

Preliminary Engineering Report

Breezy Point Wastewater Treatment Facility

Prepared for

The City of Breezy Point

May 2011

Mayor: JoAnn Weaver

Council Members: Tom Nelson
Otto Schmid
Tom Lillehei
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City Administrator / Clerk: Joe Rudberg

Wastewater Plant Supervisor: John Monnier

CERTIFICATION

PRELIMINARY ENGINEERING REPORT

BREEZY POINT WASTEWATER TREATMENT FACILITY

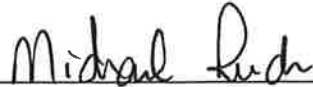
Breezy Point, Minnesota

By

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I hereby certify that this report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.



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Professional Engineer

43896
License Number

6/6/11
Date

**BREEZY POINT WASTEWATER FACILITY
2011 PRELIMINARY ENGINEERING REPORT**

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INTRODUCTION

The City of Breezy Point owns and operates a wastewater treatment facility (WWTF) that treats municipal wastewater. This facility utilizes a series of ponds to treat wastewater to the point that it is suitable disposal via forested spray irrigation fields located on property also owned by the City.

Exhibit A on the following page provides an aerial photo of the City showing the location of its wastewater treatment facility outlined in red.

This facility was last studied in 2001 by McCombs Frank Roos Associates, Inc. The study was commissioned to evaluate methods by which its treatment capacity could meet future demands and maintain compliance to discharge standards.

The facility is permitted under Minnesota Pollution Control Agency (MPCA) Solid Disposal System (SDS) Permit MN0047457.

In April of 2011, the City of Breezy Point retained the services of Widseth Smith Nolting to provide an updates study of this facility. Per the stated requirements of the request, the purpose of this study is to:

- Evaluate existing wastewater treatment facilities
- Project flows and loads on the wastewater treatment facility and lift stations
- Provide expansion and capacity alternatives where necessary
- Analyze future capital costs of the system

This report will summarize the findings of the study and provide recommendations on these points for the City to consider.

For the purposes of projections and financial analysis, a 10-year period has been requested by the City and will be used in this report.



These data are provided on an "AS-IS" basis, without warranty of any type, expressed or implied, including but not limited to any warranty as to their performance, merchantability, or fitness for any particular purpose.

Breezy Point WWTF

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PROJECTED FLOWS AND LOADS

Among other things, wastewater flows into the City's treatment facility are recorded on a regular basis and reported to the Minnesota Pollution Control Agency (MPCA) as part of the agency's permitting and compliance monitoring process.

This process makes it possible to analyze large amounts of data to identify historical patterns and predict, with some degree of confidence, future trends.

Exhibit B on the following page provides a graph of annual wastewater flows (in millions of gallons) for the years 1978, when initial construction of the treatment facility was completed, through 2010.

Based on a mathematical best fit of the historical data, a trend line has been calculated and display on the graph. The trend line has been projected forward through the year 2030.

Population projections are often considered when predicting future wastewater flows and loads. For this study, population data and projections for the City of Breezy Point was gathered from the State of Minnesota Demographer's Office and United States Census Bureau.

Historical population data was analyzed and is summarized in graphical form as Exhibit C on page 5 of this report. Also included on this graph are future population projections from the State Demographer's most recent (circa 2007) report.

From this graph, it can be seen that the population of Breezy Point has exhibited continuous growth from 1960 through the present. Periods of very high growth have been experienced between 1990 through 2000 at approximately 8.5% per year and 2000 through 2010 at approximately 9% per year.

There are a number of factors which contribute to making the use of population data less useful for predicting future wastewater flows and loads for the City of Breezy Point. Prominent among these factors is the City's suitability and history as a resort and vacation destination.

A large number of users of the City's wastewater collection and treatment system are residents of another city or state and are either resort visitors or seasonal residents of their privately-owned vacation properties. The wastewater flows generated by these non-residents does not correspond in any real way to the City's population.

