Subject: Councillor Information Request re 2014 Hauled Sewage Rate Review

Report to: Public Works Committee

Report date: Tuesday, June 14, 2022

Recommendations

1. That this Report **BE RECEIVED** for information.

Key Facts

- This report has been prepared in response to the Councillor Information Request made at the Public Works Committee held on April 5, 2022: *Provide information respecting the 2014 third party review regarding hauled sewage rate calculation methodology to Committee members.*
- The 2022 hauled sewage disposal rate is $46/1000 gallons. Over the past 15 years, this rate has cumulatively increased by 15 per cent. Niagara's rates are competitive and generally lower than other Ontario municipalities.
- The Region began implementing inflationary cost increases to the Hauled Sewage rates starting in 2018. Prior to that time, the rate was not increased for 9 years.
- The WSP Canada Inc. report of 2014, attached as Appendix 1, recommended three alternative approaches to rate setting. The Region maintained a uniform rate for all hauled sewage types as recommended by Approach #1 in the WSP report.
- The Region is conducting a review of rate setting methodology in 2022.

Financial Considerations

The Hauled Sewage Program revenue partially offsets the operational cost of providing the service to sewage generators and sewage haulers. Fees and charges for hauled sewage continue to be assessed during the annual budget review process. Any upgrades to hauled sewage locations that require capital expenditures are presented in the annual capital budgets. Revenue from the program has risen from $440K (2011) to $890K (2021) which represents 1.13% of the net 2021 wastewater budget or 0.72% of the net 2021 total water and wastewater budget.

Analysis

Niagara Region has retained consultants on three separate occasions to review hauled sewage rate-setting methodologies.

In general, the consultants have proposed using an approach that includes contaminant removal costs for Biochemical Oxygen Demand (BOD), Total Suspended Solids (TSS), Total Phosphorus (TP) and Total Kjeldahl Nitrogen (TKN) as these factors are readily obtainable.

Hauled sewage contains substantially more of these contaminants then regular sanitary sewage. Sewage with excessive concentrations of BOD, TSS, TKN and TP can compromise the ability of a treatment plant to achieve its regulatory discharge limits.

The presence of the higher concentrations also reduces the capacity of the WWTP to accommodate future growth since the Region must reserve a certain amount of capacity to ensure that non-serviced properties continue to have access to a wastewater treatment plant for hauled sewage disposals.

Consultant Review:

In 2014, staff were directed to examine full cost-recovery for fees and charges as had been done in 2007 when a uniform hauled sewage rate was approved. An engineering consultant, WSP Canada Inc. was hired to review past approaches and municipal best practices for hauled sewage rate calculations.

The rate setting approach used in 2014 calculated a cost for the removal of the contaminants in regular sewage and then applied these unit removal costs to the loads of hauled sewage coming into the plant. The rate would then be set using typical hauled sewage concentrations recognizing that there is a wide variety of hauled sewage types being brought into the various WWTPs.

The consultant reviewed the operating and maintenance costs related to wastewater treatment at the Region’s facilities. This resulted in a total wastewater treatment operating and maintenance cost. The consultant then reviewed the quantity of wastewater treated and the mass of material removed during the treatment of normal sewage to determine a base unit removal cost based on the units of mass removed – see Table 1.

Table 1: Base Unit Removal Cost Calculation (2014)

Year	Actual Costs for WW Operation and Maintenance	Total Kg Pollutant Removed	$/kg
2009	$ 47,656,713	26,683,819	$ 1.79
2010	$ 38,099,851	25,433,197	$ 1.50
2011	$ 44,683,556	26,987,671	$ 1.66
2012	$ 40,629,659	25,386,625	$ 1.60
2013	$ 42,781,364	30,230,877	$ 1.42
5-Yr Average			$ 1.59

For each load of hauled sewage brought to a wastewater treatment plant for disposal, the hauler is required to leave a sample from the delivered load. A portion of these samples are regularly analyzed by the Region's laboratory to determine the concentrations of BOD, TSS, TP, TKN and other parameters. For the 2014 consultant report, two hundred and twenty (220) samples of various types of hauled sewage were tested including wastewater from wineries, businesses and residences. The results from this testing were used to determine average concentrations for the aforementioned parameters in hauled sewage.

The average concentration of hauled sewage was used to determine an average weight of contaminants in hauled sewage. The cost as calculated in Table 1 was applied to the average weighting of contaminants in hauled sewage to determine a cost to treat hauled sewage in Table 2. Using this methodology, the rate to treat hauled sewage is calculated as $59.51/1000 gallons.

Table 2: Hauled Sewage Sample Analysis and Mass of Contaminants

Calculations	A	B	C	D= A*B*C
Materials	**Average Concentration of Contaminants in Hauled Sewage (kg/1000 gallons)**	**Average Weighting of Contaminants in Total Treated Sewage**	**5 Year Average Base Unit Removal Cost ($/kg)**	**Cost for Hauled Sewage per 1,000 gallons**
BOD	26.32	41.81%	$ 1.59	$ 17.51
TSS	50.78	51.77%	$ 1.59	$ 41.83
TP	0.35	0.97%	$ 1.59	$ 0.01
TKN	1.94	5.45%	$ 1.59	$ 0.17
Total	**79.39**	**100.0%**	**$ 1.59**	**$ 59.51**

As was previously noted, this is an average approach used to determine a uniform rate; the concentrations of these materials in hauled sewage can vary greatly from source to source. For instance, some winery wastewater hauled to Niagara's plants will contain TSS concentrations double that of the average calculated.

