CITY OF GREATER SUDBURY

OFFICIAL PLAN REVIEW

INFRASTRUCTURE BACKGROUND STUDY

December 2005

"This report is protected by copyright and was prepared by Dennis Consultants a division of R. V. Anderson Associates Limited for the account of the City of Greater Sudbury. It shall not be copied without permission. The material in it reflects our best judgment in light of the information available to Dennis Consultants at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Dennis Consultants accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report."

DENNIS CONSULTANTS
CIVIL ENGINEERS
a division of R.V. Anderson Associates Limited

City of Greater Sudbury – Official Plan Review
Infrastructure Background Study

Table of Contents

Figures

City of Greater Sudbury – Official Plan Review
Infrastructure Background Study
Table of Contents

Figures Continued

Tables

City of Greater Sudbury – Official Plan Review
Infrastructure Background Study
Table of Contents

Tables Continued

Appendices

1.0 INTRODUCTION

1.1 Background

The City of Greater Sudbury is developing a single, up-to-date Official Plan that will foster sustainable growth, economic development and a high quality of life to attract people and investment.

The Official Plan of the Sudbury Planning Area was originally released in 1978. As mandated by the Province, the City of Greater Sudbury has now initiated a review and update of this Official Plan. The Official Plan Review process has been divided into two phases. Phase I involves various Background Studies that will provide the technical foundation from which to develop sound policies and will include the following:

- Healthy Community Study
- Transportation Study
- Parks and Leisure / Master Plan
- Infrastructure Study
- Storm Water Study
- Rural & Waterfront Study
- Agricultural Study
- Natural Heritage
- Housing Study

Other City initiatives, such as the Economic Development Strategic Plan and the Senior's Study, will also complement and inform the plan. Phase II involves the preparation of the Official Plan and will begin in the Fall of 2004 and carries on through the end of 2005.

1.2 Infrastructure Background Study Overview

The Infrastructure Background Study has been completed to provide technical information on critical issues related to the provision of physical water and wastewater infrastructure to facilitate projected growth of the City of Greater Sudbury. The study will identify existing and future constraints on development within the city, and highlight opportunities and areas, which can support Future growth.

Population projections provided by the City's Planning Consultant Meridian formed the bases for our

review and analysis of the infrastructure capacity. This information was distributed in designated growth areas provided by City Staff for each community.

To facilitate a cohesive approach to the presentation of data, relative to other background studies, the Infrastructure Background Study was divided into two phases. At the request of the City, the two phases mirrored the Municipal Class EA approach being followed by the Transportation Background Study. However, the Infrastructure Background Study has not been completed in strict accordance with the Municipal Class Environmental Assessment Process.

Phase One of a typical EA process deals with the definition of the problem or opportunity presented to the community. For the Infrastructure Background Study, Phase One involved the review of the existing state of the water and wastewater infrastructure systems within the City of Greater Sudbury.

Phase Two of the EA process, normally deals with the development of alternatives to the problem identified in Phase One. For the Infrastructure Background Study, Phase Two involved the analysis of the impact of the projected development/growth on the infrastructure systems and the identification of constraints and opportunities within these systems, as it relates to the projected development/growth.

1.3 Study Scope

The Infrastructure Background Study covered the following items within its scope.

- Analysis of existing and proposed land use patterns, population projections and financial forecasts for the City of Greater Sudbury.
- Analysis of existing water and wastewater system capacities and conditions
- Identification of actual and potential environmental constraints.
- Projections of future water and wastewater flows.
- Assist in the development of infrastructure policies for the Official Plan and the development of a long-term servicing strategy for water and wastewater systems.
- Identification of ten priority areas within the City of Greater Sudbury requiring infrastructure improvements.
- Development of a twenty-year water and wastewater infrastructure improvement plan.
- Development of water and wastewater reserve capacity tracking tool for use by City Staff.

1.4 Study Objectives

The objectives of the study were as follows:

- Analyze existing infrastructure systems and identify critical infrastructure problems related to water supply and wastewater disposal over the next twenty years.
- Review water and wastewater needs and opportunities for the City of Greater Sudbury
- Provide a clear picture of available capacity within the water and wastewater systems related to development and future growth within the City of Greater Sudbury. The results of this long-term forecast will be utilized to assist in the City's budget process.
- Define critical, long-term needs of the community with respect to water and wastewater versus the "wants" of the community.

1.5 Public Consultation

As part of the study process, two public information sessions were held to present information related to the phases described above, and gather input from the public, stakeholders and review agencies. The sessions followed a "drop in" format with display boards to present project information. City of Greater Sudbury Staff from both the Planning and Public Works Departments along with project team members from Dennis Consultants Ltd. were on hand to address the questions and concerns of attendees.

Public Information Session #1 was held on the dates and locations listed below.

Date:	January 21, 2004	January 21, 2004	January 22, 2004
Time:	1:00 - 3:00 P.M.	7:00 – 9:00 P.M.	7:00 – 9:00 P.M.
Location:	Lionel Lalonde Centre	Valley East Library	Tom Davies Square

Information presented at this session included:

- The study purpose and scope.
- Existing infrastructure systems and capacity reviews.
- A description of the next steps in the study.

Public information Session #2 was held on the dates and locations listed below:

Date:	June 14, 2004	June 14, 2004	June 15, 2004
Time:	1:00 - 3:00 P.M.	7:00 – 9:00 P.M.	7:00 – 9:00 P.M.
Location:	Lionel Lalonde Centre	Valley East Arena	Tom Davies Square

Information presented at this location included:

- Explanation of the Official Plan Review Process and the significance of the background studies being completed.
- Identification of system/capacity constraints related to projected growth/development.
- Descriptions of the growth/development scenarios utilized for analysis of the infrastructure.
- A description and outline of the next steps of the study.

2.0 EXISTING CONDITIONS

2.1 Infrastructure Systems Overview

The infrastructure systems under review in this study are defined more clearly below.

2.1.1 Water System

The water infrastructure system is comprised of the water treatment plants, well systems, pump stations, and the distribution network of pipes that convey the water from the source to the customers tap.

The function of the water infrastructure system is to provide potable drinking water to the constituents of the City of Greater Sudbury as well as providing and maintain water supply for fire protection.

Wastewater System

The wastewater infrastructure system is comprised of the wastewater treatment plants, lagoons, pump stations, and the collection network of pipes that convey wastewater from the customers, back to the treatment plant and on into the receiving streams.

The function is to provide drainage of wastewater (sewage) from the homes and businesses within the City of Greater Sudbury and provide treatment to an acceptable level to allow it to re-enter the natural environment.

Both of these infrastructure systems are operated and maintained in accordance with Ministry of Environment regulations to ensure that safe potable water is provide to the public and to preserve the natural environment through the appropriate treatment of municipal wastewater flows.

2.2 Water Treatment And Distribution System

2.2.1 Water Treatment Facilities

The City of Greater Sudbury owns and operates two (2) water treatment facilities and a number of well fields to provide potable water supply to the residents of the City of Greater Sudbury. In addition, the City also purchases potable water from well fields/treatment facilities that are privately owned and operated by either INCO or Falconbridge, for the communities of Levack, Onaping, Falconbridge, Copper Cliff, Lively and Walden.

The widely dispersed nature of the communities, that make up the City of Greater Sudbury, make it cost prohibitive and operationally challenging to interconnect these communities and systems. As a

result the communities were developed with their own independent and decentralized water systems. However, as growth continues and the communities grow, efforts are being made to interconnect these systems.

2.2.2 Water Distribution System

The water distribution system is comprised of the following infrastructure assets:

Water Distribution Pipes	870 km
Water Services	42,000
Hydrants	4,650
Valves	7,500
Booster Stations	8
Elevated Tanks	5
Ground Level Reservoirs	1

NOTE: Decommissioned assets have not been included in the above totals. Offline assets which are considered operational, have been included.

Based on budget estimates, the replacement value of this system would be approximately $0.7 billion.

The water Infrastructure systems under review for this study is graphically depicted in Figures 2.3a to 2.3h.

2.3 Wastewater Treatment And Collection System

2.3.1 Wastewater Treatment Facilities

The City of Greater Sudbury owns and operates ten (10) wastewater treatment plants. These plants all have different rated capacities related to size of their service area. The City also operates four (4) lagoons, one each in Capreol, Chelmsford, Garson and Wahnapitae.

Each of the fourteen (14) facilities is operated to a Ministry of the Environment Certificate of Approval.

Similar to the water infrastructure facilities, the wastewater treatment facilities are widely dispersed throughout the City due to the distance between communities and the geographic nature of the region.

2.3.2 Wastewater Collection System

The wastewater collection system is comprised of the following items:

Wastewater Collection Pipes	713 km
Sewage Forcemains	65 km
Rock Tunnel	15 km
Manholes	10703
Lift Stations	75

Based on budget estimates, the replacement value of this system is approximately $0.6 billion.

The wastewater infrastructure systems under review for this study are graphically depicted in Figures 2.3.a, to 2.3.h

2.3.3 Population Figures and Distribution

Based on 2001 Stats Can Census data and background data provided by the City of Greater Sudbury, the City has a current population of 155,225 and 63,020 households.

In 2001, the City of Sudbury, the former Regional Municipality of Sudbury and the six (6) local area municipalities were amalgamated to form the City of Greater Sudbury. The amalgamated City occupies a geographic area of approximately 3,627 square kilometers.

Various levels of independent and decentralized water and wastewater infrastructure exist within the amalgamated City, due to the past structure of local governance, the development of the communities, associations with local industry, the large geographic areas of the City and the resulting distances between each of the outlying communities.

3.0 INFRASTRUCTURE SYSTEMS CAPACITY REVIEW

3.1 General

According to the Ministry of Environment, Guideline D-5 – "Planning for Sewage and Water Services", an effective means of planning for servicing infrastructure needs, is the preparation of servicing strategies or servicing plans. A key component to the development of servicing strategies is to target areas for growth and development, and support development. An integral part of this process is determining and monitoring the capacities of various infrastructure systems including the status of the uncommitted reserve capacity, which directly relates to the capacity of the water and wastewater treatment facilities.

As such, the City in past years incorporated an annual review of their water / wastewater plant capacities into their planning and engineering activities. The basis for their annual review is the Ministry of the Environment Procedure D-5-1 – "Calculating and Reporting Uncommitted Reserve Capacity at Sewage and Water Treatment Plants". Copies of these Guidelines D-5 and D-5-1 are included in Appendix A.

This annual report compares the use or demand on the water and wastewater facilities and identifies the uncommitted or available capacity for future development.

The drawback to this type of review is that it does not "directly" take into consideration, water storage capabilities, and the condition of the existing infrastructure, effluent quality parameters or water quality parameters, limitations with sewage collections or water distribution systems.

Therefore a primary focus of this Infrastructure Background Study was to review and analyze the servicing and infrastructure systems with consideration of the above factors and their impact on the capacity and capabilities of the systems.

This analysis was completed on three levels, namely the plant level, the pumping / lift station level and the distribution/collection system level.

a) The first level of analysis dealt with the water and wastewater treatment plants. At this level the capacities of the water and wastewater plants as well as the treatment ability, and operational limitations of the facility were reviewed and checked against existing and forecasted increases in flow based on projected population growth and development.

b) The second level of analysis dealt with water and wastewater pumping stations, their respective areas of coverage within the community, and their operational condition.

c) The third level of analysis involved a high-level review of the available capacity of the water distribution and wastewater collection systems (trunk sewer and watermains, force mains and large diameter collectors). This review focused on the areas of the systems related to forecasted development and hydraulic capacity of the system (designated lands in the official plan). No review was carried out on the sections of the systems related to approved plans of subdivision since these would have previously been formally reviewed by City of Greater Sudbury Staff as part of the approval process.

The results of our review are summarized below.

3.2 Water Infrastructure System Analysis - Existing Conditions

3.2.1 Water Plant Review

MOE Guidelines for planning water services utilizes the following formula to calculate the uncommitted reserve capacity for Water Treatment Facilities.

$$Cu = Cr - \left[\frac{L \times F \times P}{H} \right]$$

Cu	=	uncommitted hydraulic reserve capacity (m^3/d)
Cr	=	hydraulic reserve capacity (m^3/d)
L	=	number of unconnected approved lots
P	=	existing connected population
H	=	number of households or residential Connections
F	=	Maximum daily flow per capita (m^3 / day / capita)

This formula compares the maximum day plant flows or demand versus the design or rated hydraulic plant capacity as a means to monitor the reserve capacity and the ability of the facility to support any proposed development plans. Preferably the maximum day flow should be based on the recorded maximum day flow at the treatment facility. As an alternative, the maximum day flow may be derived by applying a max day factor to the three (3) year average day flow. A notable flaw in this method is

the comparison of demand to the rated hydraulic capacity of multi-sourced ground water treatment facilities vs. the firm capacity of the system.

Recommended standards for the design of multi-sourced groundwater systems dictates that the system shall be capable of equaling or exceeding the design maximum day demand with the largest producing well out of service (10 State Standards, 2003) where water storage facilities are present to accommodate peak hour and fire flows.

It should be noted that for water treatment plants using surface water as a supply source, the firm capacity is the rated hydraulic capacity of the plant.

The two (2) water treatment plants and well facilities were analyzed based on this guideline to confirm their existing operational status and to determine their ability to service future growth. The Annual Plant Capacity Report formed the basis for this analysis. The existing rated hydraulic plant capacity, maximum daily flows, population, number of households and unconnected servicing commitments and three-year average flow data was taken directly from the 2001, “Uncommitted Reserve Capacity Report”. The maximum daily flow volumes were checked against the firm plant capacity for each service area to determine the ability of the water treatment facility to provide a sufficient supply of water under current and projected growth scenarios. Factors such as plant condition and water quality were also considered.

Figure 3.2.1. summarizes the results of our review. In general the City’s facilities are operating under their rated hydraulic capacity and have sufficient capacity to meet the current maximum day flows with the ability to accommodate growth. Exceptions are the systems supplying Valley East / Capreol and Sudbury.

Figure 3.2.1
Water - Uncommitted Reserve Capacity - Summary Table

Municipal Water Supplies				Current Scenario				
Treatment Facility		Rated Hyd.Cap.	Firm Cap.	Population Current	Exist. Max. Day Flow	Exist. Max.Day Flow / Cap	Uncommitted Reserve Cap.	Percentage Utilized
Plant Name	Type	m³/day	m³/day			m³/cap./day	m³/day	
Sudbury	1999 - 2001	94000	84,000	90,254	82,589	0.92	1,411	98.3%
Sudbury	2002 - 2004	94000	84,000	90,254	68,188	0.76	15,812	81.2%
Dowling		7274	3,637	1,857	1,494	0.80	2,143	41.1%
Garson		7828	4553	4,898	3,306	0.67	1,247	72.6%
Capreol		10146	6669	3,395	7,591	2.24	-922	113.8%
Valley East		21588	18320	31814	15637	0.49	2,683	85.0%
Capreol - Valley East	Combined Systems	34831	27634	35,209	22,469	0.64	5,165	81.3%
Purchased Water Supplies								
Falconbridge		5,234	2,617	754	2,003	2.66	614	76.5%
Levack		3110	1555	1,520	1,453	0.96	102	93.4%
Onaping		6540	6540	800	2,003	2.50	4,537	30.6%
Vermilion		20381	20,381	9,115	9,965	1.09	10,416	48.9%

i) Sudbury - David Street / Wanapitei Water Treatment Plant

As noted, the 2001 Annual Plant Capacity Report and Uncommitted Resource Capacity Report formed the basis of our review. This data was then combined with known operational limitations at the facilities to present a realistic perspective of the capabilities of the system. Mechanical limitations have been identified at the Wanapitei Water Treatment Plant. These limitations are partly the result of insufficient pump capacity and hydraulic limitations of the single trunk watermain servicing Sudbury. At higher flow rates the friction losses in the trunk main further reduces the pump efficiency. The combined effect is that the plant is unable to operate at the rated capacity of 54,000 m^3/d and is limited to a maximum flow of 44,000 m^3/d. Reducing the combined output of the David Street Water Treatment Plant and Wanapitei Water Treatment Plant to 84,000 m^3/d (Wanapitei WTP

44,000 m^3/d, David Street WTP 40,000 m^3/d).

