (Years 16 to 20)	17 units

Electrical power requirements

Currently there is only single phase power available to the Temagami First Nation. Ontario Hydro is the service provider for electricity to Bear Island.

Conclusion

A combination of municipal and economic developments for the Temagami First Nation, will safeguard a stable future for future generations. This Capital Planning Study should be used as a guideline and reference for future planning and development. The following phasing and costs are the outcome of the study:

20 Year Capital Plan - Phase Costing

Phase I - Years 1 to 5	**COST**
Insurance, Mobilization, Demobilization	$75,000
Site Works	$250,000
Water Supply, Treatment and Distribution	$96,500
Wastewater Collection and Treatment	$162,500
Road Construction	$819,250
Solid Waste	$600,000
Community Facilities	$10,000,000
TOTAL PHASE I CAPITAL COSTS	**$12,003,250**
Phase II- Years 6 to 10	
Insurance, Mobilization, Demobilization	$75,000
Site Works	$250,000
Water Supply, Treatment and Distribution	$2,483,750
Wastewater Collection and Treatment	$984,000
Road Construction	$1,751,750
Solid Waste	$0
Community Facilities	$3,500,000
TOTAL PHASE II CAPITAL COSTS	**$9,044,500**
Phase III- Years 11 to 15	
Insurance, Mobilization, Demobilization	$75,000
Site Works	$250,000
Water Supply, Treatment and Distribution	$876,350
Wastewater Collection and Treatment	$187,625
Road Construction	$952,250
Solid Waste	$0
Community Facilities	$2,000,000
TOTAL PHASE III CAPITAL COSTS	**$4,341,225**
Phase IV- Years 16 to 20	
Insurance, Mobilization, Demobilization	$75,000
Site Works	$250,000
Water Supply, Treatment and Distribution	$878,850
Wastewater Collection and Treatment	$192,625
Road Construction	$953,750
Solid Waste	$0
Community Facilities	$2,000,000
TOTAL PHASE IV CAPITAL COSTS	**$4,350,225**
SUB TOTAL 20 YEAR CAPITAL COST SUMMARY	**$29,739,200**
10% Contingency	**$2,973,920**
15% Non-Construction and Engineering	**$4,460,880**
TOTAL 20 YEAR CAPITAL COST SUMMARY	**$37,174,000**

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1.0 INTRODUCTION

The Temagami First Nation has identified the need to develop a plan that will help to guide, monitor and control the growth of their community in the future.

It is anticipated that community growth, both through economics and population, will continue. Knowing this, Chief and Council see the need to plan for the future, ultimately allowing them to have greater control over future development and giving members confidence in short and long term goals for their community.

The Temagami First Nation commissioned First Nations Engineering Services Ltd. to conduct a Capital Planning Study (CPS) update for their community to develop a plan for future growth. The study will provide recommendations regarding the designation of a new 20 year land use plan with an outlook to 50 years, and assist the community by providing recommendations for the servicing of the adopted land use plan.

1.1 Location

The Temagami First Nation community is located approximately 88.5 km northwest of North Bay, on Bear Island on Lake Temagami. Figure 1.1: Location Plan identifies the location of Temagami First Nation. According to INAC's Band Classification Manual, the Temagami First Nation is classified as Zone 4, indicating the First Nation has no year round access to a service centre and therefore experiences a higher cost of transportation.

1.2 Background

The First Nation requested an update to their existing Capital Plan to assist them in planning the future development of their community. The original Capital Plan was completed in 1993 by The Lathem Group Inc. This study focused on community planning and infrastructure servicing necessary to meet the existing and future needs.

The 1993 CPS indicated the recommended plans for development would accommodate development for approximately 5 to 6 years. The CPS also indicated that it is necessary for the community to find an alternate area to grow and must urgently seek new reserve lands on the mainland.

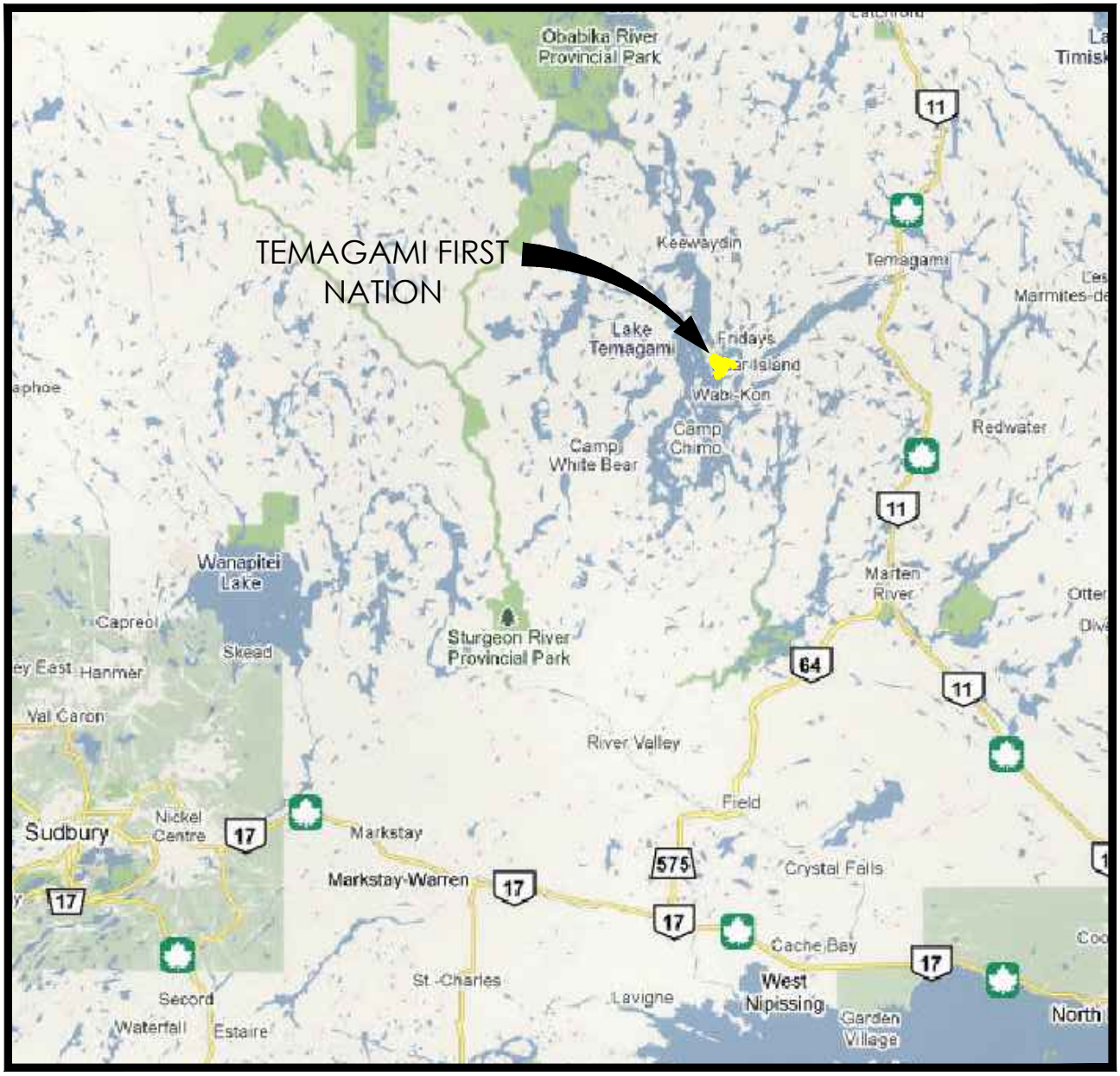

FIGURE 1.1

Location Plan

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The Chief and Council have identified the following specific concerns with regard to the communities existing infrastructure expansion and housing requirements:

- There is a housing backlog of 55 members requiring homes, lack of serviced lots and Temagami First Nation is unable to meet the immediate and future housing requirements.
- The geological and topographical nature of Bear Island has limited the developable land. It is pertinent that the community leaders undertake detailed land use planning to maximize the utility of the remaining land available for housing development.
- A long term strategy for solid waste management/disposal is required to be implemented.
- The need for water/wastewater distribution system and roads to service the proposed housing development.
- The need to upgrade the existing community facilities such as the Public Works Garage, Fire Hall/Emergency Response Building etc.
- There is a need to identify a local source of gravel to facilitate the future development of infrastructure.
- The need for a new Administration Building and Recreational Centre.

1.3 Existing Conditions

Bear Island is roughly a triangular shape and contains a land area of 288 hectares (712 acres).

The core community is located on the island's southern tip, where the majority of the residential and non-residential development is located.

According to INAC's database the current on-reserve/Crown Land population was 659 in July 2006. Information received from Temagami First Nation indicate there are a total of 241 members living on-reserve. There are 94 homes on the First Nation, resulting in an existing housing density of 2.6 people per home.

The community core is supplied with a communal water treatment and distribution system. Constructed in 1998, the system consists of a membrane water treatment plant, piped water distribution system and a raw water lake intake system.

The community core is supplied with communal wastewater treatment, collection and disposal. The system includes gravity sewers, forcemains and wastewater lagoons. The homes outside of the core community use individual septic tanks / tile beds and individual water lines to lake.

Narrower sub-standard gravel roads also serve other parts of the community to the north and east ends of the island. The community has one major gravel road. Drainage is achieved through a series of roadside ditches.

Solid waste is removed from the island by barge and deposited in the Municipality of Temagami, Briggs Landfill Site.

Power is supplied to the community by the Ontario Grid system. Single phase power is available on the First Nation.

The majority of residences and facilities have telephone services.

1.4 Previous Studies

The following studies were used for background information for this study

- Temagami First Nation, Bear Island Capital Planning Study, April 1993, The Lathem Group Inc. Consulting Engineers.
- Temagami First Nation, Sewage Treatment Plant Operations Manual, Vol 1, Rev 1, August 2000, KMK Consultants Limited.
- Temagami First Nation, Water Treatment Plant Operations Manual, August 2000, KMK Consultants Limited
- Mineral Resource Potential of Indian Reserve Lands, April 1991, Indian and Northern Affairs Canada.
- Completion Report, Bear Island Infrastructure Services, January 2000.
- Community Health Plan

2.0 EXISTING COMMUNITY

A base profile of the existing Temagami First Nation needs to be established so reliable and accurate planning for the design period can be completed. The community profile will include the current land base, the existing facilities, population, existing homes, housing densities, and existing infrastructure systems for water, wastewater, solid waste management, electrical power, roads, and drainage.

2.1 Land Base

Total area of Bear Island is 288 hectares (712 acres), the reserve portion is 1 sq. miles or 640 acres, this value will be used throughout the document.

According to information received from Temagami First Nation, all First Nation lands are controlled by the First Nation. Certificates of Possession are issued for the home but not for the land.

According to the 1993 CPS the Temiskaming Board of Education owns lots 111 to 114 and 119 to 122. It has been indicated that this land is held in trust by the Chief of the First Nation and when the current Chief's term is complete it will be turned over to the new Chief.

2.2 Residential and Non-Residential Facilities

There are currently 94 residential homes on the First Nation with 53 hooked to the communal water and wastewater system.

Existing non-residential facilities within the Temagami First Nation are as follows:

- Administration Office
- Public Works Garage
- Dock Warehouse
- Garbage Transfer Stn.
- Sonny Moore Recreational Bldg.
- Healing and Wellness Centre
- Store and Marina
- New Heated Garage
- Police Station/Old Clinic
- Laura Mackenzie Learning Centre
- Tillie Missabi Family Centre
- Fire/EFR Station
- Water Treatment Plant
- Recreation Centre
- Elders Bldg
- Police Boat House
- Garbage Compacting Station
- Doreen Potts Health Centre

Figure 2.1: Existing Land Use Plan shows the residential/non-residential areas and facilities within the Temagami First Nation. The condition of the facilities are described in subsequent sections, and are based on the 2005 ACRS report.

Administration Office

The administration office is 343.1 metres sq. in size. The original 2 storey log building is the former Lands and Forest Bldg. and was constructed in 1904 and sits on a log foundation directly on the ground. An addition of 150 metres sq. on a cement block foundation was added in 2004. The interior of the older section of the building is a combination of log and some drywall, floors are painted wood with some areas covered with vinyl tile and linoleum. The addition is wood frame construction with log siding, the interior is drywall and floors are vinyl tile and linoleum. The building is equipped with baseboard heaters and electrical fans. Handicapped access is provided. The building is well maintained.

The original portion of the building is outdated and needs to be replaced soon. The addition is in good condition and has a remaining service life of 40 years, however the overall facility does not adequately meet the needs and space requirements of the First Nation and a larger facility will be required soon.

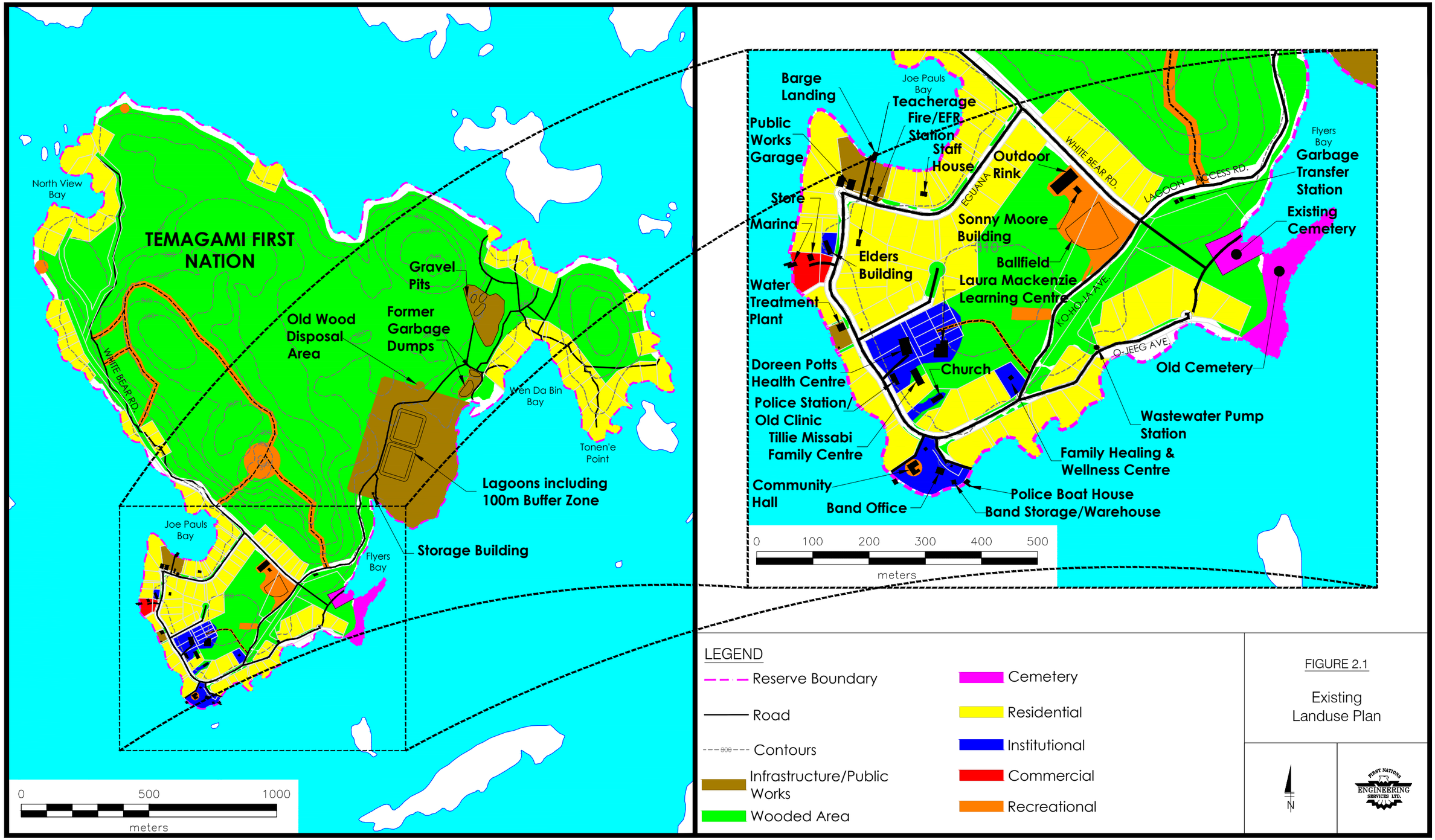
A storage shed is utilized by the Administration Office. This building is 7.75m^2 in size and was constructed in 1985. The remaining service life is approximately 10 years and is in fair condition. The building is a wood structure and consists of painted wood exterior walls, a pitched asphalt roof and wood floors. This building is uninsulated and unheated. Minor repairs are required and the building is maintained.

Public Works Garage

This building is 223.0 m^2 in size and was constructed in 1983. The building has a remaining service life of 5 years and is in fair condition. This is a prefabricated steel structure with metal clad exterior walls, pitched metal clad roof with concrete slab foundation on grade. The building is equipped with suspended electric heaters and fluorescent lamps. The building requires minor repairs and several major repairs.

Laura Mackenzie Learning Centre

This school is 658.4m^2 and is in good condition. The building was constructed in 1984 and has a remaining service life of 30 years. The building is constructed of concrete block and wood structure. The building consists of wood plank siding and an asphalt shingle roof. The building sits


TEMAGAMI FIRST NATION
North View Bay
Gravel Pits
Old Wood Disposal Area
Former Garbage Dumps
WHITE BEAR RD.
Wen Da Bin Bay
Tonen'e Point
Lagoons including 100m Buffer Zone
Joe Pauls Bay
Flyers Bay
Storage Building
0
500
1000
meters
Barge Landing
Joe Pauls Bay
Teacherage
Fire/EFR Station
Staff House
Public Works Garage
Outdoor Rink
WHITE BEAR RD.
EGUANA
LAGOON ACCESS RD.
Flyers Bay
Garbage Transfer Station
Existing Cemetery
Store
Marina
Sonny Moore Building
Elders Building
Ballfield
Laura Mackenzie Learning Centre
KO-HO-JA-AVE.
Water Treatment Plant
O-JEEG AVE.
Old Cemetery
Doreen Potts Health Centre
Church
Police Station/ Old Clinic
Wastewater Pump Station
Tillie Missabi Family Centre
Family Healing & Wellness Centre
Community Hall
Band Office
Police Boat House
Band Storage/Warehouse
0
100
200
300
400
500
meters
LEGEND
Reserve Boundary
Road
909 Contours
Infrastructure/Public Works
Wooded Area
Cemetery
Residential
Institutional
Commercial
Recreational
FIGURE 2.1
Existing Landuse Plan
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on concrete slab on grade foundation. The interior walls of the building consists of painted drywall and concrete block. Flooring consists of vinyl tile and acoustic ceiling tiles are used. The building is equipped with central and baseboard heating. Minor repairs, an upgrade to the handicap access and additional storage are required.

Tillie Missabi Family Centre

This building is 290.3 m^2 in size and was constructed in 1997. A 40 m^2 addition was constructed in 2005. The building is in good condition and has a remaining service life of 20 years. The building is a wood frame structure with log siding. The building sits on concrete slab on grade foundation. The interior of the building consists of drywall, vinyl floor tiles and painted drywall ceiling. The building is equipped with a baseboard heating system. Minor repairs are required and the heating system requires upgrades.

Two storage sheds are utilized by the Daycare Centre. The first storage shed is 11.5 m^2 and has remaining service life of 20 years. This shed is in good condition and is well maintained. The second shed is 11.7 m^2 and was constructed in 2002. This shed is in good condition and has a remaining service life of 25 years. Both sheds are uninsulated and unserviced.

Fire/EFR Station

This building is 68.5 m^2 and was constructed in 1993. The building is in poor condition and has a remaining service life of 20 years. The building consists of a wood framed structure with pitched metal clad roof. It sits on a concrete slab on grade. The exterior walls are prefinished metal clad. The interior walls and ceiling consists of insulation and painted drywall. The floor is painted concrete. Minor repairs, additional fire equipment storage and replacement of truck fill system are required. The building also houses the ambulance.

A shed which is in fair condition, is being utilized by the firehall since 2004. This building is 10.5 m^2 in size and was constructed in 1985. The building consists of metal siding on wood structure and sits on concrete block footings. The building is insulated and unheated.

Water Treatment Plant

This building is about 158.7 m^2 in size and was constructed in 1998. The building is in good condition and has a remaining service life of 35 years. The building consists of concrete floating slab foundation. The building includes a metal clad roof and decorative wood panel on exterior walls. The building is equipped with ceiling mounted electric heaters. The building requires some minor repairs and is well maintained.

The water treatment plant utilizes a warehouse. This warehouse is approximately 23.3 m^2 and was constructed in 1999. This building is in good condition and has a remaining service life of 20 years. The building consists of a wood frame, soffit fascia and metal cladding roof. The interior walls of the building are panelling and the ceiling is drywall. This warehouse is equipped with ceiling mounted heaters. The building requires some minor repairs and is generally well maintained.

Garbage Transfer Station

This building is 54.8 m^2 and is new. This building was constructed in 2005 and has a remaining service life of 35 years. The building consists of metal wall siding, asphalt shingles on wood structure and concrete slab on grade floor. The building is described as a two bay garage. It is well maintained and in good condition.

Recreational Centre

This building is 268.2 m^2 and was constructed in 1915, the log addition was added in the early 1970's. The building is in good condition and has a remaining service life of 20 years. The building consists of metal clad roofing, wood tongue and groove exterior walls. The foundation is constructed from concrete blocks. The interior of the building consists of painted drywall, hardwood and vinyl tile flooring, acoustic tile and wood panel ceilings. The building is equipped with baseboard and central HVAC system. The building requires some minor repairs as well as repair of the floor elevation differential due to settlement. Overall the building is well maintained, but the building does not adequately serve the needs of the community as it is too small for large functions/events and a new facility will be required soon.

Sonny Moore Recreational Building

This building is 90.3 m^2 and was constructed in 2000. The building is in good condition and has a remaining service life of 20 years. The building consists of a wood framed structure with square pressure-treated lumber foundation. The exterior of the building consists of vinyl siding and an asphalt shingled roof. The interior of the building consists of tongue and groove pine walls and ceilings along with vinyl tile flooring. The building is equipped with baseboard electric heaters. The building requires minor repairs and is well maintained.

Elders Building

This building is 191.7m^2 and is in good condition. The building was constructed in 1991 and has a remaining service life of 25 years. The building consists of a wood framed structure on concrete block and wooden post foundation. The exterior of the building consists of an asphalt roof and vinyl siding. The interior of the building consists of wood panelling walls, acoustic tile ceiling and a vinyl

tile flooring. The building is equipped with an air conditioning unit, baseboard heaters and a wood furnace. Some minor repairs are required as well as the replacement of the deck concrete footing. Overall the building is well maintained.

Healing and Wellness Centre

The building was built in 1996 with an original area of 136.0 sq. m. An addition of 85.5 sq. m. was added in 2004 and more recently a heated porch which doubles as a meeting/gathering room, of 29.4 sq. m. was added. Total area of the building is 250.9 sq. m. The building houses the women's shelter and various other men's and women's social programs are operated out of the facility.

The building is a single story wood frame structure on a concrete block foundation with vinyl siding and pitched asphalt shingle roof. The interior is vinyl sheet flooring and painted drywall walls and ceiling. The porch addition has plywood floor, walls and ceiling. Heating is supplied by oil-fired forced air furnace.

Dock Warehouse

This building is about 61.4 m^2 and was constructed in 1915. It has a remaining service life of 7 years and is in fair condition. The building is a wood framed structure with metal roofing and wood horizontal siding exterior walls. The building sits on wood foundation. The building is unheated and uninsulated. The building requires minor repairs and some maintenance.

Store and Marina

The Store and Marina were constructed in 1990 and 1980 respectively. The Store building is a wood framed structure with a shingled roof (4/12 pitch). The building area is 100 m^2 and rests on a concrete block foundation with a crawl space. It is electrically heated and the interior walls are finished with drywall. The Marina was constructed on log posts and is finished with wood siding with a shingled roof (4/12 pitch). There is no heat in this structure and the interior is open framed.

Police Boat House

This building was built in the 1940's and is 57 m^2 in size (18' x 34' or 612 ft^2). The structure is stick framed with a cottage style roof. The docks are 3 slips 250 m^2, with a rock and pier foundation.

New Heated Garage

The new heated garage was constructed in 2006 and is a single storey slab-on-grade wood frame on concrete block structure with a pitched metal roof. It is 105.72 sq. m. in size.

The building is located adjacent to the Public Works Garage and is attached by an enclosed walkway joining the buildings. The exterior is metal clad with an overhead door.

The interior is painted drywall and heated by overhead electric heaters.

Police Station/Old Clinic

The building was constructed in the late 1960's and was one of the first band buildings built on Bear Island. It was originally used as a dance and meeting hall and was later converted into office space for a health clinic and police station. Various other renovations/additions have occurred through the years including an attached structure for police holding cells and more recently an addition to the library portion.

The total area of the building is 169.70 sq. m. with the library portion comprising of 90.0 sq. m. The original building is a single story wood frame structure on a concrete block foundation with wood panel siding and a pitched asphalt shingle roof. The library addition is on a concrete block foundation with brick facing. The interior has vinyl tile flooring with painted drywall walls and ceiling. The interior is heated by electric forced air furnace with electric baseboard heaters in the library addition.

Doreen Potts Health Centre

The total area of the building is 392.8 sq. m. and officially opened on September 20, 1996. An addition of 18.4 sq. m. Was added last year. Various health and social programs operate out of the building including: Native Child Welfare, Healthy Babies Healthy Children, Community Health, Drug and Alcohol, Elder's Services, Medical Transportation etc.

The building is a single story wood frame structure on a concrete block foundation with wood siding and panel board on upper portions and gable ends and asphalt shingle roof. The interior is vinyl sheet flooring with stone in entrance area and front offices, painted drywall walls and ceiling with some areas acoustic tile.

Heating is oil-fired forced air furnace and electric baseboard and electric wall mounted convection heaters.

Portable Classroom

The portable has been in use since 2008 and is located adjacent to the Laura McKenzie Learning Centre. The area of the structure is 69.93 sq. m. and is a single story wood frame with concrete

pad and post foundation and pitched roof and exterior walls. The interior is vinyl tile floor with acoustic tile ceiling, vinyl panel board walls and wall mounted electric unit heaters.

2.3 Water Treatment Storage and Distribution

The following descriptions of the existing water treatment plant are summarized from the Water Treatment Plant Operations Manual prepared by KMK Consultants Ltd. in August 2000. Figure 2.2: Existing Water System identifies the components of the existing water system.

2.3.1 Raw Water Supply

Lake Temagami

The raw water source for the communal water supply is drawn from Lake Temagami. A dam on the Temagami River controls the lake levels between 292.99m and 294.20m for an average lake level of 293.80m. The manual states the water quality is generally good, but near shore the previous household intake systems were showing increased levels of coliform counts.

The following tables illustrate the results of raw water quality sampling completed by Aqua Technix in 1997 (at the intake location) and The Lathem Group in 1991.

Table 2.1: Raw Water Quality Sampling Results

PARAMETER	MOE MACL (mg/L)	RAW WATER VALUE
Alkalinity	30 to 500	10
Aluminum	0.1	
Ammonium	0.05	
Arsenic	0.05	<0.002
Barium	1.0	<0.01
Cadmium	0.005	<0.002
Calcium	100	16.9
Chloride	250 *	1.8
Chromium	0.05	<0.01
Colour (TCU)	5.0 *	11
Conductivity (uMho/cm)	400	
Copper	1.0 *	<0.005
Dissolved Organic Carbon	5.0	
Fecal coli/100 ml vol	0	<2
Hardness	80 to 100	

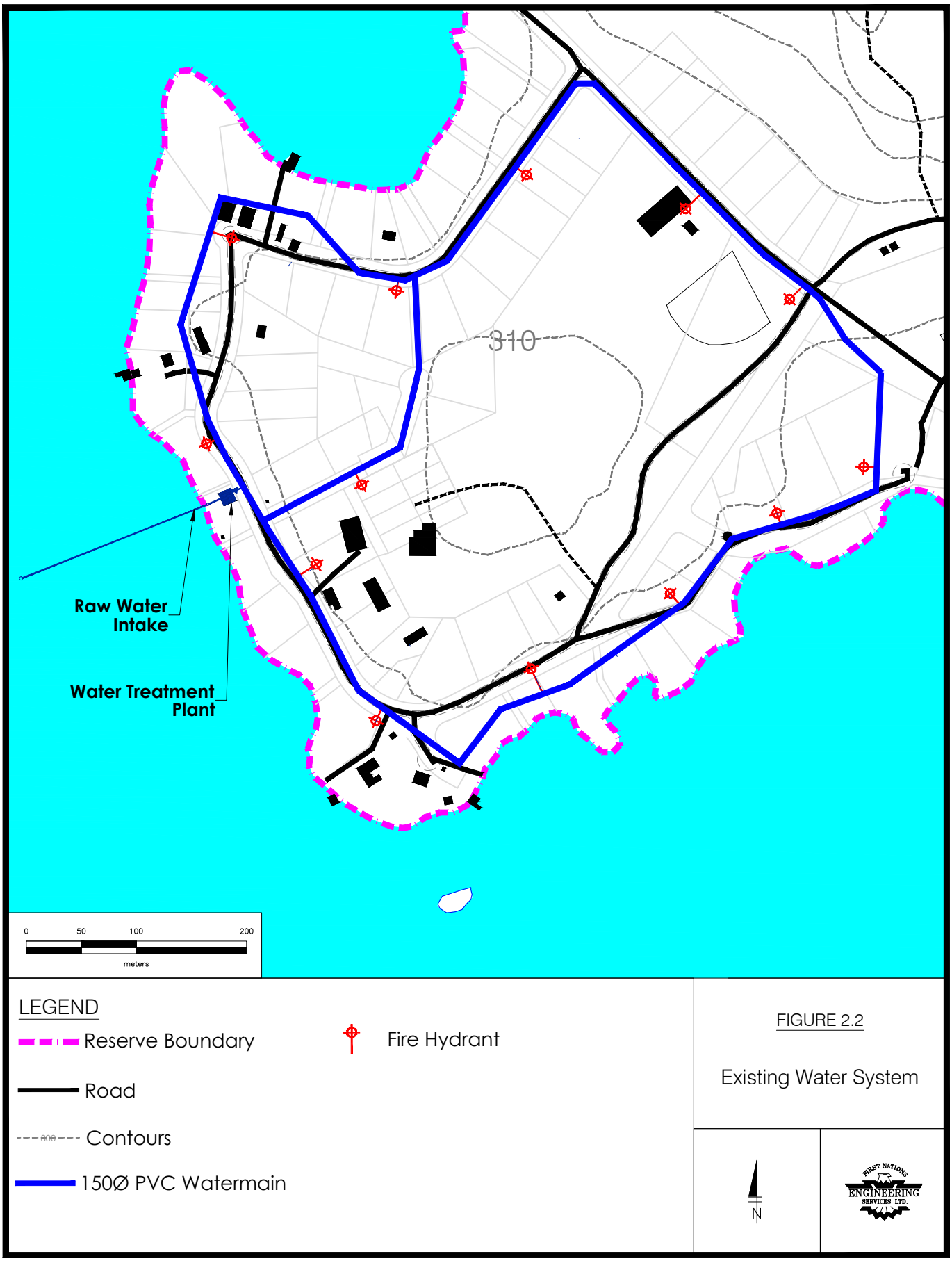


FIGURE 2.2

Existing Water System

Iron	0.3 *	<0.02
Lead	0.05	<0.02
Magnesium	30	
Manganese	0.05	0.01
Mercury	0.001	<0.00005
Nitrate	-	<0.01
Nitrite	1.0	<0.01
Nitrogen (Total Kjeldahl)	0.02	0.93
pH	6.5 to 8.5	6.55, 7.5, 8.8
Phenols	-	<0.001
Sodium	200	1.5
Sulphate	500	14
Total coli/100 ml vol	10	12
Total Dissolved Solids	<500 *	44
Total Phosphorous	-	0.183
Total Suspended Solids	-	29
Turbidity (NTU)	1.0 *	0.06 to 1.0
Zinc	5.0 *	

MACL = Maximum Acceptable Concentration Level

* Aesthetic Objective

At the time the Operations Manual was prepared, it is documented that zebra mussels were not present in Lake Temagami.

Raw Water Intake

The intake structure is located approximately 194m from the WTP, submerged and placed on the lake bottom. The structure consists of Polyethylene drum base (2.21m dia.), fill structure sandbags and a polyethylene conical cover (1.2m in dia). The overall height of the intake structure is 2.65m. A 20mm HDPE mesh surrounds the intake ports and the intake inlet location can be lowered through a range of 1.4m.

The intake pipe is a 150mm polyethylene pipe with a class rating of Series 60. A 75mm line from the high lift discharge piping is connected to the intake pipe for flushing of the intake pipe if needed.

The intake system has a zebra mussel protection system consisting of a diffuser, piping and a

chlorine solution system which is currently not connected.

The top of the intake structure is located at 283.0m and the lake bottoms elevation at the structure is 280.1m.

Based on information contained in the Design Brief for the Temagami infrastructure projects the intake is designed for a 40 year or ultimate population as per the planning report. The ultimate population in the report is the same as the 20 year projection (250 people).

Low Lift Pumping System

The low lift pumping system consists of 2 identical submersible low lift pumps each capable of providing 3.9 L/sec at 11.35m of TDH. The pumps are Barnes model 2EH512L, 1 hp and 3450 RPM. These pumps are contained in a 1.6m x 1.9m reinforced concrete pump well which has a volume of 21.94 m^3 at the high water level.

The pumps operate in a duty standby configuration with automatic operation based on the liquid level of the treated water clearwell. The following table identifies the start/stop settings of the low lift pumps.

Table 2.2: Low Lift Pumps Start/Stop Settings

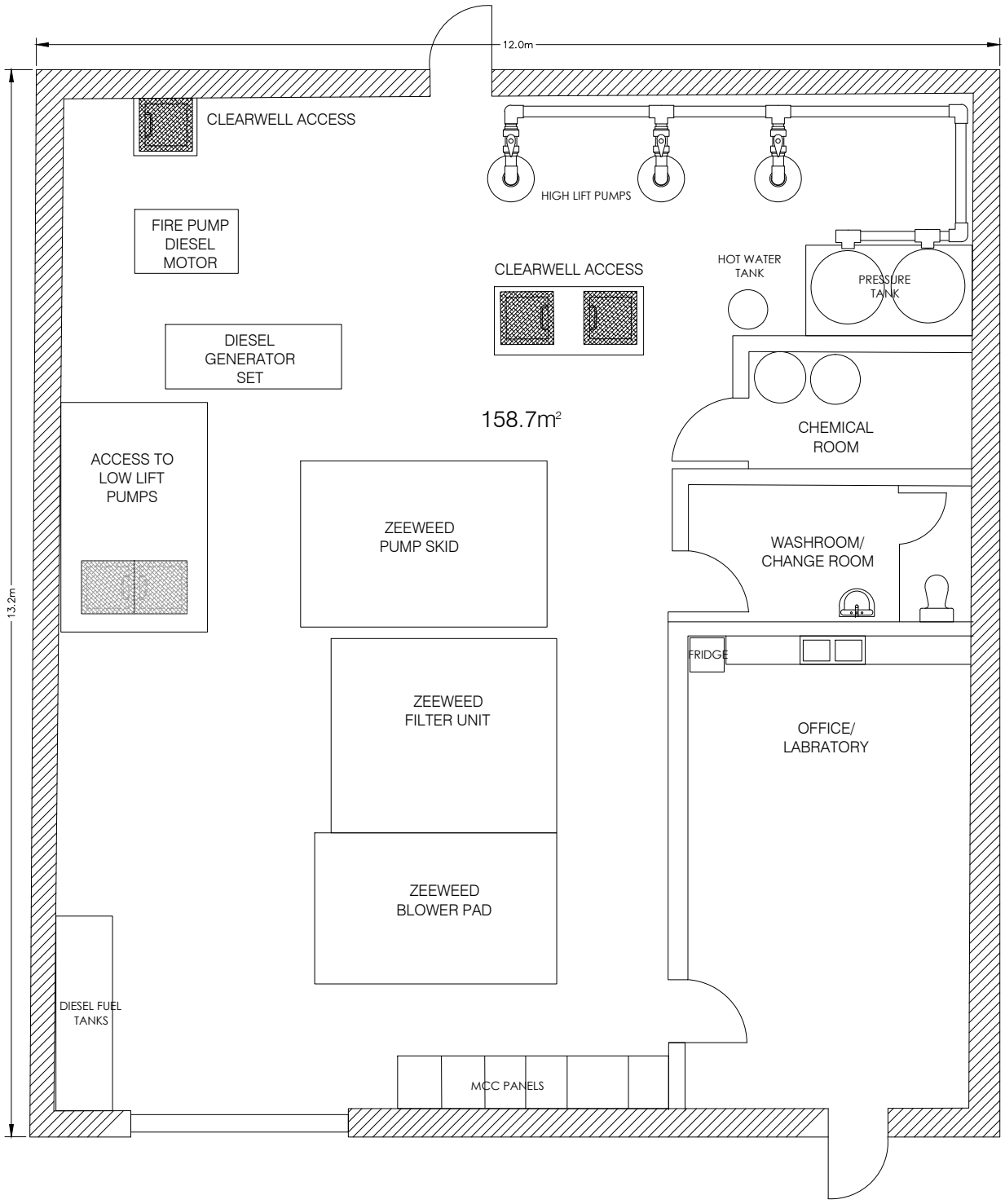
ITEM		ELEVATION	DISTANCE FROM BOTTOM OF HIGH LIFT WELL
Lead Pump	Start	294.93m	2.93m
	Stop	296.55m	4.55m
Lag Pump	Start		
	Stop	296.55	4.55m
Alarm *		294.53	2.53

* Only fire storage left in the reservoir

2.3.2 Microfiltration Water Treatment System

Treatment Units

The plant uses Two (2) Zenon Environmental Inc. “ZEEWEED” Microfiltration Units for a total design flow of 2.905 L/sec. The stainless steel process tankage is 1.524m x 2.59m x 2.489m deep. The vacuum pump skid is 2.083m x 3.048m x 2.8m deep. The water treatment plant layout is shown in Figure 2.3: Existing Water Treatment Plant Layout.



N.T.S.

FIGURE 2.3
Existing Water Treatment Plant Layout

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The normal operations of the system consist of filtration and backpulsing processes.

Filtration

Raw water is supplied to the process tank based on a signal from a level transducer. A vacuum of <10 psig is applied to the membranes and the permeate is transferred to the high lift clearwell. A reject stream continually overflows the process tank over a weir in each of the tanks. The reject rate is controlled by the PLC. Recovery is a variable which that when the raw water quality deteriorates the membranes experience fouling. The recovery rate is not set less than 75%. The membranes are continually aerated and when there is no water demand the permeate pumps can be turned off and the membranes relaxed.