In 2022, once again staff reviewed the rate setting methodology and updated the five-year average Operating and Maintenance Costs for 2017-2021. The updated cost is calculated to be $1.62 / kg. This would translate into a proposed hauled sewage rate of $61.68 / 1000 gallons. The rate recommended to Council in 2022 was $46 / 1000 gallons.

For context, if the $61.68 hauled sewage rate was charged in 2021 instead of the $45 / 1000 gallons rate actually charged, this would have generated approximately an additional $331,000 in revenue for the wastewater program.

Alternatives Reviewed

The WSP report proposed three alternative methodologies. The other alternatives proposed required rates to be determined based on sewage types or actual laboratory testing results. Staff believe that these other approaches are impractical because of the complexity and given the resources available to monitor hauled sewage disposals.

Relationship to Council Strategic Priorities

- Supporting Businesses and Economic Growth
- Responsible Growth and Infrastructure Planning

Other Pertinent Reports

PW 12-2022 Hauled Sewage Program

Prepared by:
Jason Oatley, B.Sc., C.Chem.
Manager, Quality and Compliance
Public Works Department

Recommended by:
Bruce Zvaniga, P. Eng.
Commissioner of Public Works (Interim)
Public Works Department

Submitted by:
Ron Tripp, P. Eng.
Chief Administrative Officer

This report was prepared in consultation with Joe Tonellato, Director, Water and Wastewater Services, and reviewed by Pamela Hamilton, Program Financial Specialist and Dawn Macarthur, Supervisor, Water and Wastewater Compliance and Enforcement.

Appendices

Appendix 1 Hauled Sewage Rate Review Final Report, dated December 2014, prepared for Niagara Region by WSP Canada Inc.

Appendix 2 Summary of data from Appendix B of WSP report in Appendix 1

PROJECT NO 131-24117-00

HAULED SEWAGE RATE REVIEW

FINAL REPORT

DECEMBER 2014

WSP

HAULED SEWAGE RATE REVIEW

FINAL REPORT

Project No. 131-24117-00

Prepared for:
Regional Municipality of Niagara

Date: December 2014

Prepared by:

Gustavo Arvizu, P. Eng., M. Eng.
Project Manager

WSP Canada Inc.
600 Cochrane Drive, Suite 500
Markham, Ontario L3R 5K3

Phone: +1 905-475-7270
Fax: +1 905-475-5994
www.wspgroup.com

December 18, 2014

Mr. Jason Oatley
Manager, Quality and Compliance-Wastewater
Water & Wastewater Division
3501 Schmon Parkway
P.O. Box 1042 Thorold, ON
L2V 4T7

Subject: **Hauled Sewage Rate Review**
Final Report

Dear Mr. Oatley:

WSP is pleased to submit our final report for the Hauled Sewage Rate Review.

Yours truly,

_____
Gustavo Arvizu, P. Eng., M. Eng.
Project Manager

WSP Canada Inc.
600 Cochrane Drive, Suite 500
Markham, Ontario L3R 5K3

Phone: +1 905-475-7270
Fax: +1 905-475-5994
www.wspgroup.com

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1 INTRODUCTION

WSP (previously GENIVAR) recently completed a review of the Region's sewer use by-law (GENIVAR, 2013). As part of the review, WSP compared other municipalities' by-laws and conducted interviews with staff from those municipalities to gather information on their approach to enforcing their sewer use by-laws. The findings and recommendations of the review were used by the Region to develop a new by-law (By-law No.27-2014), which was adopted by Regional Council in February 2014 (Niagara Region, 2014).

Hauled sewage is accepted from approved sewage haulers at the Region's treatment facilities. The sewer use by-law defines hauled sewage as "wastewater removed from a wastewater system, septic tank, a cesspool, a privy vault or privy pit, a chemical toilet, a portable toilet or a sewage holding tank that is transported to a sewage works for disposal."

The Region's Sewage Hauler Manual specifies that hauled sewage to be deposited into the sewage works (as defined in the by-law) must be in compliance with the current Certificates of Approval for the Sewage Works (or Environmental Compliance Approvals) of the various treatment facilities and meet conditions set out in O. Reg. 347, R.R.O. 1990 (Niagara Region, 2011). Hauled sewage that contains any substance or material prohibited by the by-law is not permitted. However, the hauled sewage may exceed the limits specified for BOD, suspended solids and phosphorus and other limits that may be approved by the Region. The hauled sewage must also have originated from within the boundaries of Niagara Region.

Niagara Region operates seven hauled sewage disposal stations located at the wastewater treatment plants (WWTP) listed below:

- Baker Road WWTP (347 Baker Road, Grimsby)
- Niagara Falls WWTP (3450 Stanley Avenue, Niagara Falls)
- Welland WWTP (505 River Road, Welland)
- Fort Erie WWTP (1 Anger Avenue, Fort Erie)
- Port Dalhousie WWTP (40 Lighthouse Road, St. Catharines)
- Seaway WWTP (30 Prosperity Avenue, Port Colborne)
- Port Weller WWTP (Welland Canals Parkway, St. Catharines)

The disposal station at the Port Weller WWTP was added in 2013 in response to the request of sewage haulers and to reduce the volume discharged at the disposal station at the Port Dalhousie WWTP. The disposal stations only permit domestic sewage from haulers, unless the Region has approved a hauler to discharge a specific type of non-domestic sewage. Domestic sewage is defined as "sewage derived from human activities and includes waste from toilets and grey water from residential activities (e.g. laundry, dish washing, showers etc.)". Sewage from on-board holding tanks (e.g. recreational vehicles, tour buses, ships, boats) and most campgrounds is considered domestic sewage. It is a violation of the Sewer Use By-law to discharge non-domestic sewage, unless the Region has given express approval. The most common source of non-domestic sewage discharged to the Region's facilities is winery waste.