In 2001 the maximum day flow equated to 98% of the combined capacity (84,000 m^3/d). At this level the plants are unable to support the growth projections for the In-Migration and High In-Migration scenarios.

It is important to note the events of Walkerton in 2000 greatly impacted the use, production, and cost of water in many municipalities. Consumption rates in recent years have seen significant reductions necessitating the need to review subsequent annual data.

Figure 3.2.1 summarizes the results of our analysis for the Sudbury system and the available capacity. Based on 2002, 2003 and 2004 data, the maximum day flow equates to 81% of the combined capacity of the plant. This reduction in consumption (gain in reserve capacity) will provide for additional growth (Refer to Section 4.1).

Notable reasons for this gain in reserve capacity are:

1) Reductions in lost water,
2) Decreases in household density and,
3) Increases cost of water and sewage rates.

II) Valley East and Capreol Wells

Similar to Sudbury, the Valley East and Capreol Systems are unique. Originally these systems were constructed as independent decentralized systems. In their present format and based on the 2001 data described above, the Capreol and Valley East are operating at 113% and 85% respectively of their firm capacity, and have limited abilities to support growth. The City is in the process of upgrading these systems to meet the requirements of the imposed regulations (O.Reg 170/03). The outcome of these upgrades will result in a combined Capreol / Valley East supply system and treatment upgrades at eleven (11) of the existing wells and the development of a new well supply with an estimated yield of 3,000 m^3/d.

These changes will lower the system operating capacity to 81% of the firm capacity under current and projected maximum day flows. With these upgrades capacity will be available to support growth. (Refer to section 4.2.1.)

3.2.2 Water Quality

Water quality, in general meets the requirements of the Regulations and Safe Drinking Water Act. However, a number of facilities, as noted in the table below, have issues with elevated levels of manganese and sodium. Anticipated changes in legislation regarding groundwater and source water protection may also impact a number of the City facilities.

Water Quality Parameters				
Facility	**Iron**	**Manganese**	**Sodium**	**Notes**
David WTP	√	√	34.3	>20 – Reportable
Capreol – Well "J"	√	X	√	
Capreol – Well "M"	√	X	√	
Capreol – Well "6"	√	X	27.6	>20 – Reportable
Dowling Riverside	√	√	20.9	>20 – Reportable
Valley East – Deschene Well	√	√	22.4	>20 – Reportable
Valley East – Well "I"	√	X	√	
Valley East – Kenneth Well	√	X	√	
Valley East – Michelle Well	√	√	43.1	>20 – Reportable
Valley East – Pharand Well	√	√	69.4	>20 – Reportable
Valley East – Philippe Well	√	√	23.5	>20 – Reportable
Garson – INCO Well	√	√	58.2	>20 – Reportable
Onaping – Falconbridge	√	√	44.0	>20 – Reportable

The David Street WTP utilizes Lake Ramsey as the source of water. Lake Ramsey is an inner City Lake, with residential properties arterial and secondary roadways, rail, and recreation activities occurring around the perimeter. Lake Ramsey is also a receiver for storm water run off from the surrounding developments. Meeting the requirements for protecting Lake Ramsey as a water source will be a difficult task.

Azilda, Chelmsford, Valley East, Hanmer and Capreol all utilize groundwater wells to meet the Communities needs for potable water. Many of these wells are located in residential, commercial and agricultural areas within the Communities. Pending groundwater source, protection requirements may impose limitations on these systems and may have significant cost impacts to maintain their operation.

3.2.3 Water Pumping Stations, Distribution System and Storage Facilities

Eight (8) individual water-booster stations and six (6) water storage facilities are operated throughout the City of Greater Sudbury to facilitate transmission through the water distribution system to the consumers tap at adequate pressure. These booster stations in conjunction with elevated tanks are integral components in the management of flow and pressure from peak hour demands and high flows (fire flows) imposed on the distribution system.

For the purposes of this study, a series of water modeling scenarios were run for the City's water system. Due to the large number of factors (model & operational) which can impact on the results of any modeling exercise and with the limited scope available to the project team for this analysis the following observations have been drawn relating to water pumping stations and water distribution systems.

i) Water Booster Stations & Water Distribution Systems

As noted earlier Water Booster Stations and distribution systems are an integral part of the water delivery system and aid in the management of flow and pressure. Their performance is typically assessed on their ability to maintain pressure in the distribution system during max hour and max day demands.

The City of Greater Sudbury's Engineering Design Manual has established minimum and maximum operating pressures for the distribution system. These are defined as follows:

Max hour	40 psi
Max pressure	100 psi
Max day	50 psi min.

System modeling was conducted by City of Greater Sudbury Staff using the City's Water Cad Model. Modeling assignments consider the effect and impact of water booster stations during the simulation. In general, a suitable level of water pressure for domestic use is produced for a significant portion of the pressure zones within the service areas during both max day and max hour conditions. Certain exceptions were noted during the review conducted by staff. These exceptions are listed below.

a) South End

The area in the vicinity of Muriel and Kaireen Street will require a booster station to provide adequate pressure. Designated areas in the vicinity of Treeview Road, Long Lake Road, and

Southview Drive will require extensions to the water distribution system to facilitate the provision of acceptable water pressures. The Algonquin Road and Maurice Street Area will also require a booster station.

b) Sudbury

The area around Corsi Hill will require a booster station. A proposed booster station is currently in development (2005). The Elizabella/Lapointe Street area will require upgrades to provide acceptable water pressure for this industrial area.

c) Copper Cliff

Further review is required to confirm the capacity of the INCO Booster, and is beyond the scope of this study.

d) Coniston

A connection to the 750mm trunk watermain on Hwy. 17 would be required to service the designated lands with adequate pressure. Based on discussions with City Staff, shortcomings with the distribution system and local distribution system issues were identified. Combined with small diameter lines, and poor C factors necessitate the need for distribution system upgrades throughout the community of Coniston.

e) Falconbridge

A new well and watermain are being built by Falconbridge Ltd.

f) Capreol

A new booster station is being built (2005) and upgraded and will be connected to the Valley East system.

g) Minnow Lake

The area in the vicinity of McKinnon Street will require upgrades to the distribution system.

ii) Fire Protection Overview

Water supply and distribution systems for a municipality are designed to provide both potable water for consumption and water for fire protection for the community. Historically this was not always the case and many older systems were originally designed to provide potable water for domestic consumption only.

The City of Greater Sudbury currently operates a number of systems that were originally constructed as independent decentralized system, designed to provide potable water for domestic consumption (for example, the Valley East system was built by the MOE to provide domestic daily consumption). The system was typically constructed with small diameter mains.

In many cases the problems are amplified by the age of the line, corrosion and deterioration, which has resulted in lost hydraulic capacity.

Over the years the City has implemented programs such as cleaning (swabbing) and relining, replacement and watermain looping to improve the capacity and capability of these systems.

For the purpose of this review and based on the history of the existing system development our review concentrated on the ability of the existing system to support residential development as opposed to reviewing the systems ability to meet design standards for a new water distribution systems. It is important to note that localized upgrades to existing sections of the distribution system may be required and are beyond the scope of this study.

Fire flows are defined as the rate of water flow, at a specific pressure, and for a specific duration necessary to control a fire in a specific structure (AWWA M31). The City of Greater Sudbury's "Guidelines for Fire Flow Requirements have established minimum fire flow rates for residential, commercial and institutional settings. Minimum fire flows for residential areas (R1 and R2) are 75 l/s for a duration of 2 hours.

Based on this standard a review of the City's distribution system was completed to determine the capability of the system to provide fire protection in areas where development may occur.

Modeling was conducted by the City of Greater Sudbury Engineering Staff, utilizing the City's Water Cad Model. Fire flow modeling exercises produce results that indicate the available flows in the system. The models were developed on the basis of engineering data and field audits conducted by the City to calibrate and validate the model; the results are a simulation, not a measured and verified flow.

It is important to note that the available fire flow at any point in the system may be limited by a number of factors such as pipe condition, hydrant location and the elevation of a section of the distribution system relative to the supply source elevation. The results of the fire flow analysis and constraints have been plotted for each community and briefly explained for each area, as follows:

Figure #	Service Area	Description Of Area With Less Than 75l/s
3.3.1a	Capreol	• Beech Crescent and designated lands • Stull Street and Lincoln Crescent
3.3.1.b	Hanmer	• Proulx Court • Chemier Street and Theresa Avenue area and designated lands
3.3.1.c	Val Therese	• Rene Street • Henry Court • Yorkshire Drive
3.3.1.d	Blezard Valley / Val Caron	• River Road and Donald Street • Frappier Rand and Percy Avenue
3.3.2.a	Chelmsford	• Bathurst Street and along Hwy. 144 westerly to McKenzie Road • Bruyere Street area. • Errington Avenue and Golf Course Road area
3.3.2.b	Azilda	• Montee Principale and Notre Dam Street West
3.3.3.a	Levack	• Entire Community *****New Water Supply Being Developed
3.3.3.b	Onaping	• Entire Community
3.3.3.c	Dowling	• Richard Court Area
3.3.4.a	Falconbridge	• Entire Community
3.4.4.b	Garson	• Ravina Gardens • Area along Municipal Road 89 between Spruce Street and Old Skead Road
3.3.4.c	Coniston	• Entire Community
3.3.4.d	Wahnapitae	• Entire Community
3.3.5.a	Copper Cliff	• Craig Street, Diorite Street area in the vicinity of the North Mine Booster Pump house
3.3.5.b	Lively	• No Constraints
3.3.5.c	Naughton	• No Constraints
3.3.5.d	Whitefish	• Entire Community
3.3.6.a	Sudbury South End	• No Constraints
3.3.6.b	New Sudbury	• Notre Dame and Turner Avenue • Elizabella Street and Lasalle Blvd. Area
3.3.6.c	Sudbury	• Lorne Street, Municipal Road 34 and Mary Street Area
3.3.6.d	Minnow Lake	• McKinnon Street and Keen Street

3.2.4 Water Storage Capacity

Typically water storage facilities are designed, in accordance with MOE Guidelines with a storage component for domestic demands during peak hour flows, fire flow and emergency storage.

The total storage requirement is a summation of the above components and is typically defined as follows:

Total Storage = A + B + C

Where

A = Fire Storage

B = Equalization Storage
(25% of max. day flow)

C = Emergency Storage
(25% of A + B)

Fire flow storage is typically developed based on the above formula, and referenced to the Fire Underwriters Survey recommendations, for fire storage or the MOE Guidelines.

At the time of writing this report the City was in the process of updating their 1985 Fire Underwriters Survey to establish the current fire storage requirements. Therefore, for the purpose of this report, fire storage requirements were compared to the suggested requirements from the MOE Guidelines.

Based on these guidelines and the above formula, the majority of the systems within Greater Sudbury were found to have sufficient storage to meet the current day demands with the capacity to accommodate growth. Figure 3.2.4 summarizes the results of our analysis.

Figure 3.2.4 Water Storage Review - Existing Conditions

Service Area	Treatment System	Firm Capacity m^3/day	Available Storage	Current Storage Req'd
Sudbury Coniston Garson Wahnapitae				
Sudbury -2001	David St. / Wanapitei	84,000	36,973	45,897
Sudbury - 2004	David St. / Wanapitei	84,000	36,973	41,397
Dowling	Well Field	3,637	1,392	948
Valley East Azilda Capreol Chelmsford Valley East				
Valley East / Capreol	Well Field	27,634	12,026	11,610
Falconbridge	Well Field	2,617	1,172	701
Levack	Well Field	1,555	1238 *	946
Onaping	Well Field	6,540	1,155	701
Copper Cliff Lively Walden				
Vermilion	Vermilion WTP	20,381	61,062	3,174

Storage Review Assumptions / Parameters

- Values for storage tanks taken from table provided by City of Sudbury

Two exceptions Sudbury and Levack are discussed below:

i) Sudbury

The MOE Guidelines used to determine the suggested fire flow storage components are limited to an equivalent population of 40,000 people. For Sudbury, the MOE Fire Flow Requirements table was extrapolated to determine a suggested fire flow storage component for the proposed populations. Based on our analysis a flow of 558L/s for a duration of 8 hours was calculated. This value, considered conservative, was used as a basis to determine the Fire Storage Component required under the In-Migration and High In-Migration scenarios.

Similar to the plant review, Sudbury was found to have insufficient storage capacity under the High In-Migration Scenario, using the 2001 Annual Report.

This situation improves using 2002 to 2004 data, however, it does not meet the suggested fire storage components, for the High In-Migration scenarios.

The extrapolated data used to access the fire storage component is an assumption of the suggested fire flow requirements and is in our opinion very conservative. We recommend the City review the fire flow storage component in greater detail after the Fire Underwriter detailed survey is completed in early 2006.

ii) Levack

The City is currently in the process of identifying a new water supply for the community of Levack. This new system will be developed with sufficient storage to meet the needs of the community of Levack, based on the MOE Guidelines.

Based on the Conceptual Design Report, a storage value of 1240 m^3 was estimated. This value was used in the analysis of the current and future storage needs for the community.

3.3 Wastewater Infrastructure System Analysis Existing Conditions

3.3.1 Wastewater Plant Review

The City's ten (10) Sewage Treatment Facilities were analyzed using a formula similar to that used to calculate the uncommitted reserve capacity for the Water Treatment Facilities described in Section 3.2.1.

Data related to existing plant capacity, average flows and existing effluent parameters were obtained from the 2001 Annual Uncommitted Reserve Capacity Report. The amount of plant capacity currently available to service new development was obtained by comparing the three-year average flow volume recorded at each plant against the rated plant capacity.

Factors such as plant conditions, effluent quality and sewage strength were also considered as part of this review.

In general, the wastewater treatment plants were found to have sufficient capacity to service the existing volume of sewage being generated by the respective service areas. Most plants were found to be operating at approximately 50 to 70% of their rated capacity. These include the following:

- Sudbury WWTP
- Coniston WWTP
- Dowling WWTP
- Valley East WWTP
- Levack WWTP

Exceptions are the Azilda, Dowling and Lively plants. Each of these facilities has limitations, which are described below: Table 3.3.1 summarizes the results of our analysis.