**Exhibit B - Sanitary Sewer Flows - Annual
City of Breezy Point**

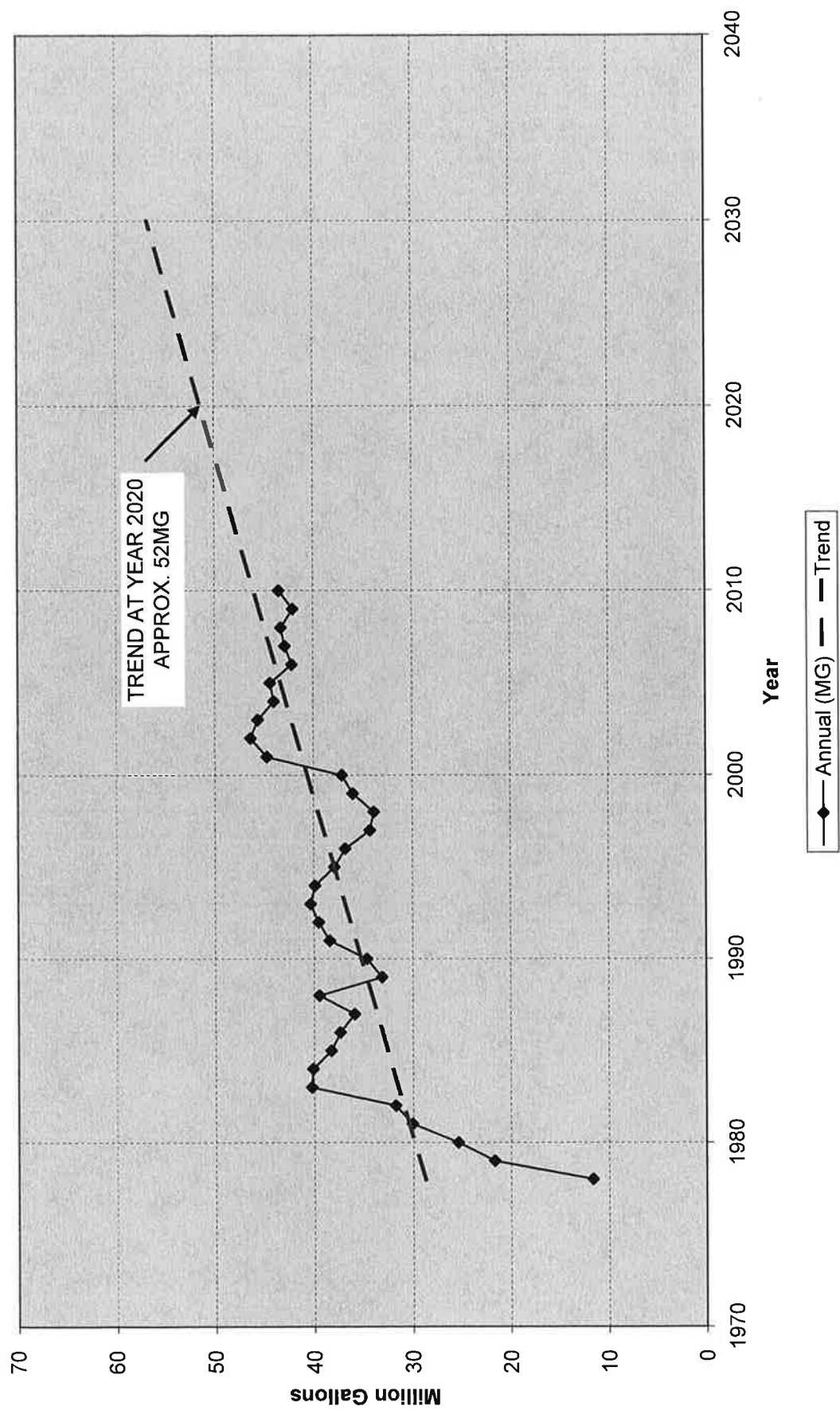
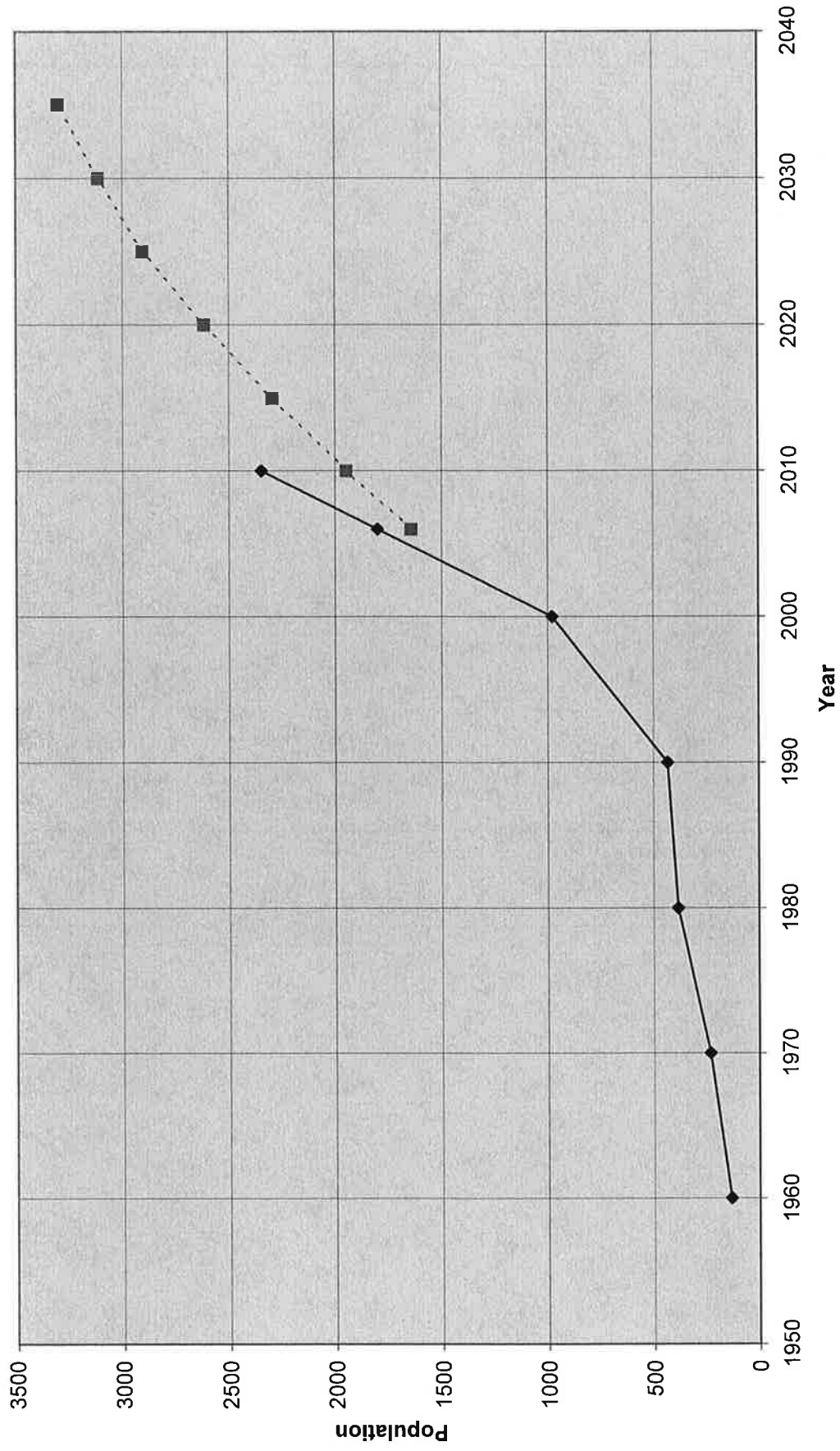
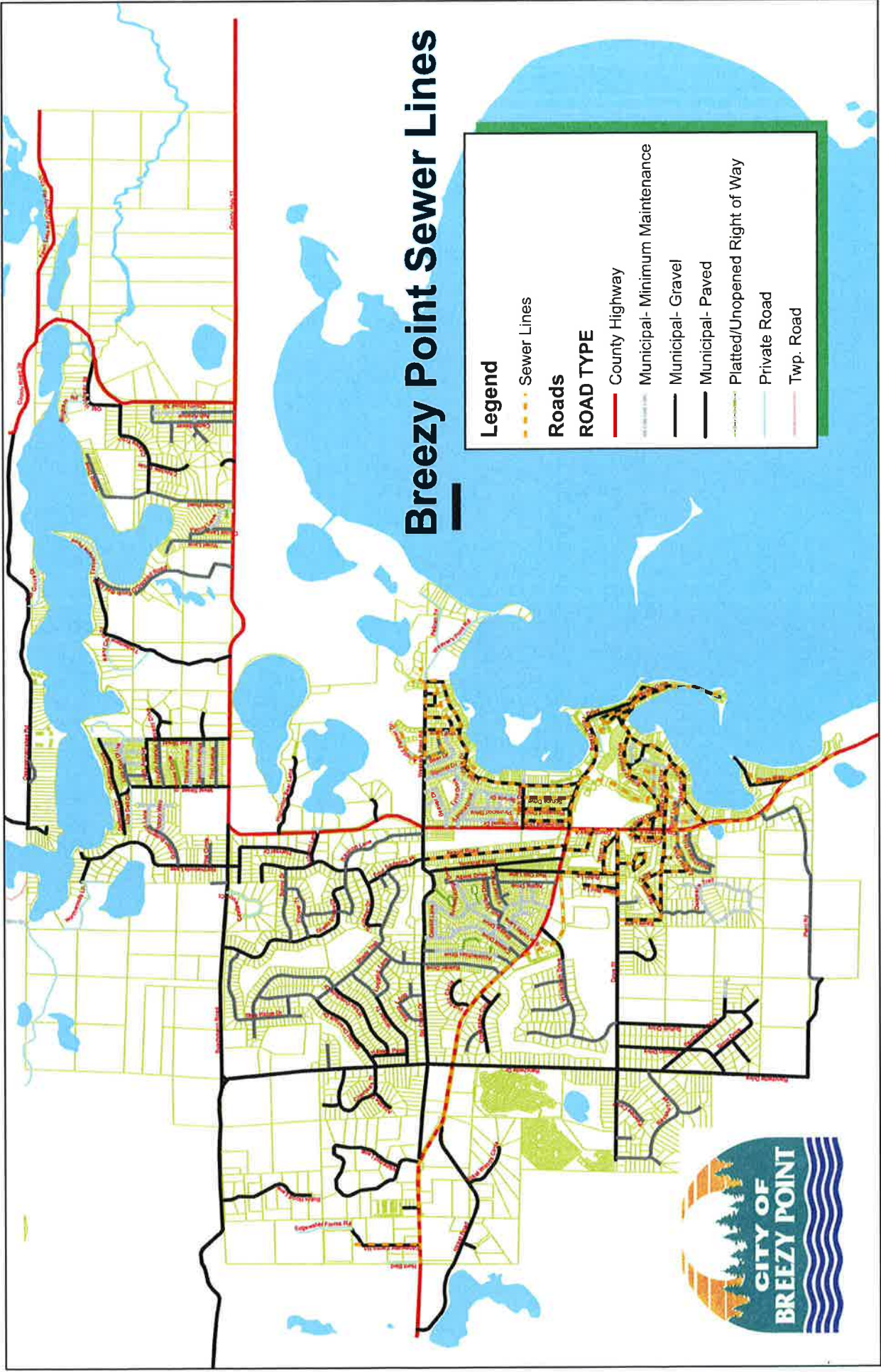