Approximately half of the hauled sewage disposed at the Region's disposal stations is domestic and half is non-domestic.

The last detailed review of the Region's hauled sewage rate was completed in 2005 (MacViro, 2005). The review included an examination of hauled waste disposal procedures, benchmarking against practices of other municipalities and industry standards, and the development of a hauled waste management policy plan. The report recommended that the cost to discharge hauled waste should reflect full cost recovery, including capital replacement costs for hauled wastewater discharge facilities and treatment plants. To achieve full cost recovery, MacViro recommended increasing the rate from $24.00 to $42.00 per thousand gallons for residential waste and from $40.00 to $109.00 per thousand imperial gallons for commercial and industrial waste.

The Region did not however adopt the rates for residential and commercial/industrial waste that were recommended in the last hauled sewage rate review. The current hauled sewage rate applies to both residential and commercial/industrial waste and has remained the same for approximately 20 years at $40/1000 imperial gallons, or $8.80/m³.

WSP was retained by the Region to review the hauled sewage calculation approach currently in place and to determine whether it adequately reflects the costs associated with the treatment of the wastewater. The review also involves a comparison of hauled sewage rates in place at other neighboring municipalities. This report presents the findings and recommendations of the review.

2 EXISTING METHODOLOGY

The Region's existing methodology for determining hauled sewage fees is based on the capacity of the haulers' truck. There is no flow measurement of discharges at the disposal stations, with the exception of the disposal station at Baker Road WWTP. Therefore, the Region calculates the hauled sewage fee based on 80% of the tank capacity of the vehicle. However, vehicle weight or other methods may be approved to determine the discharged amount on a case by case basis (Niagara Region, 2011). The formula for determining the Region's hauled sewage fees is shown below.

$$Hauled\ Sewage\ Fee = V \times R$$

Where,

V = volume of discharge, assumed to be 80% of truck volume (m^3)
R = hauled sewage rate ($8.8/m³)

Sampling and testing of the hauled sewage, at the expense of the hauler or sewage generator, may be required as the Region considers necessary. Sewage haulers are required to complete a "Hauled Sewage Record" (HSR) form as provided by the Region prior to discharging (Niagara Region, 2011). The HSR includes the name of the sewage hauler, name of the sewage generator, the estimated volume of sewage discharged, the time and date of disposal and other information required. Haulers are charged for 80% of the truck capacity regardless of the volume declared. The Region believes this approach balances out cases of under and over reporting.

Sewage haulers are required to leave a sample of the hauled sewage at the time of disposal. Approximately each month two samples per plant are tested for the parameters regulated in the Sewer Use By-law including TSS, TP, TKN, metals and other materials and substances. BOD is not regularly tested, but in such cases COD is tested instead and can be converted to BOD

Potential limitations associated with the Region's hauled sewage methodology include:

- The Region is unable to accurately determine the volume of hauled sewage discharged at the disposal stations, with the exception of the disposal station at Baker Road WWTP. Therefore, it is unknown whether haulers are being overcharged or undercharged based on discharge volume.
- The volume of domestic and non-domestic (primarily wineries) hauled sewage discharged at the Region's disposal stations is split approximately 50/50. This is relevant because different sources of hauled sewage produce different pollutants and different pollutant concentrations. The current hauled sewage rate does not consider the costs associated with treating different types of hauled sewage.
- It is unknown how the Region's current rate, $40/1000 imperial gallons, was determined. Furthermore, the Region's current rate has not been updated for approximately 20 years.

3 EVALUATION OF HAULED SEWAGE RATE CALCULATION APPROACH

3.1 EVALUATION METHOD

To objectively assess whether the Region's current hauled sewage calculation approach is adequate, it is important to define evaluation criteria, and clearly define what the fees are meant to achieve. The approach for determining hauled sewage fees should ensure full cost recovery. It should also discourage excessive discharges of regulated parameters. However, it should not be cost prohibitive and cause haulers to transport their hauled sewage to other municipalities. Finally, it should be easy to calculate and facilitate reviews and updates. Therefore, three criteria were used to evaluate the Region's calculation approach:

1. Cost Recovery – Does it reflect the true cost of treatment for every parameter and does it capture the true discharge volume?
2. Similarity to other Municipalities Rates – Does it discourage haulers from discharging at the Region's disposal stations and is it consistent with other municipalities' hauled sewage fees?
3. Simplicity – Is it easy to calculate and does it use readily available data?

These criteria are explained in more detail below.

3.1.1 COST RECOVERY

TREATMENT COST RECOVERY

To assess whether the hauled sewage rate leads to full cost recovery, it is important to understand the impact discharges with concentrations over the by-law limits would have on the performance of the wastewater treatment facilities. Hauled sewage with excessive concentrations of BOD, TSS, TKN and/or TP would compromise the ability of the treatment plant to achieve its required effluent limits and/or reduce the facilities capacity to accommodate future growth.