Table 3.3.1 **Wastewater - Uncommitted Reserve Capacity - Summary Table**

Treatment Facility			Pc	Average Daily Flows (m3/day)				F	2001 DATA			Cap L/s	%age
Name	Type		m³/day	1999	2000	2001	3 yr avg	m³/day	L	P	H	Q(exist) l/s	Cap.
Azilda	STP	*C of A*	*3,300*									40.51	73.65
	Extended Aeration			2,667	2,012	3,054	2,578	0.627	392	4,112	1,635	29.83	
Chelmsford	STP	*C of A*	*7,100*									82.18	55.63
	Summer			4,127	3,287	4,435	3,950	0.539	576	7,322	2,911	45.72	
Coniston	STP	*C of A*	*3,000*									34.72	44.53
	Extended Aeration			1,232	1,175	1,600	1,336	0.627	591	2,129	840	15.46	
Copper Cliff	INCO Vermillion STP	*C of A*	*6,800*									78.70	31.10
	Activated Sludge			2,115			2,115	0.919	73	2,302	1,094	24.48	
Dowling	STP	*C of A*	*3,200*									37.04	77.85
	Extended Aeration			2,443	2,483	2,547	2,491	1.341	36	1,857	786	28.83	
Falconbridge	STP	*C of A*	*909*									10.52	40.03
	Trickling Filter			362	380	350	364	0.483	43	754	297	4.21	
Levack	STP	*C of A*	*2,270*									26.27	47.23
	Extended Aeration			1,047	1,037	1,132	1,072	0.462	177	2,320	983	12.41	
Lively	STP	*C of A*	*1,600*									18.52	68.06
	Extended Aeration			1,036	1,045	1,186	1,089	0.394	98	2,763	1,271	12.60	
Sudbury	Garson	*C of A*	*79,625*						152	546	215	921.59	77.69
	Sudbury								12,699	84,330	40,083	715.96	
			79,625	57,113	58,163	70,302	61859		12,851	84,876	40,298		
Valley East	Conventional	*C of A*	*11,400*									131.94	53.21
	Activated Sludge			5,758	5,555	6,886	6,066	0.348	1,745	17,415	6,328	70.21	
Walden	STP	*C of A*	*4,500*									52.08	58.63
	Extended Aeration			2,549	2,455	2,912	2,639	0.782	1,296	3,376	1,553	30.54	
Capreol	Lagoon	*C of A*	*5,000*									57.87	64.08
	Exfiltration		3.31	3,316	2,713	3,584	3,204	0.945	187	3,392	1,510	37.08	
Garson	Lagoon	*C of A*	*3,506*									40.58	21.29
	Seasonal Retention			773	705	761	746	0.133	245	5,628	2,221	8.64	
Wahnapitae	Lagoon	*C of A*	*1,246*									14.42	77.28
	Seasonal Retention			916	884	1,088	963	0.845	47	1,139	449	11.14	

i) Azilda Wastewater Treatment Plant

The Azilda WWTP is operating in excess of its rated capacity with no room to accommodate for growth.

Over the last three (3) years the plant has exceeded its rated capacity by 10%.

The City has completed a number of studies on the plant to review options to expand the plant and/or increase the capacity of the facility. The outcome of this work suggests re-rating the plant to handle higher flows is a viable alternative. Consequently the City has initiated a Class Environmental Assessment to re-rate the facility to 3300 m^3/day. For the purpose of this review it was assumed this re-rating would be approved. Accordingly a rated capacity of 3300 m^3/day was used to assess the Azilda System.

Based on the 2001 Annual Data and the re-rated capacity noted above, the Azilda WTP will have sufficient capacity to accommodate the current day conditions and 72% of the In-Migration or 407 residential households. Utilizing the 2003 data the reserved capacity is further reduced, limiting the potential households to 112.

ii) Dowling Wastewater Treatment Plant

The Dowling WWTP has recently been re-rated to a rated hydraulic capacity of 3200 m^3/d, and is currently operating at 78% of the rated capacity. The plant has sufficient capacity to accommodate current day flows.

The City has also implemented a program to reduce extraneous flows (I/I) and as a result have gained additional hydraulic capacity. Continuation of this program and further reductions will provide capacity to accommodate the growth.

iii) Lively and Walden Wastewater Treatment Plant

An assessment of the individual plant capacity was conducted to determine the capacity to accommodate current conditions and projected growth.

The Lively Wastewater Treatment facility has a rated capacity of 1600 m^3/d and is currently operating with an average day flow of 1089 m^3/d or 68% of the rated capacity.

Similarly the Walden plant has a rated capacity of 4500 m^3/d. Under existing conditions, this facility is treating 2,639 m^3/d or 58.6% of the rated capacity.

Hydraulic and assimilative capacity limitations at the Lively plant have resulted in the development of an interconnecting trunk sewer between the facilities to handle flows in excess of the capacity of the Lively plant.

Due to this connection, the two facilities are able to operate in tandem to accommodate peak flows for the two communities. Based on discussions with City Staff, and a review of the operating parameters for the facilities and the connecting sewer system, the following issues / concerns were identified:

- The assimilative capacity of both Junction Creek and Meatbird Creek are already at their maximum level.
- The trunk sewer capacity connecting the two facilities has limited capacity to prevent localized flooding to Junction Creek.
- Flows in the interconnecting sewers are monitored and as capacity is reached in the gravity sewer, flows are diverted through to Junction Creek.

The resulting limitations with the Lively plant, Anderson Lift Station and interconnecting trunk sewer, constrain the Lively / Walden system and will limit growth. Section 4 of this report will discuss these limitations in greater detail and emphasize the need for a detailed review of this system to be conducted including, flow monitoring of the existing trunk sewers.

3.3.2 Effluent Quality

A review of the basic effluent quality parameters for the wastewater treatment plants were completed based on data from the 2001 Annual Report. In general the facilities are operating well within the guidelines established for effluent quality. Three facilities, specifically Chelmsford, Lively and Sudbury experienced minor exceedances for Total Phosphorus. The results of this review are summarized below, in Table 3.3.2.

Table 3.3.2 – Effluent Quality Parameters

Facility	BoD	S.S.	T. Phos.	Bypass / Notes
Azilda	Acceptable	Acceptable	Acceptable	- 2 bypass occurrences - heavy precipitation - snow melt
Chelmsford	Acceptable	Acceptable	1 Exceedance (August)	- Exceedance for E.Coli in 2002 - 3 Exceedances for T. Phos 2003
Coniston	Acceptable	Acceptable	Acceptable	
Dowling	Acceptable	Acceptable	Acceptable	
Falconbridge	Acceptable	Acceptable	Acceptable	
Levack	Acceptable	Acceptable	Acceptable	
Lively	Acceptable	Acceptable	1 Exceedance (April)	- Exceedance for E.Coli in 2002 - 23 bypass occurrences - heavy precipitation - snow melt - 1 bypass occurrence – - Equipment failure
Sudbury	Acceptable	Acceptable	1 exceedance (Sept.)	- 1 Exceedance for T. Phos – 2003 - 5 Exceedances for E.Coli - 2003 - 19 Bypass occurrences - Heavy precipitation - Snow melt - 2 Bypass occurrences - Equipment maintenance
Valley East	Acceptable	Acceptable	Acceptable	
Walden	Acceptable	Acceptable	Acceptable	3 Bypass occurrences - Heavy precipitation

3.3.3 Lift Station Systems Review

The next level of analysis focused on the lift stations, which form an integral part of the collection system. These stations essentially pump sewage from low-lying areas within a community "up grade" until the sewage can flow by gravity to the wastewater treatment facility. In order to assess whether or not these lift stations could accommodate any increased flows, it was necessary to

isolate each lift station and determine their current capacity. The flow data obtained from the City was at a coarse level for the treatment plants as the sewer model is not yet complete.
The methodology employed to analyze the lift stations is outlined below:

Determine drainage area in hectares serviced by lift station.

1) Calculate (using City design standards) the number of equivalent residential units based on 12 units per hectare.

2) Apply extraneous flow design factors to estimate total flow reaching lift stations.

3) Review, City data to obtain the rated capacity of the lift station and the firm capacity. (Note: Rated pump capacity is based on actual draw down data provided in the City's Wastewater Lift Station Operating Manual).

4) Compare the projected flow against the firm capacity and rated capacity of the lift stations.

5) Confirm that the forcemain can support flows in excess of the rated capacity of the lift station and compare the operational velocity to the MOE guidelines.

Factors such as break history, age of the forcemain, operational conditions during storm events, and features such as mechanical standby and standby power were not considered as part of our review.

Furthermore, a key factor in assessing the lift station capacity is determining the forcemain capacity. Forcemain capacity is affected by roughness, debris build up and age, resulting in low 'C' factors, ultimately reducing the forcemains capacity and pumping capacity. 'C' Factor testing was used in our analysis, where available, to assess the capacity of the forcemain. In lieu of 'C' factor data standard 'C' factor values were assigned based on the type of forcemain.

Similar to the analysis of ground water supply wells, the review of sewage lift station capacity is based on the firm capacity at the facility, and assumes the lift station can accommodate the peak flow with the largest pump out of service.

Stations capable of meeting the current flows with firm capacity are identified by a green dot, which indicates there are no constraints in this service area.

Constraints are indicated by an orange or red dot, and identify minor and major upgrades that are required to accommodate growth and in some instances, current flow levels.

Minor constraints (orange dots) may require pump upgrades to provide firm capacity at the Lift Station. Major constraints (red dot) may include pump replacement, forcemain replacement and/or replacement of the facility to accommodate current and proposed flows.

Under existing flow conditions the lift station capacities and ability to handle peak flow can be summarized as follows:

42 No Constraints
16 Minor Constraints
10 Major Constraints
7 To be replaced under the South End Tunnel Project

Table 4.2.3 summarizes the results in greater detail and expands the analysis to the proposed growth scenarios. In general 42 Lift Stations require no work to accommodate existing condition flows, and provide opportunity for growth in the particular service area. It should be noted that the majority of these facilities are located in well-established areas with little development potential. The remaining stations are either operating with both pumps to handle peak flow or incur high well alarms and have the potential for flooding.

The Lift Stations identified as being replaced or abandoned as a result of the South End Tunnel Project were not reviewed as part of this process and generally are deemed to be a major constraint.

Several areas have been identified that require lift station, and / or forcemain upgrades to accommodate the current day and growth scenarios. Efforts to reduce high flows attributed to storms or spring runoff events must also be considered.

3.3.4 Wastewater Collection System Review

The individual sewer lines within the service areas have been reviewed to determine whether or not system improvements would be required to service projected growth.

A review of the available data for the wastewater collection system identified the following items:

- CCTV records were available for a significant portion of the systems with varying ages and formats.

- The CCTV data was not complete for the entire system.
- Individual sewers, which would be identified in the CCTV data as a deficiency in need of repairs, could already have been repaired or replaced.

The capacities of the existing sanitary pipes were reviewed using the following valves and methods.

- Unit density at 12 units/ha
- Population density at 2.3 cap/unit
- New per capita flow (L/cap/day) from the Engineering Design Manual (January 1994)
- Existing per capita flow (L/cap/day) based on CGS Annual Wastewater Reports (2001, 2002, 2003)
- New extraneous flow; Infiltration rate (L/ha/day) from the RMOS Engineering Design Manual (January 1994)
- Extraneous flow; Infiltration rate (L/ha/day) from the RMOS Engineering Design Manual (January 1994)

The review was done by placing the estimated flow, from the proposed area, population increase or units, plus the existing flow, through each different size of existing pipe that would be affected by this development or estimated population increase. This analysis started from the smallest possible pipe size for that area and continued up to the largest pipe size until the flow passed through a lift station or a treatment facility. The estimated flows were compared to the maximum calculated flow for that pipe.

For the developments, the total number of units was used to calculate the amount of flow. The population increase was estimated from the In-Migration valves provided by the City and were used to determine flow for the designated area of development. The max area was used to determine the flow if the area could not hold the estimated population increase. The flow from these areas was added to the calculated flow from the existing developed areas. The pipes were tested for the maximum flow from these cases.

The pipe system failed for a given development if there wasn't a route for the flow to take, without the estimated flow exceeding the maximum pipe capacity flow.

The points identified above made it unfeasible to perform a comprehensive system review of the wastewater collection system, within the scope of the Infrastructure Background Study.

Significant problem areas, such as the South End of Sudbury, and the proposed South End Tunnel construction were taken into consideration during the analysis of the future conditions. Refer to Section 4.0.

For the most part the existing trunk sewers were found to be able to accommodate existing flows.

Table 3.3.4 summarizes the results of our analysis and identifies those sewers that are unable to handle current and proposed growth flow conditions.

Table 3.3.4. Sanitary Pipe Capacity Constrictions		
Location	**Description**	**Sanitary Trunk Main Diameter**
Valley East	Main St	400
	Herve Ave	500
	Jean D'Arc St	500
Chelmsford	Edna St	400
	Edna St	450
	Keith Ave	250
	Cote Ave	250
Garson	O'Neil Dr	250
	O'Neil Dr	300
Levack	High St	350
Lively	Anderson Dr	375
Sudbury	Mildred St	300
	Bancroft Dr	200
	Bancroft Dr	300
South End Sudbury	Loach's Trunk to Easement	300
	Easement/Millwood	450
	Stewart	450
	Stewart	450
	Stewart	300
	Rockwood	200
	Algonquin E	300
	Algonquin E	300
	At Green L.S. From Ida	200
	Paris	300
	Burwash to West Trunk	350
	Paris to East Trunk	375
	Paris to East Trunk	450
	East trunk on Regent	450
	East trunk on Regent	450
	East trunk on Regent	450
	East trunk on Regent	450
	East trunk on Regent	450
	East trunk on Regent	450
	East trunk on Regent	450
	Trunk on Regent	600
	Yale	600
	Telstar/Skyward	200
	Marcel	750
	Trunk to Marcel Park	525
	Regent E	500
	Regent E	500
	Regent E & W combine	500
	Bouchard	450
	Marcel St Park	750
	Southview Easement	300
	Trunk to Rock Tunnel	750

Efforts over the years to;

- Reduce I/I to the system
- Disconnect illegal weeping tiles
- Disconnect rainwater leaders
- Disconnect roof drains

have extended the life of the existing trunk system, which is in relatively good condition. Rainwater leaders are no longer a major issue. Efforts to reduce roof drains and weeping tiles should be maintained.

The South End Sewage Tunnel, will reduce the potential for extreme wet weather flows, to flood and overwhelm the existing South End Sewer systems, it will also deal with current capacity issues in the South End, which prohibit development and allow for future growth.

Although the tunnel will be constructed with a number of flow and level monitoring devices, the tunnel will impact the City's ability to manage extreme wet weather flows to the Sudbury Wastewater Treatment Plant.

Reliance on the Sudbury Wastewater Treatment Plant will be paramount.

3.4 Assimilative Capacity Review – Wastewater

As part of the wastewater infrastructure analysis the assimilative capacity of the receiving streams within the City of Greater Sudbury was reviewed.

Assimilative capacity is defined as "the ability of a lake / river to absorb nutrients or other potential pollutants without showing adverse effects".[1]

The normal process operation for a wastewater treatment facility involves accepting sewage influent from the wastewater collection system, passing the sewage through a series of treatment process to remove waste products, and discharging the final effluent back into the natural environment. The level of treatment at all wastewater plants is governed by the Ministry of the Environment Certificate of Approval. Specific operational levels for effluent parameters such as; BOD_5, suspended solids, total phosphorous and in some cases ammonia concentrations are set by the Ministry, and the plant operators continually monitor these parameters, making adjustments where necessary to ensure the

[1] Definition taken from North American Lake Management Society's Web Page. Http://www/nalms.org/index.html

final effluent leaving the plant does not adversely affect the receiving streams.