Exhibit C - Breezy Point Population



Breezy Point Sewer Lines



Legend

--- Sewer Lines

Roads

ROAD TYPE

- County Highway
- Municipal- Minimum Maintenance
- Municipal- Gravel
- Municipal- Paved
- Platted/Unopened Right of Way
- Private Road
- Twp. Road



Another factor which would tend to preclude population data as predictive of future wastewater flows can be found by examining a map of the City's wastewater collection system. Exhibit D on the previous page 6 provides such a map.

Examination of its wastewater collection system map reveals that the collection system serves less than half of the geographic area of the City of Breezy Point. Since a large number of platted areas within the City are not served by the system, residents who have moved or will move into these areas have not contributed wastewater flows to the City's treatment facility and will not unless expansion of the system occurs in their neighborhood in the future.

These factors are supported by further examination of the historical population and wastewater flow data. During the period 1990 through 2000, for example, population increased from 432 to 979; an increase of 127%. During this same period, while the flows vary randomly a moderate amount from year to year, wastewater flows increased from about 35 million gallons per year (MGY) to about 40MGY; an increase of 14%. For the period 2000 through 2010, results are similar.

After careful consideration, use of historical use data and trending were chosen as most predictive of future wastewater flows for the City of Breezy Point and were used to provide capacity and financial analyses provided later in this report.

Due to the City's nature as a vacation destination, flows have historically varied greatly between what will be referred to as the summer (May through September) and winter (October through April) seasonal use periods. These will be analyzed separately, as usage in each of the seasonal periods impacts the wastewater treatment facility's capacity in a different manner.

EXISTING FACILITIES

The City of Breezy Point's wastewater treatment facility consists of a treatment sequence featuring two aeration ponds, followed by three storage ponds. These five ponds can be configured to be used in series or in some cases in parallel with each other.

Upon receipt by the facility, larger solids are removed by a mechanically-cleaned bar screen and flow is measured by a Parshall flume.

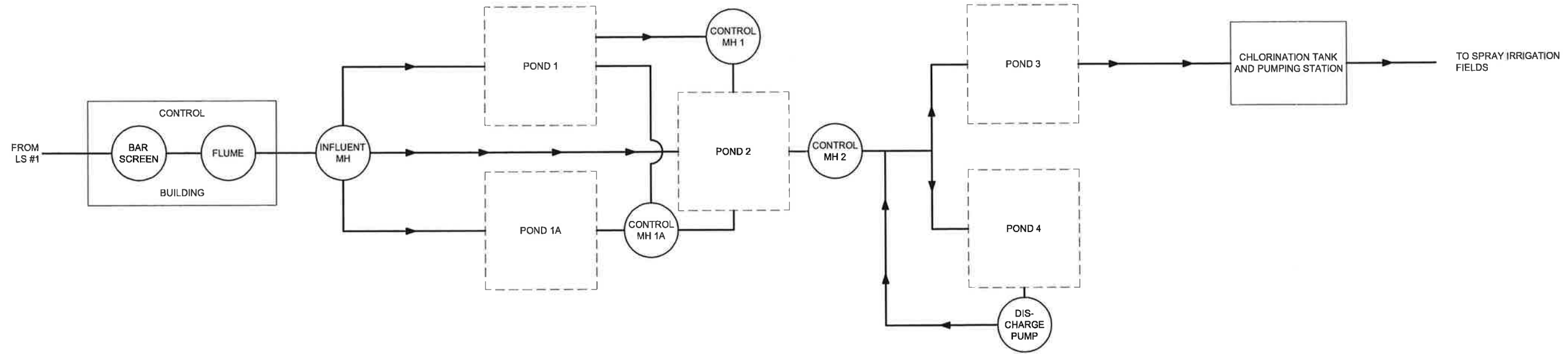
Primary treatment consists of aeration in ponds 1 and 1a. Pond 1 was constructed with the original facility and pond 1a was constructed as part of the 2004 Wastewater Treatment Facility Improvements to address increasing treatment demands.