Backpulsing

Clean permeate with sodium hypochlorite is regularly backpulsed through the membranes to remove the foulants on the membrane surface. Typically a backpulse is completed every fifteen minutes for fifteen seconds.

Clean-in-Place

Approximately every two months the membranes will require cleaning. This is completed by shutting down the unit and draining the process tank. A cleaning solution is backpulsed through the membranes and allowed to soak. After a soaking period the cleaning solution is drained from the tank and refilled with raw water. Filtration once again begins but the permeate will be diverted to a surge tank due to the possible presence of the cleaning solution.

Sludge Handling

Due to the filtering and backwashing processes waste byproducts are produced which are generally referred to as sludge. These sludges must be treated prior to disposal, which involves settling of the solids and decanting of the clarified liquid through a 150mm gravity outfall pipe eventually discharging into Lake Temagami. The suspended solids requirement for discharge into the Lake must not exceed 25 mg/L. The remaining settled sludge is disposed of at the wastewater lagoons.

2.3.3 Disinfection

Chlorination is used to ensure the satisfactory disinfection of the potable water supply. Sodium Hypochlorite is used in a chlorination system as the disinfecting agent. A provision for a future connection of a zebra mussel control system has been made.

2.3.4 Reservoir Clearwell

The water treatment plant is equipped with two underground clearwell storage tanks constructed of reinforced concrete.

Clearwell #1 has the dimensions 4.793m x 6.340m x 4.60m SWD for a high water level volume of 140m^3.

Clearwell #2 has the dimensions 4.112m x 6.340m x 4.60m for a high water level volume of 120 m^3.

Water level in the clearwells are monitored by a Milltronics MultiRanger Plus Ultrasonic Level Transducer.

2.3.5 High Lift Pumping System

The high lift pumping system consists of three submersible pumps each of the same capacity. Each high lift pump is a Grundfos 40S20-7, 7 hp, 3450 RPM rated at 1.49 L/s @ 54.9m TDH and 2.18 L/s @ 49.0m TDH.

The high lift pumping system is designed to maintain pressure within a preset operating range controlled by the use of two pressure tanks. The pumps were designed to feed the distribution system directly at a maximum day demand flow rate of 2.91 L/sec and peak hour flow rate of 4.36 L/sec. Pump control is based on a pressure sensor located on the distribution header.

The pressure tanks are model AFX-1200 manufactured by Hamlet and Garneau Ltd and have a capacity of 1,200L. The following table illustrates the High lift pumps start/stop points based on the pressure settings.

Table 2.3: High Lift Pump Start/Stop Settings

ITEM		REFERENCE ELEVATION	PRESSURE SETPOINTS
Lead Pump	Start	347.47 m	500 kPa
	Stop	353.59 m	530 kPa
Lag Pump 1	Start	342.37 m	450 kPa
	Stop	350.53 m	500 kPa
Lag Pump 2	Start	340.33 m	400 kPa
	Stop	346.45 m	450 kPa

Fire Pump	Start Stop	338.29 m	350 kPa manual only
low level lockout		292.50 m	
high lift pump low level lockout		292.50 m	

2.3.6 Fire Pump

The fire pump consists of a Floway, model 10 DKH-FP, vertical turbine pump rated at 32 L/sec @ 44.5 m TDH, 1770 RPM. The diesel drive is a Clarke-Detroit Diesel-Allison, model L4YN, 4-cycle inline with an operating speed range from 1470 to 2600 RPM.

An underground storage tank contains the required 115.2m^3 of fire storage. The reservoir also contains the equilization and emergency storage totalling a usable volume of 225.9 m^3.

2.3.7 Water Distribution System

The water distribution system at Temagami First Nation was installed in 1998 and consists of 2,120m of 150mm watermain.

2.3.8 Water Treatment Plant HVAC

Heating is provided by electric unit heaters and ventilation is provided by exhaust fans, dampers and louvres.

2.3.9 Emergency Power Supply

The water treatment plant has a Kohler model 50ROZJ, 50 kW, #2 Diesel fuel generator.

2.4 Wastewater Collection, Treatment and Disposal

The following descriptions of the existing wastewater collection, treatment and disposal system are summarized from the Sewage Treatment Plant Operations Manual prepared by KMK Consultants Ltd. in August 2000. The plant was constructed during 1998 and start up occurred December 1998.

The existing system consists of two facultative lagoons which are discharged yearly to Lake Temagami through wetlands. Wastewater is collected by a gravity collection system to a pumping station which pumps directly to the lagoons.

The lagoons have an operating capacity of 250 people and a rated capacity of 91.25 m^3/day. The

operating volume of the lagoons is 41,800 m^3.

No Certificate of Approval was issued by either Ontario Ministry of the Environment or Public Works and Government Services Canada for the wastewater lagoons.

The existing wastewater system is shown Figure 2.4: Existing Wastewater System.

2.4.1 Wastewater System Design Criteria

The following is from the sewage treatment plant operations manual, which in turn was taken from the 1997 Design Brief prepared for the project.

Table 2.4: Wastewater Lagoon Design Criteria

Design Population	250 people
Design Flow	91.25 m^3/day (1.06 /sec)
Unit Flow	365 L/cap/day
Septage Allowance	137 m^3/year
Marine Allowance	48 m^3/year (480/100L pumpouts)
Retention Time	1 Year
CELL #1	
Approximate Volume of Pond	20,900 m^3
Operating Depth	1.80 m
Area	1.33 hectares
CELL #2	
Approximate Volume of Pond	20,900 m^3
Operating Depth	1.80 m
Area	1.33 hectares

The following parameters were used as design objectives;

Table 2.5: Wastewater Treatment Design Parameters

PARAMETER	MINIMUM	MAXIMUM
5 Day Biological Oxygen Demand (BOD_5)	-	20 mg/L
Suspended Solids (SS)	-	25 mg/L
Fecal Coliforms	-	400/100ml

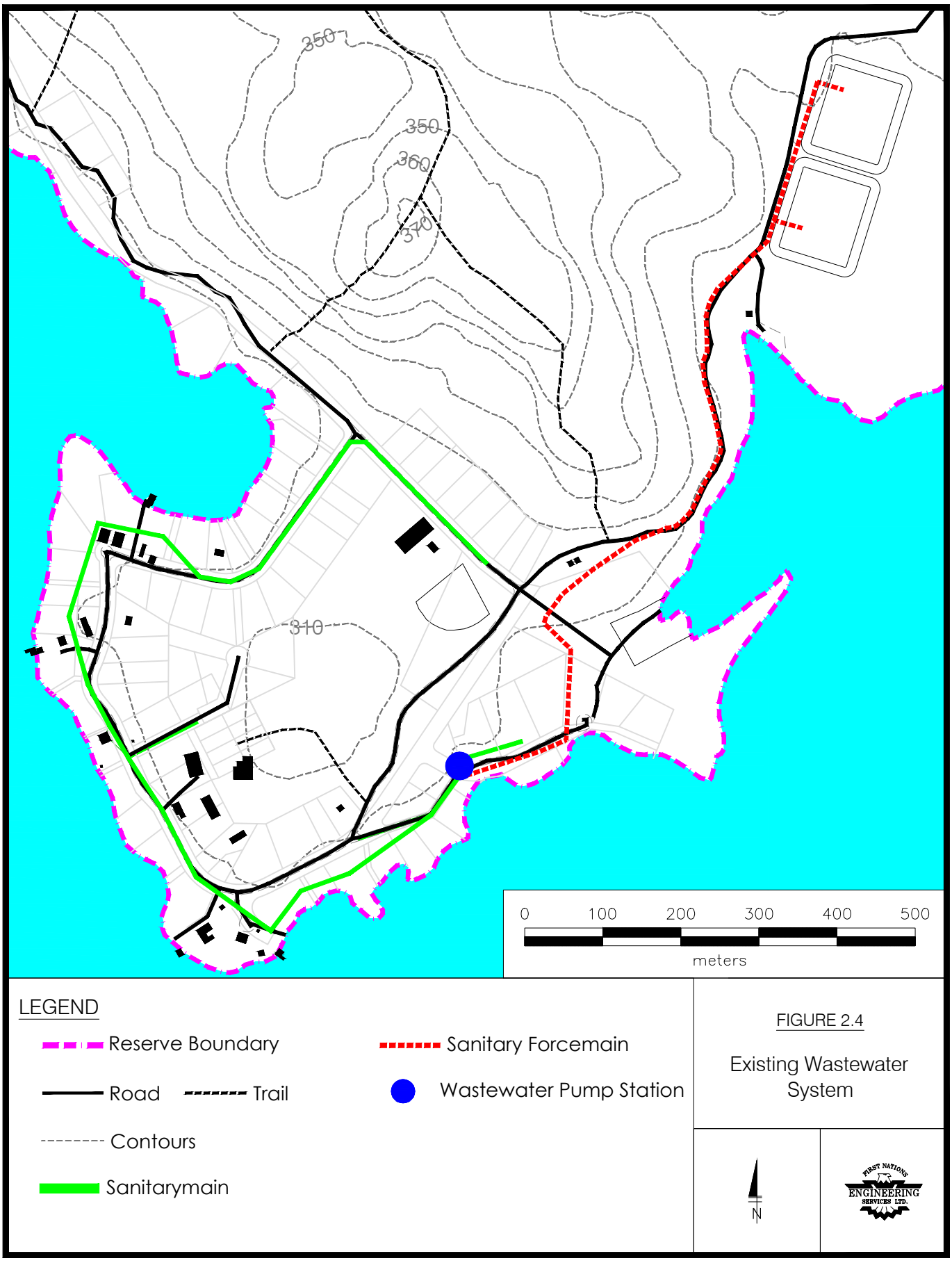


FIGURE 2.4

Existing Wastewater System

pH	6	9
Oils and Greases	-	15 mg/L
Phenols *	-	0.02 mg/L
Phosphorous **	-	1.0 mg/L

* if applicable - phenols are not normally a problem for small plants treating only domestic wastes

** If applicable - other parameters (eg. nitrogen) may also apply depending on the specific standard or limits for the discharge

2.4.2 Temagami Sewage Lagoon Analytical Results

Temagami First Nation provided analytical results of chemical testing of the sewage lagoon. These tests were completed by an Environmental Health Officer from Health Canada. The following table is a summary of the results.

Table 2.6: Sewage Lagoon - Analytical Results

Parameter	May 30 2000	May 15 2001	*June 4 2001	*June 6 2001	May 29 2002	Minimum Acceptable Guidelines
B.O.D. (mg/L)	< 5.0	12.0	10.0	8.0	6.0	**20.0**
Phenol (mg/L)	<0.002	<0.003	0.006	0.005	0.005	**0.02**
Total Phosphate (mg/L)	<0.01	0.11	0.10	0.12	0.17	**1.0**
T.K.N. (mg/L)	0.96	20.4	4.0	6.0	1.95	**No Guideline**
T.S.S. (mg/L)	2.0	10.0	1.31	1.54	9.0	**25.0**

* Represents a discharge sample

Table 2.7: Sewage Lagoon - Analytical Results Continued

Parameter	Oct 8 2002	Oct 24 2002	Jun 11 2003	May 25 2004 (1)	Sep 21 2004 (2)	Minimum Acceptable Guidelines
B.O.D. (mg/L)	9.0	17.0	6.0	14.0	**29.0**	**20.0**

Phenol (mg/L)	0.005	0.008	<0.003	<0.002	<0.006	**0.02**
Total Phosphate (mg/L)	0.23	0.37	0.08	0.10	0.34	**1.0**
T.K.N. (mg/L)	5.16	2.47	2.64	6.54	0.2	**No Guideline**
T.S.S. (mg/L)	12.0	12.0	11.0	**40.0**	**39.0**	**25.0**

(1) - May 25 2004 letter from Health Canada indicates sample could be affected by sample collection methodology and the lagoon was discharged to reduce levels during the spring run off and return lagoon to sufficient operating capacity.

(2) - September 21 2004 letter indicates high readings of B.O.D. and T.S.S. could be affected by sample collection methodology. It is indicated the lagoon was not to be discharged until the Fall of 2004 allowing for continued treatment of the wastes.

Table 2.8: Sewage Lagoon - Analytical Results Continued

Parameter	May 17 2005	Oct 11 2005 (3)	Minimum Acceptable Guidelines
B.O.D. (mg/L)	8.0	**25.0**	**20.0**
Phenol (mg/L)	<0.005	<0.005	**0.02**
Total Phosphate (mg/L)	<0.02	0.31	**1.0**
T.K.N. (mg/L)	2.56	9.0	**No Guideline**
T.S.S. (mg/L)	23.0	**110.0**	**25.0**

(3) - Oct 11 2005 letter states the sample was a grab sample from shore and no discharge was occurring to allow for sampling of the effluent, these results may not accurately reflect the quality of the lagoon and was to be re-sampled on October 25 2005.

The results were all within acceptable limits except for the results noted above. The parameters that were above the limits were determined to be due to the sample collection methodology. It appears the lagoons are operating satisfactorily.

2.4.3 Existing Wastewater Collection System

The sanitary sewer piping collects the wastewater to the wastewater pumping station where it is pumped in a 100mm forcemain 959m to the lagoons. There are 1,883m of gravity collection pipes 200mm in diameter. Nine of the homes within the community are equipped with low pressure connections to the sanitary main and consist of Barnes 1.0 HP series @ 3450 RPM pumps.

2.4.4 Wastewater Pumping Station

The main pumping station collects wastewater from the community and transfers it to the lagoon cells via a 100mm forcemain. The pumping station is located beside Lot 31 on Chen-Jus Ave and the forcemain runs along Ko-Ho-Ja Ave.

The pumping station consists of two pumps, which are on alternating duty cycles. The pumping station is a wet well type.

The pumps in the pumping station are a Barnes Grinder pump Model XSGV-3022L, which were installed in 2006. In discussions with the operators of the system, the floats have been changed and the old pumps ran for an undetermined amount of time due to the build up on the floats. Operators also indicate they are using a degreaser in the lift station chamber.

2.4.5 Wastewater Treatment System

Screening

Inside the pumping station there is a basket screen to collect large objects entering the pumping station.

Chemical Requirements

There are no chemicals used in the treatment system.

Clarification

Clarification of the influent is completed by settling over the one year detention period. No additional digestion is provided on the system.

Discharge

Through the discharge header system the treated effluent is discharged as sheet flow to a wetlands area. Orifice weirs located in the effluent chamber structure control the discharge rate. The effluent weirs control the discharge rate to 36.8 L/sec at 1.22m of head. The effluent is diffused along the lagoon side slope for a distance of 160m.

The lagoons are discharged once per year in the spring.

Drawdown

Normal operation is on a yearly basis where it was recommended that the lagoons be drawndown

in late May or when the wetland area plants have growth.

To protect the piping in the lagoon from freezing, during the next winter, it was determined that there should be at least 0.6m of lagoon water above the intercell pipe.

Sludge Handling

Consisting of organic and inorganic matter the sludge will build up over time depending on the amount of inorganic matter entering the system. A depth of 0.3m is provided in each cell for sludge storage, this depth is from the drawdown level to the cell bottom.

Effluent samples are taken at 0.3m drop in depth due to discharge. The results are averaged and must not exceed 20 mg/l BOD_5 and 25 mg/L suspended solids. Since one lagoon cell is sized for three times the organic loading requirements, if the results were out of this range a problem has occurred and the reasons would need to be established.

Sludge removal has been estimated to be required in the 5 to 7 year range. The liquid content will need to be pumped to the adjacent cell and the sludge be removed with excavation equipment.

Disinfection

There is no provision of disinfection for the system.

Power Supply

Single phase 240 volt power is supplied to the main pumping station by underground cables from the water treatment plant. The pumping station is also connected to the backup diesel generator in the water treatment plant. There is no power supply at the lagoon site.

2.4.6 Existing Individual Septic Systems

Information received from Temagami First Nation indicates that 53 of 94 homes on the First Nation are connected to the communal water and wastewater systems. It will be assumed that the remaining 41 homes use individual septic systems for wastewater treatment and disposal.

According to the 1993 CPS Development Control Guidelines it is stated that “In areas were septic systems must be used (Wen Da Bin Bay and White Bear Road Extension) soil tests shall be completed on all lots with representatives of Health and Welfare Canada in attendance to in order to determine the type, location and size of septic tile fields. All components of individual septic system facilities shall be located in accordance with current Ministry of the Environment

Regulations for in ground or raised beds.

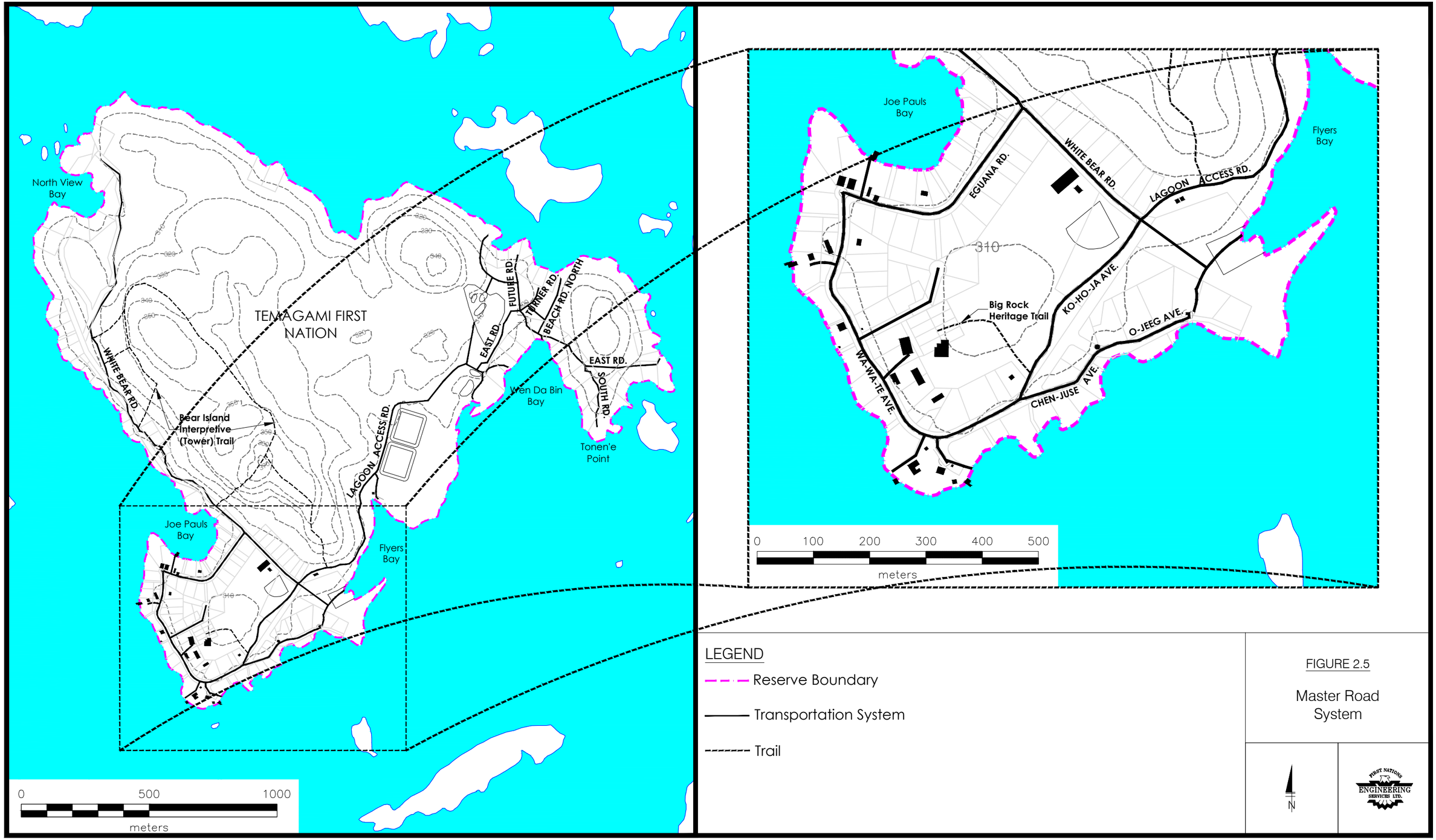
2.5 Roads

Figure 2.5: Master Road System shows the existing roads. There are no surface treated roads or earth roads. All roads have been classified as gravel roads in the community's 2005 Asset Condition Reporting System. Gravel roads have a total length of approximately 8.5 km. Table 2.9 lists the roads within Temagami First Nation, along with their length in kilometers and condition. The operation and maintenance rating of the roads according to the ACRS report ranges from substandard to acceptable. A majority of the roads described below are recommended to be graded and resurfaced with 100 mm lift granular A.

Table 2.9: Existing Road Conditions

ROAD	LENGTH	SURFACE	CONDITION
White Bear Rd.	2.40	Gravel	Good
Eguana Rd.	0.60	Gravel	Good
Wa-Wa-Te Avenue	0.60	Gravel	Good
Ko-Ho-Ja Avenue	0.60	Gravel	Good
O-Jeeg Avenue	0.30	Gravel	Fair
Lagoon Access Rd.	1.40	Gravel	Good
East Rd.	1.10	Gravel	Fair
Beach Rd.	0.30	Gravel	Fair
Turner Rd.	0.10	Gravel	Fair
Admin Rd.	0.10	Gravel	Good
South Rd.	0.30	Gravel	Fair
Garbage Transfer Stn. Rd.	0.20	Gravel	Good
Refuse Site Rd.	0.10	Gravel	Fair
Future Rd.	0.20	Gravel	Good
School Rd.	0.10	Gravel	Good
Community Rd.	0.10	Gravel	Fair
Total Length (km)	**8.50**		

The 1993 CPS, Section 9: Recommended Plan and Infrastructure Servicing for the Bear Island Reserve indicates that road construction on Bear Island is to consist of non-standard roads located in 20m right-of-ways. Road surfaces are proposed to have 4 m travelled surface, 1m shoulders and a system of ditches. The road bed would be constructed of 300mm Granular B and 150mm Granular A derived from sources on the Island. If roads are brought up to MTO Standards to ensure continued O&M funding, then it has to be determined if ATV's and cars are compatible for



LEGEND

- Reserve Boundary
- Transportation System
- Trail

FIGURE 2.5

Master Road System

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the same roads. An upgrade to MTO standards should also include traffic by-laws as traffic and the potential for accidents increases.

The 1993 CPS also indicates the main settlement roads would follow the existing loop road alignment with some alternations for vertical and horizontal alignment. Roads would continue to be primarily for pedestrian use but would be designed to accommodate service and emergency vehicles. Improvements are required to other roads based on the 1993 CPS including White Bear Road and on Ko Ho Ja Avenue extension through the Wen Da Bin Bay settlement and on to Tonen'e Point. Construction would include clearing to a 12m width, realignment and placement of granulars. Drainage to be improved by integration with the road system.

2.5.1 Lake Temagami Access Road

The Lake Temagami Access Road provides access from Highway #11 to the Lake. Approximately 18km long, the Mine Road is the primary transportation route to the Lake serving the residents of the First Nation, the largest portion of the 800 cottages on the lake and permanent non-native lake residents. During the summer months the road sustains moderately heavy usage.

At the end of the Lake Temagami Access Road there is a large parking area and system of docks known as the "Mine Landing". A second landing known as the Manitou Landing is also used by the First Nation. During the summer months community members park their cars in the parking area and access the First Nation by personal boats or water taxis. The distance to the Island is approximately 5 km and in the winter an ice road is constructed allowing for vehicular traffic directly to the First Nation.

The road is currently maintained by the Town of Temagami Public Works and repairs on the road are currently completed as per the Town schedules or on an as required basis when emergencies arise. During the 1993 CPS the First Nation believed the road was in poor condition and showed an interest in taking over the maintenance.

2.6 Drainage

Drainage is achieved through a system of roadside ditches and culverts that outlets the surface drainage to mainly seasonal creeks. The 2005 ACRS reports that several of the roadside ditches require cleaning and some reconstruction.

2.7 Power Supply and Distribution

Information received from the First Nation indicate there is only single phase power available within the community. According to the 1993 CPS electrical service is provided by Ontario Hydro using submarine cables. Distribution within the village area is by poles and overhead wires. The submarine cable has been extended to Win Da Bin and Adik Bays and all homes except for two at the back of the island are serviced by hydro, these two utilize alternative energy.

2.8 Solid Waste Disposal

The First Nation now utilizes compaction equipment which is set-up on the island where residents dispose of solid waste. The MTA with the Municipality of Temagami for dump usage is due for renewal. These bins are barged to Mine Landing where they are disposed of in Briggs Landfill, which is operated by the Municipality of Temagami. Information received from Temagami First Nation indicate the landfill has a remaining service life of 15 to 20 years.

Information contained in the 1993 CPS indicates the existing landfill sites on the island are not appropriate for the deposit of domestic waste and should be closed and capped.

3.0 BIOPHYSICAL TERRAIN ANALYSIS

This section reviews the physical, biological, and cultural aspects of Temagami First Nation, by creating theme maps that categorize areas under high, moderate, low suitability or not suitable for development. Each theme map is layered with other hatched maps as a means to graphically recommend what areas of the community are more suitable for development. This process will ensure that all sensitive areas are respected, remain undisturbed, and protected as Temagami First Nation develops and maintains a viable and sustainable community.

3.1 Land Ownership

The land area of the Temagami First Nation is 288 hectares (712 acres).

According to the 1993 Capital Planning Study prepared by The Lathem Group Inc, discussions with Administration Officials during the completion of the CPS indicate, the homes are the property of the owner while the land belongs to the First Nation as a whole (commonly held lands). No Certificates of Possession have been issued by the First Nation Administration and discussions with Energy, Mines and Resources Canada (EM&RC) indicate that all lands are commonly held with the exception of Lots 111 to 114 and Lots 119 to 122 which are the existing school site.

3.2 Waterbodies

Temagami First Nation, formerly known as Bear Island Indian Reserve No.1, is an island in Lake Temagami.

Information from the website http://en.wikipedia.org/wiki/Lake_Temagami, indicate that Lake Temagami is a lake in the Nipissing District in Northern Ontario. The lake's name comes from *teme-augama*, in the Ojibwa language means deep water by the shore. Within the Lake there are approximately 1,259 islands. The lake extends approximately 50 km from north to south and approximately 35 km from east to west. The lake has long arms extending to the north, northeast and southwest. There are shorter arms to the northwest and south with many small bays. The lake outlets into the Temagami River which eventually outlets into the Sturgeon River.

3.3 Terrain Analysis

Previous terrain analysis were documented in a 1986 report by Geocon Ltd. entitled Physical Terrain Evaluation - Bear Island Indian Reserve No. 1. The 1993 Capital Planning Study completed by the Lathem Group Inc. based a description of the terrain on that study. The following

is a summary of the terrain based on the description in the 1993 CPS.

3.3.1 Bedrock

Composed primarily of Precambrian-aged, sedimentary rock including conglomerate, argillite and arkose, the bedrock on Temagami First Nation covers approximately 90% of the surface area. The bedrock is exposed or covered by a thin mantle of unsorted till. The overburden was laid down by glacial movement over 10,000 years ago. Along the east side of the island is the most apparent evidence of glacial retreat due to the esker (ridge of sorted sand) which has been deposited.

High water levels were experienced after glaciation, due to the large volumes of melt water. A sorting effect was created resulting in finer particles being removed from the till surface and heavier sands and gravels were deposited due to erosive nature of the melt waters. The sorted deposits are found in small pockets within the bedrock area or along the east side of the island where sands and sandy silts occur with the eskers.

3.3.2 Reserve Soils

Four categories of surficial features have been identified on the First Nation and are summarized in the following and shown in Figure 3.1: Bedrock and Soil Conditions.

Precambrian Bedrock

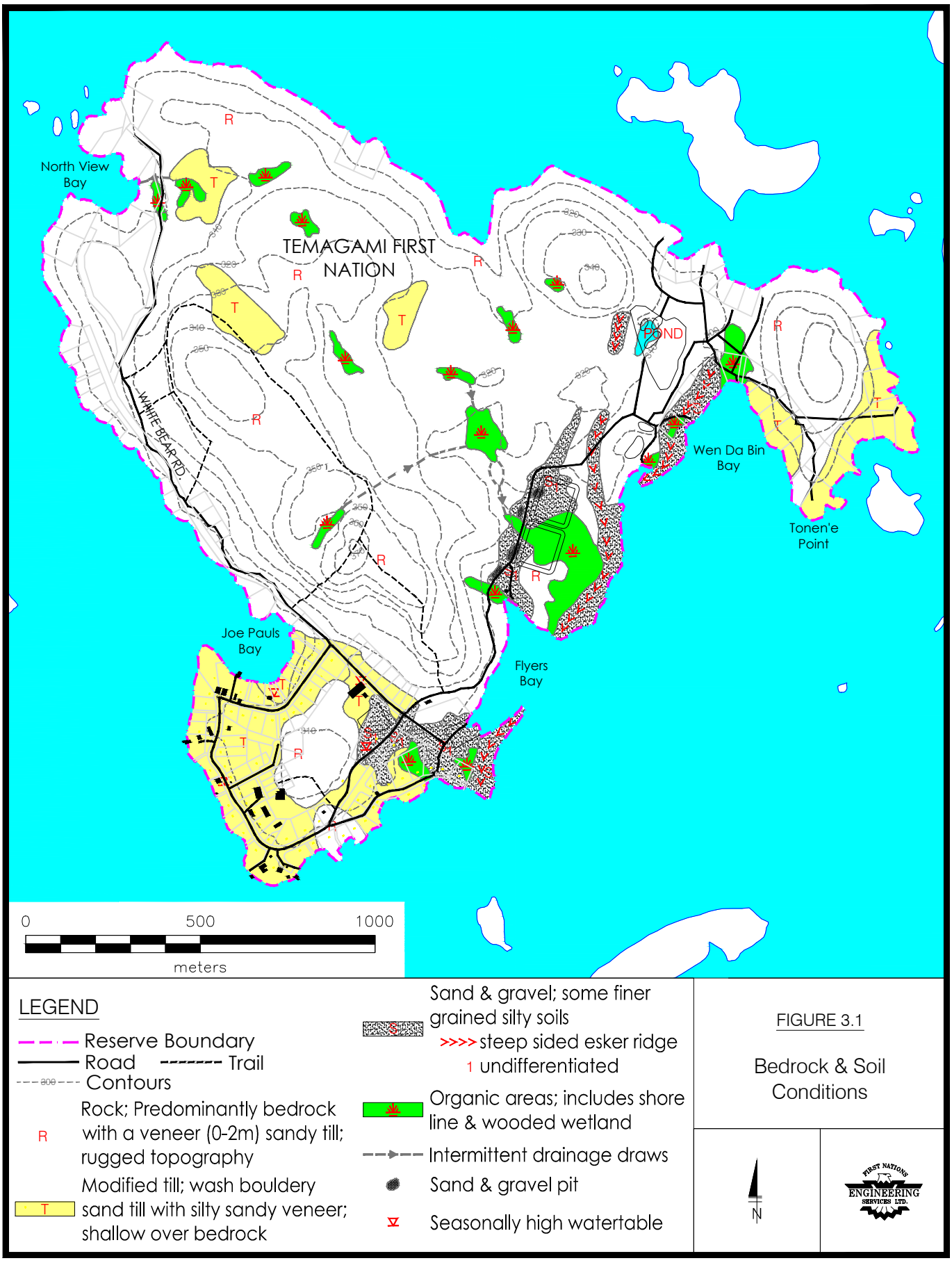
Occurring as either exposed steep rock knobs, ridges or scarps, the Precambrian bedrock controls the topography and surficial features of the island. Ranging to a maximum of two metres thick, the overburden is typically composed of very bouldery, sandy till. In the lee of the hills or topographic lows deeper pockets of till may be present. Drainage of the bedrock area is good due to the steep slopes, but there are some small wetland areas in blind depressions.

Modified Till

Three areas of the First Nation have occurrences of modified till, on the southern peninsula around the village, the northwest and the central part of the island. The modified till is wash bouldery sand till with silty sand veneer. These areas are adjacent to bedrock areas or gently sloping lands. The overburden is often less than 1 to 2 metres deep and test pits by Geocon Ltd. in the village area show a dominance of silty sand or sandy silt. The till locations are generally well drained.

Sand and Gravel

From Flyers Bay to Wen Da Bin Bay these deposits occur as a series of eskers. They also occur



LEGEND

- Reserve Boundary
- Road
- Trail
- 300 Contours
- R — Rock; Predominantly bedrock with a veneer (0-2m) sandy till; rugged topography
- T — Modified till; wash bouldery sand till with silty sandy veneer; shallow over bedrock
- Sand & gravel; some finer grained silty soils
- >>>> steep sided esker ridge
- 1 undifferentiated
- Organic areas; includes shore line & wooded wetland
- Intermittent drainage draws
- Sand & gravel pit
- Seasonally high watertable

FIGURE 3.1

Bedrock & Soil Conditions

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as interior deposits near the eastern shoreline. A stratified soil profile consisting of sands and gravelly sands separated by silty sand seams was revealed during an investigation of gravel pit faces along the east central shoreline and soil depths were measured to be ranging from 3 to 7 metres deep. Clean sands measuring up to 4m in depth were shown in the sandy deposits on a ridge formation in the northwest corner. Several metres of clay underlying the sands in the northwest corner were revealed during well drilling attempts. Near the ballfield, a seasonally high water table may occur in the deposits.

Organic Areas

In-situ decomposition of vegetation have formed shallow wet organic deposits in bedrock depressions or overburden in the interior of the island. At Flyers Bay, shoreline wetlands are present, but are controlled by constant lake flooding instead of rainfall.

3.3.3 Slope Constraints

Based on the 1993 CPS the terrain is very rugged and the slopes are complex with many changes in direction and steepness. North of the existing community is the highest elevation of 373 masl, 80 m above the normal water level. A shoreline investigation by the consultant as part of the 1993 CPS revealed that 80% of the shoreline had slopes which are prohibitive to development. Vertical bedrock scarps are common and slopes greater than 10% dominate the landscape. Figure 3.2: Slope Analysis identifies areas of the First Nation which have slopes which are suitable and unsuitable for development.

3.3.4 Surface Drainage

Surface drainage to Lake Temagami is considered rapid due to the impervious nature of the bedrock and the steep slopes. Due to the limited number of water courses within the island the surface drainage is by sheet flow. Only during spring or high precipitation do the watercourses exhibit surface flow. Since there is no watercourse to convey the flows to the lake from the central area of the community, it appears the drainage is internal which formed a wetland complex.

3.4 Mineral Resource Potential of Indian Reserve Lands

Indian and Northern Affairs Canada prepared a document entitled Mineral Resource Potential of Indian Reserve Lands in April 1991. The covering letter of the report indicates purpose of the report is to promote minerals as a vehicle to economic development. It also states the data may be useful for community planning and land use resource management. The following is a summary of the information contained in the document.

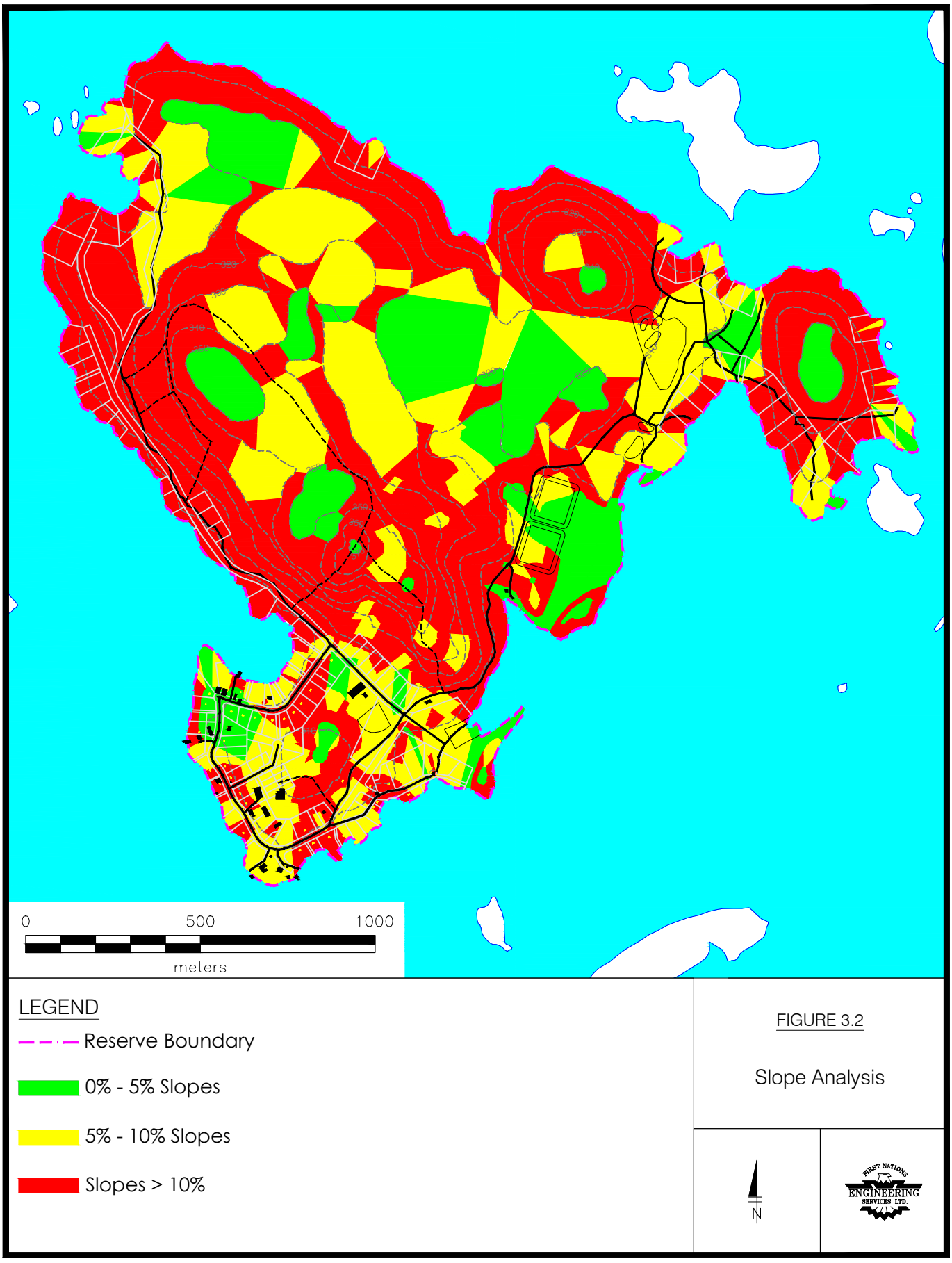


FIGURE 3.2

Slope Analysis

Coordinates

Lat . 46° 58'N

Long. 80° 05'W

Physiographic Setting

The First Nation is located in the Cobalt Plain Division of the James physiographic region in the Precambrian Shield of Canada. The First Nation's highest elevation is 373 masl, with the topography being hilly and an escarpment or ridge to the north. Ninety percent of the property is covered in woodlands.