A review of the data for all 10 wastewater treatment plants was completed based on the data reported in the 2002 Plant Capacity Report and a review of available copies of assimilative capacity reviews previously completed by the City for Whitson, Junction Creek and the Vermillion River. These three watercourses are the discharge points for Capreol lagoons, Sudbury Wastewater Treatment Plant, and the Valley East wastewater Treatment Plant. The two Wastewater Treatment Plants, treat two thirds of the sewage produced within the City of Greater Sudbury. Full assimilative capacity reviews have been completed for these facilities in the past. No assimilative capacity study is available for the Coniston, Valley East and Chelmsford WWTP.

Gore and Storrie Limited, Consulting Engineers prepared the assimilative capacity study for Whitson Creek, in August of 1990.

The assimilative capacity review for the Vermillion River, prepared by Beak Consultants Limited, in association with S.A. Kirchhefer Ltd., was completed in January of 1981.

These reports were completed to establish a baseline for effluent parameters for the water bodies. The current Certificates of Approval are set by the Ministry of Environment with the intent of preserving the water quality and natural environment as well.

The values reported in the plant capacity report for 2001 from the City of Greater Sudbury indicate that under existing operating conditions, the City of Greater Sudbury is consistently maintaining an appropriate level of treatment with respect to effluent loads entering the streams.

In most cases the treatment facilities are maintaining effluent levels for parameters such as total phosphorous and suspended solids at levels approximately 50% below acceptable limits. The relatively low percentage of forecasted growth in the individual service areas should not generate a significant increase in plant effluent loadings to the respective receiving streams.

However, based on discussions with City staff several receiving streams have low or very little additional capacity to accommodate additional loadings above the levels currently approved. In these cases, additional or tertiary treatment systems may be required to accommodate future expansions of the treatment systems.

In particular Junction Creek outletting to Kelly Lake near Lively and Meatbird Creek have no capacity to assimilate additional effluent flows. Facilities discharging into these receiving streams will likely require treatment upgrades or the addition of tertiary treatment.

Environmental Constraints

Guideline D-1, published by the Ministry of the Environment provides guidance related to land use compatibility. This guideline sets out specific limits and standards with respect to the planning of developments within municipalities. Guidelines D-2 is a similar document that provides the limits or dimensions of buffer zones to be provided around municipal sewage treatment facilities and sensitive land uses.

Copies of Guidelines D-1 and D-2 are included in Appendix E.

The existing official plan also has certain policies related to items such as environmentally sensitive areas; flood plains and zoning that discourage the activity of development and restrict land use near the plants.

Each service area and its applicable water and wastewater infrastructure was reviewed against the Ministry of Environment guidelines as well as the applicable official plan requirements. The purpose of the review was to identify any non-compliant areas and to determine which if any areas are not suitable to support forecasted development and growth.

This review revealed the following minor items:

- Chelmsford WWTP – located in flood plain – situated inside minimal buffer distance for nearby residential properties.
- Dowling WWTP – located in flood plain – most proposed residential above flood plain.
- Levack WWTP – existing residential properties within buffer zone
- Coniston WWTP – located in flood plain
- Walden WWTP – located in flood plain.
- Valley East WWTP – existing residential properties within buffer zone
- Sudbury WWTP – existing residential properties within buffer zone

These existing conditions will not constitute a constraint on any future development or growth in these service areas. In most cases the development adjacent to the WWTP was allowed after the plant was constructed. Generally the plants are operated efficiently and issues related to proximity such as odours are managed at the facility.

4.0 PROJECTED WATER CONSUMPTION & WASTEWATER FLOW RATES

4.1 Population Projections

In order to determine the long-term viability of the water and wastewater infrastructure systems, and more specifically, their ability to service future growth, it was necessary to develop population projections for the City of Greater Sudbury.

The population projections utilized in this study were developed by City of Greater Sudbury Staff. A copy of the Draft – Growth and Settlement/Development Options Discussion Paper is included in Appendix F.

The base population for the projections and basis for this study was 155,255 people, taken from the 2001 Statistics Canada Census data.

Four population projections were developed based on four different growth scenarios for the City of Greater Sudbury. The four scenarios, and their respective 20 Year population projection figures are listed below:

	People	**Households**
Out-migration	135,407	(-750)
Natural increase	150,012	4837
In-Migration	169,579	12,256
High In-Migration	175,000	13,067

The following descriptions, taken from Meridian Planning Consultants discussion paper, briefly describe the scenarios.

Out-migration Scenario

The out-migration scenario was based on the twenty-year historical trend for out-migration to outpace growth resulting from In-Migration and natural increase of births exceeding deaths. Out-migration was averaged to be a net of 650 persons per year leaving the City. The twenty-year projection from this scenario indicates a population of 135,407 and a demand for households 750 units lower, than the existing number of households in the City. The average household size is projected as 2.17 persons.

Natural Increase Scenario

The natural increase scenario was projected with no migration effect and is based on the net of births and deaths. This scenario produces a twenty-year horizon population of 150,012, and an increase in number of households to 67,857, an increase of 4,837 households overall. Average household size was projected to be 2.21 persons.

In-Migration Scenario

The In-Migration scenario assumes a return to the population peak of 1971 by 2021 with a population of 169,580. The number of households resulting from this population would be 75,276, an increase of 12,256 households overall, with an average household size of 2.25 persons.

High In-Migration Scenario

The High In-Migration scenario assumes In-Migration will exceed out-migration from 2001 to 2021 and the City will grow to a population of 175,000 by 2014. The projection after 2014 was held constant so the same figures exist for 2021 to allow a comparison among the scenarios. The number of households needed for this population would be 76,087, an increase of 13,067 households from 2001. The average household size assumed at 2021 is 2.30 persons.

Due to the widely dispersed nature of the communities that comprise the City of Greater Sudbury, it was necessary to allocate the projected population increase to each of the individual service areas. The allocation of projected population figures followed past growth and development trends.

Figure 4.1 represents the population dispersion data, utilized for this study. Three of the four scenarios were brought forward for the analysis of the infrastructure, specifically the Natural Increase scenario, the In-Migration and the High In-Migration scenarios.

The natural increase scenario was reviewed as it addresses the current situation while it was decided that the remaining two scenarios represented the “worst case” scenarios with respect to the ability of the infrastructure systems to meet the development needs of the City.

Figure 4.1 – Insert – Population Dispersion Table

4.2 Consumption and Flow Projection Methodologies

The primary focus of this study, as stated in the study objectives, is the analysis of the capacity of the water and wastewater infrastructure systems to accommodate projected growth within the City of Greater Sudbury.

Existing capacities have been reviewed in Section 3 and in all cases the treatment facilities have adequate capacity for their service areas under current operating conditions and in relation to their respective service populations.

Section 3 also described the methodology used to review the capacity of the individual facilities and their ability to accommodate current day flows.

This methodology was then applied to assess the ability of the facility to accommodate the growth scenarios presented in Section 4.1.

4.2.1 Plant Level Analysis

Analysis was undertaken to determine whether or not the water and wastewater treatment facilities are capable of handling any projected increases in population/flow.

The analysis involved calculating the resulting increase in flows generated by a given increase in population within each service area. In all but a few cases flow data from the 2001 Uncommitted Reserved Capacity Report was used as a basis for our analysis. Projected flows were calculated according to City of Greater Sudbury design standards. Standards incorporated included per capita flow rates, population density, extraneous flow (infiltration/inflow rates) etc. By applying these standard design criteria into the calculation along with factors to accommodate peak flows, a projected maximum day and average day flow was derived. This flow was then checked against the known rated hydraulic “firm” plant capacity to determine if the plant could provide adequate capacity to service the projected growth.

Table 4.2.1a and Table 4.2.1b summarizes the results of each plant analysis for each growth scenario noted.

The flow projections were completed for each service area for the Natural Increase In-Migration and High In-Migration scenario, and the percentage of utilized capacity was obtained. The results of the analysis for the treatment plants are summarized in Figure 4.2.1a and Figure 4.2.1b.

Table 4.2.1a **Wastewater Plant Capacity Comparison**

Treatment Facility	Rated Capacity m^3/d	Existing Condition 3 Yr. Avg. m^3/d	% Cap.	In – Migration Proj. Flow m^3/d	% Cap.	High In-Migration Proj. Flow m^3/d	% Cap.	Natural Migration Proj. Flow m^3/d	% Cap.
Azilda	3300	2577	78%	3846	117%	4345	132%	2491	76%
Chelmsford	7100	3950	56%	5462	77%	6049	85%	3817	54%
Coniston	3000	1336	45%	2106	70%	2224	71%	1291	43%
Copper Cliff	6800	2115	31%	2455	36%	2580	38%	2018	30%
Dowling	3200	2491	78%	3063	96%	3274	102%	2407	75%
Falconbridge	909	364	40%	665	73%	712	78%	352	39%
Levack	2270	1072	47%	1171	52%	1206	53%	1036	46%
Sudbury	79625	61859	78%	78821	99%	84586	106%	59782	75%
Valley East	11400	6066	53%	10867	95%	12549	110%	5862	51%
Lively / Walden	6100	3727	61%	5917	97%	6699	110%	3602	59%
Capreol	5000	3204	64%	3745	75%	3942	79%	3097	62%
Garson	3506	746	21%	2099	60%	2780	79%	721	21%
Wahnapitae	1246	962	77%	1092	88%	1118	90%	931	75%

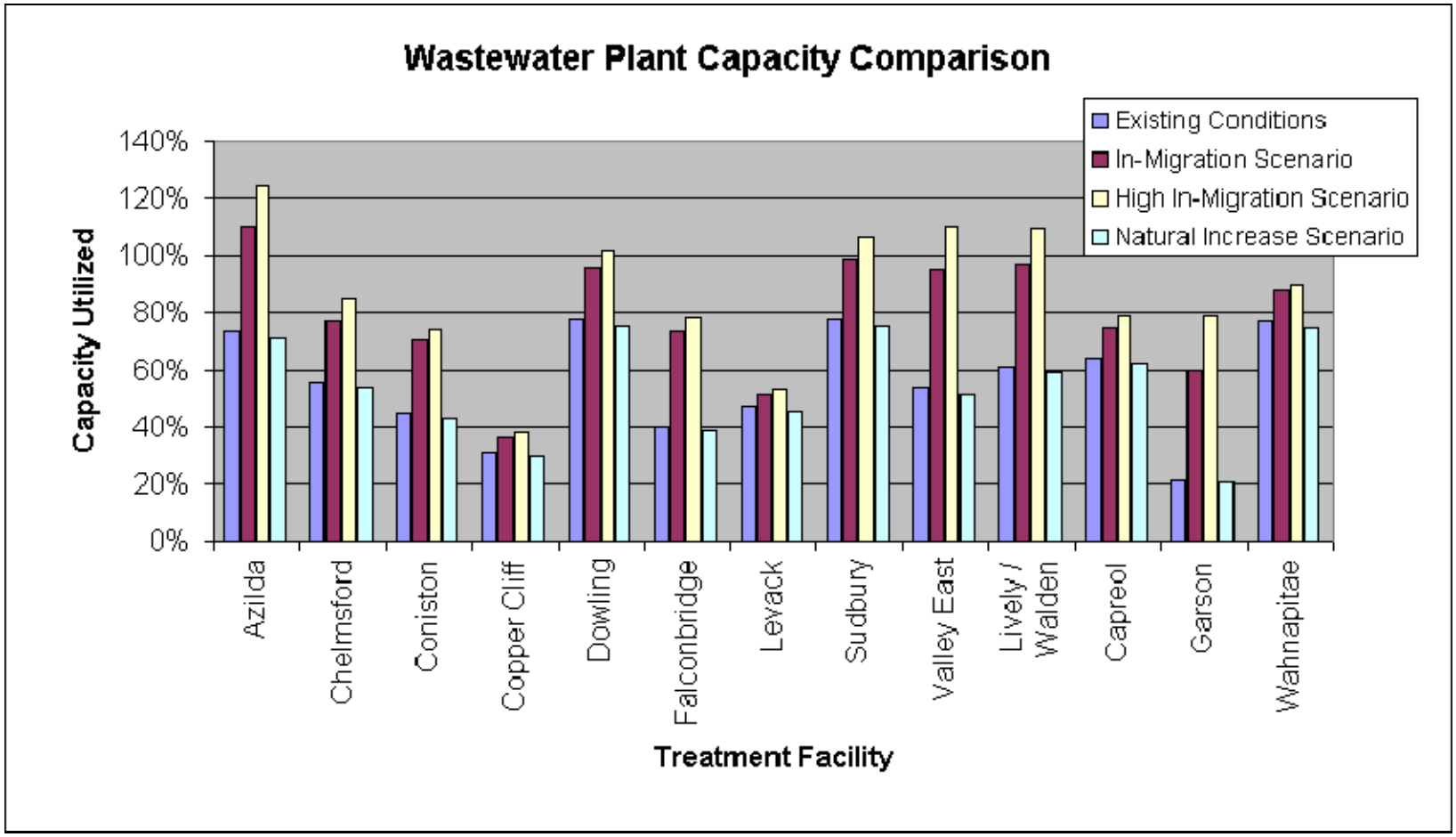
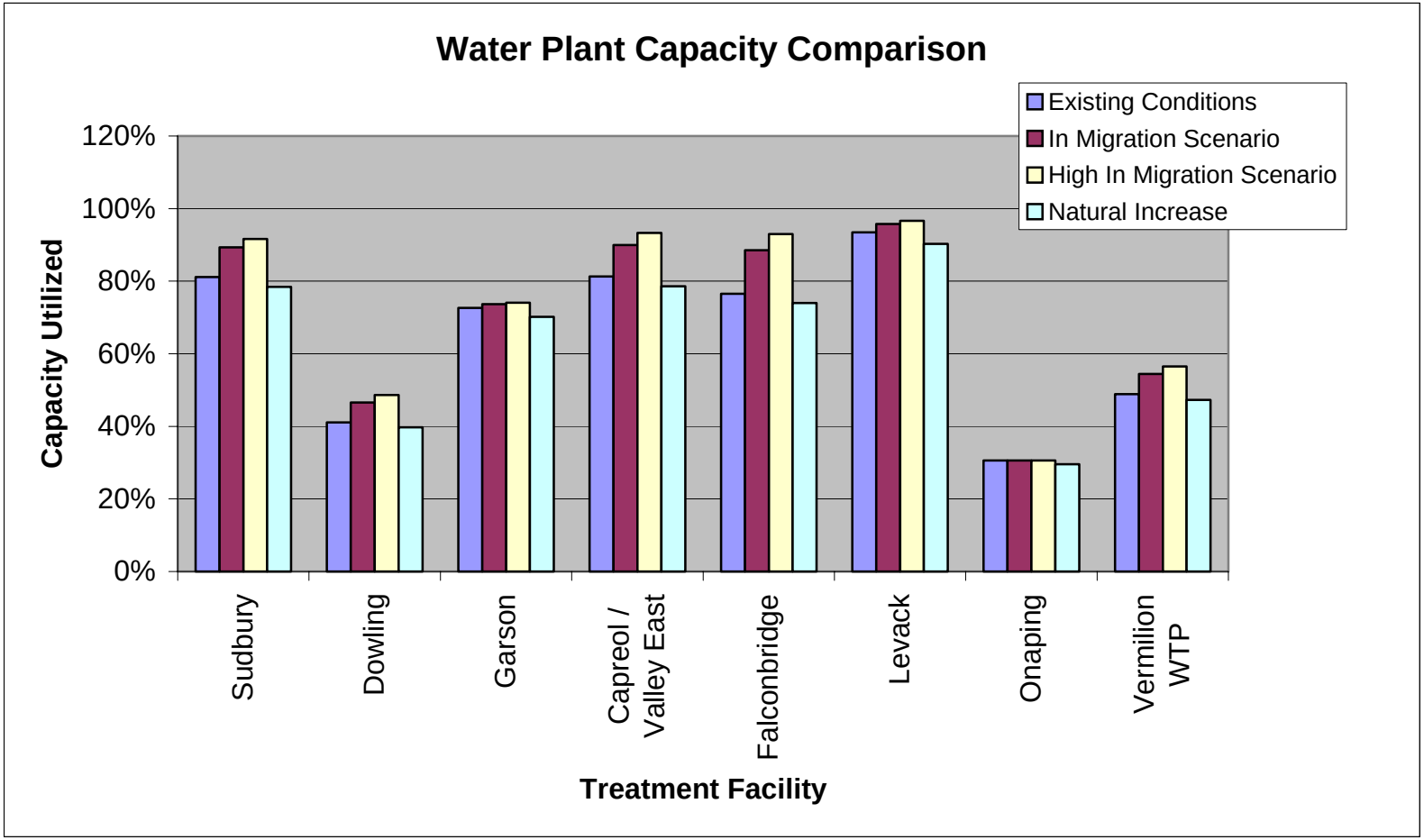