When aeration is complete, wastewater from ponds 1 and 1a is discharged to ponds 2, 3, and 4 for storage until such time it is discharged by spray irrigation to forested areas set aside for this purpose. The City's facility presently includes 101.3 acres equipped for spray irrigation, with another 80 acres set aside for future expansion.

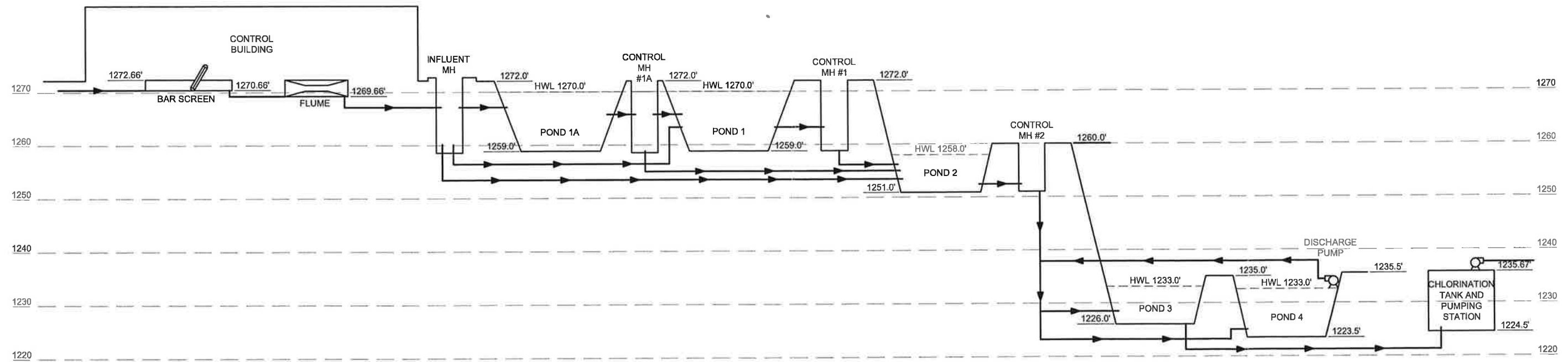
There is a network of seven ground water monitoring wells throughout the spray irrigation area. These wells are monitored for ground water quality and level. Previous years of data filed with MPCA show that the facility is functioning properly with high quality effluent used for irrigation.

Exhibit E on the following page provides a flow diagram and hydraulic profile for the wastewater treatment facility.

EXHIBIT E - WASTEWATER TREATMENT FACILITY FLOW DIAGRAM AND HYDRAULIC PROFILE



FLOW DIAGRAM
NOT TO SCALE



HYDRAULIC PROFILE
NOT TO SCALE

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www.widseth.com WIDSETH SMITH CONSULTING, INC. 1000 W. WISCONSIN AVE., SUITE 200 MINNEAPOLIS, MN 55401 TEL: 612.338.1111 FAX: 612.338.1112	
DATE: JUNE 2011 SCALE: NOT TO SCALE DRAWN BY: M.E.R. CHECKED BY: M.E.R. JOB NUMBER: 0145B0010.000	
2011 PRELIMINARY ENGINEERING REPORT CITY OF BREEZY POINT CROW WING COUNTY, MINNESOTA SYSTEM SCHEMATIC	
SHEET NO. 1	
SHEET 1 OF 1	

Condition of Facilities

During research for this report, wastewater treatment facilities were surveyed and staff was interviewed to determine what major needs were likely during the study period.

While no specific major needs were identified for the study period, the following major items should be considered when budgeting for longer-term maintenance needs:

- Pond liners
- Aeration equipment (blowers, aerators, and piping)
- Transfer and irrigation pumps
- Sludge removal for primary treatment ponds

Based on conversations with staff and information presented during Council meetings, it is apparent that operating income from quarterly usage charges has historically been adequate to meet periodic maintenance needs while providing a reserve sufficient for the major maintenance items mentioned previously.

A more in-depth analysis can be performed if the City is interested in further studying the adequacy of its quarterly usage charges to meet projected future maintenance needs.

OPERATION ISSUES

Considering its age and condition, major operational issues that will likely affect the City's wastewater treatment facility within the study period will involve addressing system capacity.

Control Building

The influent pretreatment and control building has been upgraded as recently 2001, when an existing comminutor was upgraded to the present mechanically-cleaned bar screen and Parshall flume. Capacity of this equipment is more than adequate for expected loading within the study period.

Aeration Ponds

Following the treatment process downstream, the BOD treatment capacity of the system is addressed by ponds 1 and 1a. The volume of pond 1, and the recently added pond 1a are both approximately 4.7 million gallons, for a total volume of 9.4 million gallons.

Both of these volumes are computed on a usable depth of 9 feet. Actual usable depths are somewhere between 9 feet and the designed 10 feet due to construction issues during the 2004 improvements project.

These two ponds provide a capacity based on a 25-day aeration of 377,000 gallons per day. Based on flow projects performed for this report, this capacity should be adequate for well beyond the study period.