The Region tests for several parameters in the haulers' samples including parameters regulated in the Sewer Use By-law such as TSS, TP, TKN, metals and other materials and substances. The

haulers' test results were analysed to determine what parameters have historically exceeded the by-law limits. The number of instances for which the by-law limit was exceeded is shown for each parameter in Table 3-1 below. It should be noted that Total BOD is not regularly tested. In some instances, COD is tested. Where COD was available it was converted to BOD using a factor of 1.6 parts COD per part of BOD.

Based on the data reviewed, the hauled sewage has exceeded the by-law limit for the following parameters:

- Total Biological Oxygen Demand (T BOD)
- Chromium
- Copper
- Lead
- Mercury
- Nickel
- Total Phosphorus (TP)
- Total Kjeldahl Nitrogen (TKN)
- Total Suspended Solids (TSS)
- Zinc

The hauled sewage parameters that most frequently exceed the by-law limit are BOD, TP, TKN, TSS, copper and zinc.

Discharges exceeding the by-law limits for copper, lead, mercury, nickel and zinc should be reviewed closely as these components might have an inhibitory effect on the wastewater treatment process and might also impact the quality of the biosolids generated at the plants. It should be noted that the Nutrient Management Act, 2002 (NMA) has limits for the concentration of various metals in biosolids including arsenic, cadmium, cobalt, chromium, copper, lead, mercury, molybdenum, nickel, selenium and zinc.

DISCHARGE VOLUME COST RECOVERY

The declared volume is that which the hauler claims at the time of disposal on the Hauled Sewage Record. However, the Region's bills for a volume equal to 80% of the haulers' truck capacity. Table 3-2 below compares the annual declared volume versus billed volume for each disposal station.

According to the billed volume and the number of loads, the average load volume discharged between 2010 and 2012 was approximately 2,561 gallons, or 11.6 m^3. According to the declared volume, the average load disposed was approximately 2,243 gallons, or 10.2 m^3. Overall the Region billed an average of 14% more than the declared volume for the loads disposed between 2010 and 2012. Because there is no flow measurement at the disposal stations except at Baker Road WWTP, it is difficult to confirm the accuracy of the discharged volume.

Table 3-1: Parameters Exceeding the By-law Limit by Hauler

HAULER	YEAR	NO. SAMPLES TESTED	SOURCE	NO. OF INSTANCES BY-LAW LIMIT WAS EXCEEDED									
				*T BOD	**T BOD (Converted from COD)	Chromium	Copper	Lead	Mercury	Nickel	TP	TKN	TSS	Zinc
1	2012	1	School	1							1	1	1	1
	2013	1	Restaurant	1			1				1	1	1	1
		1	Industrial		1								1	
2	2009	2	Septic	2			1		1		2	1	2	1
	2012	1	Holding Tank		1						1	1	1	
3	2012	2	Restaurant	1									1	
	2013	2	Residential	1			1				2	2	1	1
4	2013	6	Holding Tank & Commercial	6			3	2			6	5	6	5
5	2012	2	Industrial		2		1				2	2	2	1
6	2009	1	Unknown	1			1				1	1	1	1
	2010	9	Wineries & Industrial	6	4		4		1		7	7	8	3
	2011	1	Wineries		1		1				1	1	1	
	2012	12	Wineries	1	11		2	1		1	12	10	12	4
	2013	7	Wineries & Commercial	1	5		5				6	6	5	4
7	2012	2	Unknown & Industrial	2										
	2013	4	Wineries				1				4	3	4	1
8	2010	1	Wineries		1								1	1
	2012	17	Wineries	1	14		5				13	9	15	7
	2013	21	Wineries		19		5				16	12	17	11
9	2012	1	Wineries		1						1	1	1	
	2013	8	Wineries		7	1	3	1	1	1	7	5	7	3
10l	2010	33	Wineries	8	9						25	4	31	
	2011	6	Wineries	4	1						5	2	3	
	2012	5	Wineries	1	2						3	1	2	
	2013	6	Wineries	1	3						3		4	
11	2009	4	Unknown	2							2	4	4	1
	2010	6	Wineries	2	4						2	1	5	
	2012	16	Wineries		16		9				16	15	16	4
	2013	41	Wineries		39		13				36	27	34	17
12	2013	1	Unknown	1			1				1	1	1	1
Total		**220**		**43**	**115**	**1**	**57**	**4**	**3**	**2**	**176**	**123**	**188**	**68**

*Only 52 out of 220 samples were tested for T BOD.
**COD values converted to T BOD by dividing by a factor of 1.6.