Geologic Setting

Underlain by 210m of the Precambrian lower Gowganda Formation of the Cobalt group, the First Nation has outcrops of Greywacke, Argillite and conglomerate in the northeast. A large north-south striking diabase sheet caps the Gowganda Formation, which is in the centre of a north plunging synclinal structure. The projection of the lineament is Kokoko Bay.

A thin veneer of ground moraine till overlying the bedrock with an esker at the eastern edge of the First Nation is the make up of the surficial geology. A thicker till deposit of 4m is in the centre of the community at the ball diamond.

Aeromagnetic Geophysics

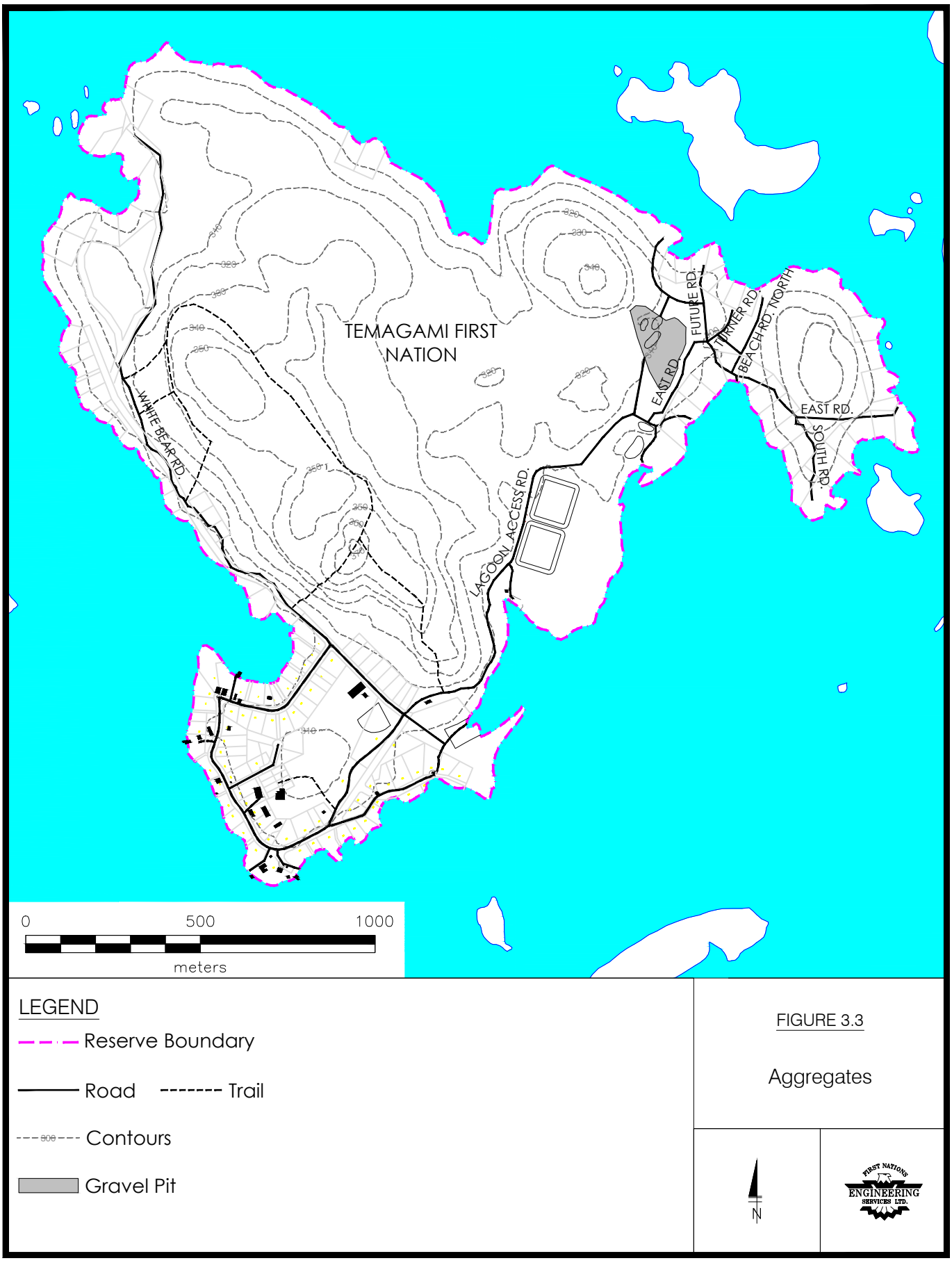
The First Nation is located in an eastern flank of a large oval anomaly of 4,900 gammas with background readings of 2,700 gammas. This anomaly is 58 km long by 19 km wide and is one of the largest in North America. It is known as th "Temagami Magnetic Anomaly".

Mineral Resources on the First Nation

Barren of mineralization the island is underlain by a thick mantle of sedimentary rocks. Aggregates for use by the band is from an esker which runs along the eastern shore of the island. A 1986 water sample from a well in the esker showed no signs of bacterial contamination.

The metallic mineral resource possibility is rated low, the aggregate potential is rated as fair for on-reserve use only and the groundwater potential for commercial purposes is rated as fair with further investigation required.

Figure 3.3: Aggregates shows location of sand and gravel pits as identified in the 1993 Capital Planning Study.


TEMAGAMI FIRST NATION
WHITE BEAR RD.
LAGOON ACCESS RD.
EAST RD.
FUTURE RD.
TURNER RD.
BEACH RD. NORTH
EAST RD.
SOUTH RD.
0
500
1000
meters
LEGEND
Reserve Boundary
Road
Trail
Contours
Gravel Pit
FIGURE 3.3
Aggregates
N
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Mineral Resources Off the First Nation

Minerals have been found in the area surrounding the First Nation including chalcopyrite, pyrite, pyrrhotite and quartz veins. Copper and iron formations have also been located in the area.

3.5 Environmentally and Culturally Sensitive Areas

According to information received from Temagami First Nation, on the west side of Bear Island there are pictographs on the rock face.

An old traditional cemetery situated on a steep ridge partly surrounded by water is reported to have a number of graves but is no longer in use. A second cemetery, which is currently used, is located at the foot of Flyers Bay. It has been reported that the current area has a high ground water level and has caused difficulties when digging the graves.

The gravel pits have been identified as an environmentally sensitive area at the request of the project team. The wetlands on the First Nation have also been identified as environmentally sensitive areas.

The Bear Island Interpretive Tower Trail has been identified as a Culturally Significant Area.

3.5.1 Culturally Significant Areas from the Community Questionnaire

The respondents to the community questionnaire were asked to identify any areas of the First Nation with cultural significance and should not be disturbed by the 20 year development. The following table identifies the culturally significant areas.

Table 3.1: Culturally Significant Areas Identified in the Community Questionnaire

CULTURAL SIGNIFICANCE
Rock paintings
Cemetery/Burial Grounds
Highest peak in Ontario
Tower
Ceremonial grounds / sweat lodges
Maple mountain
Medicinal Plants & Trees
Jumping rock
Austin Bay

CULTURAL SIGNIFICANCE
Kokoko Bay
Temagami Is.
Church
Band office area

Figure 3.4: Culturally and Environmentally Sensitive Areas, illustrates areas of the community with environmental and cultural significance.

3.6 Species At Risk

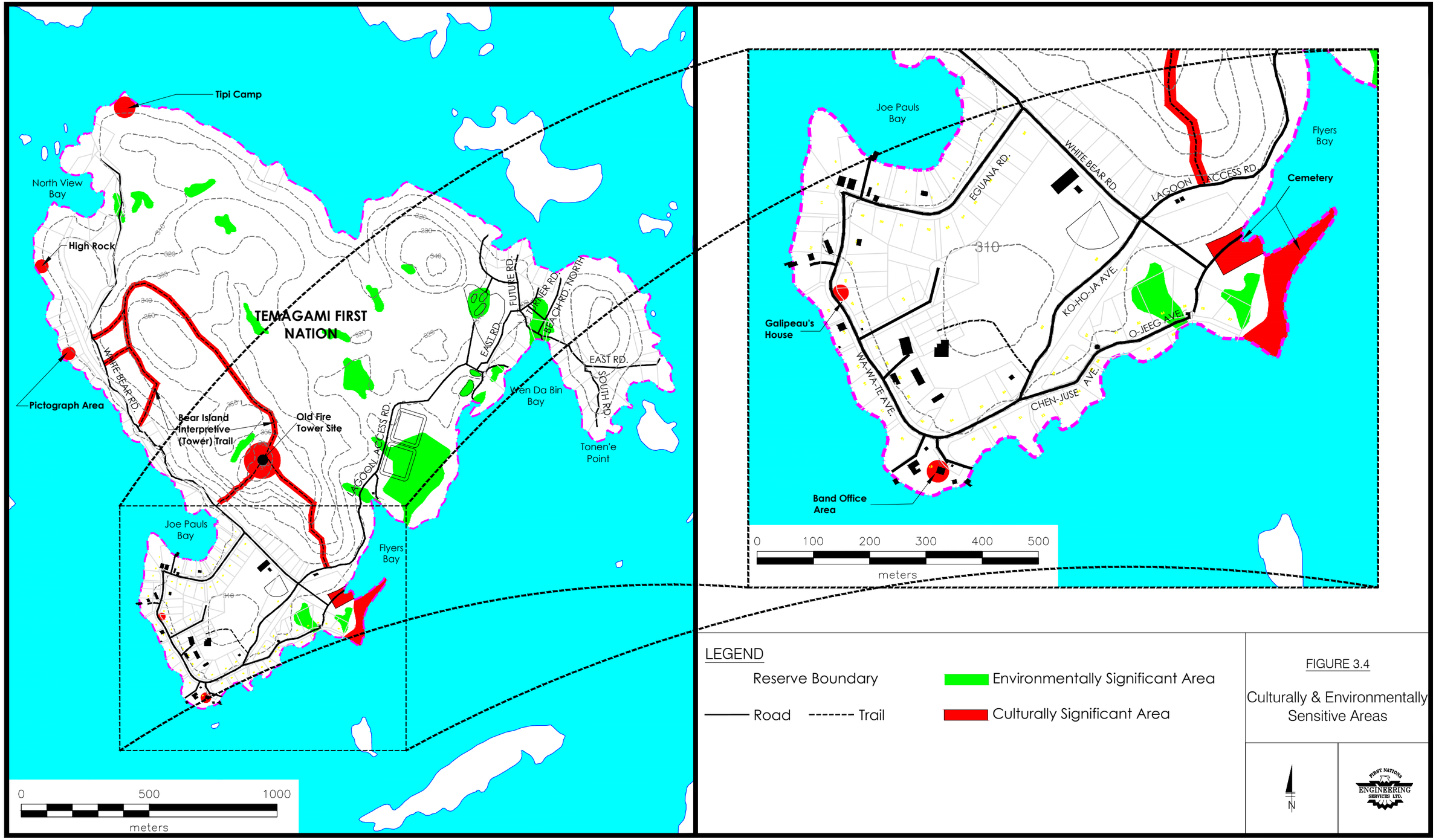
The information for the Species at Risk were obtained from:

Environment Canada, Canadian Wildlife Service. 2004. Species at Risk Web Mapping Application (http://www.sis.ec.gc.ca/ec_species/ec_species_e.phtml), accessed on October 16, 2006. Reproduced with permission of the Minister of Public Works and Government Services Canada, 2006.

The Species at Risk Act, 2002 (SARA02) was used to determine what flora and fauna listed in this regulation may be affected by future development. SARA02 identifies species at risk under four categories;

- *Extirpated* meaning a wildlife species that no longer exists in the wild in Canada, but exists elsewhere in the wild.
- *Endangered* meaning a wildlife species that is facing imminent extirpation or extinction.
- *Threatened* meaning a wildlife species that is likely to become an endangered species if nothing is done to reverse the factors leading to its extirpation or extinction
- *Special Concern* meaning a wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats

SARA02 lists species under three schedules; 1, 2, and 3. Schedule 1 species are protected under the act. Schedule 2 and 3 species require further investigation and assessment to determine whether they should be moved to Schedule 1. Once a species is moved to Schedule 1, it becomes protected under the act.



LEGEND

Reserve Boundary

Road

Trail

Environmentally Significant Area

Culturally Significant Area

FIGURE 3.4

Culturally & Environmentally Sensitive Areas

N

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The following are descriptions of the Species at Risk that may be found on or directly around Temagami First Nation.

3.6.1 Mammals

Eastern Wolf - Special Concern on Schedule 1

Found in the Great Lakes and St. Lawrence Region of Ontario and Quebec, the Eastern Wolf's largest population is in southwestern Quebec and Southeastern Ontario particularly in Algonquin Park. An estimate of the number of Eastern Wolves is 2,000 with 1,000 of these breeding adults spread among 500 packs.

The habitat for the Eastern Wolf is deciduous and mixed forests to the south and coniferous forests to the north.

Eastern Elk - Reintroduced

The Eastern elk is one of six subspecies of elk that inhabited northern and eastern United States, and southern Canada. A full-grown bull could weigh up to 1000 pounds, stand 50-60 inches tall at the shoulder, and carry a rack of antlers six feet in length.

Eastern Cougar - Endangered

In 1978, the eastern subspecies was declared "endangered" by the Committee on the Status of Endangered Wildlife in Canada. Cougars or pumas (Puma concolor) are large, tawny or greyish brown carnivores with long tails and rounded ears. "Eastern Cougar" is the name used to describe animals inhabiting the northeastern portion of the North American range. Historically, cougars in the east occupied large forested areas that were relatively undisturbed by humans. Cougars feed mostly on deer, but will also take a variety of smaller mammals.

3.6.2 Birds

Peregrine Falcon - anatum subspecies - Threatened, on Schedule 1

Nesting is usually on cliff ledges on steep cliffs near wetlands. Peregrines prefer open habitats such as wetlands, tundra, savanna, sea coasts and mountain meadows, but will also hunt over open forest. The Canadian population was estimated to be 500 pairs in the year 2000.

Passenger Pigeon - Extinct

The Passenger Pigeon is an extinct bird, which existed in North America. It lived in enormous

migratory flock, sometimes containing more than two billion birds.

Chimney Swift - Threatened

This bird looks like a flying cigar with long slender curved wings. The plumage is a sooty grey-brown. The throat, breast, underwings and rump are paler, with short tails.

Bald Eagle - Endangered

The plumage of an adult Bald Eagle is evenly brown with a white head and tail. The tail is moderately long and slightly wedge-shaped. The beak, feet, and irises are bright yellow. The legs are feather-free, and the toes are short and powerful with large talons. Bald Eagle prefers habitats near seacoasts, rivers, large lakes, oceans, and other large bodies of open water with an abundance of fish.

Common Night Hawk - Threatened

The adults have brown feathers , while others have black, gray and white patterning on the upperparts and breast. The long wings are black and reveal a white bar when in flight. The tail is dark with white barring and the underparts are white with black bars. The adult male has a white throat while the female has a light brown throat. Common Nighthawks catch flying insects on the wing, mainly foraging near dawn and dusk, sometimes at night with a full moon.

Least Bittern - Threatened

The Least Bittern is a small wading bird, the smallest heron found in the Americas. This bird's underparts and throat are white with light brown streaks. Their face and the sides of the neck are light brown; they have yellow eyes and a yellow bill. The adult male is glossy greenish black on the back and crown; the adult female is glossy brown on these parts. They show light brown parts on the wings in flight.

Black Tern - Special Concern

The Black Tern has short dark legs and a short, weak-looking black bill, measuring 27–28 mm, nearly as long as the head. The bill is long, slender, and looks slightly decurved. They have a dark grey back, with a white forehead, black head, neck (occasionally suffused with gray in the adult) and belly, black or blackish-brown cap, and a light brownish-grey, 'square' tail. The face is white. There is a big dark triangular patch in front of the eye, and a broadish white collar in juveniles.

Rusty Blackbird - Special Concern

The Rusty Blackbird, is a medium-sized blackbird. Adults have a pointed bill and a pale yellow eye. They have black plumage the rusty refers to the brownish winter plumage. Their breeding habitat is wet temperate coniferous forests and muskeg across Canada and Alaska. The cup nest is located in a tree or dense shrub, usually over water. Birds often nest at the edge of ponds/wetland complexes and travel large distances to feed at the waters edge. Emerging dragonflies and their larvae are important food items during the summer.

Short Eared Owl - Special Concern

The Short-eared Owl is a species of typical owl, and have tufts of feathers resembling mammalian ears. Short-eared Owl, is a medium-sized owl averaging 34–43 cm (13 to 17 inches) in length and weighing 206–475 grams (11 to 13 ounces). It has large eyes, big head, short neck, and broad wings. Its bill is short, strong, hooked and black. Its plumage is mottled tawny to brown with a barred tail and wings.

3.6.3 Fish

No fish species were identified in the area as a Species at Risk, according to the Environment Canada Website.

Aurora Trout - Endangered

The aurora trout, is a variant or subspecies of the brook trout native to two lakes in the Temagami District of Ontario. The aurora trout is distinguished from the brook trout by its unique colouration. Aurora trout are generally without spots, the colouration grading from a magenta hue on the back to a bright, nearly fluorescent orange along the belly, especially in mature males.

Lake Sturgeon - Special Concern

The lake sturgeon is a North American temperate freshwater fish, one of about 20 species of sturgeon. The lake sturgeon can grow to a mass of over 100 kilograms (200 lb) and a length of over 3 meters (9 ft) over its long lifetime. Its diet consists of insect larvae, worms (including leeches), small fish and other small, primarily metazoan organisms it finds in the mud.

3.6.4 Reptiles and Amphibians

No reptile or amphibian species were identified in the area as a Species at Risk, according to the Environment Canada Website.

Wood Turtle - Endangered

The wood turtle is a turtle endemic to North America. The wood turtle reaches a carapace length of 14 to 20 centimetres (5.5 to 7.9 in), its defining characteristic being the pyramidal pattern on its upper shell. It spends a great deal of time in or near the water, preferring shallow, clear streams with compacted and sandy bottoms. The wood turtle can also be found in forests and grasslands, but will rarely be seen more than several hundred meters from flowing water.

3.6.5 Molluscs

No mollusc species were identified in the area as a Species at Risk, according to the Environment Canada Website.

3.6.6 Lepidopterans

Monarch - Special Concern, on Schedule 1

The adult Monarch is a bright orange butterfly with heavy black veins and a wide black border that contains two rows of white spots.

Habitat includes wherever milkweed and wildflowers such as Goldenrod, Asters and Purple Loosestrife grow. This could be roadside ditches, abandoned fields and other open spaces with the noted plant life.

Aweme Borer - Endangered

The last sighting in Ontario was in 1936, until a recent discovery on Manitoulin Island. Further research is necessary to identify its larval host plant, habitat needs and life history to adequately understand and conserve the species. Most moths are gray to brown in colour and have line or spots on their wings. They are small to large in size, and most species are medium-sized with wingspans 2 - 4.5 cm. Most larvae feed on plant foliage , dead leaves, lichens, and fungi.

3.6.7 Plants, Lichens and Mosses

No plant, lichen or moss species were identified in the area as a Species at Risk, according to the Environment Canada Website.

3.7 Biophysical Information from the Community Questionnaire

Within the community questionnaire distributed to community members a question was presented regarding any information regarding wildlife and aquatic life. Respondents were encouraged to write down any species that they personally knew of in the area of Temagami First Nation. The following is a listing of the responses with number of responses in brackets.

Table 3.2: Birds Identified in Community Questionnaire

Hummingbird (6)	Blue jay (12)
Raven (12)	Osprey (2)
Crow (13)	Gulls (6)
Chickadees (11)	Hawks (4)
Robin (14)	Eagles (10)
Owls (2)	ducks (9)
Geese (3)	turkey vulture
crane	loons
woodpeckers (5)	fincher
partridge (3)	swallow
herons (5)	kingfisher
grouse	blackbird
cormanant	

Table 3.3: Mammals Identified in the Community Questionnaire

Moose (12)	Squirrel (6)	Otters (3)
Deer (13)	Lynx (5)	Marten (3)
Bear (15)	Rabbits (6)	Cougar (4)
Fox (12)	Muskrat (2)	Porcupine (2)
Racoon (9)	Skunk (2)	Mink (2)
Beaver (8)	Wolves	Chipmunk (4)
Dogs	Groundhog	

Table 3.4: Aquatic Life Identified in the Community Questionnaire

Herring (2)	Whitefish (4)
Pickerel (12)	Suckers (3)
Trout (9)	Crayfish (2)
Bass (9)	Perch (2)

Sturgeon	Ling (7)
Pike (7)	Minnows (3)
Crayfish (2)	Salamanders (4)
Clams	Toads
Leeches	Lizard (2)
Frogs (12)	

Table 3.5: Reptiles Identified in the Community Questionnaire

Turtles (12)	Snakes (17)

3.7.1 Additional Information from Community Questionnaire

Additional lines were provided for respondents to detail any further information. The following list identifies the additional comments:

- one respondent stated that an albino squirrel inhabits the area;
- another respondent would like to see wildlife tested for contaminants (or bio-accumulation)

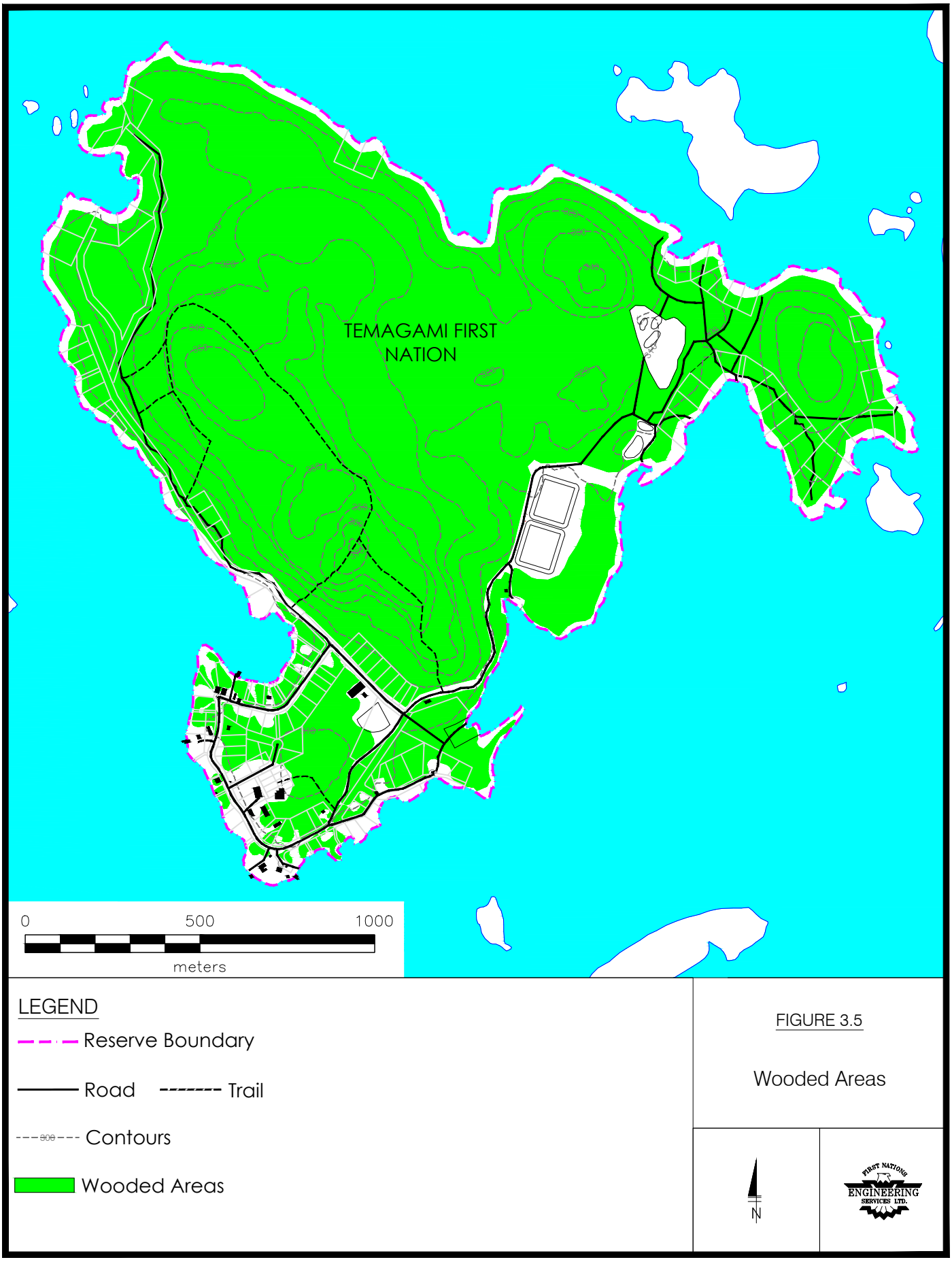
3.8 Wooded (Forest) Areas

The majority of the First Nation is covered in wooded areas based on information obtained from the Ontario Base Maps. This is shown in the following Figure 3.5: Wooded Areas.

The Bear Island forest cover is a part of the transition forest where the Great lakes - St. Lawrence Forest Region meets the Boreal of the province of Ontario, and is locally classified as Eco-Region 4E, Site 4E-4, under the MNR provincial forest structure. The forested area of the island house both herbaceous and non-herbaceous species of vegetation. Tree species found on the landscape of the island include: White Pine, Red Pine, Jack Pine, White and Black Spruce, Balsam, Tamarack, Poplar, White and Yellow Birch and Red Maple.

3.9 Recreation

The First Nation recreation facilities include a marina, outdoor skating rink, ballfield, fieldhouse, swimming beach, trail system, High Rock, sliding hill, the Administration Office area and camping area at Wen Da Bin Bay (Lots 130 and 131). These areas are identified on Figure 3.6: Recreational Areas.


TEMAGAMI FIRST NATION
0
500
1000
meters
LEGEND
Reserve Boundary
Road
Trail
Contours
Wooded Areas
FIGURE 3.5
Wooded Areas
N
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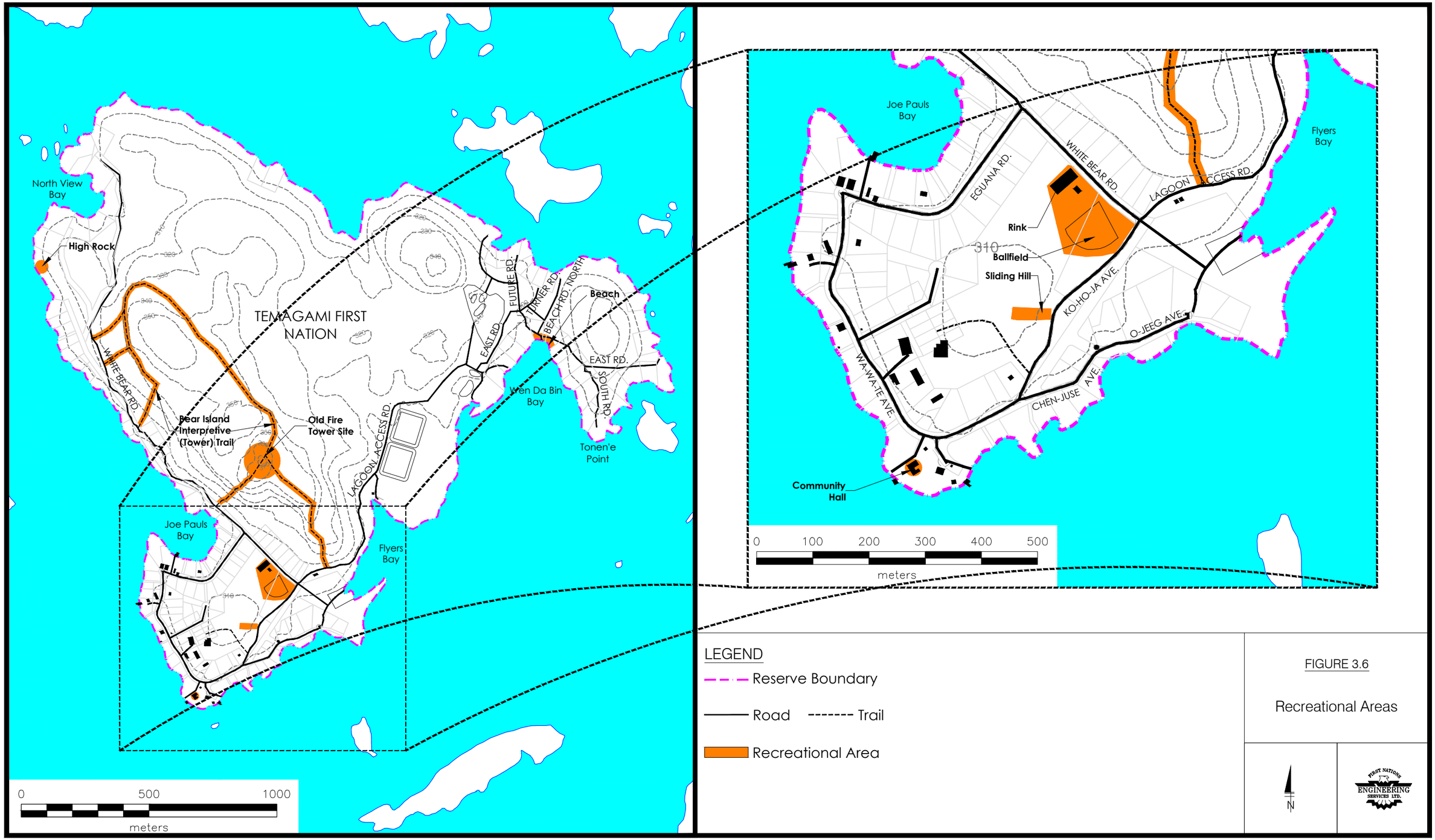

LEGEND

- Reserve Boundary
- Road
- Trail
- Recreational Area

FIGURE 3.6

Recreational Areas

N

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3.10 Development Capability

The previous sections generated development constraints which will be summarized in the following sections. Often the most suitable land for development is also the most suitable for other land uses. The priorities of the Temagami First Nation will determine which land use is of greater importance to their community.

3.10.1 Summary of Development Capability Weighting Factors

Based on the review of all known biophysical and cultural aspects of the community, the following ratings aspects of Temagami First Nation were placed under suitability ratings for development.

Low Development Capability

1. Culturally and Environmentally Significant Areas;
2. Hazard lands of steep slopes >10%;
3. Wetlands and marshes;
4. Habitats with schedule 1 species;
5. Areas of Existing Developments

Moderate Development Capability

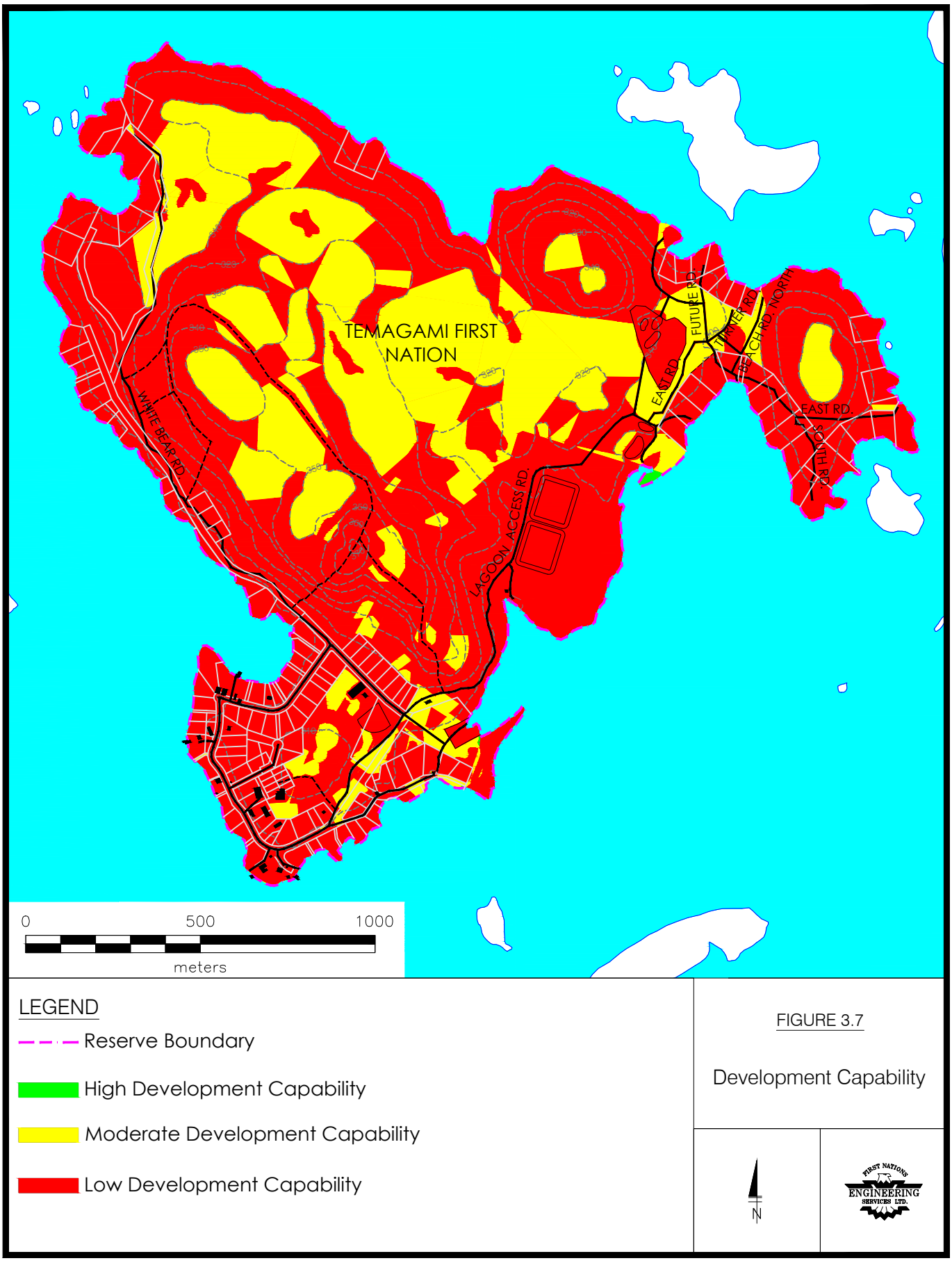
1. Forests lands.
2. Slopes of 5-10%

High Development Capability

– All remaining land.

3.10.2 Potential Development Areas

Figure 3.7: Development Capability classifies Temagami First Nation based on the above criteria.


TEMAGAMI FIRST NATION
WHITE BEAR RD.
LAGOON ACCESS RD.
EAST RD.
FUTURE RD.
TURNER RD.
BEACH RD. NORTH
EAST RD.
SOUTH RD.
0
500
1000
meters
LEGEND
Reserve Boundary
High Development Capability
Moderate Development Capability
Low Development Capability
FIGURE 3.7
Development Capability
N
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4.0 POPULATION PROJECTIONS

The majority of the planning for housing, land development, community facilities and the infrastructure to service the development is based on the projected growth and demographics for the Temagami First Nation. An analysis of community growth depends on statistical factors and the potential for economic activity to support increases to the on-reserve population.

This study makes recommendations for capital infrastructure expenditures over the next 20 years. Population projections were also completed for a 50 year term to ensure those recommendations will not hamper community growth beyond the 20 year planning period. With the limited amount of land held by the First Nation, the validity of our 50 year projection may be questionable.

Since there is a limited amount of developable land available on the First Nation, the entire twenty year projected population may not be able to be accommodated. If there is not appropriate space for new housing, the on-reserve population will not increase at the projected rate. It will be assumed in this document that the First Nation will do what it takes to accommodate the growth. This may include construction of multi-plex units, development of the interior of the island and/or development of lots smaller than required for federal funding (ie. 1/4 acre lots). A detailed discussion regarding the land areas will follow in section 6.

4.1 Data Sources and Collection

Historical population data from 1972 to 2005 was obtained from Indian and Northern Affairs Canada (INAC). The Indian Registry contains demographic data for:

- age
- sex
- membership
- on-reserve and off-reserve residents

The historical population data supplied by INAC consisted of information up to the end of December 2005. The Temagami First Nation indicated an on-reserve population of 241 in October 2006 and an off-reserve population of 418 was obtained from the INAC website for September 2006. Combining this population data results in an initial Total Population of 241 + 418 = 659 members. FNESL has input these values for the 2006 year.

The historical population data was then analysed for trends in the Annual Average Growth Rate (AAGR). This information provided the existing demographic conditions for Temagami First Nation.

4.2 Historical Population Data

Table 4.1 shows the on-reserve population for each year and the respective Average Annual Growth Rates, one using 1972 as an initial population and one using 1990 population as a base. The overall on-reserve population has increased from 81 persons in 1972 to 241 persons in October 2006. The off-reserve population has increased from 79 persons in 1972 to 418 persons in September 2006.

The Annual Average Growth Rate (AAGR) is calculated using the following formula:

$$AAGR\ \% = \left(\sqrt[n]{\frac{P_f}{P_i}} - 1 \right) \times 100$$

Where the above equation has the following variables:

n = number of years P_f = final year population P_i = initial year population.

The following table is a summary of the average annual growth rates using 1972 and 1990 as base years. The entire table can be found in Appendix II.