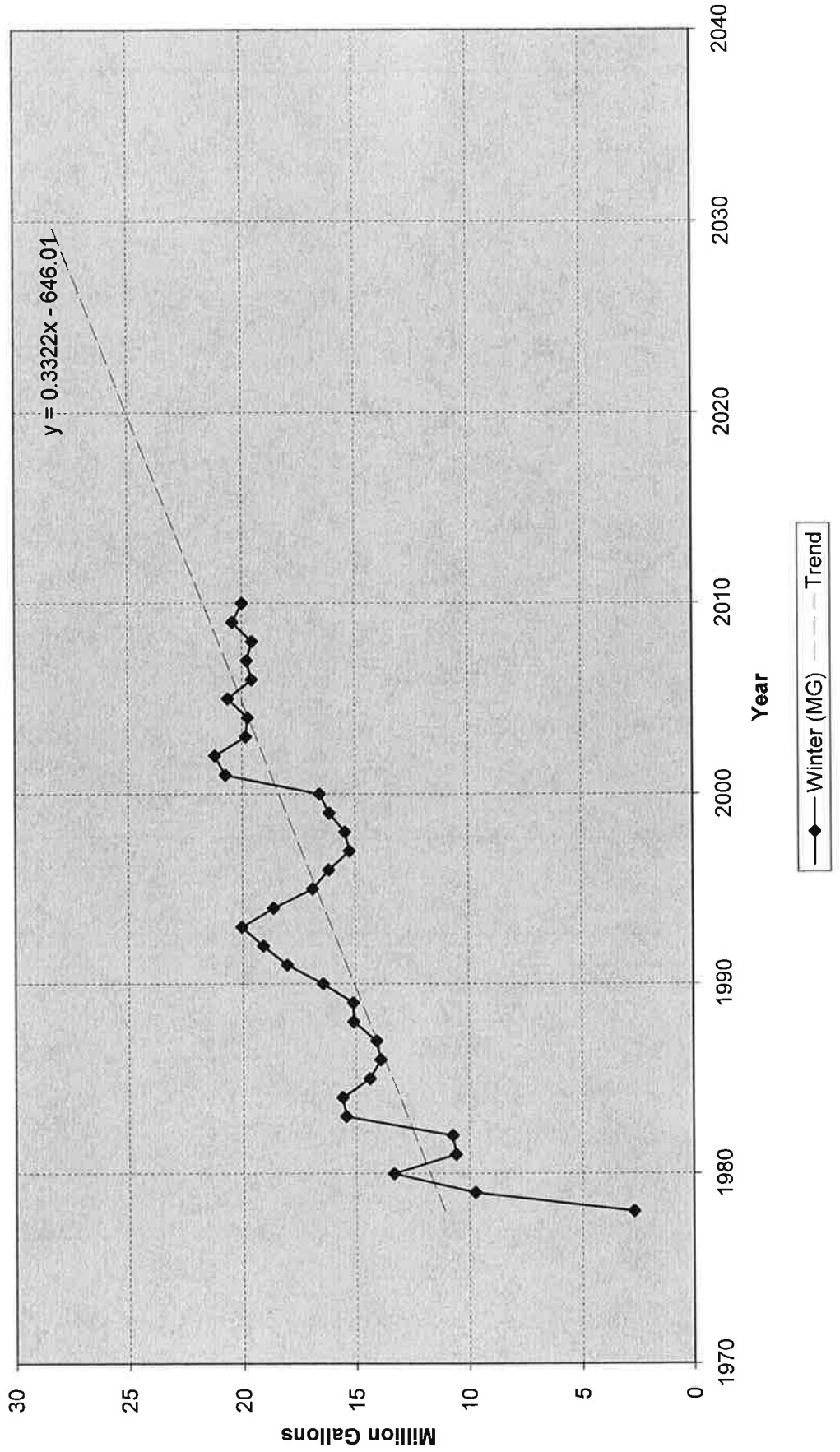
Storage Ponds

Capacity analysis for the storage ponds is evaluated over winter months, when spray irrigation is not possible. This 210 day period, which covers the months of October through April, has experienced a higher rate of growth in flows than has been experienced during the remaining months of the year.

Exhibit F provides a graph of the annual flows during this October through April storage period.

Based on this data, it is expected that winter storage needs for the wastewater treatment facility will reach 85% of storage pond capacity within the next 10 years. When flows reach this portion of the facility's capacity, it is recommended that the City commission a Facility's Plan for submittal to the MPCA that will examine options to address future facility needs in this area.

**Exhibit F - Sanitary Sewer Flows - Winter
October through April
City of Breezy Point**



Spray Irrigation System

As mentioned during the system description, seven ground water monitoring wells are present within the spray irrigation areas of the City's wastewater treatment facility. These wells are periodically sampled for groundwater quality and depth. Results are reported to MPCA for analysis and use in permitting.

Ground water monitoring has been used to determine whether spray irrigation application rates are appropriate to maintaining ground water quality standards. It is possible that application rates may be adjusted, either higher or lower, during future MPCA permit cycles. Adjustment to these rates would have a direct affect on the treatment facility's capacity.

At present permitted rates, and with future demands estimated by calculations performed for this report, the facility's spray irrigation area is expected to be adequate for a time well beyond the study period.

It does not appear to be a likely scenario, but should a downward adjustment to permitted application rates occur, the City is well-positioned with additional acreage to expand the spray irrigation system. In this event, it is recommended that the City commission a Facility's Plan for submittal to the MPCA to address this expansion.

Lift Stations

Lift station capacity is typically determined by analyzing the hours its pumps operate over the course of a given day. Peak days are used to determine whether pumping capacity is adequate 100% of the time. Inadequate pumping capacity can result in backups and property damage during even brief peak usage periods.

Exhibit G provides data collected from the nine lift stations presently operating within the City. Analyzing this data, and taking into account anomalies in lift station operation (stuck floats, control errors, etc.) it is apparent that the lift stations are adequate for present loads.

Assuming a peaking factor (peak daily flow vs. average daily flow) of 4.0, which is typical for a smaller City such as Breezy Point, City staff would be well advised to watch for lift stations which have operating times above about 6 hours per day. This would indicate that improvements to increase pumping capacity are needed.

The data indicate that lift stations #1, #2, #3 and #4 will likely require some type of upgrade within the study period. In most cases, these upgrades will likely involve pump or impeller replacement to larger sizes. It is possible that associated upgrades to electrical service may be necessary due to the larger electrical requirements associated with a pump replacement.

While the data indicate that no such improvements will likely be necessary on the remainder of the lift stations within the study period, lift station hours should continue to be monitored as insurance against unexpected escalations in operations and maintenance costs.