Table 3-2: Annual Hauled Sewage Volume by Plant

DISPOSAL STATION		2010			2011			2012		
	Load Type	**No. Loads**	**Declared Volume (gal)**	**Billed Volume (gal)**	**No. Loads**	**Declared Volume (gal)**	**Billed Volume (gal)**	**No. Loads**	**Declared Volume (gal)**	**Billed Volume (gal)**
Baker Rd WWTP	Domestic	2	5,500	8,400	8	13,500	31,760	188	368,350	736,160
	Non-domestic	7	16,400	13,120	15	41,800	46,160	420	1,287,600	1,239,100
Fort Erie WWTP	Domestic	392	1,057,350	930,480	401	1,128,300	969,120	303	714,400	733,920
	Non-domestic	284	743,800	651,440	194	532,300	451,680	98	211,750	213,120
	Maintenance	1	1,500	1,440						
Niagara Falls WWTP	Domestic	482	552,325	767,120	568	780,000	1,008,960	600	908,190	1,085,760
	Non-domestic	602	1,287,535	1,190,880	483	1,022,800	1,002,240	415	794,650	863,520
	Maintenance	2	1,300	2,880	1	3,500	4,000			
Port Dalhousie WWTP	Domestic	712	1,506,100	2,584,010	740	1,593,500	2,784,810	550	1,055,300	1,902,930
	Non-domestic	1147	3,529,750	3,386,615	1207	3,755,290	8,000	978	3,161,383	3,131,790
	Maintenance	2	6,000	5,200	2	7,000	3,681,900			
Seaway WWTP	Domestic	802	1,652,575	1,720,400	802	1,745,450	1,772,960	762	1,399,150	1,608,520
	Non-domestic	343	760,850	728,800	276	659,250	606,480	376	888,957	814,640
	Maintenance				1	2,000	2,400			
Welland WWTP	Domestic	454	587,681	1,014,720	440	749,830	1,270,680	483	727,772	1,127,640
	Non-domestic	262	423,967	542,559	194	322,380	444,080	221	367,920	442,560
	Maintenance	23	51,300	55,200				2	2,900	4,480
Total		**5517**	**12,183,933**	**13,603,264**	**5332**	**12,356,900**	**14,085,230**	**5396**	**11,888,322**	**13,904,140**

3.1.2 SIMILARITY TO OTHER MUNICIPALITIES' RATES

The approaches used by other municipalities to calculate hauled sewage rates were compared against the Region's existing methodology. The hauled sewage rates from York Region, Peel Region, Durham Region, Halton Region, Waterloo Region, City of Toronto, City of Hamilton and Haldimand County were reviewed.

All municipalities compared use the same formula as the Region, in which a rate is multiplied by the volume discharged. However, the other municipalities do not specify how volume is determined to calculate total hauled sewage fees (i.e. no details are provided on whether discharge volumes are measured or whether they assume a % of the truck capacity like the Region). There are four types of hauled sewage rates used by the municipalities described in the table below.

Table 3-3: Types of Hauled Sewage Rates

HAULED SEWAGE RATE	DESCRIPTION	MUNICIPALITIES
Flat rate per 1000 imperial gallons	The same rate is applied regardless of the type of sewage or the volume discharged.	York, Peel, Durham, Halton, Toronto, Niagara
Specific rates for set discharge volume ranges	A specific rate is applied depending on the range of volume the discharge falls within. Increasing volume ranges correspond to higher rates. The rates are not dependent on the type of hauled sewage.	Hamilton
Specific rates for different sewage types charged per 1000 imperial gallons	A specific rate is applied depending on the type of sewage discharged (i.e. leachate, holding tank waste or septic tank waste). The rates are not dependent on the volume discharged.	Haldimand
Specific rates for type of sewage per truck	A specific rate is charged per truck depending on the type of sewage a truck is discharging (i.e. holding tank waste or septic). The rates are not dependent on the volume discharged.	Waterloo

The hauled sewage rate of each municipality is displayed below in Table 3-4.

Table 3-4: Hauled Sewage Rate by Municipality

	YORK	PEEL	DURHAM	HALTON	WATERLOO	TORONTO	HAMILTON	HALDIMAND	NIAGARA
Rate ($/1000 imperial gallons)	$89.11*	$13.00	$73.86	$24.40	Ranges from $86.17/truck to $173.77/truck**	$126.65	Ranges from $43.62 to $174.48***	Ranges from $13.77 to $74.05****	$40.00
Rate ($/m3)	$19.60*	$2.86	$16.25	$5.37		$27.86	Ranges from $9.60 to $38.38***	Ranges from $3.03 to $16.29****	$8.80

*York's rate includes a 15% administration fee.
**Waterloo's rate is dependent on type of hauled sewage (i.e. holding tank waste, septic).
***Hamilton's rate is dependent on volume of hauled sewage disposed.
****Haldimand's rate is dependent on type of hauled sewage (i.e. leachate, holding tank waste or septic tank waste).

HAULED SEWAGE CALCULATION COMPARISON

To compare the Region's hauled sewage fees to those from the other municipalities, different discharge sources with different characteristics were assumed. These discharge profiles are listed below.

Table 3-5: Source Profiles used for Benchmarking

HAULED SEWAGE SOURCE	VOLUME (m^3)	VOLUME (gallons)	TYPE OF HAULED SEWAGE	BOD Concentration (mg/L)
Source 1	4.54	998.66	Holding Tank Waste	1,500
Source 2	15.9	3,497.51	Mixed Waste	2,500
Source 3	22.7	4,993.3	Septic Tank Waste	3,500
Source 4	36.3	7,984.88	Septic Tank Waste	3,000
Source 5	45.4	9,986.6	Holding Tank Waste	1,000
Source 6	10.0	2,199.69	Winery Waste	5,800

The hauled sewage fees calculated using the various municipalities' rates are summarized in Table 3-6 and are shown graphically in Figure 3-1.