Table 4.1: Temagami First Nation Historical Population AAGR

BASE YEAR	ON-RESERVE and CROWN AAGR	OFF-RESERVE AAGR	TOTAL POPULATION AAGR
1972	3.26%	5.02%	4.25%
1990	4.24%	2.82%	3.30%

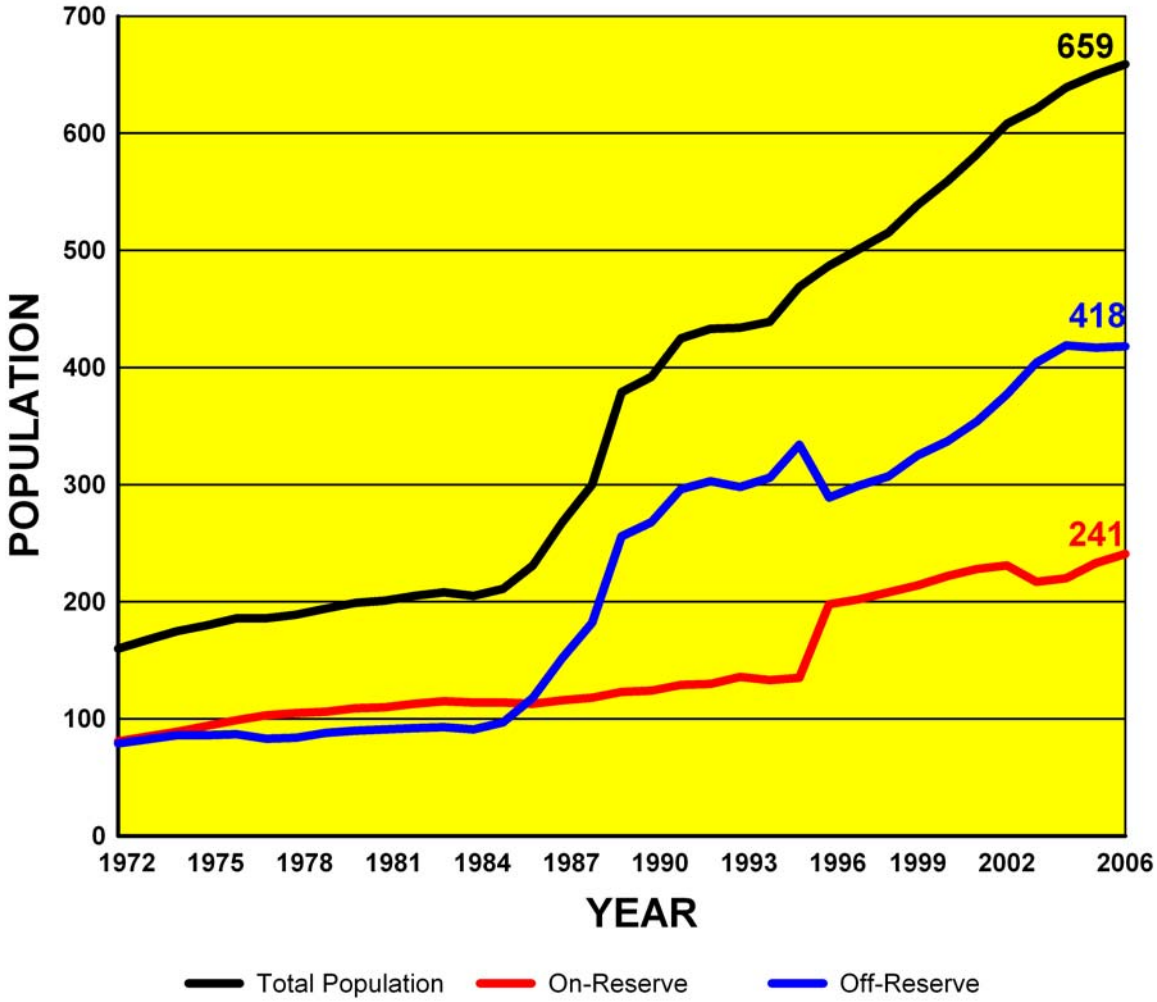
Figure 4.1: Historical Population depicts the on, off and total reserve population growth from 1972 to 2006. Figure 4.2: Base Year 1972 - AAGR illustrates the AAGR using 1972 as the base year. Figure 4.3: Base Year 1990 - AAGR illustrates the AAGR using 1990 as the base year.

The 1972-2006 AAGR (Figure 4.2) is based on the first recorded population for the community in 1972. As the number of years increase, the AAGR becomes less erratic or more stable and consistent. The on-reserve AAGR by 2006 was 3.26% using the 1972 base population of 81. The AAGR was also calculated using the 1990 base population, this resulted in an AAGR of 4.24%.

Off-reserve growth was higher with an AAGR of 5.02% using 1972 as the base year, while using

TEMAGAMI FIRST NATION

FIG 4.1: HISTORICAL POPULATION



TEMAGAMI FIRST NATION

FIG 4.2: AAGR BASE YEAR 1972

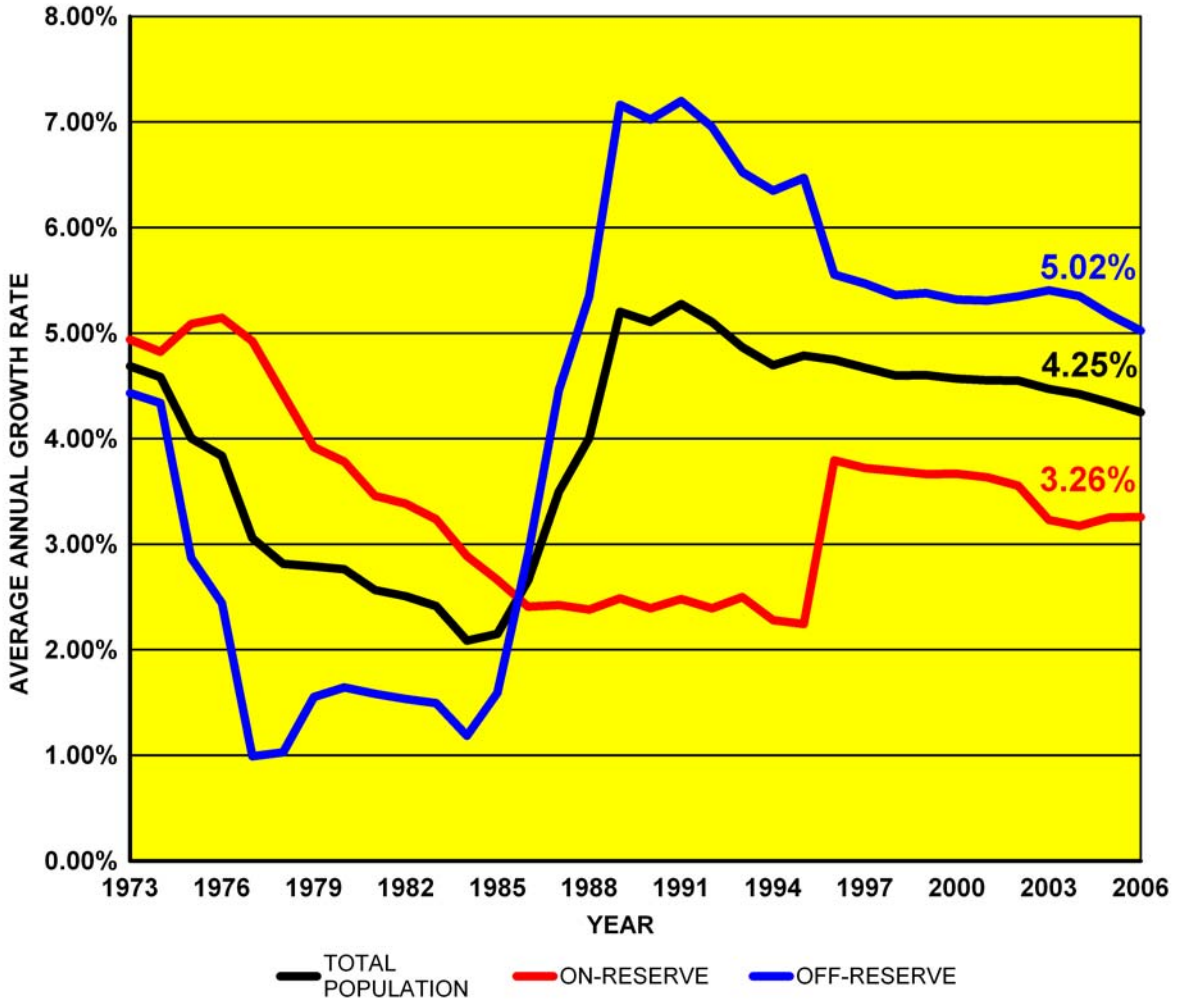


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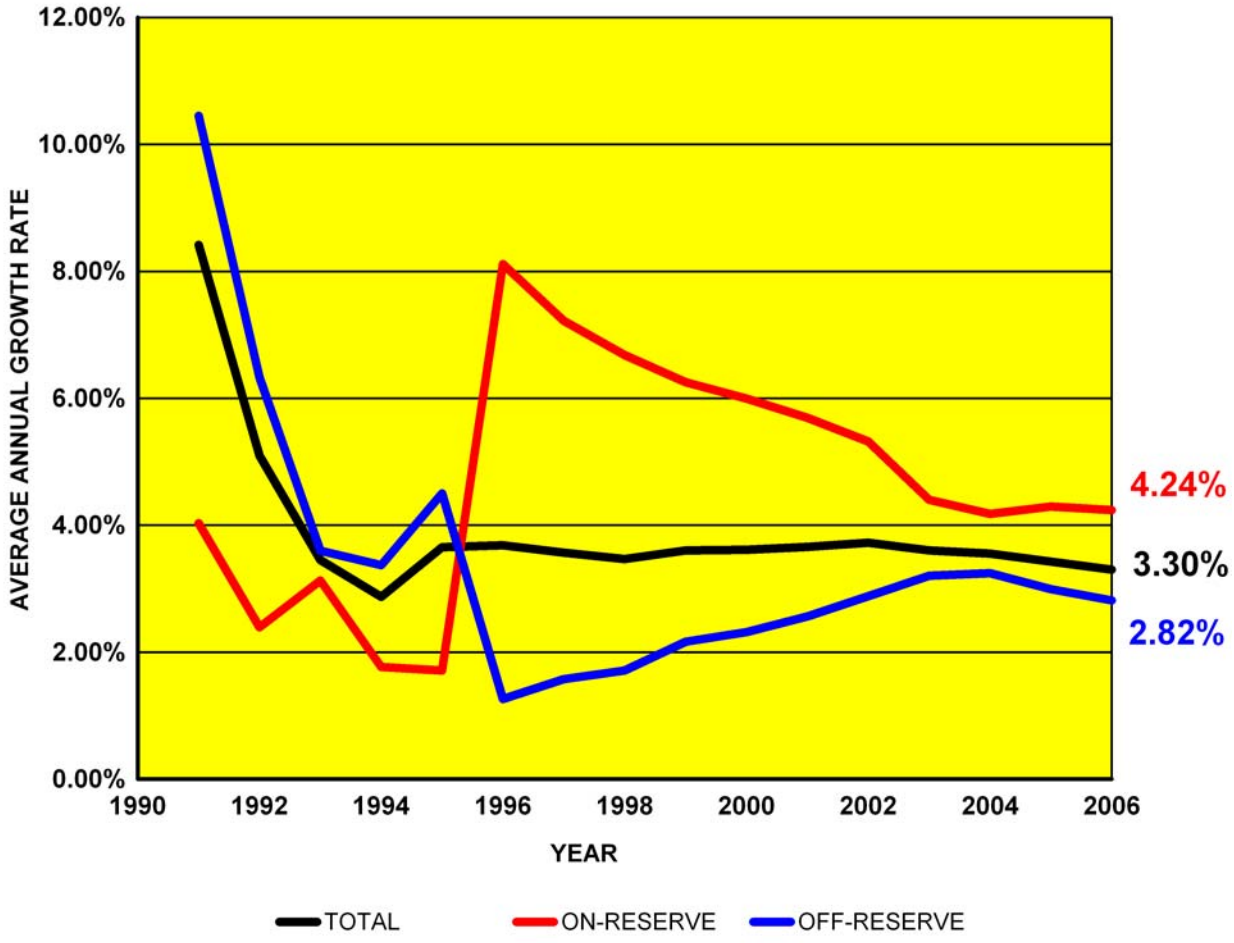
FIGURE 4.3: AAGR BASE YEAR 1990



Off-reserve growth was higher with an AAGR of 5.02% using 1972 as the base year, while using 1990 as the base year, the AAGR is 2.82%.

The total population AAGR is 4.25% using 1972 as the base year and has been 3.30% since 1990.

In 1985, there was an amendment to the *Indian Act*, when parliament passed Bill C-31. This law changed the registration system to allow children born (from status members) out of wedlock to become Status Indians, and also allowed members who lost their Status due to marriage to gain back their status and register their children. As a result, Temagami First Nation's membership increased quite dramatically in the next few years after Bill C-31 was enacted. The largest gain in membership was the off-reserve population, where in 1985 the off-reserve population was 97 by the year 1989 the off-reserve population was 256 and by 1991 the off-reserve population tripled to 296 after Bill C-31. This is illustrated in Figure 4.1: Historical Population.

4.2.1 Historical Population from 1993 CPS

Two separate population forecasts were presented during the 1993 CPS. An initial adjusted population was decided to be 154 people. The adjustments were for 15 non status members and the delayed registration of 19 children.

Historical Percentage Increase

This was based on the review of all of the historic population data and a calculation of the running mean changes from 1968 to 1990. The 20 year average annual growth rate was calculated to be 3.6%.

Growth Composition Analysis

A computer model was used to integrate all factors including:

- Family structures and age group
- marriage probabilities and their effect on births
- fertility rates
- survival rates
- migration rates (on and off-reserve)
- preliminary estimate of Bill C-31 returnees.
- Based on the growth composition method, a 20 year population of 235 was projected and a 50 year figure of 361.

Members of the project team, including First Nation Governing bodies adopted the Growth Composition Analysis method.

Based on the above AAGR formula and an initial population of 154 in 1991 and a 20 year population of 235, the resulting average annual growth rate is 2.14%.

4.2.2 Recommended AAGR

The estimate in the previous CPS for the 20 year community was based on an AAGR of 2.14% and a projected 20 year population of 235. According to information received from Temagami First Nation, in October 2006 the existing reserve and crown land population is 241, 15 years after the projection was completed. This indicates the previous population projection fell sightly short and a higher average annual growth rate should be used for projecting the population in this study.

It is anticipated that implementing the recommendations made in this study will increase economic development opportunities, improve community services and make living on-reserve more viable for Temagami First Nation members, continuing the trend of a higher on-reserve growth rate.

Table 4.1 reveals the total population average annual growth rate, using 1990 as a base year is 3.30% and the Reserve and Crown Land population AAGR is 3.26% using 1972 as the base year. FNESL recommends an Average Annual Growth Rate of 3.25% be used for projecting the future growth of the community for the 20 and 50 year planning periods.

4.3 Cohort Population Projections

Population projections for communities such as the Temagami First Nation can be susceptible to significant margins of error due to a number of factors, such as:

- migration fluctuations between the on and off-reserve communities
- fluctuations in employment opportunities
- availability of housing and community services

Taking these factors into consideration and utilizing historical data and trends in conjunction with the existing demographics population projections were developed using the cohort survival method using the DemProj version 4 software.

4.3.1 Cohort Survival Projection

This method is based on historical data collected from 1972 to 2006 and uses a computerized

cohort survival model to project a future population. There are six variables associated with the computerized cohort survival model: migration rates, fertility rates, crude death rates, life expectancy, age specific fertility rates and sex ratio of males and females at birth. A 20 and 50 year planning period has been used for this analysis.

Migration Rates

The data file for the DemProj program allows for input of the migrant demographics expected over each year. It was assumed that as housing and greater economic opportunities became available, members would move back to their home community. According to Temagami First Nation Housing Department Priority 1 & 2, Apartment and Priority 3 lists there are 55 members waiting to get accommodations. An allowance was included to accommodate the housing backlog.

As the community grows and becomes more economically sustainable, it will be more desirable for more off-reserve members to return to the First Nation. To accommodate the anticipated future migration of members back to the First Nation, a migration rate that is continually rising was used beyond the 20 year planning period to the 50 year horizon.

Fertility Rates

The fertility rates are assigned to child bearing age groups of the female population. These rates reflect the number of births per 1000 females within an age group. The age distribution of fertility is based on the child bearing age range from 15 - 44 years of age, with the highest fertility rate in the cohort of from ages 25 to 29. The Age Specific Fertility Rate (ASFR) used in the projection is from the 1996 Vital Statistics Compendium, Statistics Canada. The ASFR breaks down the birth of children among women in specific age categories. These were calculated as a percentage and used as input for the DemProj program.

Another variable associated with the fertility rates is the possibility of fertility rates changing over the planning period. Based on the document “Projections of the Aboriginal Populations, Canada, Provinces and Territories; 2001 to 2017" found on Statistics Canada’s website: www.statscan.ca/english/freepub/91-547-XIE/2005001/part2.htm,, the aboriginal fertility rates have experienced a decline. The fertility rate dropped from over five children per women at the end of the 1960's to under three children per woman by the end of the 1990's. The document states the fertility rate decline slowed through the 80's and 90's but has decreased even more in recent years. It is stated that Ontario and British Columbia characteristically had the lowest rates of just above two children per women for the period of 1996 to 2001. A declining fertility rate was used over the

planning period.

Life Expectancy and Sex Ratio at Birth

DemProj has a special feature called EasyProj which allows the use of data prepared by the United National Population Division and published in World Population Prospects. There has been data loaded into the program which are estimates and projections prepared by the United Nations based on countries. The sex ratio at birth is defined as the number of boys born for every 100 girls born. The sex ratio at birth used was 105 and was created using EasyProj based on the data supplied for Canada.

The data used for life expectancy was found in the document “Projections of the Aboriginal Populations, Canada, Provinces and Territories; 2001 to 2017" found on Statistics Canada’s website: www.statscan.ca/english/freepub/91-547-XIE/2005001/part2.htm,,.

The data contained life expectancy information for males and females based on a time frame of 2001 to 2017. The 2001 life expectancies at birth for North American Indian men was 71.1 and 76.7 for women. The mortality rate was expected to decline, resulting in an increase in life expectancy, due to improved living conditions and improved access to quality health care. The document then projected a life expectancy of 73.3 years for men and 78.4 for women by the year 2017. Since our projection starts with the year 2006, the data was interpolated between the 2001 and 2017 data to achieve a year 2006 life expectancy starting point. The data was then extrapolated beyond the year 2017 to the year 2026 and beyond for life expectancy data in the final year.

4.4 Existing Demographics

At the time of the study there was no detailed demographic data available for the October 2006 on-reserve population, but detailed demographic data was available to the end of 2005. The INAC 2005 Indian Registry for Temagami First Nation recorded an on-reserve population of 233. A demographic summary of the 2005 population statistics is presented as follows.

- 46.8% (109 of 233) are female;
- 53.2% (124 of 233) are male;
- 6.4% (15 of 233) are of day care age (0-4);
- 7.3% (17 of 233) are between the ages of 5 and 9;
- 5.2% (12 of 233) are between the ages of 10 and 14;

- 7.7% (18 of 233) are between the ages of 15 and 19;
- 4.7% (11 of 233) are between the ages of 20 and 24;
- 7.3% (17 of 233) are between the ages of 25 and 29;
- 12.0% (28 of 233) are between the ages of 30 and 34;
- 4.3% (10 of 233) are between the ages of 35 and 39;
- 8.2% (19 of 233) are between the ages of 40 and 44;
- 6.4% (15 of 233) are between the ages of 45 and 49;
- 7.7% (18 of 233) are between the ages of 50 and 54;
- 7.7% (18 of 233) are between the ages of 55 and 59;
- 3.9% (9 of 233) are between the ages of 60 and 64;
- 1.7% (4 of 233) are between the ages of 65 and 69;
- 2.1% (5 of 233) are between the ages of 70 and 74;
- 2.1% (5 of 233) are between the ages of 75 and 79;
- 2.1% (5 of 233) are between the ages of 80 and 84;
- 3.0% (7 of 233) are 85 years and above.

The information received from Temagami First Nation in October 2006 indicates there are 123 males and 118 females living on-reserve. Assuming the remaining percentages illustrated above would be applicable to the October 2006 on-reserve population of 241 obtained from Temagami First Nation, the following is a statistical demographic summary for the October 2006 data:

- 49.0% (118 of 241) are female;
- 51.0% (123 of 241) are male;
- 6.4% (16 of 241) are of day care age (0-4);
- 7.3% (18 of 241) are between the ages of 5 and 9;
- 5.2% (12 of 241) are between the ages of 10 and 14;
- 7.7% (19 of 241) are between the ages of 15 and 19;
- 4.7% (11 of 241) are between the ages of 20 and 24;
- 7.3% (18 of 241) are between the ages of 25 and 29;
- 12.0% (28 of 241) are between the ages of 30 and 34;
- 4.3% (10 of 241) are between the ages of 35 and 39;
- 8.2% (20 of 241) are between the ages of 40 and 44;
- 6.4% (16 of 241) are between the ages of 45 and 49;
- 7.7% (19 of 241) are between the ages of 50 and 54;
- 7.7% (19 of 241) are between the ages of 55 and 59;
- 3.9% (9 of 241) are between the ages of 60 and 64;

- 1.7% (4 of 241) are between the ages of 65 and 69;
- 2.1% (5 of 241) are between the ages of 70 and 74;
- 2.1% (5 of 241) are between the ages of 75 and 79;
- 2.1% (5 of 241) are between the ages of 80 and 84;
- 3.0% (7 of 241) are 85 years and above.

4.4.1 Population adjustment

Based on historical population and previous experience, it has been shown that all children in the on-reserve 0-4 cohort are not necessarily registered with the First Nation until a later cohort. Some parents tend not to register their children until they attend school at age five. Historical data was reviewed where the population in the 5-9 cohort was compared to 0-4 cohort five years earlier. This is an indication of the amount of children who did not register in the 0-4 cohort but are registered in the 5-9 cohort. The following table illustrates the percentage of children registered in the 0-4 cohort:

Table 4.2: % Registration in 0-4 Cohort Compared to 5-9 Cohort Five Years Later

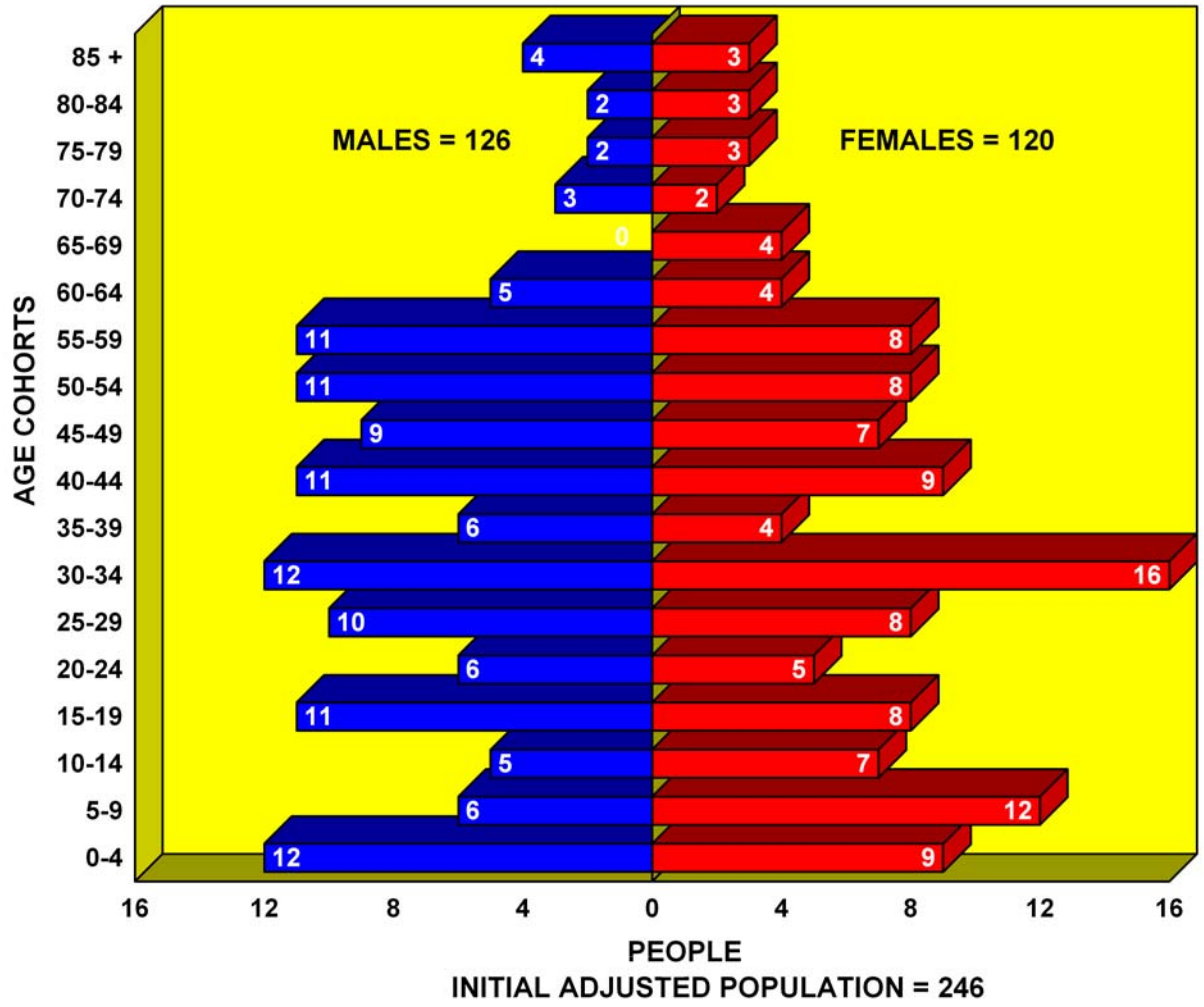
Year	# Registered in 0-4 Cohort	Year	# Registered in 5-9 Cohort	% Registered in 5-9 Cohort, But not Registered in the 0-4 Cohort 5 Years Earlier
1996	6	**2001**	11	54.5%
1997	9	**2002**	19	47.4%
1998	13	**2003**	17	76.5%
1999	15	**2004**	19	78.9%
2000	17	**2005**	17	100.0%
			Average	**71.5%**

Applying the percentage of unregistered children in the 0-4 cohort to the existing 0-4 cohort of 16 children would result in an adjusted 0-4 cohort of ((1 - 0.715) x16) + 16 = 21 children. Which in turn would result in an initial adjusted on-reserve population of (21-16) + 241 = 246.

The following Figure 4.4: Initial Adjusted Population illustrates the population distribution for the initial adjusted on-reserve population of 246. The percentages are based on the data supplied by INAC for the 2005 year.

TEMAGAMI FIRST NATION

FIGURE 4.4: INITIAL ADJUSTED POPULATION



4.5 Cohort Population Projections

20 Year Projection Cohort

The on-reserve population projection results in a population of 466 in the terminal year 2026 using an AAGR of 3.25%. The year 2026 population demographics are as follows:

- 47.9% (223 of 466) are female;
- 52.1% (243 of 466) are male;
- 6.9% (32 of 466) are of day care age (0-4);
- 6.4% (30 of 466) are between the ages of 5 and 9;
- 6.0% (28 of 466) are between the ages of 10 and 14;
- 6.4% (30 of 466) are between the ages of 15 and 19;
- 6.9% (32 of 466) are between the ages of 20 and 24;
- 7.1% (33 of 466) are between the ages of 25 and 29;
- 7.1% (33 of 466) are between the ages of 30 and 34;
- 9.4% (44 of 466) are between the ages of 35 and 39;
- 7.7% (36 of 466) are between the ages of 40 and 44;
- 8.4% (39 of 466) are between the ages of 45 and 49;
- 9.0% (42 of 466) are between the ages of 50 and 54;
- 3.9% (18 of 466) are between the ages of 55 and 59;
- 4.5% (21 of 466) are between the ages of 60 and 64;
- 3.2% (15 of 466) are between the ages of 65 and 69;
- 3.2% (15 of 466) are between the ages of 70 and 74;
- 2.4% (11 of 466) are between the ages of 75 and 79;
- 1.5% (7 of 466) are 80 years and above.

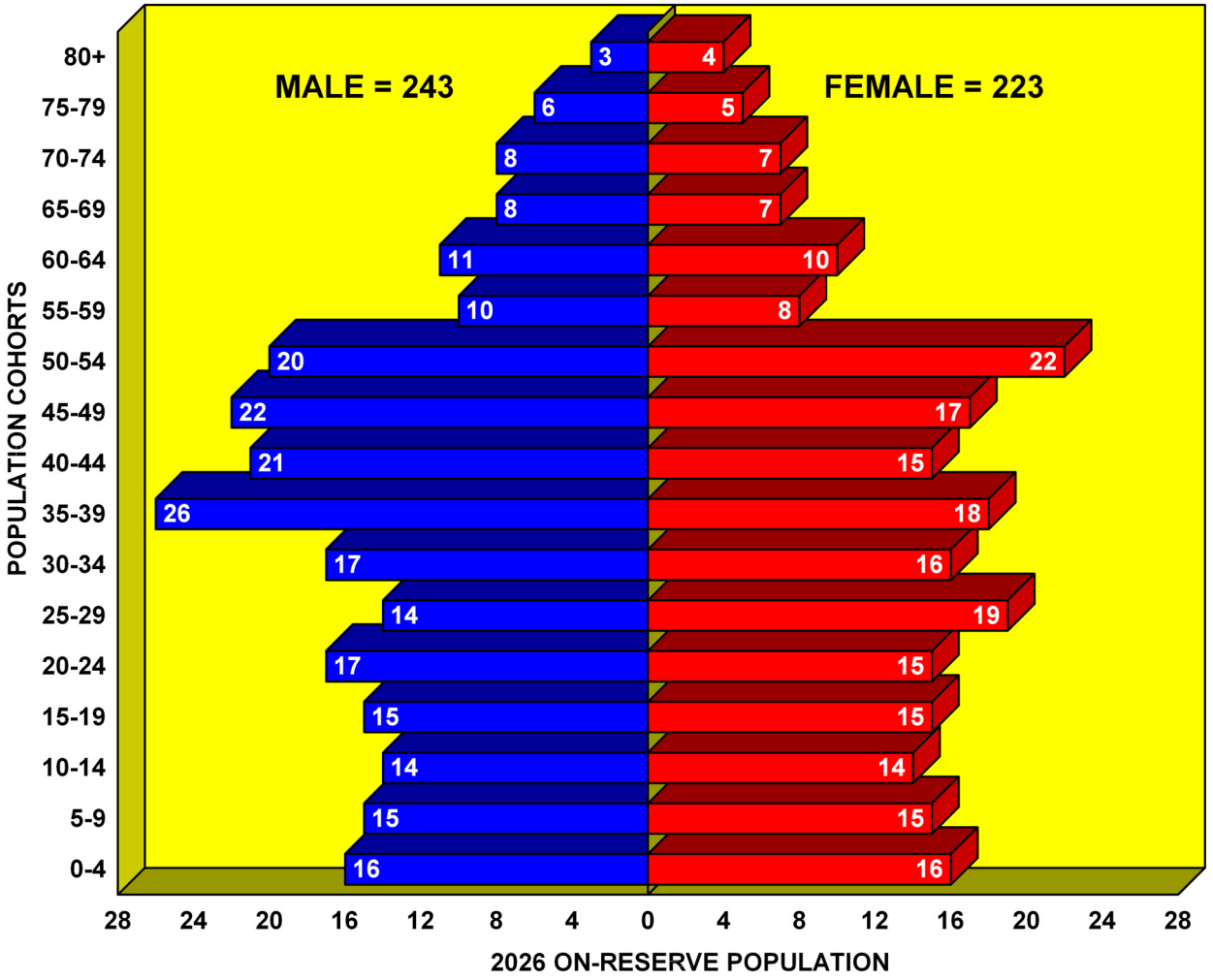
This is illustrated in the following Figure 4.5: 2026 Population Distribution.

50 Year Projection Cohort

The projected population for the 50 year community is 1,217. As previously mentioned it is not known if the 50 year projected population can be accommodated on the existing lands due to the limited land base of the First Nation.

TEMAGAMI FIRST NATION

FIGURE 4.5: 2026 POPULATION DISTRIBUTION



5.0 COMMUNITY NEEDS

The previous section projected the anticipated on-reserve population for the Temagami First Nation. Both the 20 and 50 year population projections, information gathered from representatives of the First Nation, and previous reports were used in this section to identify the future needs of the community.

5.1 Community Needs Summary from the 1993 CPS

Based on the community questionnaire, interviews with chief and council, field studies, and open house comments as part of the 1993 Capital Planning Study, the following is as summary of the Community Needs.

5.1.1 Municipal Servicing Needs from 1993 CPS

- **Improved Sewage Disposal** - The 93 CPS questionnaire identified this as the first priority. Since the completion of the study a communal wastewater collection and treatment system has been constructed on the First Nation.
- **Improved Water Treatment and Distribution** - Based on questionnaire results this was the second priority. Since completion of the 1993 CPS a communal water treatment and distribution system was constructed.
- **Improved Public Dockage and Dock Access** - First Nation members felt that the pubic docks required more maintenance and improvement. The trails leading to the docks also required cleaning of brush.
- **Fire Protection** - At the time of the 1993 CPS the community was without fire protection. With the completion of the water treatment and distribution system fire hydrants were constructed along the 150mm watermain which has allowed for fire protection for the community core area.
- **Landfill Site** - During the 1993 CPS investigations a field inspection of the landfill site was completed and the development of a new landfill site or arrangements be made for disposal at a mainland site. Information received from Temagami in October 2006 indicated the First Nation is currently in discussions with the Municipality of Temagami regarding solid waste.
- **Road Improvements** - Although the trail system was deemed adequate for access, the residents indicated more frequent maintenance is required, including repair of washed out areas, better drainage and brush removal.

5.1.2 Social Services Needs from the 1993 CPS

- **Home for the Elderly** - Identified in the questionnaire as the number one priority a independent living facility is required.
- **Recreation Centre Improvements** - The questionnaire identified the building was too small and required many upgrades. A new facility will be required in the near future to meet the need of a growing population.
- **Child Welfare or Group Home** - In terms of Social Services this was identified as the third highest priority.

5.1.3 Recreational Facilities from the 1993 CPS

- **Football/Soccer Field** - This was identified as the highest priority, but the terrain analysis indicated there is not enough flat land available in or close proximity to the village. A sports field of this nature cannot be accommodated on the island.
- **Court Game Facilities** - Tennis, volleyball and badminton courts were identified as desirable.
- **Craft and Hobby Facilities** - A building for crafts and hobbies were identified for teaching the younger band members.

5.1.4 Community Questionnaire and Department Head Survey

To obtain information regarding the needs of the community a community questionnaire was circulated. This questionnaire was developed to obtain information regarding by-laws, land uses, infrastructure, community services and facilities and educational facilities. A detailed summary of the questionnaire results are contained in the next section.

Information was also obtained from the administration department head managers. The managers were asked to provide input on facilities, private ventures and community ventures their department may have planned over the 20 year planning period. The results of the department head survey are incorporated in the following sections of the report.

5.2 Community Questionnaire Results

A community questionnaire was circulated through the community in 2007. Out of the 94 homes on the First Nation 32 questionnaires were completed or 34 % of the homes. A copy of the original questionnaire and a summary of the results are appended to the document. The survey results indicate that 59% of respondents were aware that a Capital Planning Study Update was being completed for the community. The following is a summary of responses obtained during the

questionnaire distribution.

Section 1: Capital Planning

The questionnaire presented 23 questions regarding by-laws, infrastructure, existing home conditions, future housing, Addition to Reserve (ATR) lands, future land uses, community services/facilities, recreational facilities, employment/economic opportunities, daycare and educational facilities. Eighty four (84%) percent of respondents indicated they are in favour of developing by-laws for land uses throughout the community. Specific by-laws identified include: 78% environmental, 63% historical, 59% speeding, 53% cultural, 50% zoning, 34% permits and 13% responded as other.

Fifty six (56%) of respondents are connected to the communal water system and 44% have private water supplies. Eleven (11) respondents indicated they use a private lake intake system. Eighty eight (88) respondents have no problem with their water quality with only two complaints of chlorine and four complained of an odour.

Forty four (44%) of respondents are not connected to the communal wastewater system. Nine (9) respondents indicated the use of tank, pump and bed system. A large majority (91%) have no problem with their wastewater system.

Regarding the existing road system, 81% had problems with the roads in their areas. Common responses were: too dusty, better maintenance needed, speeding, the need for gravel and roads are too bumpy.

The majority of respondents had no problem with their electrical (84%) or telephone (91%) services.

Ninety one (91%) percent of the respondents indicate they have a fire alarm and fire extinguishers in their home, while only 22% have carbon monoxide detectors.

When asked about obtaining land through the Addition to Reserve (ATR) process, 72% were in favour, 22% were not in favour and 6% did not respond to the question.

Various types of housing were presented to the respondents and they were asked if they are in favour of the band building these types of housing. The following is a listing in order of the most favourable type with the percentage in favour in brackets: Single detached (84%), duplexes (69%),

triplexes (56%), multi story (47%) and row housing (41%). It should be noted that the responses in favour of these types of housing were greater than the respondents not in favour.

Community members on communal services were asked if they are favour of infilling these lots. Only 19% were in favour and a common response was only to family members. Respondents who indicated no, their common responses were: like their privacy, don't like neighbours and the lots are already too small.

The questionnaire asked respondents to prioritize the type of land use development. From highest priority to lowest is: residential, commercial, recreational and industrial.

All but one respondent are in favour of recycling facilities on the First Nation.

Community members were asked to identify any additional community services they would like to see. The following listing is in order of priority: recreation centre, central emergency services, cultural areas, long term care, dock facilities, health/well being programs, water services, employment, library and more economic development.

Recreational facilities were identified by respondents and in order of preference the top answers are: indoor swimming pool, arena, fitness room, sports field, mini putt, hiking trails, eco tourism and golfing.

Sixty two (62%) percent of respondents stated that there are not enough employment/economic opportunities on the First Nation. Employment/economic opportunities that community members would like to see include: training programs, forestry, eco tourism, economic development, prison, water and keep employment for others.

Community members that responded to the questionnaire indicated that there is adequate day care facilities (72%), but some indicated the need for more after school programs.

When asked if there are adequate educational facilities on the First Nation, 66% indicated Yes, 31% indicated No and 3% did not respond. Of those who answered no, the following is what they felt are needed: adult education programs, secondary and post secondary counselling services, distant education programs, more training programs, existing board of education needs improvement and language courses.

Section 2: Community Services and Facilities

Community members were asked to rate the existing services on the First Nation. The following table identifies the number of responses for each category.

Table 5.1: Community Services and Facilities Questionnaire Results

Service	Good	Fair	Poor
1. Quality of roads	3	15	13
2. Water supply services	22	8	1
3. Sewer services	21	9	1
4. Telephone service	23	8	2
5. Power supply services	20	7	3
6. Education	15	14	3
7. Parks/Recreation	1	13	15
8. Retail/Commercial Ventures	2	8	14
9. Garbage removal services	1	13	18
10. Police services	10	15	7
11. Fire protection	7	20	4
12. Social services	14	13	2
13. Health Care services	19	12	1
14. Child Care services	14	12	3
15. Elders Care services	14	12	3
16. Church Services	1	11	11
17. Ceremonies	6	17	3
18. Grave Yard	2	12	17
19. Public Works	7	16	8

Based on the above results, generally the majority of respondents feel the water, sewer, power, telephone, education, social, health care, child care and elders care services are good. The majority of respondents feel the following services/facilities are fair: quality of roads, police services, fire protection, church services, ceremonies and public works. Parks and recreation, retail/commercial ventures, garbage removal, church services and the graveyard have been rated as poor by the majority of the respondents.