**Exhibit G - Lift Station Daily Hours
Peak Day per Month**

	LS1		LS2		LS3		LS4		LS5		LS6		LS7		LS8		LS9	
	Pump 1	Pump 2	Pump 1	Pump 2	Pump 1	Pump 2	Pump 1	Pump 2	Pump 1	Pump 2	Pump 1	Pump 2	Pump 1	Pump 2	Pump 1	Pump 2	Pump 1	Pump 2
Jan-10	1.8	1.8			0.7	0.7	1.8	1.9	0.4	0.6	0.4	0.5	0.3	0.3	0.1	0.1	0.1	0.1
Feb-10	2.1	1.9			0.3	0.5	1.4	2.2	0.4	0.5	0.4	0.4	0.3	0.3	0.1	0.1	0.1	0.1
Mar-10	2.2	2.1			0.6	0.6	1.3	1.9	0.5	0.6	0.8	0.9	0.4	0.4	0.1	0.1	0.1	0.1
Apr-10	1.7	1.6			0.5	0.4	1.9	2.0	0.4	0.6	0.5	0.5	0.4	0.4	0.1	0.1	0.1	0.1
May-10	2.4	2.4		0.7	1.3	1.5	3.2	2.1	0.4	0.5	0.5	0.5	0.4	0.4	0.1	0.1	0.1	0.1
Jun-10	2.4	2.4	0.5	1.7			2.8	2.9	0.5	0.6	0.7	0.9	0.5	0.5	0.1	0.1	0.1	0.1
Jul-10	3.4	3.3	1.3	1.4	2.1	2.1	3.9	4.4	0.9	0.8	0.5	0.6	0.5	0.4	0.1	0.1	0.1	0.1
Aug-10	2.8	2.6	1.0	1.1	1.3	1.3	3.3	3.3	0.6	0.6	0.6	0.5	0.3	0.3	0.1	0.1	0.1	0.1
Sep-10	3.0	2.9	0.8	0.9	1.2	1.6	2.5	3.7	0.8	1.1	0.7	0.7	0.7	0.7	0.1	0.1	0.1	0.1
Oct-10	1.9	1.8	0.5	0.4	0.8	0.8	2.0	2.7	0.4	0.4	0.7	0.7	0.4	0.4	0.1	0.1	0.1	0.1
Nov-10	1.6	1.5	1.0	0.3	0.7	0.7	2.0	2.0	0.3	0.4	0.5	0.5	0.3	0.3	0.1	0.1	0.1	0.1
Dec-10	2.8	2.6	0.8	0.2			3.6	3.2	0.6	0.7	0.4	0.4	0.4	0.1	0.1	0.1	0.1	0.1
Jan-11	2.1	2.0	3.3	5.8			3.0	3.5	0.5	0.5	0.5	0.5						
Feb-11	2.2	2.2	0.8	0.8			2.4	2.5	0.3	0.3	0.6	0.6						
Mar-11	2.5	2.4			0.4	0.4	3.0	3.5	0.5	0.4	0.4	0.4	0.4	0.3	0.1	0.1	0.1	0.1
Apr-11					0.5	0.5	2.4	2.5	0.3	0.5	0.6	0.6	0.8	0.8	0.2	0.2	0.1	0.1
Max	3.4	3.3	3.3	5.8	2.1	2.1	3.9	4.4	0.9	1.1	0.8	0.9	0.8	0.8	0.2	0.2	0.1	0.1

COSTS AND ANALYSIS

Capital Costs during Study Period

Future capital costs involved with operating the City's wastewater treatment facility and lift stations over the next 10 years will likely include preliminary investigation into additional winter storage capacity, including a Facility's Plan for submittal to MPCA.

It is recommended that the City make financial plans for a comprehensive Facilities Plan that should cost \$30,000 to \$40,000 (in 2011 prices) to take place near the end of the 10-year study period.

In addition, based upon expected growth during the study period and average ERU's served per lift station, it should be expected that at least one additional lift station will be constructed during the study period. It is recommended that the City make financial plans to spend between \$75,000 and \$125,000 (2011 prices) on a future lift station.

Sewer Availability Charge

As part of this report, the City has requested an analysis to determine a fair and equitable Sewer Availability Charge (SAC) for use in financing capital costs related to its wastewater treatment facility and lift stations. While there are a number of ways this can be approached, after some consideration the following methodology was used.

Usage and ERU data was analyzed to determine the annual long-term sanitary sewer flow for the City's average ERU. Over the period 1979 through 2010 this average calculates at 43,650 gallons per ERU per year.

Using this same average, the wastewater treatment facility's present permitted capacity of 70 million gallons per year provides an equivalent capacity of 1,604 ERU's.

Using 2011 construction pricing, the reconstruction cost of the wastewater treatment facility is estimated to be \$3,800,000.

From these figures, it can be shown that the capital cost for a single ERU's portion of the wastewater treatment facility is \$2,370 in 2011.

For the lift station component of the SAC, the analysis is similar. The City's 9 present lift stations serve a total of 1281.80 ERU's in 2011; or 142.42 ERU's per lift station. Dividing a lift station capital cost of \$125,000 by an average number of users provides a lift station capital cost per ERU of \$878.

Adding these two components provides for a SAC of \$3,248.

RECOMMENDATIONS AND IMPLEMENTATION

After reviewing the contents of this report, it is recommended that the City take the following actions:

- Determine an appropriate Sewer Availability Charge and incorporate it into the City's ordinance and fee schedule
- Continue to monitor and report lift station hours
- Continue to monitor wastewater treatment facility data and report to MPCA in accordance with statutory requirements
- Plan for a future MPCA Facilities Plan to take place at such time as winter storage demand reaches approximately 85% of capacity

In addition, it is recommended that a summary report on operations and capacity be prepared for Council review on an annual basis.