Table 3-6: Hauled Sewage Rate Comparison

	SOURCE 1	SOURCE 2	SOURCE 3	SOURCE 4	SOURCE 5	SOURCE 6	TOTAL
York	$88.98	$311.64	$444.92	$711.48	$890.43	$196.00	**$2,643.45**
Peel	$12.98	$45.47	$64.92	$103.82	$129.93	$28.60	**$385.73**
Durham	$73.78	$258.38	$368.88	$589.88	$738.24	$162.50	**$2,191.64**
Halton	$24.38	$85.38	$121.90	$194.93	$243.96	$53.70	**$724.25**
*Waterloo	$86.17	N/A	$347.54	$347.54	$258.51	N/A	**$1,039.76**
Toronto	$126.48	$442.97	$632.42	$1,011.32	$1,265.68	$278.60	**$3,757.48**
Hamilton	$43.58	$152.64	$435.61	$1,045.08	$1,743.60	$96.00	**$3,516.52**
Haldimand	$13.76	N/A	$369.78	$591.33	$137.65	N/A	**$1,112.52**
Niagara - Existing Method	$39.95	$139.92	$199.76	$319.44	$399.78	$88.00	**$1,186.86**

*Assumed 20 m^3 trucks.

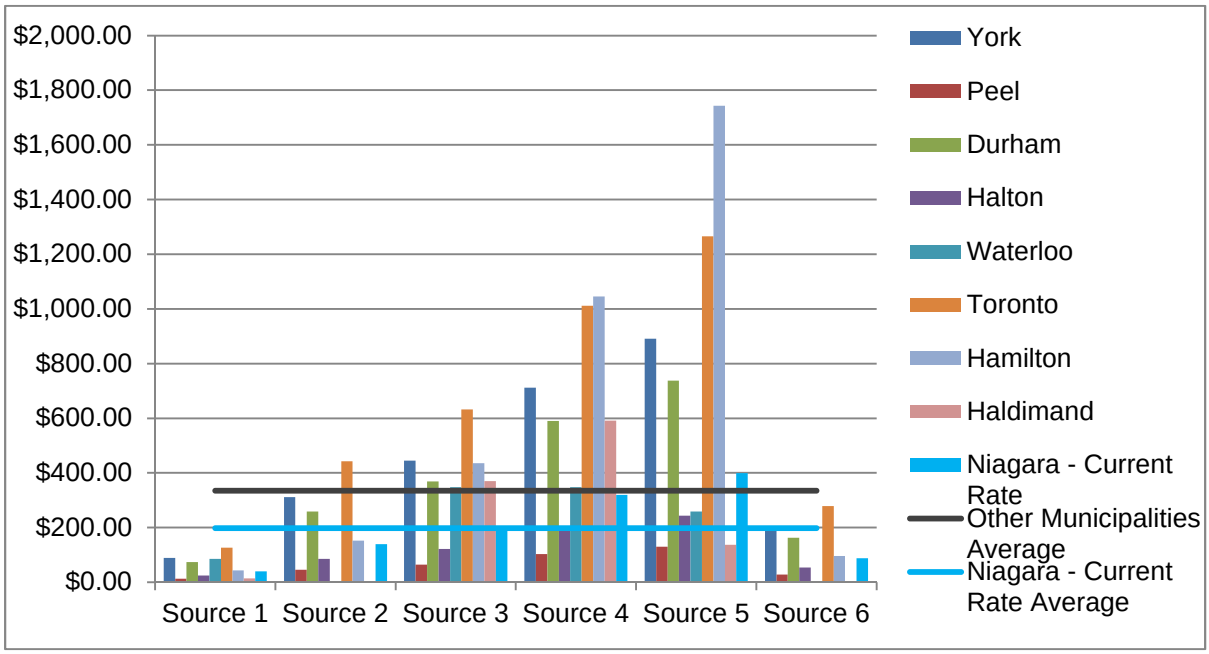

Figure 3-1: Hauled Sewage Fees by Municipality

As shown above, there is significant variation in the hauled sewage fees that would applied to different types of waste at the different municipalities compared. There is no discernible pattern. It is clear however that generally the City of Toronto and the City of Hamilton rates are greater than those for the rest of the municipalities. The Region's rates also generally lower than those at other municipalities.

3.1.3 RECREATIONAL VEHICLE SEWAGE DISPOSAL

A survey was undertaken to determine which other municipalities accept sewage disposal from recreational vehicles (RV). A summary of the findings including the applicable charges and policies for RV disposal is provided below in Table 3-7.

Table 3-7 Other Municipalities' Recreational Vehicle Disposal

MUNICIPALITY	RV DISPOSAL?	RV DISPOSAL CHARGE	COMMENTS
York	No	N/A	York Region directs RV owners to campgrounds/provincial parks for sewage disposal.
Peel	Yes	No charge	The disposal station at Wolfedale is open to RV owners Monday to Friday between 8:30am and 4:00pm. Sometimes the gate is open, but when it is closed the RV owner must call to have staff open the gate.
Durham	Yes	No charge	RV owners can access the plant between 7:30am and 3:30pm.
Halton	Yes	No charge	Residents of Halton can dispose sewage from RVs and are asked to call ahead to advise the appropriate plant of their arrival time so staff are available. Sewage is accepted Monday to Friday between 7:30am and 4:00pm.
Waterloo	No	N/A	N/A
Toronto	No	N/A	The City of Toronto website directs RV owners to campground sites for sewage disposal.
Hamilton	Yes	$5.75/1000 imperial gallons or $1.26/m³* $8.50**	RV sewage disposal is accepted only at the Mountain Community Recycling Centre (Upper Ottawa and Kilbride Road). The centre is open Monday to Saturday between 8:00am and 6:00pm. The waste must be discharged directly from the RV and the discharger must supply and connect a hose from the RV tank into the discharge manhole.
Haldimand	No	N/A	Haldimand County directs RV owners to trailer parks for sewage disposal.
Oxford	Yes	No charge	Residents of Oxford County can dispose sewage from RVs at the Woodstock WWTP Monday to Friday between 7:30am and 3:30pm.
Brantford	No	N/A	The City of Brantford no longer accepts sewage disposal from RVs.
Barrie	No	N/A	The City of Barrie directs RV owners to Heidi's RV in Hawkestone.
Guelph	Yes	No charge	Residents of the City of Guelph can dispose sewage from RVs Monday to Friday between 8:00am and 4:00pm.
Niagara	Yes	No charge	RV owners can access all sewage disposal stations between 7:00am and 7:00pm. However, gates at the facilities are closed and RV's must call to gain access.