Community members were asked to rate the existing buildings/facilities on the First Nation. The following table identifies the number of responses for each category.

Table 5.2: Community Facility Rating

Service	Good	Fair	Poor
1. Quality of roads	3	14	12
2. Water supply services	14	14	1
3. Sewer services	17	12	
4. Telephone service	18	9	1
5. Power supply services	17	11	2
6. Education	10	16	2
7. Parks/Recreation	1	13	14
8. Retail/Commercial Ventures	1	11	16
9. Garbage removal services	4	7	18
10. Police services	9	15	6
11. Fire protection	6	16	6
12. Social services	11	17	1
13. Health Care services	17	11	1
14. Child Care services	15	11	2
15. Elders Care services	12	11	6
16. Rec Centre	0	0	1
17. Recycling	0	0	1

Section 3: Community Facilities

Community members were asked to rate the community facilities in order of their importance. The following shows the number of respondents for each level of importance.

Table 5.3: Community Facility Importance Rating

Description	High Level			Moderate Level				Low Level		
	1	2	3	4	5	6	7	8	9	10
1. Senior's Housing	10	3	3	5	1	3		5		1
2. Administration Building	5	1	2	4	10	1		5		1
3. Water Quality Improvement	4	2	5	6	4	3	2	3	1	1
4. Sewage Improvement	2	3	4	7	7	1		5	2	1
5. Library	9		2	2	7	2	3	6		
6. Upgrading Power Supply	2	2	2	7	9	2	1	3	2	
7. Upgrading Telephone Service	1	3	3	5	9	4	1	3	1	2
8. Business / Industry	6	1	5	9	4	1		2	1	
9. Community Centre	15	3	4	5	1			2	1	
10. Housing Development	10		4	9	5	3				
11. Road Improvements	13	3	6	1	5			3	1	1
12. Fire Protection Services	6	3	6	5	7		1	2		1
13. Drainage Improvements	6	1	8	5	5	2	2	1		1
14. Recreation and Tourism	3	2	6	5	8	2	1	2	1	1
15. Public Works Facilities	6	1	3	5	7	1	3	2	1	
16. Churches	1		2	2	3	4	1	6	4	6
17. Education Services	9	2	2	5	7	2	2	1		
18. Recycling	15	3	6	2		1	1	1		1
19. Cultural Area	1			1						

Section 4 of community questionnaire asked community members to identify and available biophysical information available. This information was used to identify areas of the community where development should not occur. This information is included in Section 5 of this Capital Planning Study Update.

Section 5 of the community questionnaire identified culturally significant areas of the community that should not be developed. The biophysical information is contained in section 3 of the Capital Planning Study.

Section 6: Additional Comments

The community questionnaire provided an area for community members to express any further comments not covered in the questionnaire. The following is a listing of the additional comments provided.

- 2 respondents commented on attending a meeting to explain what exactly a CPS is.
- would like to see everyone on a water system
- opposed to ATR funding

5.2.1 Community Questionnaire Conclusions

The community questionnaire was completed by approximately 1/3 of the residences on the First Nation. Generally, the respondents have no issues with their water, wastewater, electrical and telephone services, but a large number had issues with the roads system, mostly to do with maintenance and speeding. Seventy-two percent of respondents are in favour of obtaining land through the Addition To Reserve (ATR) process.

Single detached homes are the most favourable type of housing, but the majority of the respondents indicated they are not in favour of infilling the serviced lots. The highest ranking of future land uses was residential followed by commercial, recreational and industrial. Existing community services, recreational facilities, employment/economic opportunities were ranked and future facilities were identified.

5.3 Housing

The existing on reserve adjusted population is 246 people, who reside within 94 homes. From this the housing density can be calculated as follows; 246/94 = 2.6 people per home. For comparison purposes, additional average housing densities are listed from Statistics Canada 2001 Census of Population;

- Canada: 2.6 persons/home
- Ontario: 2.7 persons/home
- Town of Temagami: 2.3 persons/home
- North Bay: 2.5 persons/home
- Latchford: 2.4 persons/home

As can be seen the existing housing density closely matches the existing housing densities mentioned above and is expected to remain at 2.6 people per home over the 20 year planning

period. Population projections were completed and resulted in an 10 year on-reserve population of 339 and a 20 year population of 466. Based on the housing density remaining constant at 2.6 people per home the following table identifies the number of houses required over the 10 and 20 year planning period.

Table 5.4: Housing Projection

Existing Number of Homes:	94 Homes
10 Year Projected Need:	131 Homes (37 new homes)
20 Year Projected Need:	180 Homes (86 new homes)

It has been previously documented that here is a very limited amount of land on the First Nation and it was shown in Section 3 that a small percentage of the land is acceptable for development. Due to the preceding statement, we will need to maximize the land use.
Possible suggestions for maximizing the land would be as follows:

- Make lots sizes as small as possible, intensified development using 1/4 acre lots;
- New developments to be connected to the communal wastewater system, no further development with septic systems;
- Multi-Unit Housing

5.3.1 Residential Lot Projection

Having identified the residential needs for Temagami First Nation, the land requirements to accommodate these facilities must be determined.

The servicing that is required for a certain site is dependent on the physical site conditions. This includes the topography, soil types, ground water table, bedrock, etc. Personal preferences could range from a relatively large lot with septic tank systems to smaller urban lots with communal water and sewer services. The INAC Level of Service Standards stipulate minimum housing density before funding assistance is provided, for communal municipal systems, unless no other viable servicing alternatives exist.

The size of residential lots required on-reserve will be dependent on whether or not they have a communal water or wastewater services. Fifty three (53) of the housing units are serviced with communal water supply and wastewater services which requires maximum 0.135 ha (1/3 acre) lot based on INAC funding restrictions. This equates to a lot size of 30 m x 45 m (100 ft x 150 ft). The Level of Service Standards adopted by Indian Affairs requires a minimum of 7.5 houses per hectare (3 houses per acre) for communal water and/or sanitary sewer services.

The required rural lot sizing is based on a lot having sufficient space to accommodate the house foot print, the primary field bed, the secondary field bed, a water supply well and provided the lot is of sufficient size to adequately treat the effluent within the lot area. As previously mentioned, the development scenario using individual septic systems is not recommended but for comparison purposes the calculations will be completed.

Due to the varying soil conditions and slopes which could be encountered at a particular residence, the land area required for a rural housing lot should be investigated on a case by case basis to ensure the nitrate concentration is within guidelines at the property boundary. Due to the fact that the land for development is very limited, development with individual septic systems may not be an option for development on the First Nation.

The following table shows the gross land area required for both urban and rural development concepts. Below we have shown the effect on the land requirement if 1/4 acre lots were used for development. The gross land requirements include road allowances and parkland. An additional 30% of land per lot was used for determining the urban land requirements. An additional 30% of land per lot was used for determining the urban land requirements. An allowance of 10% is used for the rural lots.

Table 5.5: Gross Residential Land Area Requirements

Lot Style	2016 Land Requirements		2026 Land Requirements	
	New Lots:	37	New Lots:	86
	Ha	Acres	Ha	Acres
Urban 1/4 Acre Lots	4.9	12.0	11.3	28.0
Urban 1/3 Acre Lots	6.5	16.0	15.1	37.3
Rural 1 Acre Lots	16.5	40.7	38.3	94.6

* Note urban lots include an additional 30% land area for park and roadway, Rural lots include additional 10%.

It should be noted that the 1993 CPS Section 9.1: Recommended Development Plan identified that only 24 building lots were available within the village area and beyond. The 20 year lot requirement at that time was 68 lots and the available 24 lots represented only a 5 to 6 year supply. These lots were created by subdivision of existing large lots to 30m frontages and development of new lots with 30m frontages along White Bear Road. The CPS also indicated that it is necessary for the community to find an alternate area to grow and must urgently seek new reserve lands on the mainland. Considering the finite amount of land available, it may be prudent that the search for additional lands begin/continue.

Based on information in the 1993 CPS there were 53 dwellings located on the First Nation. Since that time information received from Temagami First Nation indicate there are now 94 homes on the First Nation, resulting in a residential growth of 94 - 53 = 41 new homes since the 1993 CPS. Therefore, development exceeded expectations and housing was constructed.

5.3.2 Shoreline and Interior Land Development

The 1993 CPS stated that the community expressed a strong desire to continue their traditional community lifestyle and future plans were to continue to focus on the lake, the shoreline and non-urban setting.

For future development to continue on the First Nation, a significant portion of the new residential development will need to take place within the interior of the island. Due to the limited amount of developable land along the shoreline it will be assumed that 75% of new residential development will take place in urban subdivisions on 1/4 acre lots with communal water and wastewater servicing. The remaining 25% is proposed to be developed by individual homeowners along the shoreline.

Previously in section 5, it was determined that 37 new homes are required in 10 years and 86 new homes are required over the 20 year planning period. Applying the assumed percentages above the following is the number of lots to be constructed in an urban and shoreline setting.

Table 5.6: Urban and Shoreline Development

Time Frame	Urban (1/4 acre lots)	Shoreline Lots
10 Year (37 new homes req'd)	28	9
20 Year (86 new homes req'd)	65	21

5.3.3 Mainland Residential Development

In September 2009, Temagami First Nation provided preliminary drawings for development on the mainland at Shinningwood Bay. This area is located south of the Temagami Mine Road along the shoreline.

The options presented would considerably reduce the number of homes required on the First Nation over the 20 year planning period. Detailed analysis of the residential options are contained in section 6.

5.4 Community Services/Institutional Needs

It is important for planning infrastructure and capital expenditure that community services, such as institutional facilities, social support services, and public utilities be included in the planning process. This section describes the needs of the community for these services.

5.4.1 Education

The following table will identify the proposed number of children that will be attending school in the year 2026 based on the population projections completed in the previous section.

Table 5.7: 20 Year School Needs

School Grade	Projected Year 2025 Students	No. of Classes	Gross Area Req'd (m^2)	Gross Area Req'd (ft^2)	INAC School Space Accommodations (SSAS) Guidelines Section
JK & K*	13	1	805	8,665	Table 2A, App A1
Grades 1 to 8**	52	2			

*JK = 1/5 of Age 0 to 4 = 1/5*32 = 7, K = 1/5 of 5-9 = 1/5*30 = 6, Total JK & K =7+6 = 13

** Calc for Grades 1-8: Grade 1-8 = Age 5to9 + Age 10-14 - K = 30 + 28 - 6 = 52

Note: number of classrooms based on INAC's recommended size of 25 students/classroom and 52 half-time kindergarten students.

The INAC document does not account for a school with grades K-8, but does contain information on a K-9 school. The documents states that incomplete divisions of schools are treated as complete. Therefore the K-9 tables apply to a K-8 school.

An elementary school with grades kindergarten to grade 8 would require 805 m^2 of gross floor area based on the INAC School Space Accommodations Standards. According to the 2005 ACRS report the school has a floor area of 658.4 m^2. This results in the need for an addition to the school 805 - 658.4 = 145.6 m^2.

The following list illustrates the areas recommended to be included in the new schools based on the SSAS document:

- 2 Classrooms
- 1 Kindergarten Room
- Administration Area
- Multi Purpose Room
- Library/Resources Room

- Commercial/Computer Room

According to the Department Head Survey completed in March 2007, the school requires an additional classroom, heating repairs, sprinkler system and an emergency heating system. This item was identified as being required immediately. These repairs/upgrades will be included in Phase I of the 20 year plan.

School Site Development

INAC also recommends minimum sizes for lots supporting schools. According to the Corporate Manuals System, School Site Development document, Appendix A, section 4.6 states " For school additions, the developed site size recommended for the total expanded school facility, subject to the availability of sufficient suitable land, should provide a finished site size which will provide an appropriate, reasonable area for the expanded or renovated site, suitable to accommodate the expanded school program requirements, not exceeding the site size for new schools."

The recommended new school site size in the document is identified in Appendix A, section 4.5b indicates four (4) hectares (10 acres) recommended for an elementary/junior K-9 school of up to 100 students, plus 0.4 ha for each additional 100 students. Since the estimated number of students in 2026 is 13 kindergarten and 52 grade 1 to 8 students, the maximum site size would be 4 hectares.

According to the 1993 CPS the Temiskaming Board of Education owns lots 111 to 114 and 119 to 122. It has been indicated that this land is held in trust by the Chief of the First Nation and when the current Chief's term is complete it will be turned over to the new Chief. Based on C.L.S.R plan 64410, school site is situated on a parcel of land approximately 0.57 hectares in size and is not large enough to accommodate the area required based on the School Site Development document. Additionally the school does not appear to be entirely on the lands that have been designated for it based on the information FNESL has. It is recommended that the First Nation address the boundary issue of the lands for educational purposes.

5.4.2 Daycare Centre

According to the 2005 ACRS report the total area of the daycare centre is 330.3 m^2 (290.3 m^2 originally and an addition of 30m^2) in size, with an estimated remaining life of 20 years.

There are an existing 16 children attending daycare services on the First Nation. Based on the population projections completed for the community there will be approximately 26 children (4/5^{ths} of the 0-4 cohort). Or an additional 10 children requiring daycare services. This represents an increase of 10/16 = 62.5% in enrollment.

Information regarding Daycare Centres was obtained from the Health Canada Aboriginal Head Start On Reserve Standards Guide, on the website www.hc-sc.gc.ca/fnih-spni/pubs/develop/2003_ahs-papa-ref-guide/sec8_pt_reg_e.html. The guide indicates the Ontario government licences First Nation child care programs. First Nation Child Care programs are required to adhere to provincial regulations and standards for child care services. Child Space Requirements identified on the website indicate an indoor space requirement of 2.8 m^2 per child. Based on a projected daycare population of 26 in 20 years, the resulting space requirement would be 26 x 2.8 = 72.8 m^2. Since the existing daycare is 330.3 m^2 in area it appears to have adequate space for the 20 year planning period.

5.4.3 Administration

The existing administration building is 343.1 m^2 and has undergone some renovations and additions over the years. The administration building was originally constructed in 1904, which makes it over 90 years old. Any structure build over 90 years ago will have some deterioration in one form or another. Although this description is a general review of the building, it would be prudent to assess the building's foundation. The many years of freeze thaw cycles and wet dry conditions may have weakened the stability of the structure. In any event, since the construction of the building, the Ontario and National Building codes have been implemented and updated many times since the original construction. Without investigating behind the walls using intrusive techniques, one could assume the building is not in conformance with the most current building code. However, the addition completed in 2004 (45.5 m^2) would likely prove otherwise. The total building was determined to be 388.6 m^2. Due to the lack of available lands for development on the island, Chief and Council wish to design and construct a Multi-Use Building that incorporates several community services in a single building, including the administration department.

5.4.4 Recreation

The existing recreational facilities include a ball diamond, seasonal ice rink, a sliding hill and hiking trails. The Department Head Survey identified a need for a dedicated area for both tennis and volleyball courts. This was identified to be completed in the 6 to 10 year time frame and will be incorporated into phase two of the study.

5.4.5 Docking Facilities

The Department Head Survey also identified the need for four new public docks and these were identified as an immediate need and will also be incorporated into phase II of the study. A docking facility would be used as the main means of transportation by residents during ice free seasons, to and from the mainland as well as recreation. Additional docking space will be required in the future, with the development of interior subdivision(s).

5.4.6 Elders Facility

Information obtained from Temagami First Nation indicates the existing the Elders Facility is a gathering place and is not a residence and there is a need for seniors housing on the First Nation.

The Department Head Survey indicated a Seniors' Home: Independent Living Facility is required. The Temagami project team has agreed with the need for a seniors home and has identified a 10 unit complex will accommodate the community. The building is estimated to be 464 m^2 in area and is to be built in the 1 to 5 year time frame. It is recommended that this facility be constructed in the first phase of the Capital Planning Study and will be incorporated into the 1 to 5 year time frame.

5.4.7 Fire Department

The following list is a summary of the existing fire fighting equipment available to the Temagami First Nation Volunteer Fire Department:

- Pumper Truck with 300 Gallon Tank
- 12 and 50 Foot Ladder
- 4 Breathing Apparatus' with 4 spare tanks
- Spare 18 hp Pump
- Four 100' Hoses for the Pumper Truck
- Five 100' Hoses for Water Pump
- Five Fire Caches including: 1 Water Pump, 100' Hose, 2 Shovels and 1 Axe
- 3 Spare Axes and Shovels
- Hydrants

The department Head Survey also identified a new fire truck with a 1500 gallon pumper, equipment and a communications system is required. It is recommended that these be incorporated into the First Phase of the 1 to 5 year plan, and be housed within the proposed Multi-Use Complex..

5.4.8 Public Works

The public works garage is 223.0 m^2 in size and was constructed in 1983. The building has a remaining service life of 5 years and is in fair condition based on the 2005 ACRS report

According to the Department Head Survey, an addition to the works garage is required for the fire and dump truck, 4 garage bays - 51m^2 each in area, and 18m^2 of office space for a total additional area of 222 m^2.

Other information in the Department Head survey indicated additional required equipment included a new single axle dump truck with snow plow and a new closed, heavy compaction type garbage truck. As there was no time frame specified, this will be recommended to be incorporated into the second phase of the Capital Plan.

5.4.9 Health Centre

Due to being an island with limited access, having access to health care is of great importance. The Department Head Survey identified an addition to the Health Centre is required and is to include improved access, landscaping and a larger capacity emergency generator. This was identified as an immediate need and is recommended to be incorporated into Phase I of the CPS within the Multi-Use Complex.

5.4.10 Other Community Needs

In addition to the community needs identified in the previous section, additional community needs were identified in the Department Head Survey and are presented as follows:

- **Child Welfare Home: Foster Care** - 4 Bedroom Bungalow 112 m^2. It has been indicated this is to be constructed in the 6 to 10 Year time frame and it will be incorporated into the Second Phase of the 20 year plan.
- **Restaurant** - community store, coffee shop, laundromat are recommended and is to be 350 m^2 in area. It is recommended this be constructed in the Second Phase of the CPS.
- **Crafts and Hobby Centre** - single story with large meeting room too be constructed in Phase II of the CPS.
- **Ceremony Lodge** - No description or time frame was identified, this will be incorporated into the Second Phase of the CPS.
- **Emergency Services Building** - To include office space for ambulance, fire, police and jail. This will be included in the proposed Multi-Use Complex and will be incorporated into

Phase I of the CPS.

- **Cold Storage Repairs** - general maintenance required immediately, this will be incorporated in to Phase II.
- **Church Repairs** - extensive repairs to historic structure required immediately, this will be incorporated into Phase II.
- **New Boathouse** - no description/ time frame supplied, will be incorporated into Phase II.
- **Mine Landing Upgrade** - increase parking area, streetlighting, dock upgrading including 4 new docks, as this is the main transportation route to the island, it will be incorporated into Phase II.

The following needs were identified in the Department Managers Survey but did not identify details or time frames for construction.

- Emergency Communications System
- Alternative Energy Sources
- Radio Station
- Telecommunications including the internet
- Cell Tower
- Dump/Garbage incinerator
- Youth Facility
- Graveyard Planning
- Green house
- Bingo Hall
- Water Bottling

It is recommended that Chief and Council have detailed discussions with the department head managers to determine the priority ranking for these facilities. The discussions should include a plan to secure funding of these facilities, as some of the identified facilities may not be funded by INAC.

5.5 Infrastructure Needs

Future development must take place in a manner that will, optimize the use of the land base available (for development), minimize capital and maintenance costs, in addition to minimizing negative environmental impacts. The terrain and location of the land will be factors in determining development and infrastructure needs. All alternatives for municipal servicing must take into consideration the immediate, interim and long term requirements of the community. Existing and

proposed infrastructure will be planned in a manner that will allow flexibility and ease of expansion for future community development.

5.6 Water Supply Requirements

The following sections analyze the actual flow records from the water treatment plant and theoretical flows.

5.6.1 Measured Water Flow Data

Temagami First Nation's is serviced by a communal water distribution system and daily operations are recorded for the water treatment plant. A first set of records provided the amount of water produced from October 2005 to September 2006, excluding November 2005. A second set of records from February 2007 to July 2007 were supplied. It was indicated by Temagami First Nation Public Works staff that a watermain break had been attempted to be repaired in September 2006 but was not successful. The watermain leak was repaired successfully at the end of July 2007 and a third set of water data was received on September 25 2007 which included finished water data for the months of August and September 2007. The monthly average consumption rates are calculated for all of the data, the data from July 2006 to Sept 07 and the data including August and September 2007. The results are shown in the following tables.

Table 5.8: October 2005 to September 2007 Treated Water Records

Month	Average Flow (m^3/d)
October '05	48.2
December '05	60.8
January '06	67.1
February '06	81.8
March '06	75.1
April '06	68.2
May '06	56.6
June '06	53.1
July '06	63.3
August '06	67.0
September '06	60.1
February '07	45.8
March '07	43.7
April '07	41.6

May '07	48.2
June '07	52.0
July '07	58.6
August '07	54.9
September '07	43.2
Average (m^3/day)	57.3
(L/sec)	0.66

The following table identifies the flows leaving the water plant after the attempted repair of the water leak in the distribution system until the repair was completed successfully.

Table 5.9: September 2006 to July 2007 Treated Water Records

Month	Average Flow (m^3/d)
September '06	60.1
February '07	45.8
March '07	43.7
April '07	41.6
May '07	48.2
June '07	52.0
July '07	58.6
Average (m^3/day)	50.0
(L/sec)	0.58

During this time frame in June 2007, the daily reading on June 13, 2007 was recorded to be 155 m3/day and the average for the month of June was recorded to be 52.0 m3/day. This results in a maximum day factor for the month of June 07 to be 2.98.

The following table identifies the treated water flows after the successful repair of the water distribution system leak.

Table 5.10: Treated Water Flows from August and September 2007

Month	Average Flow (m^3/d)
August '07	54.9
September '07	43.2
Average (m^3/day)	49.1
(L/sec)	0.57

As can be seen the flows recorded after the first repair and the second repair are very close in value, therefore will be used as the baseline for determining the future flows of the community.

5.6.2 Existing Theoretical Water Demands

There are 53 residential units connected to the water distribution system. Using the existing housing density of 2.6 people per home there are (53 x 2.6 =) 138 people connected to the communal water system. The following table estimates the existing theoretical water demands for the Temagami First Nation.

Table 5.11: Existing Theoretical Water Demands

Item	Quantity	Unit	Unit (L/day/cap)	Total (L/day)
Existing Residential	138	people x	280	**38,640**
Total Theoretical Existing Residential Demand				**38,640**
Non-Residential				
Garage	1	staff x	60	60
Teacherages	3	teachers x	280	840
Fire Hall	14	staff x	60	840
Store	1	staff x	60	60
Water Treatment Plant	2	staff x	60	120
Recreation Centre	20	visitors x	20	400
Community Hall	50	visitors x	20	1,000
Band Office	15	visitors x	20	300
	9	staff x	60	540
Family Healing and Wellness Centre	6	beds x	450	2,700
	5	staff x	60	300
Church	30	visitors x	20	600
Tillie Missabie Family Day Care Centre	16	children x	70	1,120
	7	staff x	60	420
Doreen Potts Health Centre	20	visitors x	60	1,200
	15	staff x	60	900
Laura McKenzie Learning Centre	26	students x	70	1,820
	8	staff x	60	480
Northstar Building	10	people x	60	600

Police Services	2	staff x	60	120
Emergency First Response Team	3	staff x	60	180
Total Non-Residential Demand (L/day)				**14,600**
2006 TOTAL AVERAGE DAY WATER DEMAND (L/day)				**53,240**
2006 TOTAL AVERAGE DAY WATER DEMAND (L/sec)				**0.62**
2006 Equivalent Per Capita Water Demands (L/person)				386
2006 Equivalent Population (persons)				190
2006 Equivalent Homes (based on 2.6 persons per home)				73

The theoretical existing average day demand has been estimated to be 53,240 L/day. The theoretical value is slightly greater than the average day demands since the repairs on the distribution system. The theoretical model is within the range of measured water demands as supplied by the water treatment plant and is considered to be a good estimate of the existing water demands.

Design flows are calculated based on average day demands and MOE peaking factors which are chosen according to the equivalent population of the community. Maximum day demand is used to size the raw water delivery and treatment system. Peak hour factors are used to size the domestic distribution pumps. A storage reservoir is sized based on maximum day demands, fire flow requirements and emergency storage. For communities of this size, fire flows typically govern the sizing of the distribution mains.

Based on an equivalent population of 190, the MOE maximum day and peak hour factors are 3.0 and 6.5 respectively.

The following table identifies the maximum day and peak demands based on the theoretical average day demands.

Table 5.12: Existing Theoretical Water Demand Peaking Factors

Demand Type		**Theoretical**
Average Day Demand	(L/day)	53,240
	(L/sec)	0.62
MOE Maximum Day Factor		3.0
Maximum Day Demand	(L/sec)	1.85
MOE Peak Hour Factor		6.5
Peak Hour Demand	(L/sec)	4.01

The existing plant is capable of producing 2.905 L/sec and has some remaining capacity based on the theoretical maximum day demand calculated above. The MOE value is the standard for sizing of water treatment facilities and will be used throughout the remainder of the document. It should be noted that the MOE maximum day factor of 3.0 is very close to the value obtained on June 13, 2007 when the highest reading for the month was 155 m3/day and the average for the month was 52 m3/day resulting in a factor of 155/52 = 2.98. As a result the MOE maximum day factor of 3.0 will provide a good estimate of the maximum day demand of the community. With both trains running at the same time, the water treatment plant needs to operate for 15.3 hours to produce the existing maximum day demand.

For comparison purposes, with both treatment trains running the water treatment plant would need to operate approximately 5.1 hours to produce the existing average day demand.

5.6.3 Remaining Capacity of the Water Treatment Plant

The original design of the water treatment plant was for a maximum day demand of 251 m3/day (2.905 L/sec) and based on the above information the water treatment plant has remaining capacity. Based on the original design criteria the water treatment plant has a remaining capacity of 2.905 L/sec - 1.85 L/sec = 1.055 L/sec or 36.3% of original design capacity. Using the previously determined average day equivalent per capita water demand of 386 L/cap/day multiplied by the maximum day factor of 3.0 and housing density of 2.6 people per home, the following was determined; **The remaining capacity of the water treatment plant would service approximately 30 more homes.**

5.6.4 Remaining Capacity Based on 10 State Standards

It should be noted that N–1 trains are now required according to the current design standards. “N” number of treatment trains, where “N minus 1" trains meet the design flow according to the 2003 Recommended Standards for Water Works (10 States Standards) with the existing treatment trains providing 2.905 L/s, or 1.45 L/s each. Each of the two trains is capable of producing 1.45 L/s. Therefore, the rated capacity of the plant under this scenario would be 1.45 L/s, although when the plant operates in parallel - it can produce 2.905 L/s. Assuming the maximum day factor is 3.0, then the following applies:

Table 5.13: Existing Water System Demands

Existing Average Day	53,240	L/day
	0.62	L/s
Maximum Day Factor	3	
Existing Maximum Day Demand	1.85	L/s
Capacity of Existing N–1 Train	1.45	L/s
24 hour constant operation:	125,496	L/day
Capacity of Existing N Trains	2.905	L/s
24 hour constant operation:	250,992	L/day

The existing water treatment plant has a capacity of 1.45 L/sec (125.5 m^3/day) based on the 10 State Standards. The existing maximum day demand was calculated to be approximately 1.85 L/sec (160 m^3/day). This results in water treatment plant operating beyond the capacity based on the 10 State Standards N–1 criteria.

5.6.5 20 Year - Estimated Water Demands

As previously determined, 86 new homes are required over the 20 year planning period with 65 of these to be within an interior urban development on communal servicing and the remaining 21 built on the shoreline with individual servicing.

Based on a housing density of 2.6 people per home, the future number of people to be serviced with communal water is 65 homes x 2.6 people/home = 169 people. The existing number of people on the distribution system is 138 for a total 20 year population serviced by communal water of 169 + 138 = 307 people. Using the previously determined equivalent per capita water demand of 386 L/cap/day, the following is an estimate of the 20 year average day water demand.

307 People x 386 L/person/day = 118,502 L/day (Year 2026 Average Day Water Demand)

Design flows are calculated based on average day demands and MOE peaking factors which are chosen according to the equivalent population of the community. Maximum day demand is used to size the raw water delivery and treatment system. Peak hour factors are used to size the domestic distribution pumps. The maximum day and peak hour demands are calculated in the following table.

Table 5.14: Future Theoretical Water Demand Peaking Factors

2026 Average Day Demand	(L/day)	118,502
	(L/sec)	1.37
2026 Equivalent Population (based on 280 L/cap/day)		423
2026 Equivalent Homes (based on 2.6 people/ home)		163
MOE Maximum Day Factor		3.00
2026 Maximum Day Demand	(L/day)	355,506
	(L/sec)	4.11
MOE Peak Hour Factor		4.50
2026 Peak Hour Demand	(L/sec)	6.2

The 2026 maximum day demand is calculated to be 4.11 L/s. The existing water treatment system is rated for 2.905 L/sec based on the original design capacity and 1.45 L/sec based on the 10 State Standards for Water Works and both scenarios do not have the capacity to accommodate the 20 year maximum day demand. A recommendation for the 20 year water system will be completed in Section 7.

5.7 Fire Flow Requirements

The Fire Underwriters Survey (FUS), Water Supply for Public Fire Protection 1999, is the recommended standard for fire protection in INAC's Corporate Manual System. The FUS calculates the fire flow requirement in litres per minute using the following equation:

$$Flow = 220 \times C\sqrt{Area}$$

Where C is a coefficient related to the type construction. Area is the net floor area after allowable reductions based on factors outlined in the 1999 FUS document. The most critical building on the distribution system will govern the required fire flow. It was previously determined that the existing school would require an addition for a total area of 805 m^2.

5.7.1 FUS Calculations - Laura Mackenzie School - No Sprinklers

The school is 658.4m^2 and previous sections indicated an addition is required for a total area of 805m^2. The building is a concrete block and wood structure. The building consists of wood plank

siding and an asphalt shingle roof. The building sits on concrete slab on grade foundation. The interior walls of the building consists of painted drywall and concrete block. Flooring consists of vinyl tile and acoustic ceiling tiles are used. Based on the description of the school construction contained in the 2005 ACRS report, the school would fall between two categories outlined in the FUS document: Wood Frame Construction (structure essentially all combustible C=1.5) and Ordinary Construction (brick or other masonry walls, combustible floors and interior, C= 1.0). The FUS document states that for types of construction that do not fall within the given categories, coefficients may be determined by interpolation between construction types. Based on the preceding statement a construction coefficient of 1.25 will be used in the calculation.

The FUS document indicates that schools are considered as Low Hazzard Occupancies and are eligible for a reduction of the fire flow up to 25%. For a reduction of 25% the building is to be Non-Combustible, since the majority of the school is constructed of wood and concrete, it will be considered as Limited Combustible which is eligible for a reduction of 15% and this value will be used in the calculation.

There are currently no sprinklers installed at the school and the reduction for sprinklers will be 0%.

The existing daycare centre is approximately 40m away from the school building based on Autocad measurements. The FUS document states that an exposure charge should be added to the fire flow requirement based on distances to the closest buildings. The FUS document states that an exposure charge of 5% should be added for structures exposed within 30.1m to 45m of the fire area under consideration. Since the daycare is approximately 40m away from the school and exposure charge of 5% will be added to the fire flow calculation.

Table 5.15: FUS Calculations - Laura Mackenzie School - No Sprinklers

Item	
Area (m^2)	805.0
C	1.25
Fire Flow (l/min)	7,802
Fire Flow Rounded (l/min)	8,000
Occupancy Reduction, Low Hazard - Limited Combustible	15%
Fire Flow after Occupancy Reductions (l/min)	6,800
Sprinkler Reduction	0%

Item	
Fire Flow after Sprinkler Reduction (l/min)	6,800
Exposure Charge	5.0%
Fire Flow after Exposure Charge (l/min)	7,140
Fire Flow Rounded (l/min)	7,000
Fire Flow (l/sec)	116.7
Duration (hours)	2.00
Fire Storage Requirement (litres)	840,000

5.7.2 FUS Calculations - Laura Mackenzie School - With Sprinklers

This section investigates the possibility of installing a sprinkler system at the school. The Department Head Survey indicated upgrades/repairs to the school are to include a sprinkler system. For the purposes of this calculation we will assume that the sprinkler system will cover the entire school and it will be designed NFPA 13 and other NFPA sprinkler standards for a reduction of 30%. It is also assumed that the fire flow can be further reduced by 10% due to the water supply being standard for both the sprinkler system and the fire department hose lines. This results in a sprinkler reduction of 40%. The following table identifies the FUS calculation for the school with sprinklers.

Table 5.16: FUS Calculations - Laura Mackenzie School - with Sprinklers

Item	
Area (m^2)	805.0
C	1.25
Fire Flow (l/min)	7,802
Fire Flow Rounded (l/min)	8,000
Occupancy Reduction, Low Hazard - Limited Combustible	15%
Fire Flow after Occupancy Reductions (l/min)	6,800
Sprinkler Reduction	40%
Fire Flow after Sprinkler Reduction (l/min)	4,080
Exposure Charge	5.0%
Fire Flow after Exposure Charge (l/min)	4,284
Fire Flow Rounded (l/min)	4,000
Fire Flow (l/sec)	66.7

Item	
Duration (hours)	1.50
Fire Storage Requirement (litres)	360,000

5.7.3 Water Storage

FUS Fire Flow & Storage Calculation - No Sprinklers

Water storage requirements are specified by the following MOE criteria:

Storage Volume = A + B + C

Storage Volume =Fire Flow + Equalization Storage + Emergency Storage

where:

A =Minimum Acceptable Fire Flow

B =Equalization Storage = (Maximum Daily Demand (L/s)) x 0.25 x 86,400

C =Emergency Storage = (A + B) x 0.25

The resulting water storage requirements based on FUS fire flows for the Laura Mackenzie School and 2026 maximum day are outlined in the following table:

Table 5.17: 2026 Water Storage Requirement - No Sprinklers

Conditions	Year 2025
Maximum Day Demand (L/s)	4.1
Fire Flow (L/s)	116.7
Duration (hours)	2
Fire Storage (L)	840,000
Equalization (L)	88,877
Emergency (L)	232,219
Storage Volume (L)	**1,161,096**

The following table identifies the water storage requirements, if a sprinkler system was installed at the school.

Table 5.18: 2026 Water Storage Requirement - with Sprinklers

Conditions	Year 2025
Maximum Day Demand (L/s)	4.1
Fire Flow (L/s)	66.7
Duration (hours)	1.5
Fire Storage (L)	360,000
Equalization (L)	88,877
Emergency (L)	112,219
Storage Volume (L)	**561,096**

The required storage volume based on the area of the school including addition, 20 year maximum day demand, FUS Fire Flow calculation and the MOE criteria is shown above for the school with and without a sprinkler system.

As can be seen the required storage volume could be reduced by a volume of 1,161,096 - 561,096 = 600,000 L.

As can be seen there is a significant storage volume that can be saved by installing a sprinkler system at the school. It is recommended that a sprinkler system be installed at the school and this will be included in Phase I of the Capital Planning Study. The remainder of the calculations in the study will assume that a sprinkler system will be installed at the school in the first phase of the study.

As the existing fire pump is rated for 32 L/sec, a new fire pump will also be required over the 20 year planning period.

5.7.4 20 Year Required Water Storage

The existing storage available for the First Nation is shown in the following table.

Table 5.19: Existing Water Storage

Storage Area	Volume (m^3)
Clearwell #1	140
Clearwell #2	120
Fire, Equalization and Emergency Storage	225.9
Total Available Storage	**485.9**

The required storage for the 20 year planning period was calculated to be 561.1 m^3. This results in a need for an additional storage volume of 561.1m^3 - 485.9m^3 = 75.2m^3.

The storage volume will need to be revisited during detailed design of the storage facility. It is proposed that Human Resources Development Canada (HRDC) review the calculation for appropriateness.

The storage volume deficit will be addressed in section 7.

5.8 Raw Water Supply System

Raw water is conveyed from Lake Temagami. A dam on the Temagami River controls the lake levels between 292.99m and 294.20m for an average lake level of 293.80m. The intake structure is located approximately 194m from the WTP, submerged and placed on the lake bottom. The structure consists of Polyethylene drum base (2.21m dia.), fill structure sandbags and a polyethylene conical cover (1.2m in dia). The overall height of the intake structure is 2.65m. A 20mm HDPE mesh surrounds the intake ports and the intake inlet location can be lowered through a range of 1.4m.

The intake pipe is a 150mm polyethylene pipe with a class rating of Series 60. A 75mm line from the high lift discharge piping is connected to the intake pipe for flushing of the intake pipe if needed.

The intake system has a zebra mussel protection system consisting of a diffuser, piping and a chlorine solution system which is currently not connected.

The top of the intake structure is located at 283.0m and the lake bottoms elevation at the structure is 280.1m.

5.8.1 Raw Water Intake Breakpoint Hydraulics

Based on elevations taken from the contract drawings for the infrastructure project the raw water intake system has a theoretical intake breakpoint of 0.393m. This results in the capacity of the intake pipe to be 3.98 L/sec.

The 20 year maximum day demand was calculated to be 4.1 L/sec and as can be seen the raw water intake may require an upgrade nearing the end of the planning period. Due to the capacity of intake being so close to the 20 year maximum day demand, it is recommended that the raw water flow be monitored over the planning period and upgrades could be considered when it is nearing capacity.

5.8.2 Intake Upgrades

Although it may not be required within the 20 year planning period, the following identifies the required intake pipe sizing for a 50 year planning period.

A raw water intake system is typically designed to meet a 50 year water demand for a community. Based on a projected 50 year population of 1,217 and an equivalent per capita water demand of

386 L/cap/day the 50 year average day water demand would be 1,217 x 386 = 469,762 L/day. The maximum day factor would be based on a unit water demand rate of 280 L/cap/day divided by the 50 year average day demand, 469,762/280 = 1,678 equivalent population. An equivalent population of 1,678 represents a maximum day factor of 2.5. The 50 year maximum day demand would be 469,762 L/day x 2.5 = 1,174,405 L/day (13.6 L/sec).

Based on an existing hydraulic breakpoint of 0.393 m and the intake pipe length of 194 m, a new intake pipe would need to be at least 11 inch inside diameter to convey the required 50 year maximum day demand. The pipe that would be used in this application would most likely be a 12" pipe, due to an 11" being a non-standard pipe that is manufactured.

The option of lowering the existing 6" intake pipe to a point where it would be able to convey the 50 year maximum day demand was analyzed. This resulted in an intake hydraulic breakpoint of 3.82m or an elevation of 289.17m. As the existing bottom of the intake chamber is 292m, the invert of the pipe would need to be below the existing intake chamber.