Figure 4.2.1a. Wastewater Plant Capacity Comparison

Table 4.2.1b **Water Plant Capacity Comparison 2002 – 2004 Data**

Water Treatment Facility	Firm Pc m^3/d	Existing Condition Max. Day Capacity m^3/d	% Capacity	Natural Increase Proj. Flow m^3/d	% Capacity	In - Migration Proj. Flow m^3/d	% Capacity	High In-Migration Proj. Flow m^3/d	% Capacity
Sudbury	84000	68188	81%	65899	79%	75041	89%	76969	92%
Dowling	3637	1494	41%	1444	40%	1695	47%	1770	49%
Garson	4553	3306	73%	3195	70%	3353	74%	3371	74.0%
Capreol / Valley East	27634	22469	81%	21715	79%	24869	90%	25776	93%
Falconbridge	2617	2003	77%	1936	74%	2316	89%	2433	93%
Levack	1555	1453	93%	1404	90%	1489	96%	1503	97%
Onaping	6540	2003	31%	1936	30%	2003	31%	2003	31%
Vermilion WTP	20381	9965	49%	9630	47%	11096	54%	11524	57%


Water Plant Capacity Comparison
Existing Conditions
In Migration Scenario
High In Migration Scenario
Natural Increase
120%
100%
80%
60%
40%
20%
0%
Capacity Utilized
Sudbury
Dowling
Garson
Capreol / Valley East
Falconbridge
Levack
Onaping
Vermilion WTP
Treatment Facility

4.2.2 Water Storage Capacity

Similar to the review for water treatment capacity the methodology described in Section 3.2.4 was expanded to account for the projected growth scenarios.

Table 4.2 2 Summarizes the result of our water storage analysis with the projected growth scenarios applied.

Once again the Sudbury and Levack Systems were flagged as having insufficient storage based on the MOE Guidelines. As noted in Section 3 the City is currently in the planning process to construct a new reservoir for the community of Levack.

Storage for the Sudbury system should be reviewed in greater detail once the Fire Underwriter Survey is complete and the requirements for Fire Flow storage components established.

Table 4.2.2 Water Storage Review – Summary

Service Area	Treatment System	Firm Capacity m^3/day	Available Storage	Current Storage Req'd	In-Migration Storage Req'd	High In-Migration Storage Req'd
Sudbury Coniston Garson Wahnapitae						
Sudbury -2001	David St. / Wanapitei	84,000	36,973	45,897	48,491	49,221
Sudbury - 2004	David St. / Wanapitei	84,000	36,973	41,397	43,538	44,141
Dowling	Well Field	3,637	1,392	948	1,096	5,133
Valley East Azilda Capreol Chelmsford Valley East						
Valley East / Capreol	Well Field	27,634	12,026	11,610	11,760	12,627
Falconbridge	Well Field	2,617	1,172	701	721	728
Levack	Well Field	1,555	1238 *	946	948	949
Onaping	Well Field	6,540	1,155	701	701	701
Copper Cliff Lively Walden						
Vermilion	Vermilion WTP	20,381	61,062	3,174	3,664	3,690

4.2.3 Lift Station System Review

The next level of analysis focused on the lift stations, which form an integral part of the wastewater collection system. Following the methodology established in Section 3.3.3. and in order to assess whether or not these lift stations could service any increased flows it was necessary to isolate each lift station and determine how much flow they were currently handling.

The draft approved plans of subdivision related to each drainage area were added to the existing flow. The number of approved residential lots was multiplied by the factor for density and the design factor of 500 l/person /day to derive the anticipated maximum flow from previously identified development activity. These plans of subdivision have been draft approved and as such existing plant capacity has been allocated for a period of one year under current policy to service these subdivisions.

The final step in the analysis involved calculating the additional flow generated by the balance of the projected populations. To clarify, the population increases projected by the planning consultant are assumed to be accommodated by the existing draft approved subdivision plans first. The overflow of population once all approved subdivisions are full would then be allocated to the various designated lands within the service area.

The estimated flow volumes, incorporating the draft approved plans and the balance of the population projections were then checked against the rated hydraulic “firm” and “installed” capacity of the lift station as well as the capacity of the forcemain. A pass/fail grade was then assigned NOTE: Interview with City operations was completed to provide a rough check of the results of the analysis. The comments and information obtained for the interviews were reviewed and adjustments to the lift station analysis were made to address field operating issues.

Table 4.2.3 summarizes the results of the Lift Station review. It identifies opportunities and constraints on development in a general and easily recognizable format.

As noted in Section 3 opportunities for growth and development are identified by a green dot, which indicates that no constraints are present in the service area based on the projected growth dispersement.

Constraints are indicated by an orange or red dot, and identify upgrades minor and major that are required to accommodate growth and in some instances, current flow levels.

Minor constraints (orange dots) may require pump upgrades to provide firm capacity at the Lift Station.

Major constraints (red dot) may include pump replacement, forcemain replacement and/or replacement of the facility.

This desktop exercise is based solely on theoretical design criteria established for the design of new systems, limited in field data and population forecasts. The results are suitable for this level of review and to identify potential constraints or development. Thorough analysis of any proposed development would be required to ensure adequate capacity exists. Furthermore it is recommended that prior to upgrading the constrained facilities, a detailed flow study be completed including flow monitoring be conducted to develop actual flow data. Copies of the various spreadsheets, developed to facilitate this analysis are included in Appendix G.

The results of our analysis are based on theoretical values established for the design of new systems. The results are suitable for this level of review and, to identify potential constraints on development. However, flow numbers may differ substantially from actual flows.

Table 4.2.3 Lift Station Review Table

4.2.4 Wastewater Collection System Analysis

The individual trunk sewer lines within the service areas have been reviewed to determine whether or not system improvements would be required to service projected growth.

The individual drainage areas related to the draft approved lots were defined similar to the approach utilized for the lift stations.

The wastewater collection system, within each drainage area, was reviewed to determine which trunk sanitary sewer line would most likely provide drainage for each draft plan of subdivision. The existing flow conditions were estimated using drainage area quantities and a design factor of 12 units per hectare multiplied by a density of 2.3 and 500 l/capita/day. This segment of pipe and all downstream segments of trunk sewer to the nearest lift station or treatment plant were analyzed to determine whether or not sufficient capacity exists to service new development. Where applicable theoretical values for 'C' Factor or Manning's were used to model the pipe systems. Factors such as lost hydraulic capacity due to the age of the pipes and break history were not considered and are beyond the scope of this study. Copies of the spreadsheets utilized to compile this data are included in Appendix G.

4.2.5 Overall Systems Performance Review

As part of the analysis for the consumption and flow projections, a review of the overall system performance was completed. This review focused on the quantity of potable water produced verses the quantity of water billed as revenue, as well as the quantity of wastewater billed as revenue versus the quantity of wastewater being treated at the wastewater treatment plant.

The results of this analysis are depicted in figure 4.2.5.

Water system

At present, based on the 2001 Annual Plant Capacity Report and water billing data from 2002, the City of Greater Sudbury produces 78,070 m^3 of potable water on a given day. The total billable volume reported in the same time frame is 43,930 m^3/day. The balance, described as non-revenue water, is lost through the treatment process, (backwash) (wastewater equals 1% of the flow through the plant), leakages in the water distribution system and operating procedures such as flushing of water lines to improve water quality in specific areas.

.

Figure 4.2.5

Lost or unbilled water equates to 43% of the total water produced for all systems in the City of Greater Sudbury.

Lost water however is not uniform through the City. Individual system losses can be broken out as follows:

- Sudbury 47.4%
- Dowling 8.3%
- Capreol/Valley East 31.4%

Sudbury was found to have the highest level of lost or non-billable water. This is in part due to age and size of the system, geographic area and topography.

Reduced levels of loss were noted for the newer outlying areas.

Wastewater

The City collects revenue for wastewater treatment operations based on the volume of water delivered to consumer. As noted above the total billable volume of water is 43,931 m^3/day. The Annual Plant Capacity reported indicates that the wastewater treatment facilities treat a flow of approximately 89,248 m^3/day. This difference in flow is explained by a number of factors: Lost water or non-billable water is a component. However, factors such as lawn watering, watermain breaks, treatment process maintenance (back washing), are also contributors. The higher wastewater flow is also attributed to extraneous flows such as inflow and infiltration and distribution system flushing, which is directed into the wastewater collection system.

These results are marginally higher than the performance of a large number of systems throughout Ontario and reflect the impacts of aging infrastructure, vast geographical area and varied operating conditions.

Any operational improvements within the system will have an impact on the water and wastewater infrastructure systems to service future growth/development.

4.3 Identification of System Deficiencies - Service Area Summaries

4.3.1 General

In order to provide a clearer picture of the long-term infrastructure needs for the City of Greater Sudbury, the results of the analysis have been complied into concise summaries for each service

area. These summaries provide an overview of the infrastructure system within each service area along with any identified constraints on development.

These summaries are broken down according to water and wastewater infrastructure. In the wastewater summaries each level of infrastructure, plant, lift station and trunk collection system are discussed.

For the water infrastructure systems, the plant analysis is presented. As noted in section 3.2.2 the pumping station and trunk water distribution analysis was of a limited scope. As such a general conclusion related to constraints on development will be applied to each service area related to pumping stations and fire flow.

The population figures utilized for this analysis are the serviced population figures for each area. This simply means the population that is currently connected to the water and wastewater systems. There is a small percentage of the population in each service area that remains disconnected from the water and wastewater systems.

Table 4.3.1 summarizes the various constraints on capacity within the individual service areas within the City of Greater Sudbury.

4.3.2 Capreol

Capreol is a community with a service population of approximately 3,400 people in the northern section of the City of Greater Sudbury.

According to the projections utilized for this study, the community of Capreol is projected to see an increase in population of 187 people in the In-Migration scenario, and 257 people in the High In-Migration scenario. Capreol will lose 114 people in the Natural Increase Scenario.

There are no draft approved plans of subdivisions within the community of Capreol.

Table 4.3.1 - Summary of Localized Constraints

Wastewater Treatment Facilities

A sewage lagoon services the community of Capreol with rated capacity of 5000 m³/day. The average daily flow currently reaching this facility is 3,204 m³/day. This equate to 64% of the capacity of the lagoon. The equivalent flows from the projected level of development will be readily accommodated by the existing sewage lagoons.

Wastewater Lift Stations

Analysis of the two lift stations located in Capreol indicated the following:

- The Lloyd Street station is capable of handling all existing & projected flows with the firm capacity of the station.
- The Vermilion Street station has a history of high flows and/or high well alarms under wet weather flow conditions based on discussion with City Staff and operation of both sewage pumps (installed capacity) during peak flows. Upgrades to the station, including; pump upgrades and standby power and/or replacing the forcemain may be required to accommodate growth. The existing situation is managed operationally by City of Greater Sudbury staff. This condition would be viewed as a marginal constraint on any future development in the community.
- Standby power is not present at the above facilities.

Wastewater Collection System

A review of the wastewater collection systems in the community of Capreol was undertaken. The analysis indicates that the trunk sewage collection system is capable of handling all existing flows and any projected increase in flows related to development.

Water Treatment Facilities

The community of Capreol is supplied potable water from a well field located to the south of the community in the vicinity of Green's Lake. This well field is currently rated to provide a firm capacity of 6,220 m^3 of potable water per day. Proposed upgrades to the Capreol System will see Capreol Well #6 abandoned and Wells M & J being combined with wells from the Valley system. A "new" well will also be constructed in the Valley to supplement the firm capacity. This work will be completed in late 2006.

The combined Valley and Capreol system will have a firm capacity of 27,634 m^3/d. A combined maximum day flow for the Chelmsford / Valley / Capreol areas is approximately 22,469 m^3/d and equates to 81% of the well field capacity.

The Valley East system is projected to see the second highest level of growth in the City. Projected combined maximum day flow for the above area is 25,776 m3/d.

Based on our analysis the proposed well water system has the capacity to accommodate the In-Migration and High In-Migration growth scenarios.

The results of the analysis are represented graphically on Figure 4.3.1

4.3.3 Valley East

Valley East is a community with a serviced population of approximately 17, 415 people.

According to the projections, Valley East will sustain the second highest level of growth over the next twenty years, next to the City of Sudbury. The Natural Increase scenario indicates a projected decrease in population of 643 people, while the In-Migration scenario provides a population increase for Valley East of 2297 people and the High In-Migration scenario projects an increase of 3164 people.

The latest subdivision activity maps provided by the City indicate a total of 508 remaining lots within the community of Valley East.

Wastewater Treatment Facilities

The community of Valley East is serviced by a wastewater treatment plant with a rated capacity of 11400 m^3/day and is currently operating at 53% of its capacity in 2001

The rapid development of the Valley area and projected growth for this area necessitates more recent data be reviewed. Since 2001 the flows to the plant have increased by 22% in 2003. The plant in 2003 was operating at 65% of the rated capacity.

The additional flows to be expected from the In-Migration scenario will be readily accommodated by the plant. However, the additional flows projected for the High In-Migration scenario is estimated at 12549 m^3/d and will exceed the plant rated capacity by 10%.

Wastewater Lift Stations

Valley East has 9 lift stations within its wastewater collection system. The analysis of the lift stations in conjunction with information from the City staff indicated the following:

- The St. Isidore, Madeline, Tupper and Flemming lift stations can handle the existing conditions and projected growth with the firm capacity of the Station.

- Hillside lift station has a history of high flows and/or high well alarms based on discussions with City Staff, and would have a marginal ability to service growth with the installed capacity of the stations. Pump and / or forcemain upgrades may be required.

- Four (4) lift stations, namely Tena, Spruce, Helene and Jeanne D' Arc are operating in exceedance of the installed capacity and would be unable to service any new development without major upgrades to the pumps and / or forcemain.

- Standby power is not present at Madeline and Flemming.

Wastewater Collection System

A review of the wastewater trunk collection system within Valley East and specifically in the drainage areas related to development has been completed. The analysis indicated that the trunk sewers in the vicinity of the designated lands (Main Street, Herve Avenue, and Jean D'Arc Street) would not be capable of handling the projected flows for the scenarios investigated and as such would be a constraints on development.