APPENDICES

2011 SAC ANALYSIS

Breezy Point WWTF

Waste Water Treatment Facility

Permitted Capacity	70,000,000	gallons per year
Average ERU	43,650	gallons per year
WWTF Capacity	1,604	ERU's
WWTF Capital Cost (2011)	\$3,800,000	
WWTF Cost per ERU (2011)	\$2,370	

Lift Stations

Lift Stations	9	
2011 ERU's	1281.80	
ERU / Lift Station	142.42	
Cost / Lift Station	\$125,000	
Lift Station Cost / ERU	\$878	

2011 SAC (WWTF + Lift Stations) \$3,247

2011 CAPACITY ANALYSIS
Breezy Point WWTF

Waste Water Treatment Facility

Permitted Capacity	70.0 Million Gallons
Permitted Capacity	59.5 Million Gallons
Average Annual ERU Usage	43,650 Gallons
WWTF Capacity	1,604 ERU's
2011 Usage	1,282 ERU's
Capacity Remaining	322 ERU's
1980 - 2010 ERU Growth	25 ERU / Year
85% Capacity at Year	2,035
100% Capacity at Year	2,055

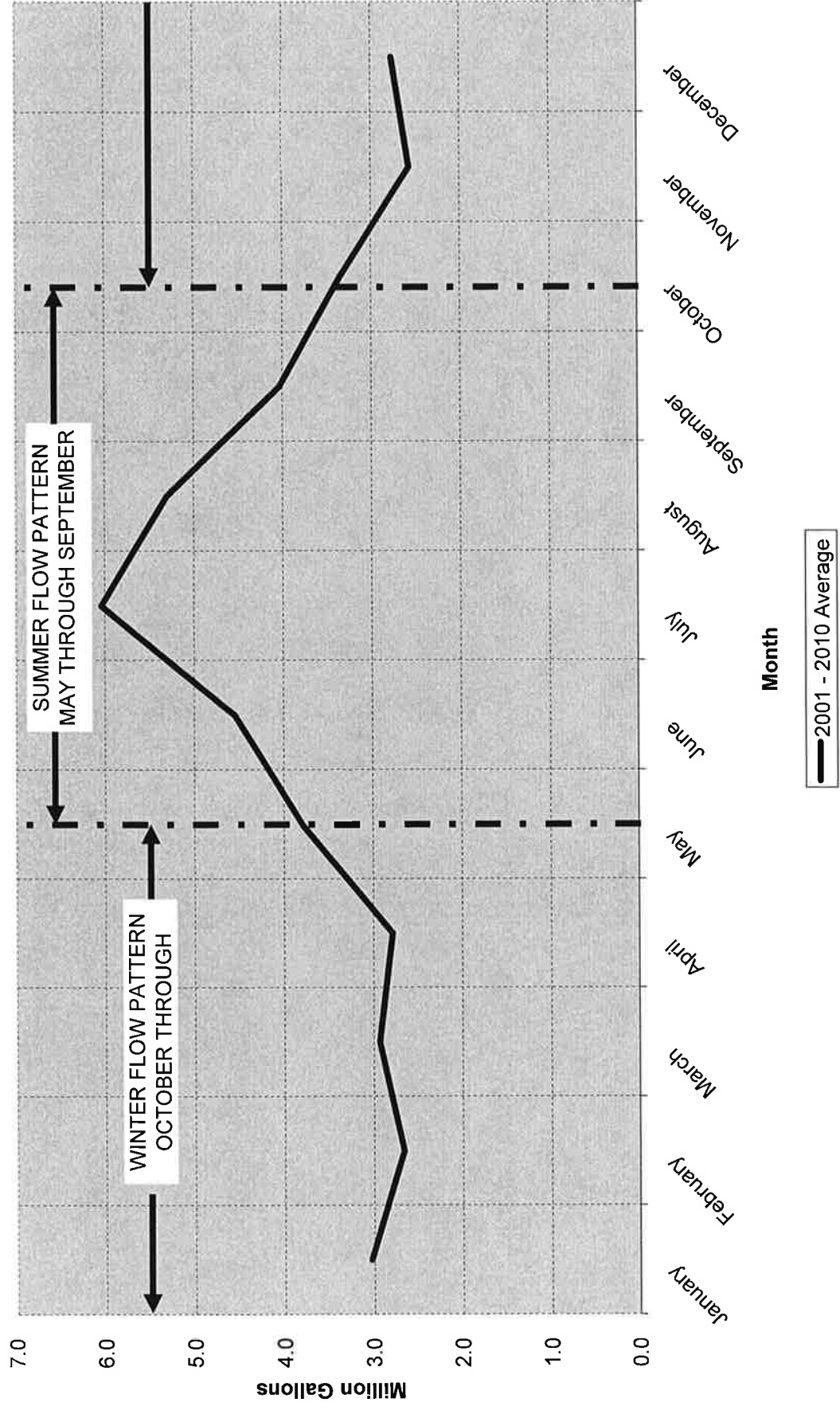
Winter Storage

Present Capacity	30.7 Million Gallons
85% of Present Capacity	26.1 Million Gallons
85% Capacity at Year	2023
100% Capacity at Year	2037