*RV disposal charge in the City's Sewer Use By-law.
**RV disposal charge on the City's website.

Half of the municipalities consulted accept sewage disposal from RVs. With the exception of the City of Hamilton, these municipalities do not apply a charge for RV sewage disposal.

There are policies for RV sewage disposal at some of the municipalities. Some municipalities specify that only residents may dispose sewage from RVs. Furthermore, RV owners must call to get access to the disposal facility if the gate is locked.

The approach currently in place at the Region is considered consistent with practices at other nearby municipalities.

4 ALTERNATIVE HAULED SEWAGE RATE SETTING APPROACHES

Alternative approaches to determine the hauled sewage rate were considered given the fact that the Region's rate is considerably lower than the average for the municipalities consulted. These are explained below.

4.1 ALTERNATIVE APPROACH 1

This approach is based on achieving full cost recovery for the treatment of BOD, TSS, TP and TKN. Data for all plants for the past 5 years (i.e. 2009-2013) is summarized below in Table 4-1. The fraction of each parameter relative to the total mass of pollutants is also noted in the table.

Table 4-1: Historical Pollutant Removal Data from the Region's WWTPs

YEAR	BOD (kg)	TSS (kg)	TP (kg)	TKN (kg)	TOTAL kg REMOVED	% BOD	% TSS	% TP	% TKN
2009	11,139,256	13,893,973	268,061	1,382,529	26,683,819	41.7%	52.1%	1.0%	5.2%
2010	10,575,808	13,190,507	253,172	1,413,710	25,433,196	41.6%	51.9%	1.0%	5.6%
2011	11,219,406	14,071,314	264,563	1,432,388	26,987,671	41.6%	52.1%	1.0%	5.3%
2012	10,635,489	13,012,662	248,172	1,490,302	25,386,626	41.9%	51.3%	1.0%	5.9%
2013	12,775,442	15,572,714	272,147	1,610,574	30,230,878	42.3%	51.5%	0.9%	5.3%
AVERAGE						**41.8%**	**51.8%**	**1.0%**	**5.4%**

$$Mass\ Fraction_{BOD} = \frac{Total\ BOD\ Mass\ Removed}{Total\ BOD\ Mass\ Removed + Total\ TSS\ Mass\ Removed + Total\ TP\ Mass\ Removed + Total\ TKN\ Mass\ Removed}$$

A cost per kg removed (denoted R_1) was calculated using the annual gross capital wastewater costs and the annual total mass removed of BOD, TSS, TP and TKN at all of the Region's wastewater treatment plants. The cost data was obtained from the Region's annual operating statements for "5000C Wastewater Systems".

$$R_1 = \frac{Total\ Operations\ Cost\ \text{for}\ all\ Treatment\ Plants + Total\ Operations\ Costs\ for\ Garner\ Road\ Facility}{Total\ BOD\ Removed + Total\ TSS\ Removed + Total\ TP\ Removed + Total\ TKN\ Removed}$$

Table 4-2: Unit Removal Cost

YEAR	WASTEWATER OPERATIONS COST (GROSS CAPITAL)	TOTAL kg REMOVED	COST/ TOTAL kg REMOVED
2009	$47,656,713.23	26,683,819	$1.79
2010	$38,099,851.36	25,433,196	$1.50
2011	$44,683,556.26	26,987,671	$1.66
2012	$40,629,659.03	25,386,626	$1.60
2013	$42,781,364.19	30,230,878	$1.42
Average (R_1)			**$1.59**

Alternative Approach 1 assumes that the ratio of the mass of each parameter over the total mass of pollutants removed is the same as the ratio of the removal cost of the parameter over the total removal cost for all parameters.

$$Cost\ Fraction_{BOD} = \frac{Cost\ per\ Kg\ of\ BOD\ Removed}{Cost\ per\ Kg\ of\ BOD\ Removed + Cost\ per\ Kg\ of\ TSS\ Removed + Cost\ per\ Kg\ of\ TP\ Removed + Cost\ per\ Kg\ of\ TKN\ Removed}$$

All of the samples from all of the haulers were analyzed to obtain average concentrations of BOD, TSS, TP and TKN in the hauled sewage. The complete list of hauler test results used to determine the average sample concentrations for each parameter are included in Appendix B.