Water Treatment Facilities

Valley East is provided their potable water from a well field comprised of nine (9) ground water wells dispersed throughout Hanmer and Val Therese. The well field has a rated capacity of 21,588 m^3/day and the current average daily consumption is 9,093 m^3 with a projected maximum day flow of 15,637 m^3/day, which equates to 85% of the rated "firm" capacity.

As noted in Section 4.3.2 Capreol, proposed upgrades to the Capreol Well field will see the Capreol and Valley East system combined to service the communities of Valley East, Chelmsford, Azilda and Capreol.

The rated "firm" capacity of the combined system is 27,634 m^3/day. Projected maximum day flow for the above areas is 25,776 m^3/day. At these levels the system will be operating at 93% of its rated capacity under the High In-Migration growth scenario for the above areas. However, a number of wells in the Valley system have experienced deteriorating water quality and elevated levels of

sodium. Future regulations governing source protection may impose significant restrictions on the Valley Well Field.

The results of the analysis are represented graphically on Figure 4.3.1.

Figure 4.3.1 Infrastructure Constraints

4.3.4 Azilda

Azilda is a community with a serviced population of approximately 4112 people.

The population projections for Azilda brought forward in this study indicate an increase of 567 people in the In-Migration scenario and 781 people in the High In-Migration scenario. The Natural Increase scenario indicates a projected decrease in population of 167 people.

Wastewater Treatment Facilities

The community of Azilda has its own wastewater treatment facility with a rated capacity of 2840 m^3/day. This rating is under review and the City has initiated a capital project in 2004 to re-rate this facility to 3300 m^3/day. The treatment facility currently treats an average daily flow of 2,578 m^3/day and is operating at 91% of its capacity. Once the facility is re-rated to 3300 m^3/day, the average daily flow would equate to 78% of the facilities rated capacity.

However, any subsequent growth or development as projected for in the In-Migration and High In-Migration scenarios would cause the plant to exceed the proposed rated capacity (3300 m^3/d). It is anticipated that a plant expansion will be required after the service area and population is delineated by the Official Plan.

Development beyond the rated capacity could be directed to a more viable service area such as Chelmsford.

Wastewater Lift Stations

There are 5 lift stations operating in Azilda. A review of their operations in light of the projected population increased resulted in the following observations. It is anticipated that a plant expansion will be required after the service area and population is delineated by the Official Plan.

- Principale, Maple and Laurier Lift Stations have sufficient firm capacity to accommodate the existing and projected flow. However, Laurier lift station is the only facility affected by new development,

- The Marier and Landry lift stations have a history of high flows and high well alarms based on discussions with City Staff. The facilities have insufficient installed capacity to handle the current and proposed flows. Upgrades to the pumps and / or forcemain will be required.

- Standby power is not present at the Maple Station.

Wastewater Collection System

A review of the trunk sanitary sewer collection system was completed. The sewer segments related to servicing the remaining lots were checked for capacity issues and the results of the analysis indicate that there were no constraints and that the trunk sewers would be capable of handling the projected flows from the forecasted population increase.

Water Treatment Facilities

Azilda receives its potable water supply for the Valley East well field via a 450 mm feeder main and 300 mm main from Chelmsford.

The capacity review completed for the Valley East well field indicates that it is capable of servicing all projected growth for Valley East, Azilda and Chelmsford. The results of the analysis are represented graphically on Figure 4.3.2.

The community also has an elevated storage. Operation Problems with the tank including; freezing, chlorine residual and problems with the fire pump have been on-going issues with this tank and may need to be reviewed in detail to accommodate the proposed growth.

4.3.5 Chelmsford

Chelmsford is a community with a service population of approximately 7,332 people.

The population projections for the community of Chelmsford are an increase in population of 681 in the In-Migration scenario and 979 people in the High In-Migration scenario. Chelmsford will lose 114 people in the Natural Increase Scenario.

The subdivision activity maps from the City indicate 216 remaining in 2 draft-approved subdivisions.

Wastewater Treatment Facilities

In recent years, all wastewater flows have been directed to the Chelmsford wastewater treatment facility. In the past a portion of the flow operated by the community would flow to the lagoon at the north end of the community. This facility is still operational and available to manage peak flows, however, it is rarely used.

The Chelmsford facility is currently rated at 7100 m³/day and is receiving an average daily flow of 3,950 m³/day, which is 55.63% of its rated capacity.

The wastewater treatment facility is capable of servicing both the existing flow and the projected increases in flow over the 20 years planning period.

Wastewater Lift Stations

Chelmsford has 8 lift stations operating throughout the community to maintain wastewater flow to the treatment facility. Three of the eight facilities are operating well within the firm capacity. Proposed developments and any projected population increases should not have any impact on these lift stations.

The Main and Belanger lift stations are currently operating with a history of high flows and high well alarms based on discussions with City Staff. These lift stations are marginal in there capability to service the existing conditions with the installed capacity.

Fortunately, there is limited growth and development potential in the area serviced by these stations, and as such they have been rated as marginal in both the In-Migration & High In-Migration analysis results.

The Charrette lift station is currently experiencing high flows and has a history of high well alarms. This lift station is operating at approximately 83% of the installed capacity, based on the design assumptions, and has been noted as marginal under existing conditions.

The draft approved Belanger – Lacasse subdivision is in the vicinity of the Charrette lift station and the additional flows generated by this development will bring the lift station over its capacity. Upgrades to pumps and / or the forcemain will be required.

The Brookside and Winston Lift Stations utilize the installed capacity to handle current and proposed growth flows. These constraints are considered minor and no restriction on growth is anticipated.

Standby power is not available at the Radisson, Hazel, Brookside, Belanger and Whitson Stations.

Wastewater Collection System

A review of the trunk sanitary sewer collection system was completed. The sewer segments

related to servicing the remaining lots were checked for capacity issues and the results of the analysis indicate that the trunk sewers on Edna Street, Keith Avenue and Cote Avenue would not be capable of handling the projected flows from the forecasted population increase. As such, these trunk sewers would be a constraint on development

Water Treatment Facilities

Similar to Azilda, Chelmsford receives its potable water from the Valley East well field via a 450 feed water main and interconnection with the Azilda system. Chelmsford also has an elevated storage tank. The capacity review completed for the Valley East well field indicates that it is capable of servicing the projected growth for Valley East, Azilda and Chelmsford. The results, of the analysis are represented in Figure 4.3.2.

Azilda Figure

4.3.6 Levack and Onaping

Levack and Onaping are communities with a serviced population of approximately 2320 people. The communities are projected to increase in population by 38 people in the In-Migration scenario and 52 in the High In-Migration scenario. The Natural Increase scenario indicates a projected decrease in population of 51 people.

At present there are no draft approved plans of subdivision within the communities of Levack or Onaping.

Wastewater Treatment Facilities

Levack is serviced by a wastewater treatment facility rated at 2,270 m^3/day. This facility also treats all wastewater flows from the community of Onaping. Wastewater flow from Onaping is conveyed by the Fraser lift station across the Onaping River to the treatment facility.

The treatment facility currently receives an average daily flow of 1072 m^3/day. This daily flow equates to 47% of the plant capacity for the current and In-Migration levels. Upgrades may be required under the High In-Migration scenario. It is recommended a more detailed study be completed as growth continues.

The existing wastewater treatment facility will readily accommodated the existing condition and all projected growth.

Wastewater Lift Stations

The Fraser lift station is the only lift station within this service area and it is capable of servicing the existing conditions and the minimal projected growth for this area with the firm capacity. Upgrades may be required under the High In-Migration scenario. It is recommended a more detailed study be completed as growth continues.

Wastewater Collection System

A review of the trunk sanitary sewer collection system was completed. The sewer segments related to servicing the remaining lots were checked for capacity issues and the results of the analysis indicate that the trunk sewers on Onaping Drive and High Street would not be capable of handling the projected flows from the forecasted population increase. As such, these trunk sewers would be a constraint on development.

Water Treatment Facilities

Historically, the community of Levack has been supplied potable water from a well field operating by INCO Ltd. In December 2003, in light of MOE compliance issues, INCO Ltd gave formal notice to the City of Greater Sudbury that they would no longer provide this supply of water affective December 31, 2004.

The community of Onaping obtains its potable water supply from the Wickwas well field, which is operated by Falconbridge Ltd.

The City of Greater Sudbury has initiated the required works to locate a suitable alternative water supply for the community of Levack.

Once a suitable water supply is located, a new water treatment facility will be constructed and commissioned to service the needs of the community of Levack.

Consideration is being made to review the potential of the water system to accommodate the needs of Levack as well as Onaping. The additional capacity to service Onaping is being considered as insurance against the possibility that Falconbridge may also suspend supplying the community potable water from the Wickwas well field. The results of the analysis are represented graphically in Figure 4.3.3.

4.3.7 Dowling

Dowling is a community with a service population of approximately 1857 people.

Dowling is projected to see an increase in population of 249 and 344 people according to the In-Migration and High In-Migration scenarios respectively. Dowling will lose 62 people in the Natural Increase scenario.

At present there are no draft approved plans of subdivisions within the community of Dowling.

Wastewater Treatment Facilities

The Dowling wastewater treatment facility has be re-rated in 1999 from 2500 m^3/day to 3200 m^3/day. The average daily flow currently reaching this facility is 2491 m^3/day, which is approximately 78% of its rated capacity.

The wastewater treatment facility is capable of handling the existing flows and can service the In-Migration without going over capacity. The projected increases from the High –In-Migration scenario will bring the treatment facility over its rated capacity though it is marginal at 102%. However, current and projected flows for the facility will exceed the installed capacity of the plant lift station imposing potential constraints on development. It is important to note that recent I/I Programs implemented by the City have resulted in significant reductions in peak flows, necessitating the need to study this area and the sewer flows in greater detail.

Wastewater Lift stations

Dowling's only lift station at Lionel Street is capable of servicing the existing conditions and projected flows with firm capacity.

Standby power is not present at these facilities.

Wastewater Collection System

A review of the wastewater trunk collection system in the vicinity of the designated lands was completed to ensure that any projected increase in flows would be accommodated. The results of the analysis indicate that the existing collection system will be capable of servicing the projected growth.

Water Treatment Facilities

The existing well field in Dowling has a rated "firm" capacity of 3637 m^3/day and the maximum daily consumption being utilized by the community is 1494 m^3/day, or approximately 41% of its rated capacity.

The minimal levels of projected growth for this community will be readily serviced by this water treatment facility. The results of the analysis are represented graphically in Figure 4.3.3.

Figure 4.3.3 - Levack

4.3.8 Coniston

Coniston currently has a service population of 2,129 people.

According to the population projections developed for this study, Coniston will see an increase in population of 310 people in the In-Migration scenario and 427 people in the High In-Migration scenario. Coniston will see a decrease in population of 71 people in the Natural Increase scenario.

At present, there are no draft approved plans of subdivision in the community of Coniston.

Wastewater Treatment Facilities

The Coniston wastewater treatment plant has a rated capacity of 3000 m^3/day. Under existing conditions, the facility is treating an average daily flow of 1336 m^3/day, which is 45% of its rated capacity.

The analysis of the projected flows for Coniston indicates that the treatment facility is capable of servicing the long-term growth of this community.

Wastewater Lift Stations

There are 2 lift stations in operation in Coniston. The Government Lift Station is able to accommodate the current and projected flows with the firm capacity. The Government Lift Station is not situated in a location that would be impacted by any future development.

The Edward lift station has a history of high flows and high well alarms based on discussions with the City. The Lift Station is currently exceeding the installed capacity. Any future development in the designated lands will generate an increase in flows that may result in localized flooding in the area of the Edward Avenue lift station. Upgrades to pumps and / or forcemains will be required.

Wastewater Collection Systems

The wastewater trunk collection systems in the area adjacent to the designated lands within Coniston were checked to ensure they were capable of servicing any future growth. The analysis indicates the trunk collection system should be capable of servicing the anticipated growth.

Water Treatment Facilities

Potable water is supplied to the community of Coniston from the Wahnapitae Water Treatment Plant.

The analysis of the Wanapitei and David Street treatment facilities will be covered in the Sudbury section. The results of the analysis are represented graphically in Figure 4.3.4.

Numerous operational issues with the distribution system have been identified from our review and from discussions with City Staff. Upgrades to the distribution systems including new trunk mains are required to facilitate growth and are described in greater detail in Section 3.2.3.

4.3.9 Falconbridge

The current service population of Falconbridge is 754 people.

Over the twenty-year planning period, Falconbridge is projected to increase its population by 118 people in the In-Migration scenario and 162 people in the High In-Migration scenario. Falconbridge will lose 25 people in the Natural Increase Scenario.

There are 6 remaining lots indicated on the subdivision activity maps for Falconbridge.

Wastewater Treatment Facilities

The Falconbridge wastewater treatment facility owned and operated by Falconbridge Ltd. and has a rated at 909 m^3/day. The current average daily flow is 364 m^3/day and the plant is operating at 40% of its rated capacity. The additional flow and the minimal projected increases, will be easily serviced by the existing treatment facility.

Wastewater Lift Stations

There are no lift stations in Falconbridge.

Wastewater Collection System

The trunk collection systems, in the areas around the designated land within Falconbridge, were checked to ensure they were capable of servicing any future growth. The analysis indicates the trunk collection system should be capable of servicing the anticipated growth.

Water Treatment Facilities

Falconbridge receives its potable water supply from a well field operated by Falconbridge Limited. The well field is rated at 5,451 m³/day and as such is more that capable of meeting any future increase in population.

4.3.10 Garson

Garson is a community with a service population of 5,628 people.

The planning projections for Garson indicate an increase of 606 and 836 people for the In-Migration and High In-Migration scenario respectively. Garson will see a decrease of 164 people as part of the Natural Increase scenario.

The current subdivision activity maps indicated a total of 261 remaining lots exist in 4 draft approved plans of subdivisions in Garson.

Wastewater Treatment Facilities

Most wastewater from Garson is treated at a sewage lagoon located to the north of the community. This facility is operated seasonally, and during the winter months when it is not in operation, the remaining flows are diverted to the Sudbury wastewater treatment facility. The Garson lagoons have a rated capacity of 3506 m³/day and while in operation are servicing average daily flows of 746 m³/day or 21% of their capacity. Wastewater from the west end of Garson is treated at the Sudbury Wastewater Treatment Plant in Sudbury.

The flow increases due to projected growth in both scenarios will be easily serviced with the existing lagoon system and can readily accommodated at the Sudbury wastewater treatment facility.

Wastewater Lift Stations

Garson has three lift stations in service at this time. Under existing conditions the Garson – Coniston Lift Station is operating within the firm capacity of the station. However, it is experiencing high flow and high well alarms based on discussions with City Staff. Upgrades to pumping and / or I/I reduction may be required.

The O'Neil lift station is currently operating at the installed capacity. The projected population increases in the In-Migration scenario will not impact the capacity level. Further increases associated with the High In-Migration scenario will bring this lift station over its installed capacity

although it will only be at 103%. Upgrades to the pumps and / or forcemain will be required.

No standby power is available at Garson, Penman and O'Neil Stations.

Wastewater Collection System

A review of the trunk sewers in Garson, in the vicinity of the designated development lands, indicated potential constraints in the O'Neil Drive sewer.

Water Treatment Facilities

Garson obtains its potable water supply from three (3) wells located in the vicinity of Orell Street. The Well field has a rated "firm" capacity of 4553 m^3/d and is currently experiencing flows of 3306 m^3/d or 73% of the capacity.