5.9 Water Distribution

The distribution consists of the following components:

- over 2,100m of 150mm watermain
- Three submersible high lift pumps (all equal capacity), 7 hp, 3450 RPM, 1.49 L/sec @ 54.9m TDH & 2.18 L/sec @ 49m TDH;
- Two pressure tanks AFX-1200, 1200 L capacity
- Vertical turbine fire pump, 32 L/sec @ 44.5m TDH;
- Underground storage tank with 115.2 m^3 fire storage, and a total storage including fire, equalization and emergency storage of 225.9 m^3

The water distribution system should be capable of conveying the maximum daily demand plus fire flow. Domestic flows and pressures within the system are maintained by the pressure tanks and the high lift pumping system. Fire flows are provided by the fire pump. Previously it was determined that a fire flow of 66.7 L/sec for 1.5 hours is required based on the size of the school. A new fire pump with a minimum capacity of 66.7 L/sec will be required over the 20 year planning period if sprinklers are installed at the school. As well as a new fire pump, new high lift pumps would also be required.

5.10 Municipal Wastewater Servicing Needs

Sewage pumping station pump hour data was provided by the First Nation. The pump data obtained included the hours from September to December 2001 and from January to November

2002. This data was used to determine the flow rate of the pump installed at that time. Information received from the operation staff indicated that the pump had since been changed and no new pump flow data is available. Due to the fact that all connections to the water system are connected to the wastewater system as well, we will use the previously completed analysis on the water system as a baseline for determining the existing and future wastewater flows for the community.

5.10.1 Existing Wastewater Treatment System Flow

The water system records identified an average day flow rate of 50 m^3/day for the months of September 2006 to July 2007 and an average day flow rate of 49.1 m^3/day for the months of August and September 2007. A theoretical model for the existing water demands estimated the water demand to be 53.2 m3/day. As these flows are very close in value, we will use the 53.2 m^3/day for calculation purposes. As previously mentioned the MOE suggests an infiltration rate of 90 L/cap/day and this will be applied to the wastewater generation rate.

However the water system records do not take into the account the contribution of the marina pumpouts and septic sludge disposals into the wastewater treatment system. Since these portions are disposed of directly into the lagoon and are not pumped in with the rest of the wastewater. The design flows of the wastewater system were calculated to consider an allowance of 137 m^3/yr for septic sludge and 48 m^3/yr for marina pumpouts. These values have been incorporated into the wastewater generation calculations. The following table estimates the existing wastewater generation:

Table 5.20: Existing Wastewater Generation

Average Day Water Flow Rates (L/day)	53,240
Equivalent Population based on 280 L/cap/day	190
Infiltration based on 90 L/eq.pop/day (L/day)	17,113
Septic Tank and Marina Pumpouts (L/day)	507
Total Wastewater Generation (L/day)	70,860
Equivalent Per Capita Wastewater Generation based on 138 people (53 homes x 2.6 people/home) connected to Wastewater Collection System	513

The peak demands of a wastewater treatment system are calculated using peaking factors. The Harmon Method[1] calculates the peaking factor using the following equation:

[1] Computer Applications in Hydraulic Engineering, Third Edition, Haestad Methods Inc.

$$PF = 1.0 + 14/(4 + (P/1000.0)^{½})$$

where:

PF = Peaking Factor

P = Equivalent (Contributing) Population

Based upon the above calculated equivalent population, the peaking factor is shown in the following table. The average day and peak generation rates on the system are summarized in the following table.

Table 5.21: Existing Theoretical Wastewater Volume Generation Peaking Factor Table

Generation Type	Peaking Factor	Flow (L/day)	Flow (L/s)
Average Day	N/A	70,860	0.82
Peak Flow	3.96	280,605	3.25

The existing wastewater lagoon system has a design capacity of 91,250 L/day (1.06 L/sec) or an operating volume of 41,800 m^3. As can be seen the lagoons have adequate capacity for the existing wastewater generation based on the average day demand.

Based on an average day equivalent per capita wastewater generation rate of 513 L/cap/day, a housing density of 2.6 and the remaining capacity of 91,250 - 70,860 = 20,390 L/day, the existing wastewater treatment system could accommodate approximately 15 more homes.

5.10.2 20 Year Wastewater Generation

As with the water system, the 20 year wastewater generation is based on the location of residential development. It was determined in the water section that of the 86 new lots required that 65 of these will be built in an urban development with communal services.

There are 53 homes or 138 people connected the existing wastewater system and connecting 65 more homes or 169 people, would result in 138 + 169 = 307 people connected to the wastewater collection system over the 20 year planning period.

Assuming the existing equivalent per capita wastewater generation rate of 513 L/cap/day will be

valid in 20 years, the 20 year wastewater generation rate would be:

307 people x 513 L/capita/day = 157,491 L/day (2026 Average Day Wastewater Generation Rate)

The equivalent population would be 157,491 L per day / 280 L/cap/day = 562 equivalent population.

Based upon the above calculated equivalent population, the peaking factor is shown in the following table. The average day and peak generation rates on the system are summarized in the following table.

Table 5.22: Future Theoretical Wastewater Volume Generation Peaking Factor Table

Generation Type	Peaking Factor	Flow (L/day)	Flow (L/s)
Average Day	1.0	157,491	1.82
Peak Flow	3.94	620,515	7.18

As the existing wastewater system is designed for an average day flow of 91,250 L/day, the system will require an upgrade of 157,491 - 91,250 = 66,241 L/day to accommodate the 20 year wastewater generation of the community.

Recommendations for wastewater servicing for the 20 year planning period will be made in section 7.

5.11 Municipal Solid Waste Servicing Needs

The following will identify the solid waste needs for Temagami First Nation over the 20 year planning period. Currently First Nation members have to take their solid water to the barge landing where bins are set up for collection. The solid waste is then loaded on to a barge, taken to the mainland and transferred to the Briggs Landfill site for disposal.

5.11.1 Solid Waste Needs from 1993 CPS

It was noted in section 2, the 1993 CPS identified the existing solid waste sites are not appropriate for domestic waste disposal and should be closed and capped.

Recommended work for the closure included:

- Shoving the refuse into compact piles and burning to reduce the volume and render

burnable items inert;

- The remaining material shall be covered with an impervious material and graded to a convex surface to promote drainage;
- The site should be drained to prevent surface waters from entering the refuse piles;
- vegetation should be established on cover materials.

It was also recommended that the First Nation purchase a garbage truck and implement a weekly collection program and household wastes be transported to the mainland by barge/winter road for disposal.

These items will be incorporated into Phase I of the Capital Planning Study.

5.11.2 Temagami Briggs Landfill Analysis

In January 2008, Story Environmental Services Inc. prepared a presentation entitled Temagami Briggs Landfill Analysis. This landfill site is currently used by Temagami First Nation for their waste disposal. The analysis was completed to determine the best approach in managing the Briggs Landfill site, which is nearing capacity. The analysis included landfill operating practices, equipment selection and use, costs for closing the landfill and opening a new one. It also proposed a new management system which would satisfy the existing MOE Certificate of Approval C of A).

Based on information contained in the Story Environmental presentation it was estimated 300 tonnes per year or 1,500 m^3 are deposited at Briggs, with 176 tonnes or 600 m^3 being produced by Temagami First Nation.

The cost to establish a new landfill site (< 40,000m^3) was estimated to cost $500,000 in the Story Environmental Presentation and also estimated the cost to close the existing landfill at approximately $400,000.

The next option investigated was expanding the landfill from 40,000 m^3 to 100,000 m^3, this was estimated to cost approximately $110,000.

The presentation then identified factors impacting compaction of the waste including waste layer thickness, number of machine passes during compaction, landfill compacting technologies were also presented.

Landfill mining, the recovery of recyclables and cover material was reviewed as a possibility for the site.

A cost benefit analysis of 10 options revealed that the landfill expansion was least expensive and gained more landfill life without major increases in O&M and equipment.

Recommendations from the presentation included:

- Pursue the Environmental Screening Process;
- Application of best compacting practices;
- Implement a waste management system as per the MOE.

As the First Nation relies on the Briggs Landfill site for their solid waste disposal and there is not adequate land for the construction of a new landfill site on the First Nation, it is recommended that the First Nation seek the required funding to assist the Municipality of Temagami with the expansion of the Briggs Landfill Site.

In discussions with an official from the Municipality of Temagami in February 2008, it was indicated the existing landfill site has approximately 2 years capacity remaining and that the expansion to the landfill site would provide the First Nation will solid waste disposal for longer than 20 years.

5.11.3 Alternative Solid Waste Option

If the option for expanding the landfill is not viable, alternatives for solid waste disposal will need to be considered.

The Municipality of Temagami has indicated that they would consider to continue accepting the solid waste from the community. If the expansion of the Briggs landfill does not occur, accepting the waste from the First Nation would most likely be at an additional cost.

FNESL recommends a solid waste management study be undertaken to explore options for future solid waste disposal. Options that could be considered in the study include: land purchase off reserve for construction of a new landfill, extension to MTA and incineration on the First Nation.

5.11.4 20 Year Solid Waste Generation

Knowledge of the waste generation rates and quantities are necessary to determine the required capacity of a solid waste disposal alternative. Ideally, such parameters should be based on

historical data of solid waste generation for a community. Waste volumes can be estimated assuming an average rate of daily waste generation if local data is unavailable.

Statistics from "Community Solid Waste" as issued by Public Works Government Services Canada (TID-MS-03), the per capita waste generation rate of the average Canadian is 1.5 kg/day with the average First Nation community member producing slightly less. For the purposes of this study a value of 1.5 kg/cap/day waste generation rate will be used for the Temagami First Nation over the 20 and 50 year planning periods.

The On-Reserve community was estimated to be 466 people in 2026 and 1,217 people in 2056.

The following is an estimate of the solid waste generated by Temagami First Nation over the 20 and 50 year planning period.

1.5 kg/person/day x 466 people = 699 kg of waste generated per day in 2026,
1.5 kg/person/day x 1,217 people = 1,825.5 kg of waste generated per day in 2056.

The Community Solid Waste Document states the volume of uncompacted waste could range from 50 to 150 kg/m^3. Since the solid waste from the community is stored in collection bins, it will be assumed that little to no compaction of the waste is being completed and a density of 50 kg/m^3 will be used to determine the volume of solid waste generated over the planning period. The following estimates the volume of daily waste generated:

(699 kg/day) / (50 kg/m^3) = 14 m^3 /day in 2026 and;
(1,825.5 kg/day) / (50 kg/m^3) = 36.5 m^3/day in 2056

The recommendations to address solid waste for the design period are carried in Section 7.

There appears to be a discrepancy in the waste generation rates for the community. The Story Environmental presentation identified an existing generation of 600 m^3 per year and the using the Technical Information Document (TID) from Public Works Canada recommended generation values, the community would be producing approximately 2,600 m^3 per year. It is recommended that the 2,600 m^3/year be used for planning purposes.

5.12 Roads and Drainage Servicing Needs

Information contained in the 1993 CPS indicates that proper roads were never constructed on the Island and the existing roads are not adequate to accommodate low volume vehicular traffic.

The existing road system was not constructed for vehicular traffic, but during the winter months a few residents have brought their cars from the mainland on the winter road and using them on the island all year.

Two options will be considered for the road system on Temagami First Nation.

1. Upgrade the roads to appropriate, Ministry of Transportation (MTO) Standards;
2. Ban cars on the island.

Since many residents have cars on the island and use them for transportation within the island it is recommended that the roads be upgraded to the appropriate standards.

A unit cost will be carried in the study for upgrading the roads to approximately 20m Right-of-Ways (ROW). It should be noted that in some areas of the First Nation 20m ROW's may not be feasible due to existing land developments and topography. A detailed design would need to be undertaken before construction could be completed. A major component of detailed design would include a detailed study which would include a legal survey of the existing lands and a topographical survey. The study would also investigate areas which would require a ROW smaller than 20m and the possibility of one way traffic in the smaller ROW areas. The unit cost of upgrading carried in section 7 of this study includes the use of granular roadways.

5.13 Geotechnical Investigation - Granulars

The Terms of Reference for the project identified the need for a geotechnical investigation. FNESL's proposal stated that once the scope of a geotechnical investigation was defined, a decision to obtain a price, would provide cost savings to the project. This geotechnical investigation would include a granular sourcing investigation on the island. Since it is recommended that the roadways be upgraded to appropriate MTO standards with granular driving surfaces, it is recommended the geotechnical investigations with granular sourcing be considered to determine the volumes of granulars that can be expected.

5.14 Electrical Servicing Needs

Discussion with officials from Hydro One indicate the existing community is supplied by single phase power. It was indicated that Hydro One is planning on installing a three phase line to the island for reliability purposes. The three phase feed is planned that this be installed in the summer of 2008. When asked if there was any concern of supplying the community with power for a 20 year planning period, Hydro One indicate there doesn't appear to be a problem and also stated that the services on the Island are fairly new. Hydro One also indicated that if a shortage of power to the island is determined, additional power from other areas of the hydro grid could be directed to the island.

6.0 COMMUNITY DEVELOPMENT

The objective of this section is to present a development plan which will serve the needs of the First Nation over the 20 and 50 year planning period. Previous sections of this report have laid the foundation for developing a community plan. Section 3.0 identified the physical and biological resources of the reserve to determine those areas with high, moderate and low development capabilities. Section 4.0 provided population projections over 20 year and 50 year planning periods, while Section 5.0 reviewed residential and non-residential needs as well as general infrastructure requirements of the Temagami First Nation community.

6.1 Recommended Development Plan - 1993 CPS

The 1993 Capital Planning Study spanned two different Chief and Council administrations and included input from both. The First Council adopted a limited development approach favouring only development of the seven large lots on Eguana Road and Wa Wa Te Avenue. The second Chief and Council identified the need for new lots in the village area and increased the number of lots by re-dividing vacant lots with 30m frontages and developing new lots in two areas, north of White Bear Road and west of the existing school.

Recommended Village Development Plan - 1993 CPS

The village development plan was designed by subdivision of existing lots #4, 5, 53, 54 ,55, 56 and 57 on Eguana Road and lot #34 on Ko Ho Ja Avenue to frontages with 30m or less and development of lots #17 and 40 on Wa Wa Te Avenue which could not be subdivided due to their size.

New lots would be produced by development along White Bear Road and a new street adjacent to the school would create 12 new lots. This results in an additional 23 single family residential lots in the village area. One new lot is available at Wen Da Bin Bay for a total of 24 lots. The requirement at the time of the study was 68 lots, resulting in a deficit of 44 lots.

6.2 Discussion of Developments Since Completion of the 1993 CPS

The 1993 CPS Recommended Development Plan identified that only 24 residential building lots were available within the village area and beyond. The 20 year lot requirement at that time was 68 lots and the available 24 lots represented only a 5 to 6 year supply. The CPS also indicated that it was necessary for the community to find an alternate area to grow and must urgently seek new reserve lands on the mainland.

Based on information in the 1993 CPS there were 53 dwellings located on the First Nation. Since that time information received from Temagami First Nation for the Capital Planning Study Update indicate there are now 94 homes on the First Nation, resulting in a residential growth of 94 - 53 = 41 new homes, exceeding the projection of the 1993 CPS.

6.3 Community and Land Use Planning

Organized community planning is needed to facilitate future growth in an environmentally sustainable and orderly process. Interactive meetings with community members will allow future growth to develop in conjunction with their wishes and desires. This will also aid in preventing "scattered" development patterns and inefficient infrastructure servicing requirements.

Accordingly, general planning principles which will be adhered to in this study are:

- Desires of community members will be incorporated into the community plan whenever possible.
- Parkland and greenbelts will be integrated into the community to preserve desirable natural features.
- Cultural and environmentally sensitive areas will be designated as low development areas.
- Will follow the general development pattern established by the First Nation.

6.4 20 Year Residential Development Alternatives for Temagami First Nation

It was previously determined that 65 new homes will need to be developed to accommodate further growth. Two lot layouts on Temagami First Nation were developed to satisfy the 20 year housing need of the First Nation. Due to the limited amount of land available for development on the community a lot size of 1/4 acre (25m x 40.5m) was previously used, which is slightly smaller than the required 1/3 acre lots as required by INAC's Level of Service Standards. The 1/3 acre lot size is the maximum lot size which is eligible for communal water and wastewater servicing.

At Project Team Meeting #2, The Project Team identified areas of the First Nation where development is to take place. These areas included the village area, northeast interior and the western interior of island north of Whitebear Road.

These areas were field proofed during a site visit in August 2007. The Chief and members of the project team showed FNESL representatives the proposed areas for residential development.

One area that was suggested for residential development did not have adequate space identified as moderate development capability for the projected housing demand. A larger area west of gravel pits has adequate space identified as moderate development capability and a proposed housing development was prepared for this area.

Temagami First Nation has also identified an area known as Shinningwood Bay as another possible location for community development. This area is located on the mainland near the Temagami Mine Road.

The following are descriptions of the three development scenarios that have been proposed to service the First Nation for a 20 Year Planning Period.

6.4.1 Future Residential Alternative #1 - Island Location

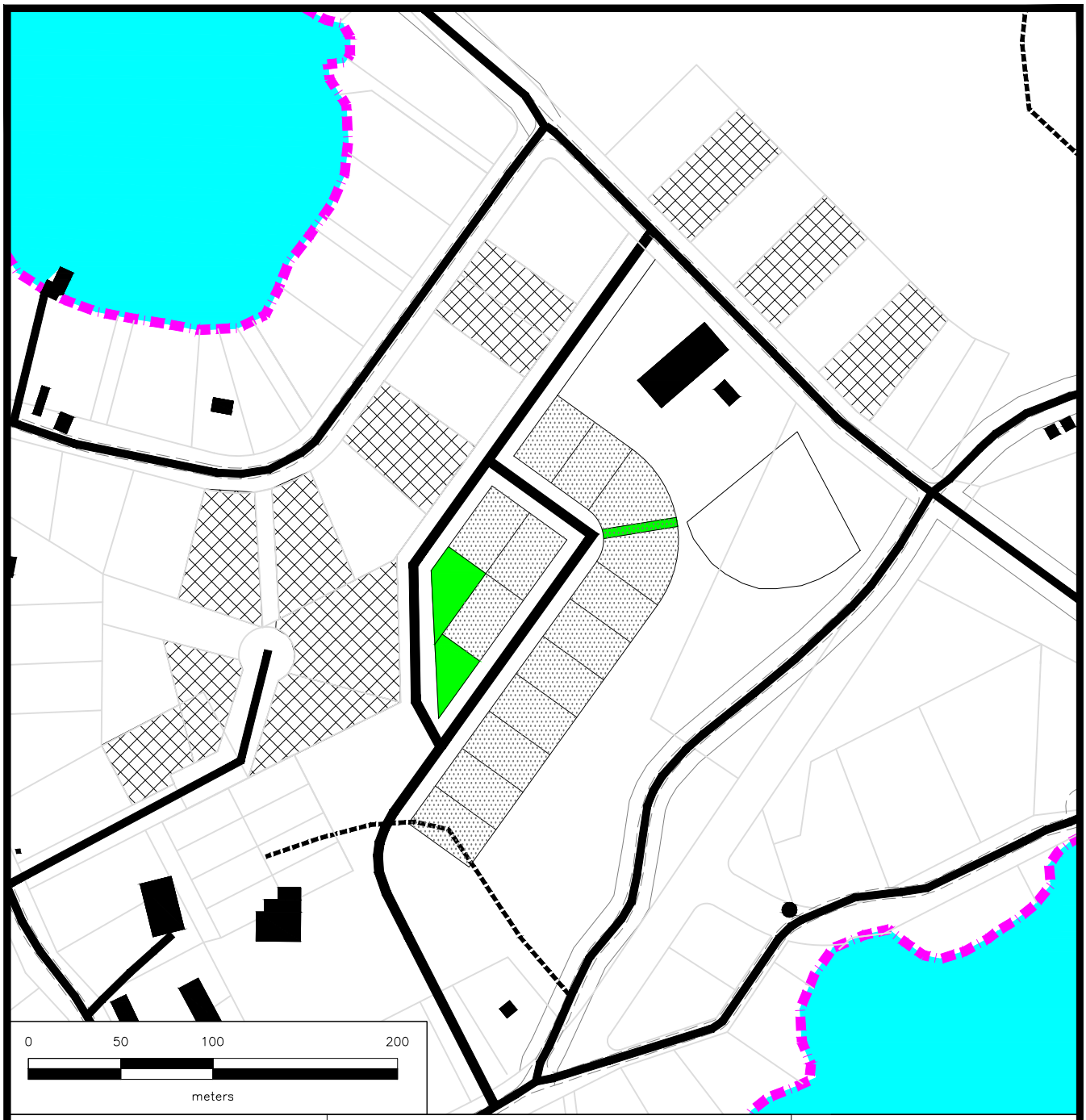
This development consists of:

- Twelve (12) village area infills;
- Fourteen (14) village area new lots;
- An interior island development consisting of thirty nine (39) 1/4 acre lots;
- Future development area of 3 hectares.

Table 6.1: Advantages/Disadvantages of Residential Development #1

Advantages	Disadvantages
Closer to existing water distribution system then alt #2.	High elevation, will require higher capacity high lift pumps and individual Pressure Reducing Valves (PRV's) on all existing connections
Provides housing lots for 20 year population	Longer distance to the wastewater collection than Alternative #2
Provides 3 ha of future development space	Lift Station required to convey wastewater to lagoons

This is shown in Figure 6.1: Residential Development #1 - Village Area and Figure 6.2: Residential Development #1 - Interior Subdivision



LEGEND

- Reserve Boundary
- Road
- New Lots
- Infill Lots
- Greenspace

Residential Development #1 Summary

Required # of Lots = 65

Village Area New Lots = 14 lots
Village Area Infill Lots = 12 lots
Interior Subdivision = 39 lots
65 lots

FIGURE 6.1

Residential Development #1 Village Area

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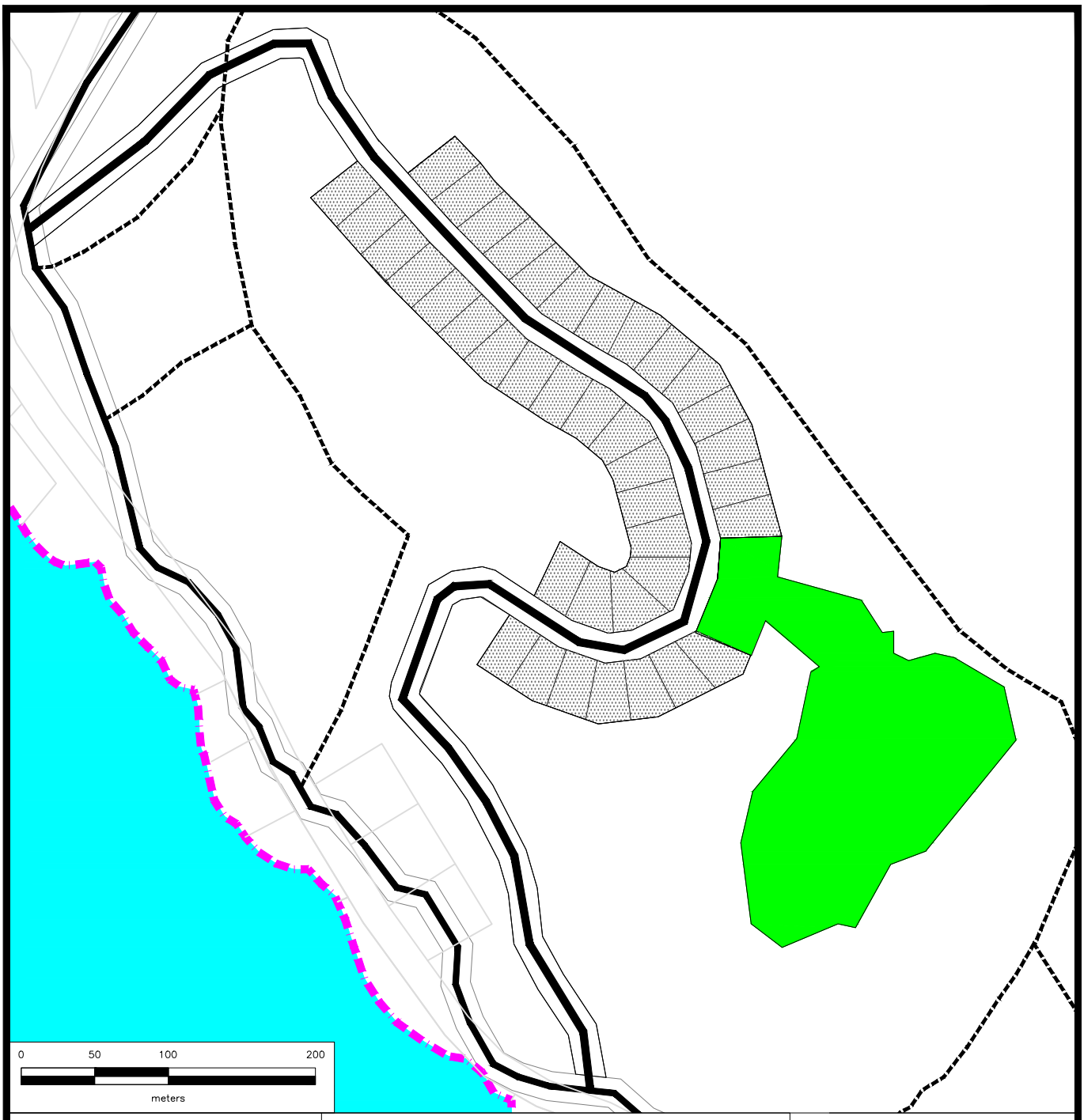

LEGEND

- Reserve Boundary
- Road
- New Lots
- Greenspace

Residential Development #1
Summary

Required # of Lots = 65

Interior Subdivision = 39 lots
Village Area New Lots = 14 lots
Village Area Infill Lots = 12 lots
65 lots

FIGURE 6.2

Residential Development #1 Interior Subdivision

N

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6.4.2 Future Residential Alternative #2 - Island Location

This development consists of:

- Twelve (12) village area infills;
- Seventeen (17) village area new lots;
- An interior island development consisting of thirty-six (36) 1/4 acre lots with a possibility for many additional interior lots.

Table 6.2: Advantages/Disadvantages of Residential Alternative #2

Advantages	Disadvantages
Development closer to the existing lagoon system than alt #1	Longer distance to existing water distribution than Alternative #1
Provides housing for 20 year population and beyond Development in same pressure zone as WTP	Lift Station required to convey wastewater to lagoons

This is shown in Figure 6.3: Residential Development #2 - Village Area and Figure 6.4: Residential Development #2 - Interior Subdivision

As can be seen these two development scenarios have more than enough land area to accommodate the required housing needs.

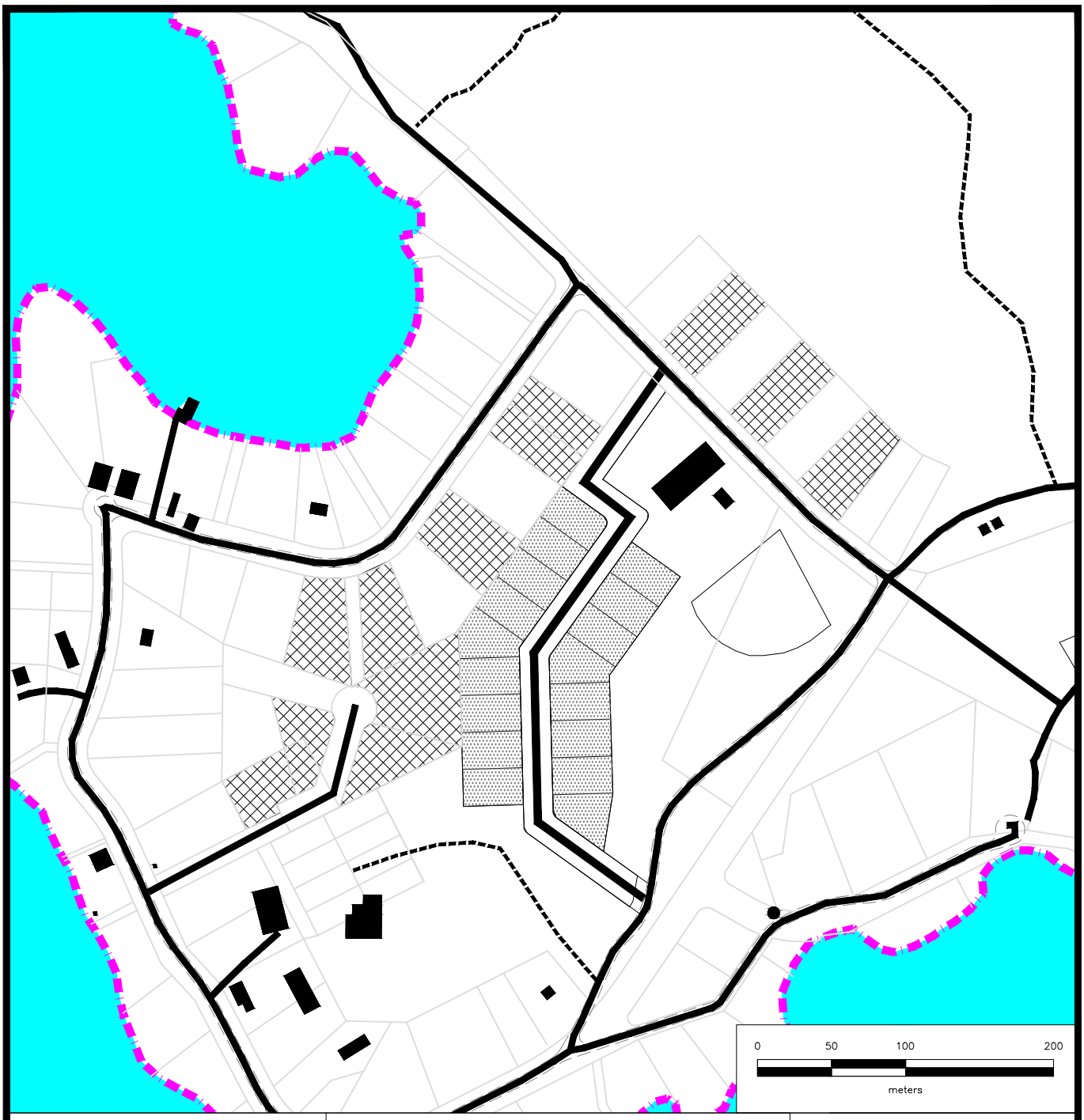
6.4.3 Future Residential Alternative #3 - Mainland (Shinningwood Bay)

Temagami First Nation began a site study investigation in 1993 (by the Lathem Group Inc.). This study was initiated to find lands for the development of a new community. In 1993 and 1994 the project included field studies, community consultations, and discussions with Federal and provincial government agencies. After some time, the study was completed and the area known as Shinningwood Bay was identified as a potential expansion area for Temagami First Nation's. There were 3 options presented in the study, along with Class "D" cost estimates. Although not requested in the Terms of Reference, these 3 options will be revisited to allow the Temagami First Nation to consider a third alternative for future residential and infrastructure development.

The development options consist of (based on information in the Lathem Group Inc Study) :

Option #1

- 38 large residential lots of 1800 m^2 (30m x 60m);
- lots contain room for a house and two septic systems (active and reserve);
- water supply via a central communal treatment and distribution system, new construction



LEGEND

- Reserve Boundary
- Road
- New Lots
- Infill Lots
- Greenspace

Residential Development #2
Summary

Required # of Lots = 65

Initial Interior Subdivision = 90 lots

Possible Future
Interior Subdivision = 41 lots

Village Area New Lots = 17 lots
Village Area Infill Lots = 12 lots

160 lots

FIGURE 6.3

Residential
Development #2
Village Area

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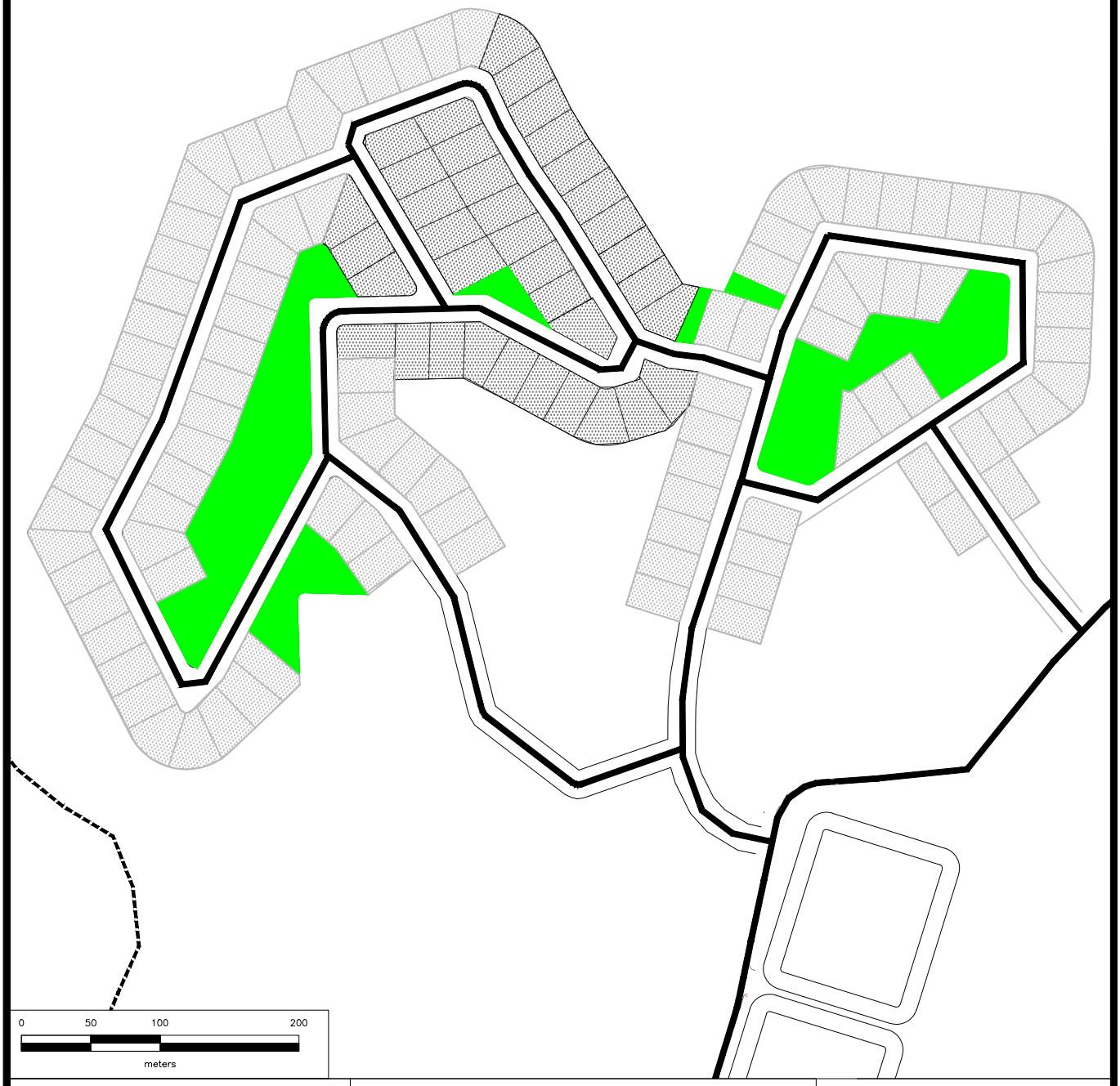

LEGEND

- Road
- Initial New Lots
- Possible Future Lots
- Greenspace

Residential Development #2
Summary

Required # of Lots = 65

Initial Interior Subdivision = 36 lots
Village Area New Lots = 17 lots
Village Area Infill Lots = 12 lots
65 lots

Possible Future
Interior Subdivision = 95 lots

FIGURE 6.4

Residential Development #2 Interior Subdivision

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of roads, drainage ditches and individual septic systems.

Option #2

- 54 residential lots on 30m x 45m lots (1,350 m^2). This option would meet INAC's Level of Service Standards of 7.5 units per hectare.
- lots contain room for a house and two septic systems (active and reserve);
- water supply via a central communal treatment and distribution system, new construction of roads, drainage ditches and individual septic systems.

Option #3

- 61 residential lots on 30m x 45m lots (1,350 m^2). This option would meet INAC's Level of Service Standards of 7.5 units per hectare.
- additional lots were developed by completing regrading the upper table lands to eliminate the steep slopes and drainage course which traverse the site.
- lot contains a useable area of 30m x 30m and extend an additional 15m into areas that may have adverse topography;
- water supply via a central communal treatment and distribution system, new construction of roads, and drainage ditches. Two options for wastewater collection in this option included gravity sewers and grinder pumps with sewer pipes.

Table 6.3: Advantages/Disadvantages of Residential Alternative #3

Advantages	Disadvantages
Easier access to new community due to being on the mainland.	Would require the development of all new infrastructure, as well as O&M costs for two water treatment plants and wastewater treatment plants would be required.
Close to landing on Lake Temagami that is used for access to Temagami First Nation.	Based on limited information, area does not have appropriate area for 20 year housing requirements.
Easier access for emergency and health services	More expensive than the other two alternatives.

6.4.4 Shinningwood Bay Preferred Option

In all of the options presented for the Shinningwood Bay area, none are able to accommodate the entire 20 year housing demand. This observation is based upon very limited information that is contained in the Lathem Group Study.

It should be noted that the Shinningwood Bay area is in the Municipality of Temagami and would need to be obtained before development could occur.

Based on planning principals it would not be prudent to recommend the development proceed using individual septic systems on the size of lots recommended without a detailed soils investigation. For the purposes of this study, it is recommended that if development should occur at this area, communal water and wastewater treatment be incorporated to ensure potable water is available to the community members and the effects on the environment are limited with wastewater treatment.

Discussion on Developing Shinningwood Bay (Mainland)

This section will focus on the social implications and discuss the advantages and disadvantages of developing on the mainland rather than the island. The Temagami First Nation is in a unique situation where the community is currently based on a small island that has numerous development constraints, and a growing population. As mentioned previously, a report was developed to assess potential lands available to relocate the community to the mainland. Since the report was finalized, several terms of Chief and Councils has passed and their decisions allowed the island to be developed with new assets that improved living and social conditions of the residents. More specifically, a water and waste water system was constructed which services several newly constructed houses. These types of developments may be considered investments in building a foundation for a long term community. Knowing this, the land identified for relocation on Shinningwood Bay will likely be considered for expansion rather than relocation. If the decision is made to develop on the mainland, the Temagami First Nation will no longer be a community focused in one specific area, it could be thought of as two small communities. It is not expected or it may not be feasible to construct new community buildings for the mainland community, such as a community centre, youth centre or senior's centre. These facilities will be assumed to remain in the existing village area on the island. Having all the community buildings located on an island while other residents are living on the mainland could be viewed as a disadvantage for people living in Shinningwood Bay. There is currently no regular scheduled ferry system that would allow families or individuals easy access to the island. A private boat would likely be used in the summer months while a snow machine may be used during winter months to travel from the mainland to a community event or function. Not all residents may have access to these types of vehicles and if they do increased travel over any body of water increases the risk of accidents and may not be considered safe. Especially, if youth residing on either side attempts to cross the water alone.