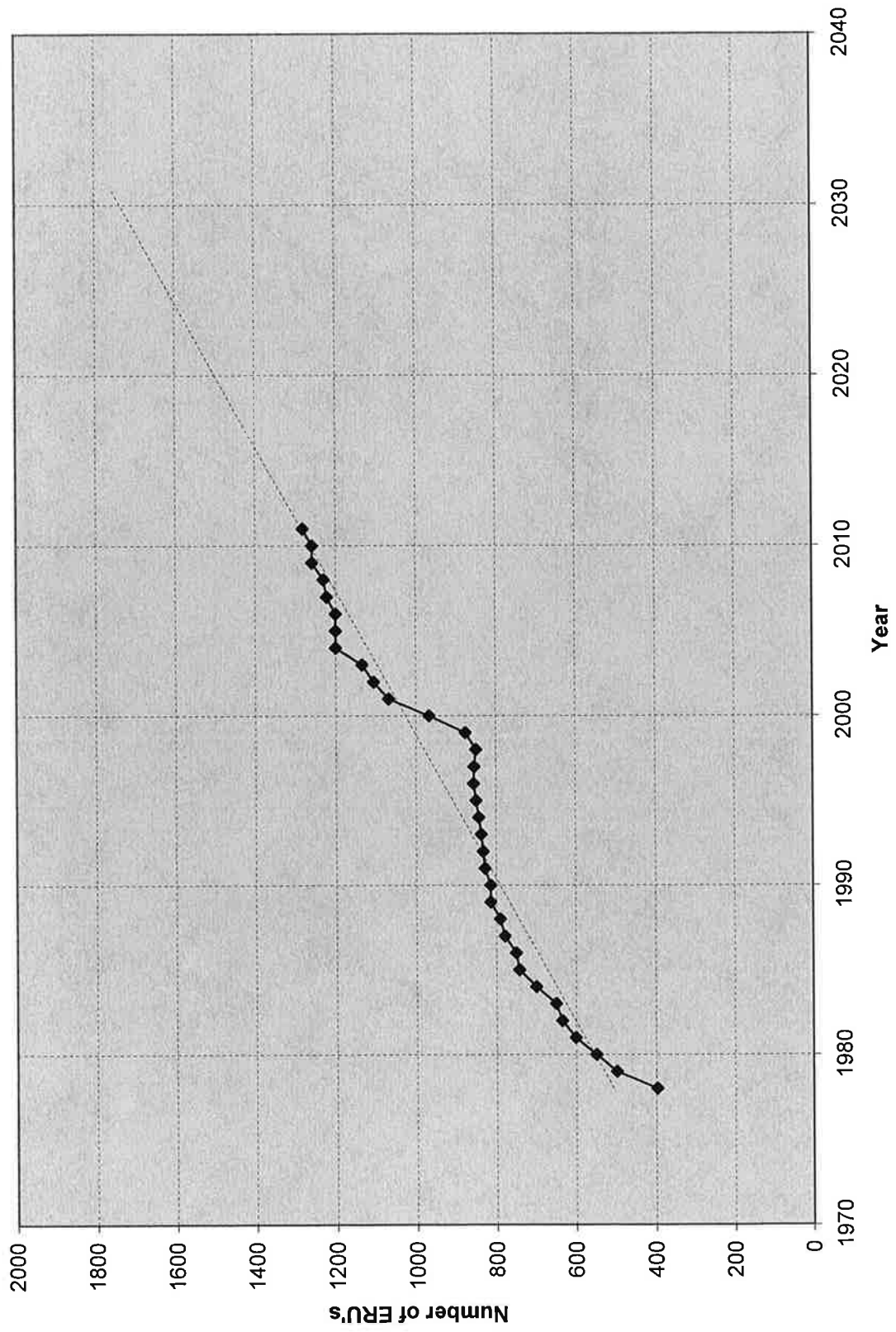
BOD Loading

Pond 1 & 1A Volumes	9,435,400 Gallons
25-Day Capacity	377,416 GPD
85% of Capacity	320,804 GPD
85% Capacity at Year	2118
100% Capacity at Year	2164

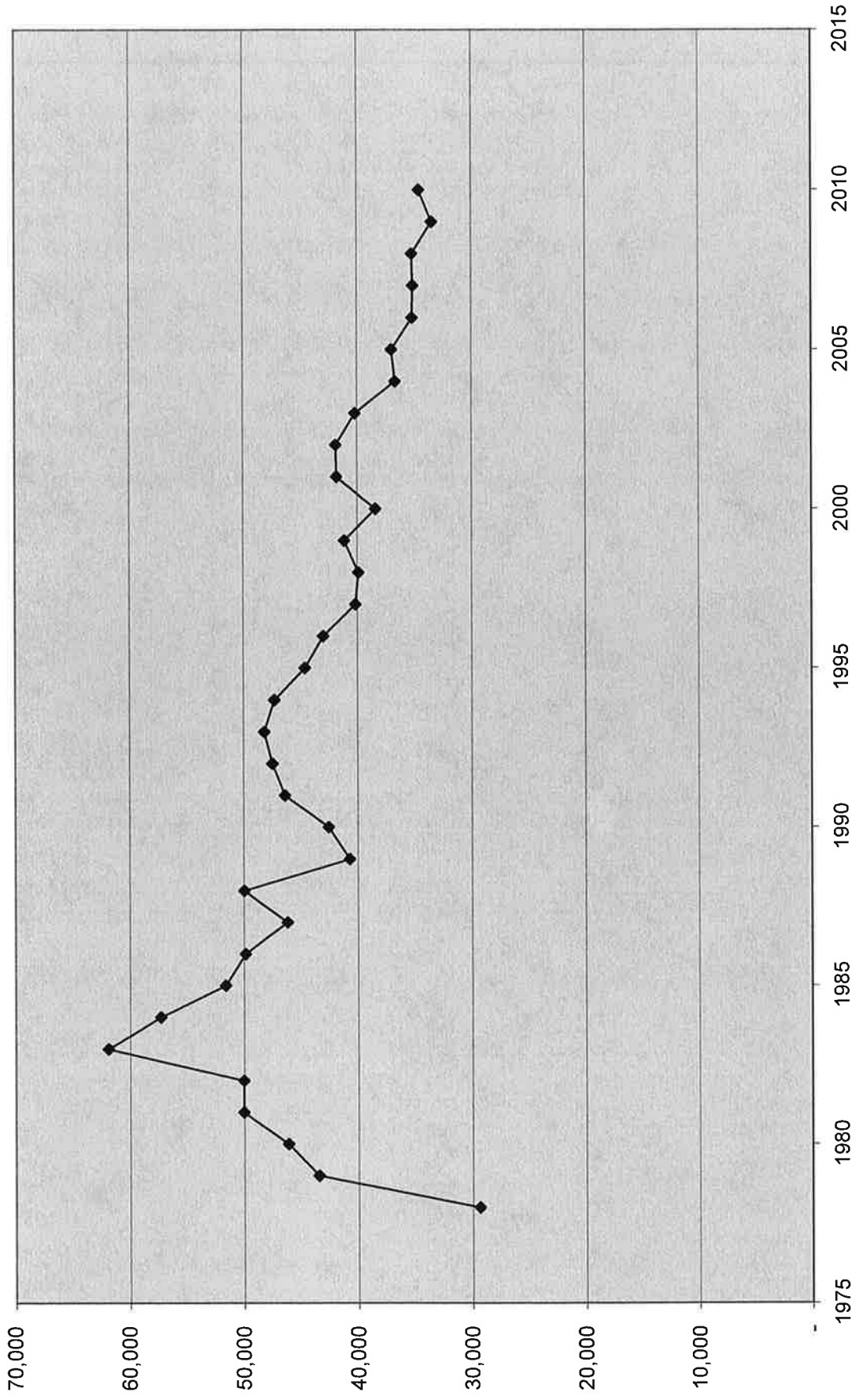
Monthly Sanitary Sewer Flows City of Breezy Point



**ANNUAL ERU's
City of Breezy Point**



Annual Flow per ERU



**Sanitary Sewer Quarterly Charge per ERU
City of Breezy Point**