Under the In-Migration and High In-Migration scenario the maximum day capacity increases to 3371 m^3/d or 74% of the firm capacity. The facilities are capable of servicing the existing and projected needs of Garson.

4.3.11 Wahnapitae

Wahnapitae is a community with a service population of 1,139 people located to the east of Sudbury.

The planning projections for Wahnapitae indicated an increase of 50 people in the In-Migration scenario and 60 in the High In-Migration scenario. Wahnapitae will lose 41 people in the Natural Increase scenario.

There are no active draft plans of subdivision in the community of Wahnapitae

Wastewater Treatment Facilities

The Wahnapitae sewage lagoons have a rated capacity of 1,246 m^3/day and at the present the average daily flow to the lagoons is 963 m^3/day, or 77% of their capacity. This facility is more that capable of handling the minor additional flows projected for the 20 year planning period.

This holds true for the single lift station and the trunk collection system in Wahnapitae.

Water Treatment Facilities

The community of Wahnapitae receives potable water from Wanapitei treatment facility. The

Figure 4.3.4 - Falconbridge / Wahnapitae

analysis of the flows for Wahnapitae is included in the section on Sudbury. The results of the analysis are represented graphically in Figure 4.3.4.

4.3.12 Lively/Walden

The communities of Lively and Walden are situated beside each other on either side of Hwy 17 to the West of Sudbury. For the purposes of this summary, the two communities will be discussed together since their wastewater infrastructure systems are linked together and one community impacts another.

Lively has a service population of 2763 people, while Walden has a service population of 3,376 people.

The planning projections for Lively indicated an increase in population of 586 people and 808 people in the In-Migration and High In-Migration scenarios respectively.

Walden is projected to increase its population by 332 people in the In-Migration and 458 people in the High In-Migration.

Natural increases projections are indicative of a decrease in population of 96 and 133 respectively.

The subdivisions activity maps indicate 327 remaining lots in the communities of Lively and Walden.

Wastewater Treatment Facilities

As noted, under the existing conditions both the Lively and Walden treatment facilities are operationally challenged. However, the City Staff manages the flows to the facility and are able to operate the plant at acceptable levels.

Lively Wastewater Treatment Plant is only capable of handling an increase of 203 people before it reaches capacity. In-Migration scenario forecasts indicate an increase of 586 people.

Walden Wastewater Treatment Plant is capable of servicing the flow from the projected increase in-population of 332 people.

In light of the projections for the In-Migration scenario, increased flow related to projected growth would put the Lively facility over capacity. The Walden facility has the capacity to treat this overflow

as well as the additional flow related to projected growth for Walden in the In-Migration scenario.

Lively Wastewater Treatment Plant fails as noted in the In-Migration scenario.

Walden Wastewater Treatment Plant is capable of handling the projected population increase of 570 people.

In the High In-Migration scenario, the Walden treatment facility can service the additional flows related to projected growth. If the overflow from Lively is added to this facility, then the Walden treatment facility would be marginally over capacity at 104%.

As discussed under the existing conditions section for wastewater treatment plants, Lively and Walden are able to work in tandem to meet existing flow levels. In the In-Migration scenario, the two plants working in tandem would have the capacity to handle the increased flows. The constraint in this scenario is the capacity of the gravity sewer system and its inability to effectively transfer the surplus flow from Lively to the Walden Wastewater Treatment Plant.

Under the High In-Migration scenario, the corresponding increases in flow will bring the two plants over capacity. Similar to the In-Migration scenario, the constraint would still exist in the gravity sewer system. In light of the fact that neither Junction Creek nor Meatbird Creek are able to handle any increases in effluent loading, the Wastewater Treatment Plants would require major upgrades for tertiary treatment.

In light of the complicity of the Lively and Walden systems, a detailed study is recommended, including flow monitoring of the WWTP's and interconnecting trunks to establish the constraints and rationalize the extent of the upgrades.

Wastewater Lift Stations

The Anderson lift station in Lively currently operating at the installed capacity and experiences high flow and high well alarms based on discussion with City Staff. The additional flow generated by the remaining 34 draft approved lots cannot be accommodated by this facility. The total of the additional flows generated in the high-in scenario will exceed the installed capacity of the station. Upgrades to the pumps and / or forcemain will be required.

Walden has a total of six (6) lift stations. The Jacob lift station currently experiences high flows and/or high well alarms based on discussion with City Staff.

Simon Lake West, Simon Lake East, Jacob and Magil Lift Stations are operating at the installed capacity and will require upgrades to facilitate growth. The Jacob lift station is situated down stream of the community of Lively and Walden and as such must handle the majority of flows from Walden and the flow bypassed from the interconnecting trunk sewer. Currently, Jacob is managed by City Staff, by diverting excess flow at the Lively STP and bypassing to the environment. The analysis indicates that this pumping station is operating at the installed capacity and will not be capable of servicing the projected increases in flow from the In-Migration scenario or High-Immigration scenarios without upgrades to the pumps and / or forcemain.

Standby power is not available at Oja, Simon Lake West, Simon Lake East, Vagnini, and Magil.

Wastewater Collection System

The trunk collection system and interconnecting trunk sewer were reviewed to confirm that the systems have adequate capacity to service the projected growth. The analysis indicates that the wastewater trunk collection systems connecting Lively and Walden runs surcharged and has limited capacity to accommodate the projected increases in flow from both the In-Migration and High In-Migration scenarios.

As noted, the interconnecting trunk sewer is unable to handle current day peak flows directed from the Lively Plant. The trunk sewer is managed by City Staff through a combination of high level alarms and bypass to reduce surcharging.

Water Connecting Treatment Facilities

Lively and Walden both receive their potable water supply from the Vermilion water treatment facility which is owned and operated by INCO Ltd. This facility has sufficient capacity to accommodate the projected growth in both scenarios. The only constraint would be brought about by a refusal of INCO to increase into supply volume, which is not anticipated at this time. The results of the analysis are represented graphically in Figure 4.3.5.

4.3.13 Copper Cliff

The community of Copper Cliff has a service population of 2302 people.

The population for Copper Cliff indicates an increase of 116 people in the In-Migration scenario and 160 people in the High In-Migration scenario. Natural increases results in a decline in growth of 77 people.

There are no draft approved plans of subdivision in the community of Copper Cliff.

Wastewater Treatment Facilities

The community of Copper Cliff is serviced by the Copper Cliff STP, which is owned and operated by INCO LTD. The rated capacity of this facility is 6800 m^3/day. At present this facility treats 2115 m^3/day or 31% of capacity.

The minor increases projected for Copper Cliff will be readily serviced by the existing facility.

Wastewater Lift Stations

There are 2 lift stations operating in Copper Cliff. The Orford lift station is operating at approximately 20% of its capacity, while the Nickel lift station is experiencing high flows and/or high well alarms based on discussion with City Staff.

The projected 160 people will not cause a significant impact to either of these lift stations.

Wastewater Collection System

The existing trunk wastewater collection system is capable of servicing both the existing and projected flows.

Water Treatment Facilities

Copper Cliff obtains its potable water from the Vermilion water treatment facility, which is owned and operated by INCO LTD. The plant is rated at a capacity 22,800 m^3/day and is currently experiencing flows of less than 50% of this capacity. This facility is capable of servicing the existing and future consumption needs of Copper Cliff.

The results of the analysis are graphically represented in Figure 4.3.5.

4.3.14 Sudbury

The City of Sudbury has a service population of 84, 876 people. This number includes an area of the community of Garson serviced during the winter months by the Wastewater Treatment facilities in Sudbury with a population of approximately 546 people.

Due to the large scale of the infrastructure systems in Sudbury the analysis was done on a sub-area basis.

Figure 4.3.5 - Lively Naughton

The sub areas are:

1) South End
2) New Sudbury
3) Old City

These are designations utilized in the subdivision activity maps. The results of the analysis for the infrastructure systems will be discussed relative to these sub areas.

The South End of Sudbury is an area roughly bound by Walford Road to the north, Southview Drive and Kelley Lake to the West, Long Lake in the south and the South Lake to the east. (The 1998 Secondary Plan for the former City of Sudbury designated this area as a designated growth area.) This area has a history of sewer problems including excessive backup issues in the lower lying residential areas. The City of Greater Sudbury, in recognition of these problems commissioned an Environmental Assessment to develop a solution to the problem. The Environmental Assessment was completed in October 2001 and the preferred alternative was accepted by Council resolution in November 2001. The preferred alternative a large sewer tunnel through the rock is illustrated in figure 4.3.6a. This tunnel will provide a suitably sized outlet for the existing South End sanitary flows and accommodate the projected growth for this area.

The subdivision activity maps identify the number of remaining lots for each subarea of the City of Sudbury as follows:

South End – 1340 lots.
New Sudbury – 419 lots.
Old City – 271 lots.

Data received from the Planning Department related to Industrial, Commercial, and Institutional development indicates the following levels of projected growth in the City of Sudbury:

South End	– 1,053,000 square feet.
New Sudbury	– 211,671 square feet.

Wastewater Treatment Facility

The Sudbury Wastewater Treatment plant has a rated capacity of 79,500 m^3/day. The annual plant treatment report indicates that the facility is treating an average daily flow of 61859 m^3. It should be noted here that the current average daily flow of 72,718 m^3/day equates to 92% of the plant capacity.

Figure 4.2.6a Preferred Alternative

The analysis indicates that the Sudbury treatment plant is capable of handling the projected increases in flow for both the In-Migration scenarios.

Wastewater Lift Stations

There are 33 lift stations in operation in the City of Sudbury. The results of the analysis, as discussed earlier, will be presented on a sub area basis.

4.3.15 South End

The South End of Sudbury has 17 lift stations operating under existing conditions. In the near future, the South End sewer tunnel will be constructed to alleviate localized flooding in the area. The South End Tunnel, as illustrated in Figure 4.3.6a has been designated to include extensions that will provide an outlet for low lying areas in the South End. This means that certain lift stations will be taken out of service. This will in turn reduce the potential for flooding.

The following lift stations are all currently experiencing high flows and/or flooding, and will be addressed as part of the development of the South End Sewer Tunnel:

- Marcel Bouchard L.S.
- Walford West L.S.
- Oriole L.S.
- Stewart L.S.
- Old Burwash L.S.
- Paris L.S.
- Green L.S.

The Cerilli, Brenda, Ester and Countryside lift stations are all operating within firm capacity levels under existing conditions and are capable of servicing the projected growth in their respective areas.

Base on discussion with City staff, Southview, Helen's Point, Walford East and Loach's lift station all currently experience high flows or high well alarms. These lift stations service relatively small areas, with limited growth potential, as such they should not be impacted by any future development or growth and their operation will be maintained by City Staff. Upgrades may be required to accommodate growth. The analysis for the South End is represented graphically in Figure 4.3.6b.

Standby power is not available at Cerilli, Loaches, Helen's Point and Ester Stations.

Figure 4.3.6b – South End

Water Treatment

The City of Sudbury is provided with potable water from both the David Street Water Treatment Plant and the Wanapitei Water Treatment Plant. Coniston and Wahnapitae as well as portions of Garson also receive their water from these two facilities. The David Street Plant capacity of 40,000 m^3/d. while the Wanapitei facility has a capacity of 44,000 m^3/d.

The analysis completed for this study indicates that these two facilities have sufficient capacity to meet the projected increase in demand for both the In-Migration and High In-Migration scenarios.

The analysis for the Sudbury area was completed using more up-to-date data, (2004 Plant Capacity Report) to better reflect the viability of the treatment facilities.

Upgrades at the David Street Plant, coupled with changes in the operation of the water distribution system have significantly lowered the demand on these facilities.

A second issue that affects the available capacity is the density (number of people per house) being applied in the forecasts from Meridian. The current density of approximately 2.7 people is forecasted to drop to 2.3 people per household. This means lower consumption for each unit of development.

4.3.16 New Sudbury

In the New Sudbury section of the City there are 2 lift stations, Don Lita and Sherwood under existing operating conditions, both lift stations are running at approximately 40% of their capacity.

There are no draft plans of subdivision in the vicinity of these stations or any designated lands. As such it is anticipated these lift stations will provide adequate service capacity over the twenty year planning period. The analysis for New Sudbury is represented in Figure 4.3.6c.

4.3.17 Old City

There are 14 lift stations within the Old City sub-area. These facilities have been reviewed and the following items identified:

- Lift Stations at the Lagace, York, Beverly, Bell Park, Lakeview, Mark, Kincora, Moonlight Beach, and North Shore are operating at acceptable levels with firm capacity under existing conditions based on discussions with City Staff.

Figure 4.3.6c – New Sudbury

- Of this group of facilities, only the Levesque lift station would have any additional loads due to anticipated growth. The analysis indicates that this lift station can accommodate the expected growth for both the In-Migration and High In-Migration scenarios.

- There are 4 lift stations, specifically Moonlight, Selkirk, St. Charles, and Duffern lift stations have sufficient firm capacity. However, based on discussion with City Staff the stations that experience high flow and/or high well alarms under current operating conditions and have been identified as a minor constraint. These lift stations are not located in the vicinity of any projected development and as such should not be impacted by any additional flows.

- The Ramsey and Fourth Ave. Lift Stations are not capable of servicing the existing conditions, and have no capacity to service the projected flows in the In-Migration and High In-Migration scenarios with firm capacity.

- The Southview Lift Station is discussed in the South End sub-area review.

- Standby power is not present at Moonlight Beach, North Shore, Selkirk, Lagace, Dufferin, Bell Park, Lakeview, Kincora, and Beverly

The analysis for the Old City is represented in Figure 4.3.6d.

Wastewater Collection Systems

4.3.18 Sudbury

A review of the trunk sewers in the Sudbury sub-area indicated potential constraints in the sewers on Mildred Street and two sections of sewer on Bancroft Drive.

4.3.19 South End

The trunk wastewater collection system in the South End is currently undergoing significant changes with the impending construction of the South End sewer tunnel. There are a number of sections of sewer that have a history of flooding, but they are related to lift stations and low-lying areas.

A formal review of the sewer operating conditions should be conducted after the tunnel is completed to confirm these areas are flowing effectively.

4.4 Water and Wastewater Rate Forecast

A review of existing water and sewer rate structures was undertaken to determine the level of funding available to the City to facilitate the ongoing operation and maintenance of the water & wastewater infrastructure systems. Forecasted levels of revenue were also developed based on the population/demographic data and the forecasted flow data developed in the system capacity review section of this report.

Figure 4.3.6.d - Sudbury

In May of 2001, the City of Greater Sudbury adopted a revised water and wastewater rate structure to address the financial sustainability of the water and wastewater systems to ensure a safe long-term supply of water and the provision of adequate wastewater disposal services.

The new policy came into affect in July of 2001 and involves doubling the current rate level over a ten-year period to ensure full cost recovery of water and wastewater services for the City of Greater Sudbury.

At the time of the rate review a number of assumptions were made and they formed the basis of the proposed sustainable asset management program. The assumptions included the following:

- The City currently spends approximately $10 million on capital projects for water and wastewater infrastructure – approximately 1% of the replacement value of the system.
- The City should be spending 2% on capital to achieve a sustainable Asset. Management Program.
- 2002 water revenues would be approximately $15 million
- Time period for projections – 10 years.
- Doubling of the rates would provide projected annual capital financing of $21 million.
- Population growth projections were not included in this forecast.