The combination of children and schooling has potential to be a disadvantage to the residents on the mainland. There is an elementary school located on the island and federal funds are likely allocated for this school to operate with a main directive to teach Temagami First Nation students. If the students do not have reasonable access to the Island School, they may have to travel to municipality schools where a tuition may be required.

For certain, if the community expands to the mainland, new roads, water supply, water distribution and wastewater services would be recommended. In addition to the high capital cost of the mentioned infrastructure, several civil services would be recommended. These services could be a benefit to qualified First Nation individuals who may find a career in necessary services such as policing and fire fighting. In addition to these services, other infrastructure tools would be required to operate and maintain the roads, water supply system, and wastewater system. Some of which would include a grader, tri-axle truck for gravel hauling, salt spreading and snow plowing, others would include the cost of personnel to operate the water and wastewater system and the on-going costs associated with the chemicals required to operate the respective systems. On the other hand, it may be possible to negotiate a municipal type agreement for some services with the nearest municipality.

One advantage of developing a community on the mainland is, residents would have direct all year round road access to services not readily available to island residents. Some services would be road access to health centres or hospitals in North Bay or in the Municipality of Temagami.

Class “D” cost estimates have been developed to assess the expected capital costs of all three proposed options. To allow for a more congruent capital dollar comparison between the 3 residential alternatives, the summary chart will include the cost for constructing the 20 year infrastructure. The infrastructure upgrades and/or new construction includes water supply, roads and wastewater. These costs are included in the summary chart because the, “Future Residential Alternative #3 - Mainland (Shinningwood Bay)” will require these essential services. Actual residential construction costs will vary depending on the sub-surface material, there may or may not be a need for rock removal. As such, we have assumed the residential construction costs will be addressed by the hired housing contractor (builder) and will be considered beyond the scope of this report. It is also assumed, the cost for constructing new residential housing will be equivalent for all alternatives and will therefore be neglected in the costing tables.

Table 6.4: Residential Lot Servicing and Associated Infrastructure Summary

Alternatives	Water	Sewer	Roads	Total*
Island Option #1	$3,745,475	$1,718,500	$1,213,725	$9,978,375
Island Option #2	$3,715,600	$1,612,500	$1,518,150	$10,182,813
Mainland Option #3	$5,806,500	$5,063,000	$1,345,950	$17,144,313

*** See detailed tables located in Appendix #1.**

These estimates are based on the analysis completed in section #7. It should be noted that for the accuracy level of this cost estimate, Alt #1 and #2 are essentially equal.

6.5 Preferred Residential Development

The project team has chosen residential alternative #2 as the preferred alternative. This alternative will be used throughout the remainder of the document for costing purposes.

6.6 Non-Residential Development

The following is a listing of future non-residential facilities which are to be built during the 20 year planning period. Numerous non-residential facilities were identified at project team meetings, in the community survey, the program manager survey and previous studies as being required over the 20 year planning period.

Temagami First Nation - Island

Phase I - $10,000,000

- Multi-Use Complex; includes Administration, Community Hall, Fire Hall, Emergency Services; $8,500,000
- Seniors Complex; $1,500,000

Phase II - $3,500,000

- Child Welfare Home; $500,000
- Youth Facility; $200,000
- Four New Public Docks; $1,000,000
- Tennis and Volleyball courts; $200,000
- Restaurant; $200,000
- Crafts and Hobby Centre; $200,000
- Ceremony Lodge; $200,000
- New Boathouse/Marina; $1,000,000

Phase III - $2,000,000

- Bingo Hall; $1,000,000

- Radio Station; $500,000
- Cell Tower; $300,000
- Greenhouse; $200,000

Phase IV - 2,000,000

- Water Bottling; $2,000,000

6.6 20 Year Land Use Plan

Figure 6.5: 20 Year Land Use Plan, identifies the various land uses proposed for Temagami First Nation, over the 20 year planning period.

Future Development Area

North View Bay

WHITE BEAR RD.

Wen Da Bin Bay

Tonen'e Point

Joe Pauls Bay

Flyers Bay

Future Interior Residential Development (36 New Lots)

0 500 1000

meters

Joe Pauls Bay

Flyers Bay

WHITE BEAR RD.

LAGOON ACCESS RD.

KO-HO-JA AVE.

O-JEEG AVE.

Future Infill Lots Locations to be Verified (12 Shown)

Future Village Residential Development (17 New Lots)

0 100 200 300 400 500

meters

LEGEND

- Reserve Boundary
- Road
- 300 Contours
- Infrastructure/Public Works
- Wooded Area
- Cemetery
- Residential
- Institutional
- Commercial
- Recreational
- Future Residential - New Lot
- Future Residential - Infill Lot
- Future Development

FIGURE 6.5

20 Year Landuse Plan

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7.0 SERVICING ALTERNATIVES

This section will analyse alternatives for servicing the 20 Year Land Use Plan.

7.1 General

Section 5 outlined the general requirements for Temagami First Nation regarding potable water requirements, wastewater requirements, housing needs, solid waste needs, road needs and electrical power consumption needs.

Section 6 identified potential development alternatives for the First Nation. The objective of this section is to determine the most appropriate means of servicing Temagami First Nation's 20 year community plan. Therefore, various servicing alternatives are reviewed in this section. Each alternative is assessed regarding its feasibility and benefit to the community.

7.2 20 Year Water Treatment System

The existing water treatment system has an original design capacity of 2.905 L/sec. It should be noted that N–1 trains are now required according to the current design standards. "N" number of treatment trains, where "N minus 1" trains are required to meet the design flows according to the 2003 Recommended Standards for Water Works (10 States Standards). The existing treatment trains provide 2.905 L/s combined, or 1.45 L/s each.

The 20 year maximum day demand was estimated to be 4.1 L/sec and this section will examine two alternatives for supplying the First Nation with a water system capable of meeting the 20 year demand. The two options are:

1. Construct a new water treatment facility
2. Expand and upgrade capacity of the existing facility.

7.2.1 Option #1 - Replace Existing Water Treatment System

A new water treatment facility to service the 20 year demand has been considered.

Due to the fact that this alternative would require a new site and that there is such limited land available for future development as well as the plant is approximately only 8 years old, this alternative is not a feasible option and will not be considered further in the analysis.

7.2.2 Option #2 - Expand Existing Water Treatment System

This alternative investigates upgrading the existing membrane treatment system. Continued use of the existing facility and what upgrades are required to bring it up to current standards (O.Reg 170/03) are examined in the analysis. The analysis will be based on constructing the treatment system upgrade to meet the 2026 maximum day demands. The components required to provide a complete and working water filtration and disinfection system are as follows:

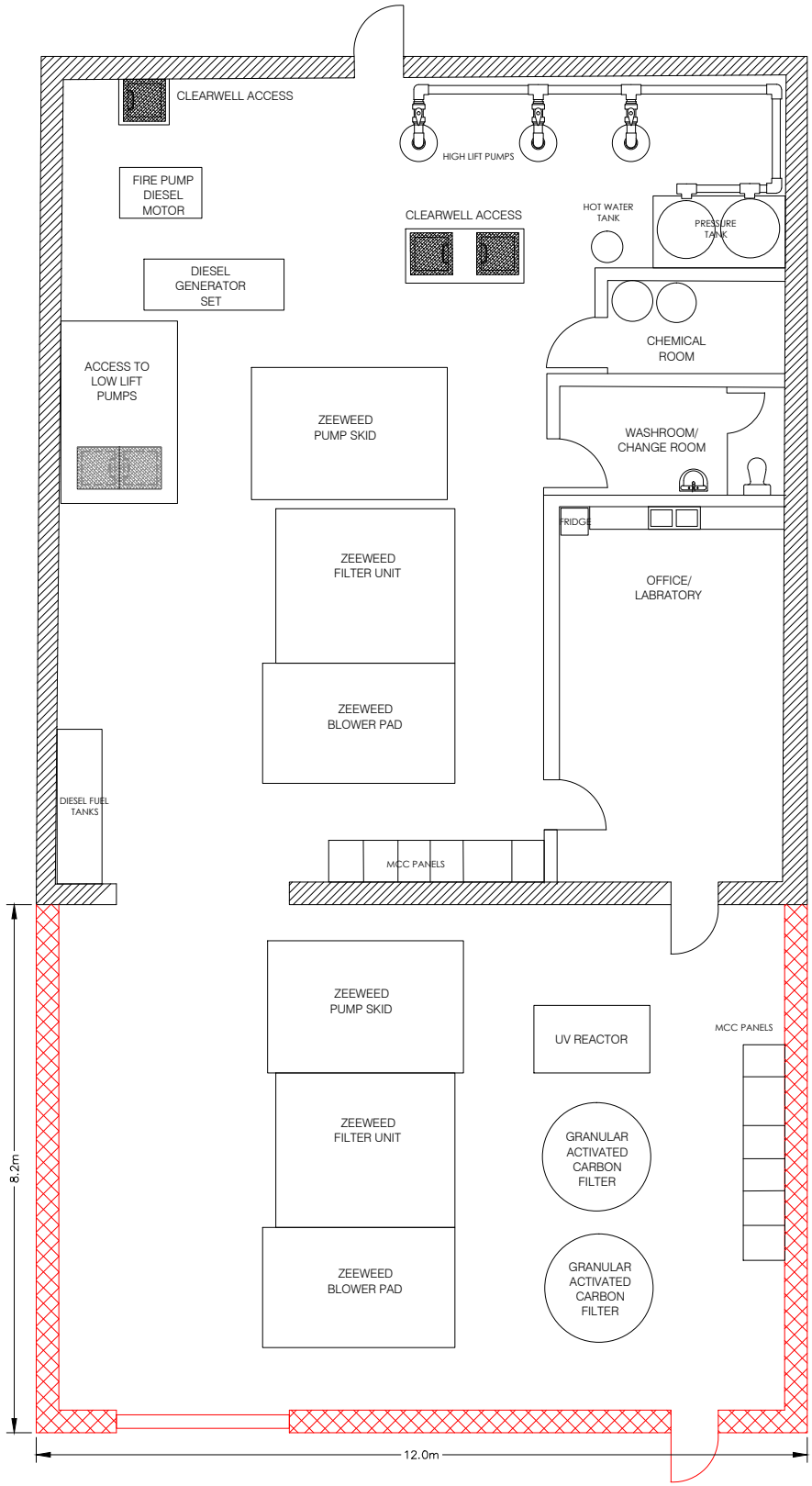
1. "N" number of treatment trains, where "N minus 1" trains meet the design flow according to the 2003 Recommended Standards for Water Works (10 States Standards) with the existing treatment trains providing 2.905 L/s, or 1.45 L/s each. For the 2026 maximum day demands of 4.1 L/sec, two new filtration trains each sized for a minimum of 1.4 L/s, for a minimum total of 4.1 L/s, with one filter down are required.
2. Expansion to the existing facility.
3. Upgrade capacity of raw water supply accordingly
4. Granular Activated Carbon Contactors for taste and odour control.
5. Instrumentation and control system.
6. Water quality analysis and process instrumentation.
7. New ultraviolet disinfection system
8. New high lift pumps.
9. New fire pump

An important aspect of this is the consideration of keeping the existing filtration system online during the construction process. Mechanical improvements for flow regulation and flow meters are required on each train's dedicated feed line to divide the raw water flow correctly. Figure 7.1: Water Treatment Plant Expansion, illustrates the proposed water treatment plant layout for the 20 year planning period

The following table identifies the Class C construction cost estimate, Operation and Maintenance costs and Life Cycle Costing for the expansion of the water treatment facility to accommodate the 2026 maximum day demands.

Table 7.1: Water Treatment Plant Upgrade Costing

ITEM	COST
Class C Capital	$1,973,750
Annual Operation and Maintenance	$150,000
20 Year Life Cycle Costing	$4,283,551



N.T.S.

FIGURE 7.1

Water Treatment Plant Expansion

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7.3 Raw Water Supply System

The existing hydraulic breakpoint for the raw water system has been calculated to be 0.393 m and has a calculated rated capacity of 3.98 L/sec. As the 20 year maximum day demand was calculated to be 4.1 L/sec, the raw water intake system appears to have adequate capacity until near the end of the 20 year planning period.

The capacity of the raw water system will need to be monitored to ensure that before the system reaches capacity, a detailed raw water system evaluation is undertaken.

A raw water intake system is generally designed for a 50 year water demand. Due to the limited land area on the First Nation it is unclear if there is enough develop able land to support the 50 year community. For the purposes of this study a 50 year water demand will be calculated and the required size of intake system will be recommended.

7.3.1 50 Year Water Demand Projection

The 50 year on-reserve population was estimated to be 1,217 people and based on the existing per capita water usage rate of 386 L/cap/day.

The following table is an estimate of the 50 Year water demands for Temagami First Nation.

Table 7.2: 50 Year Water Demand Estimate

2056 On-Reserve Population		1,217
Equivalent Water Demand (L/cap/day)		386
2056 Average Day Demand	(L/day)	469,762
	(L/sec)	5.4
Equivalent Population ,based on 280 L/cap/day (people)		1,678
Maximum Day Factor		2.5
Maximum Day Demand	(L/day)	1,174,405
	(L/sec)	13.6
Peak Hour Factor		3.75
Peak Hour Demand	(L/sec)	20.4

Assuming that the existing hydraulic breakpoint is maintained along with the same length of pipe,

a minimum 11" inside diameter pipe would be required to convey the 50 year maximum day demand.

The raw water supply system would consist of:

1. A new intake structure;
2. 194m intake pipe with zebra mussel control;
3. Mechanical & Electrical for new low lift pumps and new MCC.

Although it may not be required over the 20 year planning period, a Class C cost estimate is provided in the following table for a new raw water supply system.

Table 7.3: Raw Water System Upgrade - Cost Estimate

Section	ITEM	COST
A	Raw Water Supply System	$680,850
B	Insurance, Mobilization, Demobilization	$24,000
	Construction Sub-Total	**$704,850**
	Contingency @ 10%	**$70,485**
	Non-Construction Costs @ 15%	**$105,728**
	Class C Construction Cost Estimate - Total	**$881,063**

It was estimated that the raw water intake system would need an upgrade nearing the end of the 20 year planning period. It is recommended that a detailed raw water system evaluation study be completed in the 10-15 year phase of the 20 year capital plan to more accurately determine the time frame when the upgrade will be required.

7.4 20 Year Water Storage System

Reservoirs are required for storing sufficient potable water to buffer peak flows demands from the distribution system, to accommodate community emergencies, and to house a quantity of water to fight fires within the community area. The required storage volume for the 20 year Temagami First Nation community is 561.1 m^3 based on the 20 year maximum day water demands.

The existing water treatment plant has clearwell storage totalling 485.9 m^3 and as previously determined the required upgrade would be 561.1 m^3 - 485.9 m^3 = 75.2 m^3.

Two options that are considered for the 20 year community water storage are as follows:

1. Elevated storage reservoir;
2. Expand existing reservoir;

7.4.1 Option #1 - Elevated Storage Reservoir

Elevated reservoirs store sufficient volumes of water at a high elevation to pressurize the distribution system. This type of design accommodates peak hourly and fire flow demands without the use of variable speed high lift pumps or fire pumps. Neither does it depend on the supply of electricity or diesel fuel once the fire flow volume is contained in the reservoir. It does require constant speed high lift pumps and a clear well to convey treated water to the tower. A heat tracing system is required during the winter months for the feed pipe into the elevated reservoir. A chlorine trim station is also required to ensure the water prior to extended storage has a sufficient residual. Criteria used to locate a potential site for a storage reservoir are outlined as follows:

- The reservoir should be located at a high elevation to maintain a low design height thereby reducing capital costs.
- Location should typically be central to the existing community and future development.
- Should be located so that shadows are not cast on lots within the community.
- Should be located such that piping costs are minimized.

It should be noted that elevated storage reservoirs typically come in predetermined volumes for the ease of construction and reduce design costs. These are typically considerably larger than the required expansion. For a volume of this size an elevated storage reservoir would be overly large and costly, therefore it will not be considered further in the analysis.

7.4.2 Option #2 - Expand Existing Concrete Reservoir

This alternative would consist of constructing an expansion to the existing concrete reservoir at the water treatment plant. To accommodate the required storage capacity the following would be required:

- Site Works;
- Reinforced concrete;
- mechanical work (valves, pipe work etc.)

An estimated cost to construct an expansion the existing concrete reservoir is contained in the following table.

Table 7.4: Reservoir Expansion - Cost Estimate

ITEM	COST
Reservoir Expansion	$150,000

It should be noted that the 10 state standards recommends that above ground storage for potable water be used. It is also noted that construction of inground storage directly beside the existing concrete storage tank may not be feasible if rock blasting is required. Rock blasting could possibly cause damage to the existing infrastructure. This information would be revealed during detailed design of the system and if conditions dictate, above ground storage may be required.

7.5 20 Year Water Distribution System

Two alternatives were considered regarding the water distribution system. The two alternatives were based on servicing the two residential developments.

The project team selected residential development #2 as the preferred development.

7.5.2 Residential Alternative #2 - Island Water Servicing

This alternative consists of constructing an interior residential subdivision approximately 200m from the existing lagoon site. The proposed residential subdivision is located in the 310m contour and the existing water treatment plant is located in the 295m contour zone. This results in a difference in elevation of 15m or approximately 20 psi of water pressure. Typically a water pressure zone is delineated by a pressure difference of 30 psi, therefore this development is in the same pressure district as the water treatment plant.

Portions of this residential development beyond 20 years may require some form of pressure boosting due to being located in the 320m contour range. It is recommended a detailed investigation be completed beyond the 20 year planning period should these areas be developed.

7.5.4 Recommended 20 Year Water System

The following are the recommended components associated with the 20 year water system for the Temagami First Nation.

- Expand the treatment system to 4.1 L/sec including two new filtration trains each sized for 1.4 L/s, for a minimum total of 4.1 L/s, with one filter down;
- Expand existing building to accommodate additional equipment;

- Upgrade raw water system with a 11" inside diameter pipe and low lift station modifications.
- Expand treated water storage with an expansion to the existing inground concrete reservoir. If conditions dictate, install an above ground storage reservoir instead of the inground reservoir.
- Install a watermain from the existing water distribution system to the new development area.

Figure 7.2: 20 Year Water Distribution System illustrates the water servicing scenario.

7.6 20 Year Wastewater System

Previous sections of this study reviewed the needs of the Temagami First Nation community for the next 20 years based on the projected population growth of the reserve. Design criteria for potable water demands and wastewater generation were estimated. As well the housing requirements for the planning periods were outlined in detail.

Previous sections estimated the existing lagoon system will be at design capacity within 5 to 6 years and this corresponds to approximately 15 more homes based on a housing density of 2.6 people per home and an equivalent generation rate of 513 L/eq. cap/day.

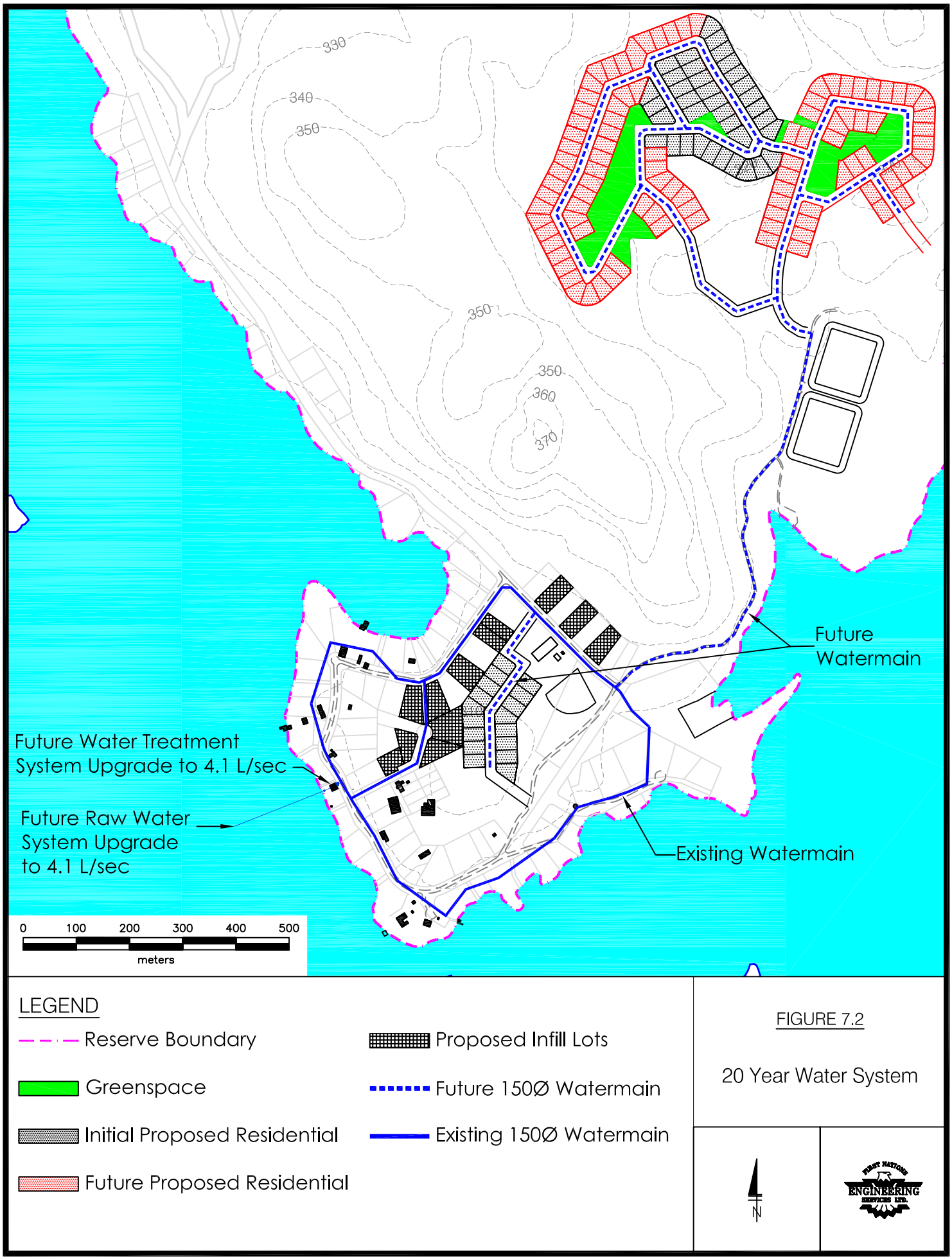
Temagami First Nation currently has 53 homes connected to the communal wastewater treatment system with the remainder of the homes using individual sewage treatment.

The objective of this section is to determine the most appropriate means of servicing Temagami's 20 Year Land Use Plan for wastewater collection, treatment, and disposal. Servicing alternatives are reviewed and assessed regarding its feasibility and benefit. A servicing alternative will then be recommended to the First Nation.

Wastewater Treatment Alternatives

Two alternatives to be analyzed for wastewater treatment of future residences and facilities are:

- Option #1 - Individual Septic Systems;
- Option #2 - Communal Wastewater Servicing.
- Option #3 - Construct New Wastewater System at Shinningwood Bay.


330
340
350
350
350
360
370
Future
Watermain
Future Water Treatment
System Upgrade to 4.1 L/sec
Future Raw Water
System Upgrade
to 4.1 L/sec
Existing Watermain
0
100
200
300
400
500
meters
LEGEND
Reserve Boundary
Greenspace
Initial Proposed Residential
Future Proposed Residential
Proposed Infill Lots
Future 150Ø Watermain
Existing 150Ø Watermain
FIGURE 7.2
20 Year Water System
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7.6.1 Option #1 - Individual Septic Systems

Forty-one (41) of the ninety-four (94) homes on Temagami First Nation use individual wastewater treatment systems (septic tanks/tile beds) for sewage collection, treatment and disposal. The septic tank acts as a sedimentation basin to reduce suspended solids and by virtue of the accumulated mass, anaerobic bacteria develop allowing further decomposition and digestion of the septage to occur. The field bed introduces the septic tank effluent into the environment, where aerobic bacteria develop in the soil media to further reduce concentrations of nutrients and particulate matter in the effluent as it travels through the soil regime. The recommended minimum septic tank sizes for residential dwellings are as follows:

Two Bedroom Residence or less - 3,600 litres (950 US gallons)
Three Bedroom Residence - 3,600 litres (950 US gallons)
Four or Five Bedroom Residence - 4,500 litres (1,190 US gallons)

Field beds should be located perpendicular to the groundwater flow direction to minimize the linear loading rate. In cases where ground slopes are excessive (i.e. greater than 5 percent), lot sizes may have to be increased to prevent down gradient breakout of partially treated wastewater.

A septic system consists of a concrete underground tank which receives the wastewater from the residence and a field bed for distribution of the effluent into the ground. The septic tank consists of two chambers, the first chamber provides for sedimentation, sludge digestion and storage. The second chamber provides additional sedimentation, sludge storage and protects against the discharge of sludge and other material. The field bed distributes the effluent from the septic tank evenly over the receiving ground area. A biomass is formed at the soil/sewage interface and the bacteria within the biomass feed on the organic matter in the effluent. The effluent is further treated by bacteria in the soil as it moves downward. The downward flow rate must be slow enough for the bacteria to effectively treat the effluent before it reaches the ground water. The field bed may become clogged due to the build up of a slimy black substance consisting of bacteria, organic wastes and other debris, due to overloading of the system with solids or age of the system.

7.6.1.1 Design Guidelines for Septic Tank Systems

The septic tank systems are to follow Health Canada Guidelines for the design and construction. Typically these types of systems require 1 to 2 acres for a properly designed system depending on soil type.

7.6.1.2 Existing Septic System Conditions

Rural Developments

Ninety-one (91%) percent of homeowners do not have any problems with existing rural septic systems according to the community questionnaire. The top problems were, it is undersized and needs to be emptied.

7.6.1.3 Class IV System Recommendation

Rural Developments

The existing rural developments are currently using septic systems for wastewater treatment and disposal. The minimal number of problems reported in the community questionnaire indicate the majority of the septic systems appear to be functioning adequately. The drawback to individual septic systems is the fact that they take up a large amount of land for a properly installed system to service one home.

For a communal wastewater collection system to be implemented and funded by INAC, the development must conform to the Level of Service Standards (LOSS) of 7.5 homes per hectare. The rural residences are scattered throughout the community and do not meet the LOSS requirements.

Due to the limited land base of the Temagami First Nation, it would not be prudent land use planning to recommend individual septic systems for new home developments because of the large land area required. It is recommended that all new home construction (rural and urban developments) be connected to the communal wastewater collection and treatment system, but the reality of the situation is that funding is based on the L.O.S.S. criteria and the rural areas do not meet the requirements to be considered for a communal collection system.

Although not recommended, areas where septic systems are the only viable option for wastewater treatment, soil tests shall be completed on all lots with representatives of Health Canada in attendance to in order to determine the type, location and size of septic tile fields. All components of individual septic system facilities shall be located in accordance with current Ministry of the Environment Regulations for in ground or raised beds.

7.6.2 Option #2 - Communal Wastewater Servicing

The previous section analyzed the use of individual wastewater treatment systems for the area of the First Nation where communal wastewater serving is not viable.

This section will concentrate on servicing the new residential development with communal wastewater services. The new residential subdivision has been designed to conform to INAC's L.O.S.S. requirements.

Two alternatives will be considered for the communal wastewater servicing option:

- Construct a new mechanical wastewater treatment plant;
- Expand the treatment capacity of the existing lagoon system

7.6.2.1 New Mechanical Wastewater Treatment Plant

This alternative consists of constructing a new mechanical treatment wastewater treatment facility.

This type of facility would require additional land to be designated for the facility including a 100m buffer zone. Since there is such limited developable land on the First Nation, it is not clear where a new plant could be located, but for the purposes of comparing the alternatives it will be assumed a new plant would be located closely to the existing lagoons since the existing collection system conveys the wastewater to this location. The following is a cost estimate of a new mechanical wastewater treatment plant.

Table 7.5: New Mechanical Wastewater Treatment Plant

ITEM	COST
Capital	$4,206,250
Operation and Maintenance	$200,000
20 Year Life Cycle	$7,085,984

7.6.2.2 Additional Cell to Existing Lagoon System

The existing wastewater system is designed for an average day flow of 91,250 L/day. The 20 year average day demand for the community was estimated to be 157,491 L/day and the system will require an upgrade of 157,491 - 91,250 = 66,241 L/day to accommodate the 20 year wastewater generation of the community. Based on an linear interpolation between the existing average day flow and the 20 year average day flow an upgrade to the system would be required in 5 to 6 years.

This section investigates the possibility of constructing an upgrade to the existing facultative lagoon system to treat the wastewater generated by the Village area and new residential subdivision.

There are two alternatives for expanding the existing lagoons treatment capacity:

- Construct an additional lagoon cell;
- Add an aeration unit and tertiary treatment to the lagoons

Construct an Additional Lagoon Cell

Facultative lagoons are relatively shallow bodies of wastewater contained in earthen basins. Lagoons are vessels in which the stabilization of wastes is brought about by a combination of aerobic, anaerobic, and facultative bacteria. Facultative lagoons have become popular with small communities because of their relatively low construction costs when the appropriate site conditions exist and their low operation and maintenance costs.

The main drawback of facultative lagoons is that they require a very significant area of flat land with impermeable soils. If impermeable soils are not available, manufactured liners for the lagoons may be considered. Another area of concern is that the level of treatment provided by using only facultative lagoons may not be sufficient. The Federal Government is currently developing regulations to replace the existing wastewater effluent guidelines. It is anticipated that the future wastewater regulations will have similar impacts on First Nations as the existing water regulation O. Reg.170/03 had on off reserve water systems.

The following will calculate the required land area for an additional lagoon cell to accommodate the 20 year average day demand of the community. It is assumed that the lagoons would be operated for 365 days and will need to maintain the same operating depth of 1.8m.

Table 7.6: Preliminary Sizing of an Additional Facultative Lagoon Cell

Total 20 year Wastewater Generation (L/day)	157,491
Design Capacity of Existing Lagoon Cells (L/day)	91,250
Additional Capacity Required (L/day)	66,241
Total Volume Required for One Cell based on a 365 Day Storage (litres)	24,177,965
(m^3)	24,178
Total Land Area Required for One Cell based on a 1.8m Operating Depth (m^2)	13,432
(hectares)	1.3
(acres)	3.3

Due to the limited amount of land available on the Temagami First Nation, the construction of an additional lagoon cell is not recommended and will not be further considered in this study.

7.6.2.3 Convert Facultative Lagoons to Aerated Lagoons

It was determined in a previous section that the existing facultative lagoon system is currently capable of treating the existing wastewater generation but would require an upgrade to accommodate the 20 year generation. Furthermore, the Federal Government is in the process of enacting regulations for effluent discharges from wastewater treatment facilities.

This approach requires that improvements be made to the existing lagoons to increase the capacity of the system. Detailed studies are required and would include an assimilative capacity study and a study to investigate the possibility of increasing the capacity. It is estimated a study would cost approximately $50,000 and would investigate the possible addition of an aeration system which would reduce the retention time of the lagoons allowing for more capacity.

For the purposes of this study we have estimated the addition of an aeration system would be in the $400,000 range.

The following is a cost estimate for adding an aeration system to the existing wastewater lagoon system.

Table 7.7: Upgrade Existing Lagoon - Cost Estimate

ITEM	COST
Lagoon Upgrade & Assimilative Capacity Study	$50,000
Lagoon Aeration System	$400,000
Sub - Total	$450,000
10% Contingency	$45,000
15% Non-Construction	$67,500
TOTAL	**$562,500**

7.6.2.4 Summary of Communal Wastewater Alternatives

The following is a summary of the alternatives considered for the communal servicing of the 20 year community.

1. **Mechanical Wastewater Treatment Plant** - construction of a new mechanical plant would require the use of additional land on the First Nation and is quite expensive compared to the other alternatives considered. One advantage of a mechanical treatment system is the treatment process could be augmented at a later date to meet the future regulations which are anticipated to be enacted well before the end of the 20 year planning period.
2. **Upgrade Existing Lagoon** - Upgrading the existing lagoon system with an aeration unit would provide additional treatment capacity. An advantage of this alternative would be no additional land area would be required. The detailed study would include an Assimilative Capacity Study on Lake Temagami and identify the additional capacity that would become available due to the aeration unit.

7.6.3 Option # 3 - Shinningwood Bay Stand Alone

As with the water system, an entire wastewater system would be required to service the residential development. Due to the limited information regarding the soils at this site, a full wastewater treatment and collection system will be used for comparison purposes. The collection system would consist of gravity sewers with maintenance holes, while an allowance has been included for wastewater treatment. The entire wastewater system is expected to cost approximately $5,000,000.

7.6.4 Recommended 20 Year Communal Wastewater System

Wastewater Treatment System

Based on capital cost estimates and the proposed regulations, it is recommended to upgrade the existing lagoons with aeration. It is unclear if the existing lagoons will meet future regulations since they have not been enacted yet. If these and/or further upgrades cannot meet the future regulations a mechanical wastewater treatment and disposal facility may need to be constructed on the First Nation.

The Project Team preferred upgrading the existing lagoon to an aerated system rather than expanding on the existing facultative cells. This will be carried through the remainder of the document.

Wastewater Collection System

The following section reviews wastewater collection for the new development areas. Temagami First Nation currently collects wastewater using the standard gravity collection system to a lift station within the village area.

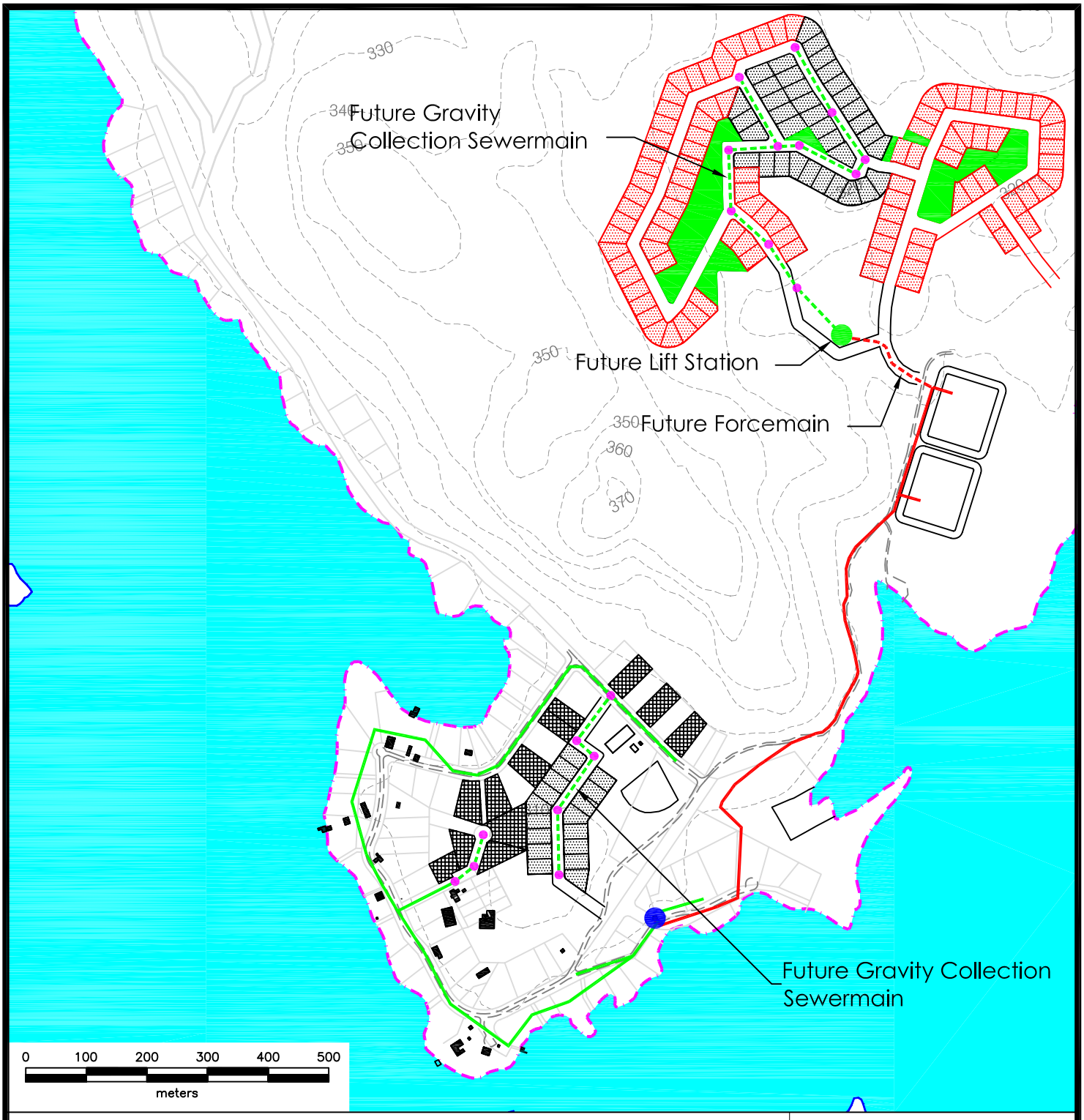
It is recommended that new developments are constructed using similar gravity collection sewers. Typically, a collection this size would require a minimum 200 mm diameter PVC collection pipe buried below the area frost line. The initial runs are sometimes sloped more to ensure velocities are appropriate through the remaining collection system. A pre-cast benched manhole is placed at a maximum separation distances of 120 meters on straight runs, while other bends beyond the pipe deflection limits must have an additional manhole.

The topography in the area of the new development is generally flat, but this area is at a higher elevation than the existing lagoon system. As a gravity sewer extends in length, along flat land so does its depth of bury. Lift stations may be required to raise the sewage to another collection system and ultimately the wastewater treatment facility. Assuming a minimum grade of 0.35% for all sewer and an initial grade on the first collection pipe of 1.0%, it has been found that a maximum length of 600 metres of gravity sewer can be used before burial costs become prohibitive. This will be used as a factor when considering the cost of a gravity collection system. Another consideration is the shallow depth of bedrock on the island. This factor will be accounted for in the cost estimates.

Design Infiltration Rates for Sewer

The Ministry of Environment (Appendix A, Sewer Design) recommends a maximum of 593 L/cap per day be used to account for peak extraneous flows into a sewer. This plus the 280 L/cap per day generation rate of sewage is equal to a 873 L/cap per day unit flow rate which will be used to size a gravity sewer pipe. Assuming a maximum length of 600 metres for gravity collection prior to pumping the sewage to a higher elevation (see previous discussion), and 25 metre lot frontages, the maximum number of lots that can be serviced on a length of collection main are 600 ÷ 25 x 2 = 48 lots. The housing density for the 20 year development is 2.6 people per home. This equates to a design maximum of 125 people serviced by a gravity collection pipe prior to it requiring pumping. The design flow rate is 125 people x 873 L/person per day ÷ 86,400 sec per day = 1.26 L/s.

The minimum grade for a 200 mm diameter sewer is 0.35% in order to maintain a flushing velocity of 0.60 m/s as recommended by the MOE. This results in a pipe capacity of 20 L/s. Therefore a 200 mm diameter pipe has sufficient capacity for the peak flows required in the design of a conventional gravity sewer. Figure 7.3: 20 Year Gravity Collection System, illustrates the gravity collection system for the 20 year planning period.



LEGEND

- Reserve Boundary
- Greenspace
- Initial Proposed Residential
- Future Proposed Residential
- Proposed Infill Lots
- Future Forcemain
- Existing Forcemain
- Future Sewermain
- Existing Sewermain
- Future Maintenance Hole
- Future Lift Station
- Existing Lift Station

FIGURE 7.3

20 Year Wastewater System

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7.7 20 Year Road Development

Due to the increasing number of vehicles that have been transported to the island, FNESL has been directed to incorporate road upgrades to meet MTO standards. The existing roadways were never designed to support vehicular traffic, but during the winter months when the ice road is built to the island, many residents bring their personal vehicles to the community.

7.7.1 Island Roads

Personal motor vehicles are increasingly brought from the mainland to the island by winter roads. This has raised community concern that pedestrians safety is more at risk due to the inadequate road geometry and construction. In addition, emergency response vehicles find it difficult to manoeuver to secluded areas of the Island when a vehicle is sharing the narrow roadway. Figure 7.4: Typical Roadway Cross Section, illustrates the proposed road construction.

Due to the nature of the topography on the First Nation a detailed study and design will need to be undertaken for the design of the roadways and drainage system. For the purposes of this study a general unit cost of $250/metre of roadway will be included for the costing analysis. The following table identifies the cost to upgrade the existing road system to MTO Standards.

Table 7.8: Roadway Upgrade Cost Estimate

ROAD	LENGTH (Km)	UNIT COST PER METRE	COST
White Bear Rd.	2.4	$350	$840,000
Eguana Rd.	0.6	$350	$210,000
Wa-Wa-Te Avenue	0.6	$350	$210,000
Ko-Ho-Ja Avenue	0.6	$350	$210,000
O-Jeeg Avenue	0.3	$350	$105,000
Lagoon Access Rd.	1.4	$350	$490,000
East Rd.	1.1	$350	$385,000
Beach Rd.	0.3	$350	$105,000
Turner Rd.	0.1	$350	$35,000
Admin Rd.	0.1	$350	$35,000
South Rd.	0.3	$350	$105,000
Garbage Transfer Stn. Rd.	0.2	$350	$70,000
Refuse Site Rd.	0.1	$350	$35,000
Future Rd.	0.2	$350	$70,000
School Rd.	0.1	$350	$35,000
Community Rd.	0.1	$350	$35,000
Total Length (km)	**8.50**		$2,975,000

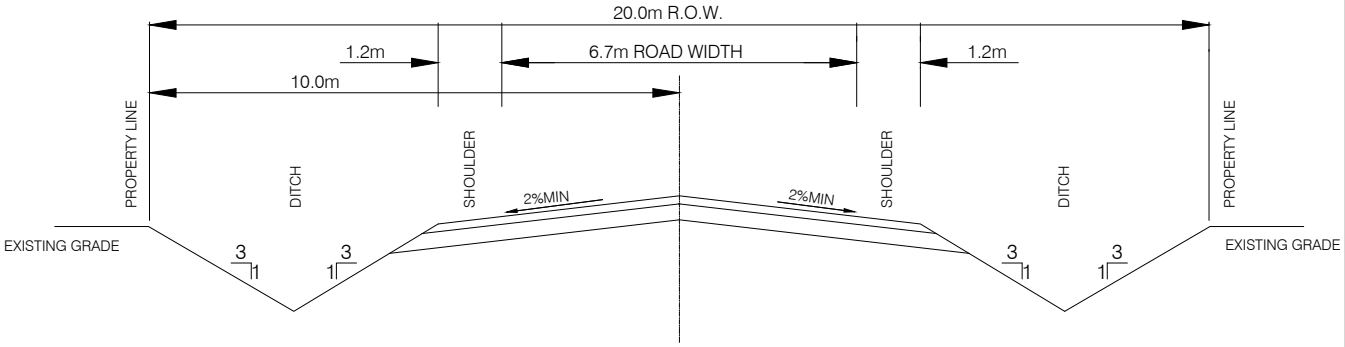

FIGURE 7.4

Typical Roadway
Cross Section

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As these are the existing roads on the First Nation, the new roads to be constructed will be designed to these same specifications. It will be assumed that these upgrades will take place over the entire 20 year planning period and therefore the costing will be distributed evenly over the phases of the Capital Planning Study.

7.7.2 Mainland Roads

For access to the Shinningwood Bay site, an access road approximately 750m long would be required. For the residential development it has been shown that 1,280m of roadway would be required along with 65 driveways. It is estimated that it would cost approximately $1,400,000 to construct these roadways.

7.8 20 Year Solid Waste Disposal

Currently all residents of the First Nation are required to haul their residential waste to the barge landing where it is hauled to the mainland and disposed of in the Temagami Landfill site. Previously it was identified that the existing solid waste sites are not appropriate for domestic waste disposal and should be closed and capped.

Recommended work for the closure included:

- The remaining material shall be covered with an impervious material and graded to a convex surface to promote drainage;
- The site should be drained to prevent surface waters from entering the refuse piles;
- vegetation should be established on cover materials.

It was also recommended that the First Nation purchase a garbage truck and implement a weekly collection program and household wastes be transported to the mainland by barge/winter road for disposal.

As previously mentioned in section 5, the First Nation and the Municipality of Temagami are working together to obtain funding for the expansion of the Briggs Landfill site along with the implementation of an effective solid waste management plan. The Briggs landfill site is nearing capacity and is in need of an expansion. As the landfill is approaching capacity, this will be included in Phase I of the Capital Plan.

7.8.1 Solid Waste Options

If the option for expanding the landfill is not viable, alternatives for solid waste disposal will need to be considered.

The Municipality of Temagami has indicated that they would consider to continue excepting the solid waste from the community. If the expansion of the Briggs landfill does not occur, accepting the waste from the First Nation would most likely be at an additional cost.

FNESL recommends a solid waste management study be undertaken to explore options for future solid waste disposal. Options that could be considered in the study include: land purchase off reserve for construction of a new landfill, extension to MTA and incineration on the First Nation. It is assumed that a study would cost approximately $50,000

8.0 RECOMMENDATIONS

This section contains the recommended development alternatives for the Temagami First Nation over the 20 year planning period.

The recommended projects are to occur over four phases of the 20 year planning period. Phase I is the first 5 years of the 20 year development. This phase includes a portion of the residential development and other projects which are deemed to have considerable importance and impact on the health and growth of the community. Phase II covers the second 5 years of development in the 20 year plan. It includes another portion of the projected housing requirements and additional projects that may be required. The third and fourth phase occurs over the remaining 10 years of the 20 year planning horizon. These include the rest of the housing needs and any remaining projects recommended in the Capital Planning Study.

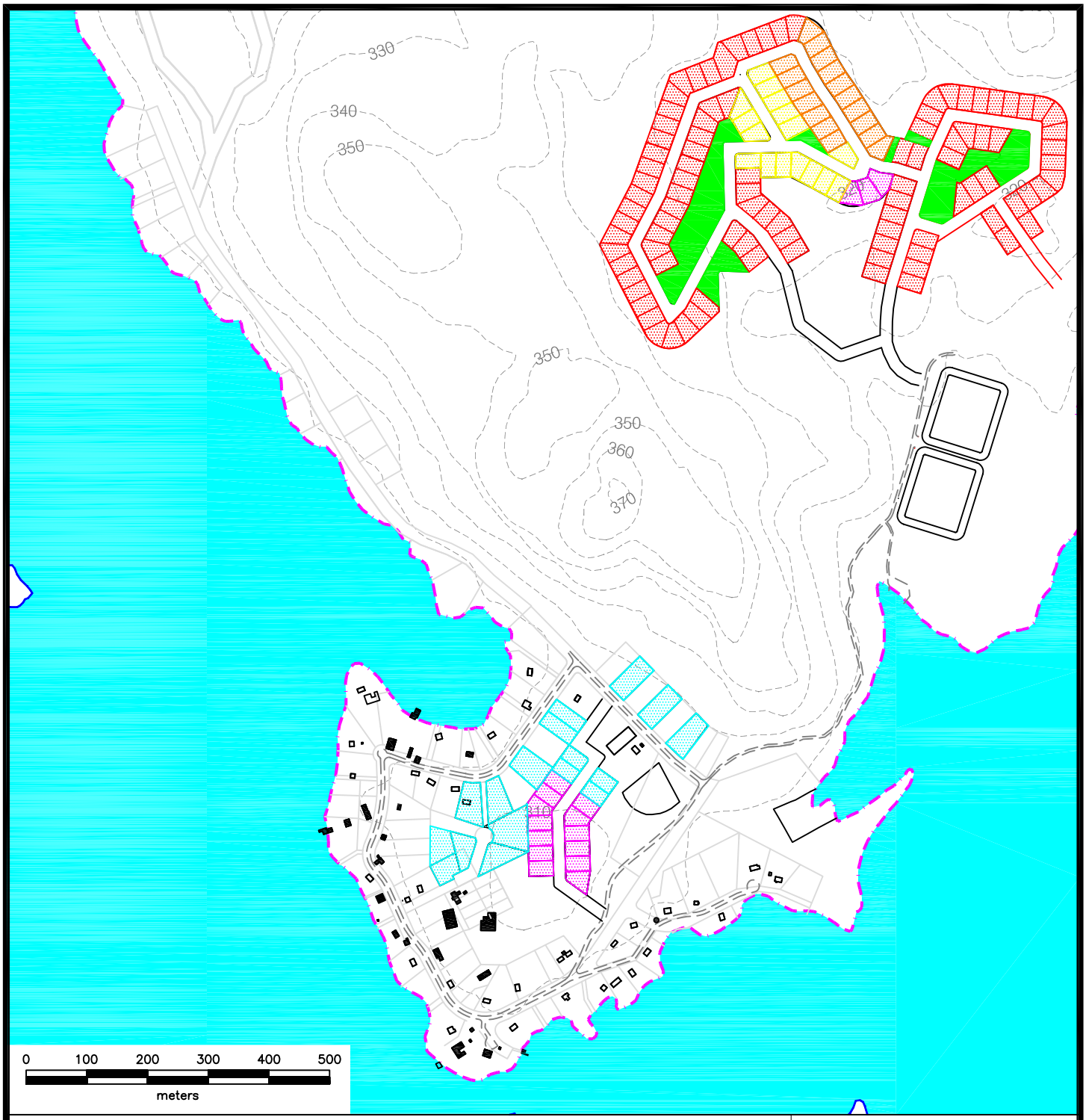
8.1 Residential and Non-Residential Development

The projected number of new lots required over the 20 year planning period is 86. It has been estimated that approximately 75 % of the new residential development will occur in an urban style subdivision, with the remaining homes being constructed in rural areas by individual homeowners along the shoreline. This results in 65 new homes in the subdivision and 21 constructed by individuals. Servicing infrastructure and roads should be planned for the proposed lots in each phase as follows: 16 lots in Phase I, 16 lots in Phase II, 16 lots in Phase III and 17 lots in Phase IV. Each lot is to be serviced by communal water and wastewater systems. Figure 8.1: Residential Phasing illustrates the residential lot requirements required over the 20 year planning period.

Numerous non-residential facilities were identified at project team meetings, in the community survey, the program manager survey and previous studies as being required over the 20 year planning period.

8.2 Municipal Servicing Recommendations

Section 7 identified the recommended water servicing alternatives, the recommended wastewater servicing alternatives, the recommended servicing alternatives for solid waste and roads. These will all be incorporated into the recommended phasing of the 20 year Temagami First Nation Community.



LEGEND

- Phase 1 16 Lots
- Phase 2 16 Lots
- Phase 3 16 Lots
- Phase 4 17 Lots
- Future Proposed Residential

FIGURE 8.1

Residential Phasing

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8.3 Phasing Summary of Recommended Projects

A list of the recommended works is as follows:

PHASE I - YEARS 1 TO 5: 2006 - 2011

Residential Development

1. Design and construct the infrastructure for infilling 12 lots within the core area.
2. Design and construct the infrastructure for expanding new 4 lots within the core area.

Solid Waste

1. Obtain funding for the landfill study or negotiate a MTA for Briggs landfill site.
2. Purchase garbage truck and implement weekly garbage pickup.
3. Proper closure of the existing landfill sites on the First Nation.

Roads

1. Upgrade 1/4 of the roads on the First Nation to MTO Standards. A priority list will be determined by the governing Chief and Council.

Community Facilities

1. Construct a new Multi-Use Complex including the following services,
   - First Nation Administration,
   - Community Hall,
   - Fire Hall,
   - Police Station,
   - Ambulance Services Garage,
2. Construct a seniors complex for independent living,

PHASE II - YEARS 6 TO 10: 2012 - 2016

Residential Development

1. Design and construct the infrastructure for expanding new 12 lots within the core area.
2. Design and construct the infrastructure for future 4 to 5 interior residential lots.

Solid Waste

1. Obtain funding for closure of the existing Landfill site, and decommission the landfill.

Water Supply

1. Upgrade existing water treatment system to 4.1 L/sec.
2. Expand existing inground reservoir.

Wastewater Collection, Treatment and Disposal

1. Conduct Assimilative Capacity,
2. Upgrade the lagoon from facultative to aeration system.

Roads

1. Upgrade 1/4 of the roads on the First Nation to MTO Standards. A priority list will be determined by the governing Chief and Council. Completing Phase II road upgrades will account for ½ of the road network upgrading.

Community Facilities

1. Child Welfare Home,
2. Youth Facility,
3. Four New Public Docks,
3. Tennis and Volleyball courts,
4. Restaurant,
5. Crafts and Hobby Centre,
6. Ceremony Lodge,
7. New Boathouse/Marina,
8. Church Repairs,
9. Cold Storage Repairs

PHASE III - YEARS 11 TO 15: 2017 - 2021

Residential Development

1. Design and construct the infrastructure for future 16 interior residential lots.

Water

1. Upgrade Raw Water System

Roads

1. Upgrade 1/4 of the roads on the First Nation to MTO Standards. A priority list will be determined by the governing Chief and Council. Completing Phase III road upgrades will account for 3/4 of the road network upgrading.

Community Facilities

1. Bingo Hall,
2. Radio Station,
3. Cell Tower,
4. Greenhouse.

PHASE IV - YEARS 16 TO 20: 2022 - 2026

Residential Development

1. Design and construct the infrastructure for remaining future 17 interior residential lots.

Roads

1. Upgrade the remaining roads to MTO Standards.

Community Facilities

1. Community owned water bottling facility.

8.4 20 Year Recommended Project Costing

Table 8.1: Phase I Recommended Projects Costing

Section A - Insurance, Mobilization/Demobilization					
1	Insurance, Mob/Demob	l.s.	1	$75,000	$75,000
				Sub-Total Section A	**$75,000**
Section B - Site Works					
1	Site Works	ls	1	$250,000	$250,000
				Sub-Total Section B	**$250,000**
Section C - Road Construction					
Existing Village - New Lots and Infills					
1	Residential Road Construction	m	100	$265	$26,500
2	Driveways	ea.	16	$1,500	$24,000
3	Rock Removal (1 m^3/metre)	m3	100	$250	$25,000
Existing Roads					
4	Upgrade 1/4 of roads to MTO Standards	ls	100%	$743,750	$743,750
				Sub-Total Section C	**$819,250**
Section D - Water System					
Existing Village - New Lots and Infills					
1	Watermain	m	100	$225	$22,500
2	Connect to Existing Watermain	ea.	1	$5,000	$5,000
3	Water Services	ea	16	$2,500	$40,000
4	Fire Hydrants	ea	1	$4,000	$4,000
5	Rock Removal (1 m^3/metre)	m3	100	$250	$25,000
				Sub-Total Section D	**$96,500**
Section E - Wastewater System					
Existing Village - New Lots and Infills					
1	Gravity Sewermain	m	100	$225	$22,500
2	Rock Removal (1m3/m)	m3	100	$250	$25,000
3	Maintenance Holes	ea	5	$5,000	$25,000
4	Connect to Existing Collection System	ea	2	$5,000	$10,000
5	New Residential Services	ea	4	$5,000	$20,000
6	Infill Services	ea	12	$5,000	$60,000
				Sub-Total Section E	**$162,500**
Section F - Community Facilities					
1	Multi Use Complex	ls	100%	$8,500,000	$8,500,000
2	Seniors Complex	ls	100%	$1,500,000	$1,500,000
				Sub-Total Section F	**$10,000,000**
Section G - Solid Waste					
1	Landfill Study	ls	100%	$50,000	$50,000
2	Garbage Truck	ls	100%	$250,000	$250,000
3	Landfill Closure	ls	100%	$300,000	$300,000
				Sub-Total Section F	**$600,000**
				Sub-Total Construction	**$12,003,250**
				Contingency (10%)	**$1,200,325**
				Non-Construction (15%)	**$1,800,488**
				TOTAL PHASE I	**$15,004,063**

Table 8.2: Phase II Recommended Projects Costing

Section A - Insurance, Mobilization/Demobilization					
1	Insurance, Mob/Demob	l.s.	1	$75,000	$75,000
				Sub-Total Section A	**$75,000**
Section B - Site Works					
1	Site Works	ls	1	$250,000	$250,000
				Sub-Total Section B	**$250,000**
Section C - Road Construction					
Existing Village - New Lots and Infills					
1	Residential Road Construction	m	250	$265	$66,250
2	Driveways	ea.	13	$1,500	$19,500
3	Rock Removal (1 m^3/metre)	m3	250	$250	$62,500
Interior Subdivision lots					
1	Residential Road Construction	m	1,350	$265	$357,750
2	Driveways	ea.	3	$1,500	$4,500
3	Rock Removal (1 m^3/metre)	m3	1,350	$250	$337,500
4	Hydro Extension	m	1,600	$100	$160,000
Existing Roads					
1	Upgrade 1/4 of roads to MTO Standards	ls	100%	$743,750	$743,750
				Sub-Total Section C	**$1,751,750**
Section D - Water System					
1	Water Treatment Plant Upgrades	l.s.	1	$1,555,000	$1,555,000
2	Reservoir Expansion	l.s.	1	$150,000	$150,000
Existing Village - New Lots and Infills					
1	Watermain	m	100	$225	$22,500
2	Connect to Existing Watermain	ea.	1	$5,000	$5,000
3	Water Services	ea	13	$2,500	$32,500
4	Fire Hydrants	ea	1	$4,000	$4,000
5	Rock Removal (1 m^3/metre)	m3	100	$250	$25,000
Interior Subdivision lots					
1	Watermain	m	1,350	$225	$303,750
2	Connect to Existing Watermain	ea.	1	$5,000	$5,000
3	Water Services	ea	3	$2,500	$7,500
4	Fire Hydrants	ea	9	$4,000	$36,000
5	Rock Removal (1 m^3/metre)	m3	1,350	$250	$337,500
				Sub-Total Section D	**$2,483,750**
Section E - Wastewater System					
1	Aerated Lagoon Cell	l.s.	1	$450,000	$450,000
Existing Village - New Lots and Infills					
1	Gravity Sewermain	m	100	$225	$22,500
2	Rock Removal (1m3/m)	m3	100	$250	$25,000
3	Maintenance Holes	ea	3	$5,000	$15,000
4	Connect to Existing Collection System	ea	2	$5,000	$10,000
5	Residential Services	ea	13	$5,000	$65,000
Interior Subdivision lots					
1	Gravity Sewermain	m	400	$225	$90,000
2	Forcemain	m	170	$200	$34,000
3	Rock Removal (1m3/m)	m3	570	$250	$142,500
4	Maintenance Holes	ea	7	$5,000	$35,000
5	Connect to Existing Collection System	ea	1	$5,000	$5,000
6	Residential Services	ea	3	$5,000	$15,000
7	Lift Station	ls.	1	$75,000	$75,000

				Sub-Total Section E	**$984,000**
Section F - Community Facilities					
1	Child Welfare Home	ls	100%	$500,000	$500,000
2	Youth Facility	ls	100%	$200,000	$200,000
3	Four New Public Docks	ls	100%	$1,000,000	$1,000,000
4	Tennis and Volleyball Courts	ls	100%	$200,000	$200,000
5	Restaurant	ls	100%	$200,000	$200,000
6	Crafts and Hobby Centre	ls	100%	$200,000	$200,000
7	Ceremony Lodge	ls	100%	$200,000	$200,000
8	Boathouse/Marina	ls	100%	$1,000,000	$1,000,000
				Sub-Total Section F	**$3,500,000**
				Sub-Total Construction	**$9,044,500**
				Contingency (10%)	**$904,450**
				Non-Construction (15%)	**$1,356,675**
				TOTAL PHASE II	**$11,305,625**

Table 8.3: Phase III Recommended Projects Costing

Section A - Insurance, Mobilization/Demobilization					
1	Insurance, Mob/Demob	l.s.	1	$75,000	$75,000
				Sub-Total Section A	**$75,000**
Section B - Site Works					
1	Site Works	ls	1	$250,000	$250,000
				Sub-Total Section B	**$250,000**
Section C - Road Construction					
Interior Subdivision lots					
1	Residential Road Construction	m	300	$265	$79,500
2	Driveways	ea.	16	$1,500	$24,000
3	Rock Removal (1 m^3/metre)	m3	300	$250	$75,000
4	Hydro Extension	m	300	$100	$30,000
Existing Roads					
1	Upgrade 1/4 of roads to MTO Standards	ls	100%	$743,750	$743,750
				Sub-Total Section C	**$952,250**
Section D - Water System					
1	Raw Water Supply System	l.s.	1	$680,850	$680,850
Interior Subdivision lots					
1	Watermain	m	300	$225	$67,500
2	Connect to Existing Watermain	ea.	1	$5,000	$5,000
3	Water Services	ea	16	$2,500	$40,000
4	Fire Hydrants	ea	2	$4,000	$8,000
5	Rock Removal (1 m^3/metre)	m3	300	$250	$75,000
				Sub-Total Section D	**$876,350**
Section E - Wastewater System					
Interior Subdivision lots					
1	Gravity Sewermain	m	195	$225	$43,875
2	Rock Removal (1m3/m)	m3	195	$250	$48,750
3	Maintenance Holes	ea	2	$5,000	$10,000
4	Connect to Existing Collection System	ea	1	$5,000	$5,000
5	Residential Services	ea	16	$5,000	$80,000
				Sub-Total Section E	**$187,625**
Section F - Community Facilities					
1	Bingo Hall	ls	100%	$1,000,000	$1,000,000
2	Radio Station	ls	100%	$500,000	$500,000
3	Cell Tower	ls	100%	$300,000	$300,000
4	Greenhouse	ls	100%	$200,000	$200,000
				Sub-Total Section F	**$2,000,000**
				Sub-Total Construction	**$4,341,225**
				Contingency (10%)	**$434,123**
				Non-Construction (15%)	**$651,184**
				TOTAL PHASE III	**$5,426,531**

Table 8.4: Phase IV Recommended Projects Costing

Section A - Insurance, Mobilization/Demobilization					
1	Insurance, Mob/Demob	l.s.	1	$75,000	$75,000
				Sub-Total Section A	**$75,000**
Section B - Site Works					
1	Site Works	ls	1	$250,000	$250,000
				Sub-Total Section B	**$250,000**
Section C - Road Construction					
Interior Subdivision Lots					
1	Residential Road Construction	m	300	$265	$79,500
2	Driveways	ea.	17	$1,500	$25,500
3	Rock Removal (1 m^3/metre)	m3	300	$250	$75,000
4	Hydro Extension	m	300	$100	$30,000
Existing Roads					
1	Upgrade 1/4 of roads to MTO Standards	ls	100%	$743,750	$743,750
				Sub-Total Section C	**$953,750**
Section D - Water System					
1	Raw Water Supply System	l.s.	1	$680,850	$680,850
Interior Subdivision lots					
1	Watermain	m	300	$225	$67,500
2	Connect to Existing Watermain	ea.	1	$5,000	$5,000
3	Water Services	ea	17	$2,500	$42,500
4	Fire Hydrants	ea	2	$4,000	$8,000
5	Rock Removal (1 m^3/metre)	m3	300	$250	$75,000
				Sub-Total Section D	**$878,850**
Section E - Wastewater System					
Interior Subdivision lots					
1	Gravity Sewermain	m	195	$225	$43,875
2	Rock Removal (1m3/m)	m3	195	$250	$48,750
3	Maintenance Holes	ea	2	$5,000	$10,000
4	Connect to Existing Collection System	ea	1	$5,000	$5,000
5	Residential Services	ea	17	$5,000	$85,000
				Sub-Total Section E	**$192,625**
Section F - Community Facilities					
1	Water Bottling Facility	ls	100%	$2,000,000	$2,000,000
				Sub-Total Section F	**$2,000,000**
				Sub-Total Construction	**$4,350,225**
				Contingency (10%)	**$435,023**
				Non-Construction (15%)	**$652,534**
				TOTAL PHASE IV	**$5,437,781**

Table 8.5: Phased Recommended Projects Costing

ITEM	Phase I	Phase II	Phase III	Phase IV	Item Totals
Insurance Mob/Demob	$75,000	$75,000	$75,000	$75,000	**$300,000**
Site Works	$250,000	$250,000	$250,000	$250,000	**$1,000,000**
Water Supply, Treatment and Distribution	$96,500	$2,483,750	$876,350	$878,850	**$4,335,450**
Wastewater Collection and Treatment	$162,500	$984,000	$187,625	$192,625	**$1,526,750**
Road Construction	$819,250	$1,751,750	$952,250	$953,750	**$4,477,000**
Solid Waste	$600,000	$0	$0	$0	**$600,000**
Community Facilities	$10,000,000	$3,500,000	$2,000,000	$2,000,000	**$17,500,000**
Phasing Construction Totals	**$12,003,250**	**$9,044,500**	**$4,341,225**	**$4,350,225**	**$29,739,200**
Engineering and Non-Const. @ 15%	**$1,800,488**	**$1,356,675**	**$651,184**	**$652,534**	**$4,460,880**
Contingency @ 10%	**$1,200,325**	**$904,450**	**$434,123**	**$435,023**	**$2,973,920**
TOTAL PROJECT COSTS	**$15,004,063**	**$11,305,625**	**$5,426,531**	**$5,437,781**	**$37,174,000**

Appendix I - Detailed Cost Estimates

Class D Estimate - Development #1 & Associated Infrastructure

Section A - Insurance, Mobilization/Demobilization					
1	Insurance, Mob/Demob	l.s.	1	$305,000	$305,000
				Sub-Total Section A	**$305,000**
Section B - Site Works					
1	Site Works	l.s.	1	$1,000,000	$1,000,000
				Sub-Total Section B	**$1,000,000**
Section C - Road Construction					
Existing Village - New Lots and Infills					
1	Residential Road Construction	m	530	$265	$140,450
2	Driveways	ea.	26	$1,500	$39,000
3	Rock Removal (1 m^3/metre)	m3	530	$250	$132,500
Interior Subdivision lots					
1	Residential Road Construction	m	1,285	$265	$340,525
2	Driveways	ea.	39	$1,500	$58,500
3	Rock Removal (1 m^3/metre)	m3	1,285	$250	$321,250
4	Hydro Extension	m	1,815	$100	$181,500
				Sub-Total Section C	**$1,213,725**
Section D - Water System					
1	Raw Water Supply System	l.s	1	$680,850	$680,850
2	Water Treatment Plant Upgrade	l.s.	1	$1,555,000	$1,555,000
3	Reservoir Expansion	l.s.	1	$150,000	$150,000
Existing Village - New Lots and Infills					
1	Watermain	m	530	$225	$119,250
2	Connect to Existing Watermain	ea.	1	$5,000	$5,000
3	Water Services	ea	26	$2,500	$65,000
4	Fire Hydrants	ea	4	$4,000	$16,000
5	Rock Removal (1 m^3/metre)	m3	530	$250	$132,500
6	Non-Residential PRV (2 per service)	ea	24	$1,500	$36,000
7	Individual Home PRV (2 per service)	ea	158	$1,500	$237,000
Interior Subdivision lots					
1	Watermain	m	1,285	$225	$289,125
2	Connect to Existing Watermain	ea.	1	$5,000	$5,000
3	Water Services	ea	39	$2,500	$97,500
4	Fire Hydrants	ea	9	$4,000	$36,000
5	Rock Removal (1 m^3/metre)	m3	1,285	$250	$321,250
				Sub-Total Section D	**$3,745,475**
Section E - Wastewater System					
1	Aerated Lagoon Cell	l.s.	1	$450,000	$450,000
Existing Village - New Lots and Infills					
1	Gravity Sewermain	m	385	$225	$86,625
2	Rock Removal (1m3/m)	m3	385	$250	$96,250
3	Maintenance Holes	ea	8	$5,000	$40,000
4	Connect to Existing Collection System	ea	1	$5,000	$5,000
5	New Residential Services	ea	14	$5,000	$70,000
6	Infill Services	ea	12	$5,000	$60,000
7	Lift Station Upgrades	ls.	1	$25,000	$25,000
Interior Subdivision lots					
1	Gravity Sewermain	m	915	$225	$205,875
2	Forcemain	m	280	$200	$56,000
3	Rock Removal (1m3/m)	m3	1,195	$250	$298,750
4	Maintenance Holes	ea	10	$5,000	$50,000
5	Connect to Existing Collection System	ea	1	$5,000	$5,000

6	Residential Services	ea	39	$5,000	$195,000
7	Lift Station	ls.	1	$75,000	$75,000
				Sub-Total Section E	**$1,718,500**
				Sub-Total Construction	**$7,982,700**
				Contingency (10%)	**$798,270**
				Non-Construction (15%)	**$1,197,405**
				TOTAL	**$9,978,375**

Residential Alternative #2 & Infrastructure Class D

The following is a cost estimate for development of Residential Development #2:

Class D Estimate - Development #2 & Associated Infrastructure

Section A - Insurance, Mobilization/Demobilization					
1	Insurance, Mob/Demob	l.s.	1	$300,000	$300,000
				Sub-Total Section A	**$300,000**
Section B - Site Works					
1	Site Works	ls	1	$1,000,000	$1,000,000
				Sub-Total Section B	**$1,000,000**
Section C - Road Construction					
Existing Village - New Lots and Infills					
1	Residential Road Construction	m	350	$265	$92,750
2	Driveways	ea.	29	$1,500	$43,500
3	Rock Removal (1 m^3/metre)	m3	350	$250	$87,500
Interior Subdivision lots					
1	Residential Road Construction	m	1,960	$265	$519,400
2	Driveways	ea.	36	$1,500	$54,000
3	Rock Removal (1 m^3/metre)	m3	1,960	$250	$490,000
4	Hydro Extension	m	2,310	$100	$231,000
				Sub-Total Section C	**$1,518,150**
Section D - Water System					
1	Raw Water Supply System	l.s.	1	$680,850	$680,850
2	Water Treatment Plant Upgrades	l.s.	1	$1,555,000	$1,555,000
3	Reservoir Expansion	l.s.	1	$150,000	$150,000
Existing Village - New Lots and Infills					
1	Watermain	m	350	$225	$78,750
2	Connect to Existing Watermain	ea.	1	$5,000	$5,000
3	Water Services	ea	29	$2,500	$72,500
4	Fire Hydrants	ea	3	$4,000	$12,000
5	Rock Removal (1 m^3/metre)	m3	350	$250	$87,500
Interior Subdivision lots					
1	Watermain	m	1,960	$225	$441,000
2	Connect to Existing Watermain	ea.	1	$5,000	$5,000
3	Water Services	ea	36	$2,500	$90,000
4	Fire Hydrants	ea	12	$4,000	$48,000
5	Rock Removal (1 m^3/metre)	m3	1,960	$250	$490,000
				Sub-Total Section D	**$3,715,600**
Section E - Wastewater System					
1	Aerated Lagoon Cells	l.s.	1	$450,000	$450,000
Existing Village - New Lots and Infills					
1	Gravity Sewermain	m	375	$225	$84,375
2	Rock Removal (1m3/m)	m3	375	$250	$93,750
3	Maintenance Holes	ea	8	$5,000	$40,000
4	Connect to Existing Collection System	ea	2	$5,000	$10,000
5	New Residential Services	ea	17	$5,000	$85,000
6	Infill Services	ea	12	$5,000	$60,000
7	Lift Station Upgrades	ls.	1	$25,000	$25,000
Interior Subdivision lots					
1	Gravity Sewermain	m	785	$225	$176,625
2	Forcemain	m	170	$200	$34,000
3	Rock Removal (1m3/m)	m3	955	$250	$238,750

4	Maintenance Holes	ea	11	$5,000	$55,000
5	Connect to Existing Collection System	ea	1	$5,000	$5,000
6	Residential Services	ea	36	$5,000	$180,000
7	Lift Station	ls.	1	$75,000	$75,000
				Sub-Total Section E	**$1,612,500**
				Sub-Total Construction	**$8,146,250**
				Contingency (10%)	**$814,625**
				Non-Construction (15%)	**$1,221,938**
				TOTAL	**$10,182,813**

Residential Alternative #3 & Infrastructure Class D

This alternative consists of developing a new residential development at Shinningwood Bay on the mainland.

Class D Estimate - Development #3 & Associated Infrastructure

Item	Description	Unit	Estimated Quantity	Unit Price	Amount
Section A - Insurance, Mobilization/Demobilization					
1	Insurance, Mob/Demob	l.s.	1	$500,000	$500,000
				Sub-Total Section A	**$500,000**
Section B - Site Works					
1	Site Works	l.s.	1	$1,000,000	$1,000,000
				Sub-Total Section B	**$1,000,000**
Section C - Road Construction					
1	Community Access Road	m	750	$265	$198,750
2	Residential Road Construction	m	1,280	$265	$339,200
3	Driveways	ea.	65	$1,500	$97,500
4	Rock Removal (1 m^3/metre)	m3	2,030	$250	$507,500
5	Hydro Extension	m	2,030	$100	$203,000
				Sub-Total Section C	**$1,345,950**
Section D - Water System					
1	Raw Water Supply System	l.s.	1	$1,000,000	$1,000,000
2	Water Treatment Plant	l.s.	1	$4,000,000	$4,000,000
3	Watermain	m	1,280	$225	$288,000
4	Water Services	ea	65	$2,500	$162,500
5	Fire Hydrants	ea	9	$4,000	$36,000
6	Rock Removal (1 m^3/metre)	m3	1,280	$250	$320,000
				Sub-Total Section D	**$5,806,500**
Section E - Wastewater System					
1	Maintenance Holes	ea	11	$5,000	$55,000
2	Gravity Sewermain	m	1,280	$225	$288,000
3	Wastewater Treatment System	l.s.	1	$4,000,000	$4,000,000
4	Services	ea	65	$5,000	$325,000
5	Lift Station	l.s	1	$75,000	$75,000
6	Rock Removal (1 m^3/metre)	m3	1,280	$250	$320,000
				Sub-Total Section E	**$5,063,000**
				Sub-Total Construction	**$13,715,450**
				Contingency (10%)	**$1,371,545**
				Non-Construction (15%)	**$2,057,318**
				TOTAL	**$17,144,313**

APPENDIX II - HISTORICAL POPULATION AVERAGE ANNUAL GROWTH RATE

Reserve & Crown Land (TOTAL)	BASE YEAR 72	BASE YEAR 96	BASE YEAR 1990
81			
85	4.94%		
89	4.82%		
94	5.09%		
99	5.14%		
103	4.92%		
105	4.42%		
106	3.92%		
109	3.78%		
110	3.46%		
113	3.39%		
115	3.24%		
114	2.89%		
114	2.66%		
113	2.41%		
116	2.42%		
118	2.38%		
123	2.49%		
124	2.39%		
129	2.48%		4.03%
130	2.39%		2.39%
136	2.50%		3.13%
133	2.28%		1.77%
135	2.25%		1.71%
198	3.79%		8.11%
202	3.72%	2.02%	7.22%
208	3.69%	2.49%	6.68%
214	3.66%	2.62%	6.25%
222	3.67%	2.90%	6.00%
228	3.63%	2.86%	5.69%
231	3.55%	2.60%	5.32%
217	3.23%	1.32%	4.40%
220	3.17%	1.33%	4.18%
233	3.25%	1.83%	4.29%
241	**3.26%**	**1.98%**	**4.24%**

Off Reserve	BASE YEAR 72	BASE YEAR 96	BASE YEAR 1990	
79				
83	4.43%			**INTERPOLATED VALUE**
86	4.34%			
86	2.87%			
87	2.44%			
83	0.99%			
84	1.03%			
88	1.55%			
90	1.64%			
91	1.58%			
92	1.54%			
93	1.49%			
91	1.19%			
97	1.59%			
118	2.91%			
152	4.46%			
182	5.35%			
256	7.16%			
268	7.02%			
296	7.20%		10.45%	
303	6.95%		6.33%	
298	6.53%		3.60%	
306	6.35%		3.37%	
334	6.47%		4.50%	
289	5.55%		1.27%	
299	5.47%	3.46%	1.58%	
307	5.36%	3.07%	1.71%	
325	5.38%	3.99%	2.17%	
337	5.32%	3.92%	2.32%	
354	5.31%	4.14%	2.56%	
377	5.35%	4.53%	2.88%	
404	5.41%	4.90%	3.21%	
419	5.35%	4.75%	3.24%	
417	5.17%	4.16%	2.99%	
418	**5.02%**	**3.76%**	**2.82%**	**2006 On Reserve DATA RECIE**
				2006 Off -reserve data from Ina
				2006 Total Population is a tota

Reserve & Crown Land (TOTAL)	BASE YEAR 72	BASE YEAR 96	BASE YEAR 1990
81			
85	4.94%		
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Off Reserve	BASE YEAR 72	BASE YEAR 96	BASE YEAR 1990	
79				
83	4.43%			**INTERPOLATED VALUE**
86	4.34%			
86	2.87%			
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418	**5.02%**	**3.76%**	**2.82%**	**2006 On Reserve DATA RECIE**
				2006 Off -reserve data from Ina
				2006 Total Population is a tota