The last assumption is quite important to the analysis undertaken for the Infrastructure Background Study. The level of funding required to operate and maintain the existing infrastructure will be attained through respective rate increases. The additional amount of population projected within this study will generate an increase in revenue above these already accounted for in the water and wastewater rate study.

Figure 4.4.1 Illustrates the difference in the revenue forecasts discussed above.

Calculations were completed to determine the level of additional revenue to be expected from the increase in population due to projected growth.

The same assumption related to per capita daily consumption rates and extraneous flows were applied. Household densities were taken from the Meridian Planning Consultants report.

The doubling of the water and wastewater rates coupled with the projected growth in population and

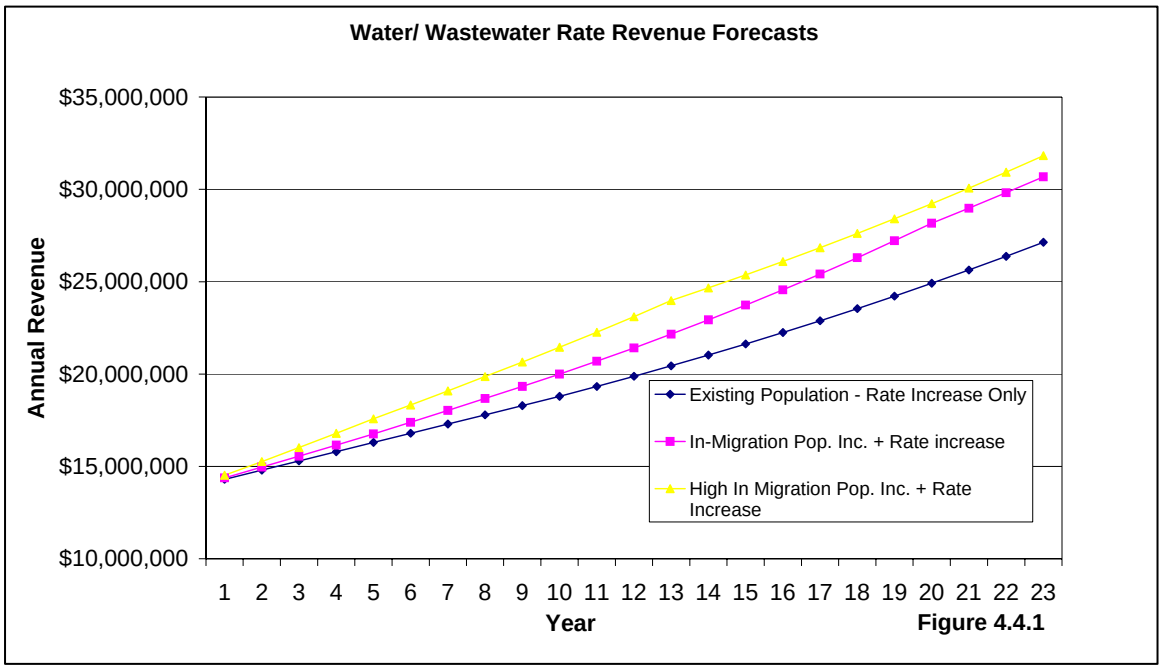

Water/ Wastewater Rate Revenue Forecasts
$35,000,000
$30,000,000
$25,000,000
$20,000,000
$15,000,000
$10,000,000
Annual Revenue
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Year
Existing Population - Rate Increase Only
In-Migration Pop. Inc. + Rate increase
High In Migration Pop. Inc. + Rate Increase
Figure 4.4.1

Figure 4.4.1

the reduction of household densities will generate additional revenue of approximately $4.5 million, over the $21 million identified in the water / Wastewater Rate Review.

The plant level capacity analysis indicated that level of growth expected to occur within the City of Greater Sudbury over the 20 year forecast period, will require upgrades and / or expansion to a number of facilities (plants, lift stations and trunk sewers). The timing and scope of these upgrades are dependent on actual growth and as such it is not possible to detail the costs for each facility.

As such based on the review presented in this report, the water and wastewater rate levels would provide an adequate revenue stream to facilitate a planned maintenance and operational program for the water and wastewater infrastructure systems. Detailed analysis of the identified areas where there are constraints should be undertaken to facilitate the development of a long-term plan for the systems.

5.0 INFRASTRUCTURE IMPROVEMENT PLAN

5.1 Review of Existing "1998 Priority List"

The "Priority List – Sewer and Water for un-serviced areas in the Regional Municipality of Sudbury" was created in 1978 as a policy guide for council to evaluated sewer and water servicing needs across the Former Regional Municipality of Sudbury. The original list, now 26 years old, identifies projects brought forward by constituents throughout the former Region and provided a ranked priority for each project. This ranking however did not automatically mean the first ranked project would be built first. The Priority list is reviewed on an on going basis and where practical, projects are completed either in conjunction with other City capital works or where as the guidelines dictates where the constituents participate in funding their share of the capital works.

The City of Greater Sudbury is currently reviewing this policy document, and its applicability in terms of the long-term development and operation of the water and wastewater infrastructure systems.

5.2 Near-Term Capital Improvements

Typical proposed capital works improvements may include the following:

Capital Program

Water Projects:

- Water Supply Improvements
- UV Upgrades
- Groundwater & Surface Water Protection
- New Wells
- Storage Tank & Valve Chamber Improvements
- Water Conservation Initiatives
- SCADA Upgrades/ Communication System Upgrades
- Ontario Regulation 170/03 – Safe Drinking Water Act – Various Upgrades
- Groundwater Studies and Watershed Protection

Wastewater Projects

- WWTP Upgrades
- WWTP Clarifier Upgrades

- WWTP Pumpstation
- Sewage Liftstation Upgrades
- SCADA Upgrades/ Communication System Upgrades
- Lift Station, Forcemain Replacement
- Sewage Treatment Plant – Tertiary Treatment

.

6.0 HIGH PRIORITY INFRASTRUCTURE IMPROVEMENT AREAS

Over the next twenty years there are a number of potential infrastructure improvements projects. These have been based on a review of the results of the analysis completed on the infrastructure systems and the identification of areas requiring improvement with respect to infrastructure policy and development related growth.

The analysis of the infrastructure systems highlighted a number of both positive and negative issues for the City of Greater Sudbury. On the positive side the analysis indicates that in all but two or three cases, the existing major infrastructure systems such as water treatment and wastewater treatment plants have sufficient capacity to sustain all forecasted growth within the City of Greater Sudbury. On the negative side, the review has clearly highlighted the issue of fire flow and system inefficiencies related to water losses and extraneous flows within the infrastructure systems, and constraints with regard to lift station and trunk sewer capacities.

Based on past investment in sewer and water plant infrastructure, there is adequate plant capacity to accommodate anticipated development in designated growth areas across the City with the possible exception of Azilda. Local improvements may be required which at this time is the responsibility of the developer. Certain specific infrastructure investments are discussed in the report.

The items identified within this section include specific large scale capital projects already identified as required for current operational issues, areas of existing operational constraint, and areas highlighted by the technical review that are required to support and manage any long term growth within the City of Greater Sudbury, and those projects recommended as part of the City's long range 20 year plan. Items may be added to or deleted from this list as time passes or circumstances change.

Item 1: Large Scale Capital Projects

The following large capital projects were suggested and form part of the City's Long Term Capital Planning.

- Levack Water Supply – New Well / Plant
- Valley East Water Supply Replacement Plant and Storage
- Sudbury WWTP- Expansion
- Lively WWTP – Expansion / Upgrades
- Azilda WWTP – Re-rating / Expansion

- Chelmsford - Tertiary Treatment
- Wanapitei WTP – Alternative Transmission Main
- Wanapitei WTP – Process Upgrades, metering and standby power (Sudbury, Garson, Falconbridge)
- Lake Wanapitei - New Water Treatment Plant
- Regional Ground Water/Surface Water Protection
- Water / Wastewater Master Plan

These capital projects have been developed to address existing and long-term system deficiencies within the City, and a number of them will span multiple years. The South End Tunnel addresses both the existing operational issues and provides for future growth in the south end of the City, while re-rating the Azilda plant simply enables existing approved plans of subdivision to be completed.

Item 2: Infiltration and Inflow Reduction Program

The City has made significant progress over the years to reduce Infiltration in Azilda, Lively and Chelmsford. However, the results of the technical analysis indicate that a substantial portion of the wastewater flows being treated at the wastewater treatment plants is a result of inflow to the wastewater collection system. The problem lies in the connection of weeping tile to the sewers, the age of the collection system pipes, lateral connections, and as is the case in an area such as Valley East, very high water tables.

A more defined study should be undertaken to determine the worst areas of inflow/infiltration and a remediation program brought forward to remove connected weeping tiles and seal the wastewater collection pipes. This would result in savings for the City in terms of wastewater treatment plant operation and would free up existing plant capacity that is currently being wasted treating ground water.

Item 3: Water Loss Reduction Program

Similar to the infiltration issue brought forward in Item 2, the results of the analysis indicate that the City is currently treating a substantial amount of potable water that is unbilled and does not reach the homes and industries within the community. Certain operating policies within the City, such as advising residents to run their water during the winter months to avoid frozen pipes, flushing water and blow off lines installed to maintain water quality, leakage in the system result in the City treating a great deal more water than is required to meet the needs of the community. This water does not pass through a water meter and is unable to be billed. This results in increased operating costs for the City of Greater Sudbury.

A review of these policies and a cost/benefit analysis of the running water policy could help the City to reduce their water treatment plant operating costs and again take a portion of the load off the water treatment plants.

Item 4: Pump Station Upgrades

The technical analysis of the pumping stations for the wastewater collection system involved a theoretical calculation to determine plant operating levels and a review of the lift stations with City of Greater Sudbury, Public Works Department Operating Staff. The results as presented on the boards at the public meeting indicate that a number of the lift stations are currently operating at the installed capacity during peak load conditions. Any further growth or expansion of the collection system draining to these facilities would result in a hydraulic overload for these stations during these times.

A detailed review of the operating parameters for these pumping stations including flow monitoring and plant operation review should be conducted prior to any further expansion in these areas. Under the current policy within the City, the onus is on the developer to upgrade the pumping station as a condition of approval should they wish to develop their land.

Item 5: Sewer Collection System Upgrade

The final section of the wastewater collection interceptor sewer leading into the Sudbury Wastewater Treatment Plant will require upgrades to accommodate near term and forecast sewer flows. This project was identified as part of the South End Sewer Tunnel Environmental Assessment.

Minor upgrades to various trunk sewers have also been identified for the service areas. Typically these upgrades would be the Developers requirements.

Item 6: Water and Sewer Models

The City of Greater Sudbury currently uses water and sewer models to aid developers and consulting engineers. The water model is well established for the former City of Sudbury and is utilized to determine the available capacity, flow and pressure at a given point in the system. Less developed and refined models are available for the outlying communities. Similarly, sewer models are in a developmental stage but are periodically used as aids in determining system capacity.

Work done in the area of infiltration reduction or in the reduction of water losses should be followed up with corresponding work by the City of Greater Sudbury to re-calibrate their sewer and water models to reflect the changes in flows. The data from the existing models has been utilized for the

purposes of this study, but it is felt that the on-going calibration and refinement of the models should be done in conjunction with any field works to ensure the validity of the models.

Fully developed and properly calibrated, sewer and water models are an invaluable tool in determining system capacity, and the potential for development growth.

Typical uses for the model can include; determining the capacity of a specific section of the system in relation to the overall capacity of the system, and determining constraints and or areas that are sub-standard and require replacement or repair. As a tool for development, models can be used at an early stage in the development process to determine the feasibility of the development and cost associated with connecting to or upgrading the City's systems, before significant dollars are spent on engineering design.

As noted the City has models in various stages of development for the City of Greater Sudbury. We understand that the long-term plan is to translate this information and develop a database to support a GIS based system. As recently as this January the City has hired a GIS operator to initiate the process of developing and populating the database. Once established a GIS based system in conjunction with the City's modeling software will permit the City to quickly identify the location and constraints that may be imposed on a specific development. A GIS based system is the first step in developing an interactive tool and will permit the combining of a multitude of data streams to develop an overall picture of the system.

The two biggest challenges with using these computer models is to ensure that they are kept current and that they reasonably reflect the scenarios that should be assumed for planning and design of subdivisions and site plans (land development).

Recognizing that development is a dynamic process and that the water and sewer systems are continuously being upgraded (e.g. new pipes and pumps), the City must designate tasks to continually refine and update the data used to develop the model as new components are constructed and new demands/loads are added to the systems. The demands/loads in the models should be consistent with those used in the calculation of hydraulic reserve capacities.

In addition to maintaining the database the models must be calibrated on a yearly basis. Hydrant flow testing programs (for water distribution systems) and flow monitoring programs (for sewer systems) need to be established and scheduled to confirm the calibration of the model.

A procedure for the use of the models must be developed to permit system simulation of the specific development under typical scenarios (e.g. maximum day demand plus fire flow for water distribution systems, peak wet weather flow for sanitary sewer systems). The procedure will need to provide a consistent approach to the design of new subdivisions and site plans, simplify the review process, while protecting the City from liabilities.

This procedure may take the form of a numeric rating system for development, whereby a potential developer/land development would be given a rating based on the available sewer and water capacity. The rating system could be developed based on zonal information developed in the GIS database and combined with capacity information calculated from modeling runs. A rating would then be applied to a specific street based on the available aggregate capacity of each system. Such a subsystem would allow early indicators to potential developers as to the constraints that they may be facing and help the City in prioritizing capital works with respect to development potential.

Item 7: Sewer Condition Assessment Program

This study has been premised on the data readily available from the Engineering and Operations Sections of the Public Works Department, and the latest versions of any pertinent Planning data. Data related to the wastewater collection system, specifically the pipe condition data was not available, and as such the review of the system from the perspective of structural conditions and operational conditions was unable to be completed. A detailed system inspection of the wastewater collection system including continuous CCTV inspection programs would assist in the completion and validation of the sewer model and would facilitate the long-term planning for system remediation such as repairs / replacement and capital works upgrades.

Item 8: Tracking System Sewer And Water Reserve Capacities

The City of Greater Sudbury currently tracks the reserve capacity of the Sewer and Water systems according to the Ministry of Environment, Guideline D-5 – “Planning for Sewage and Water Services”. This guideline is an effective means of planning for sewer and water infrastructure needs and preparing servicing strategies. A key component to the development of servicing strategies is to target areas for the support of growth and development, and support development. An integral part of this process is determining and monitoring the capacities of various infrastructure systems including the status of the uncommitted reserve capacity, which relates to the capacity of the water and wastewater treatment facilities.

The City, in past years, incorporated an annual review of their water / wastewater plant capacities into their planning and engineering activities. The basis for their annual review is the Ministry of the

Environment Procedure D-5-1 – “Calculating and Reporting Uncommitted Reserve Capacity at Sewage and Water Treatment Plants”. Copies of these Guidelines D-5 and D-5-1 are included in Appendix A.

Typically these procedures incorporate historic data on a three-year revolving basis and use this information in-conjunction with growth and density projections to determine the remaining reserve plant capacity and number of developable lots. This method of determining reserve capacity can be extended to segmented areas such as those divided by sewage lift stations or water booster stations. Calculations and accompanying spreadsheets have been included in Appendix G. The continued use and updating of these spreadsheets will allow the City to review the reserve capacity at a more localized level to determine the potential for development and the ability of the infrastructure to support growth.