To determine the corresponding hauled sewage rate the following formula was used.

$$R = C_{BOD} \cdot Cost\ Fraction_{BOD} + C_{TSS} \cdot Cost\ Fraction_{TSS} + C_{TP} \cdot Cost\ Fraction_{TP} + C_{TKN} \cdot Cost\ Fraction_{TKN} \cdot R_1$$

Where,

R = Hauled sewage rate per unit volume
C_{BOD} = Average concentration of BOD from all hauler samples
C_{TSS} = Average concentration of TSS from all hauler samples
C_{TP} = Average concentration of TP from all hauler samples
C_{TKN} = Average concentration of TKN from all hauler samples
and the other terms are as defined in the formulas above.

The corresponding fee would be calculated per:

$$Hauled\ Sewage\ Fee = V \times R$$

The new hauled sewage rate based on full cost recovery for BOD, TSS, TP and TKN is shown below in Table 4-3.

Table 4-3: Hauled Sewage Rate Calculation – Approach 1

	BOD (mg/L)	TSS (mg/L)	TP (mg/L)	TKN (mg/L)
Average Sample Concentration (mg/L)	5,790	11,170	76	426
Average Sample Concentration (kg/1000 gallons)	26.32	50.78	0.35	1.94
Cost Fraction (per Table 4-1)	41.8%	51.8%	1.0%	5.4%
R_1 ($/kg removed)	$1.59			
New Hauled Sewage Rate ($/1000 gallons)	**26.32 X 41.8% + 50.78 X 51.8% + 0.35 X 1% + 1.94X5.4% = $59.51**			
New Hauled Sewage Rate	**$13.09/m³ or $59.51/1000 gallons**			

The hauled sewage rate obtained using Alternative Approach 1 is greater than the existing rate in use at the Region ($13.09/$m^3$ vs. $8.80/$m^3$) and thus would result in higher surcharge fees. However, the rate is still slightly below the average for the other municipalities compared.

This approach takes into account different kinds of discharges with varying concentrations of BOD, TSS, TP and TKN. However, this approach has disadvantages:

- → The approach to calculating the cost fractions of each parameter (based on percentages of the total mass removed) does not take into account the relative cost of removal of the various parameters – TSS removal is cheaper than BOD, TKN, and TP removal even when there might be more TSS in the influent.
- → The concentrations of the various parameters for all samples and all haulers were averaged. This means that some haulers (those with lower pollutant loading) may be overcharged, while others (winery waste haulers) may be undercharged.

4.2 ALTERNATIVE APPROACH 2

All of the fees applied at other municipalities (and Alternative Approach 1) are based on the following formula:

$$Hauled\ Sewage\ Fee = V \cdot R$$

Thus, the fee is a function of the volume discharged. Alternative Approach 1 attempts to take into consideration the differences in the cost of treatment for discharges with varying concentrations of BOD, TSS, TP and TKN. However, the above approach uses an average of all the samples from the haulers to determine the surcharge rate R. As noted above, a disadvantage of this approach is the potential overcharging or undercharging to haulers with hauled sewage of different strengths. The above approach does not take into account variations in the strength of sewage discharged by haulers at different times (some haulers may discharge septage at certain times and sometimes may discharge winery waste). Furthermore, some of the discharges greatly exceed the by-law limits for BOD, TSS, TKN and TP. The average hauled sewage sample concentrations are compared in Table 4-4 below to the Region's sewer discharge by-law limits for BOD, TSS, TP and TKN.

Table 4-4: Average Sample Concentrations vs By-law Limits

	BOD (mg/L)	TSS (mg/L)	TP (mg/L)	TKN (mg/L)
Average Sample Concentration	5,790	11,170	76	426
By-law Limit	300	350	10	100

Industrial surcharge fees are only applicable for users that have entered a surcharge agreement and which have demonstrated that they cannot economically change their processes to reduce concentrations of BOD, TSS, TKN and/or TP, below the Region's discharge limits (WSP, 2014). Alternative Approach 3 under Section 4.3 considers the cost at which hauled sewage would be charged if it were discharged under an industrial surcharge agreement instead of at a hauled sewage disposal station.

This is not the case for haulers, which have no restriction on the amount of hauled sewage they can discharge. In fact, per conversations with Region staff, the Region's Water and Wastewater Master Plan takes into consideration hauled sewage when determining the capacity requirements for the different treatment facilities (AECOM, 2011).The volume of hauled sewage is small, but the impact on plant loadings will be greater than residential sewage as hauled sewage is more concentrated.

Capacity upgrades to treatment plants are triggered by population growth and the funding for these upgrades is derived from development charges. Development charges are assigned on a development unit basis, i.e. the total cost of infrastructure required to service the development is divided by the number of development units.

However, capacity at the treatment plants is also taken up by hauled sewage, and therefore the corresponding costs (those related to operations and maintenance and also those related to capacity expansions) should be covered through hauled sewage rates.

The hauled sewage fee using Alternative Approach 2 therefore includes two components: a capital cost component (derived from Development Charges) and a O&M cost component (derived from the Region's O&M budget).

The calculation for the capital component is based on the following assumptions:

- New units of development are required to cover the cost of wastewater services through development charges. The development charge per unit is $3,226/dwelling unit (Niagara Region, 2012).
- A per capita BOD loading of 75 g/cap/day (MOE, 2008) was assumed.
- A value of 2.3 people per unit was assumed.
- Therefore, the unit equivalent BOD loading is 75 g/cap/day times 2.3 people per unit = 0.1725 kg/d/unit.
- This approach assumes that the average useful life of a treatment plant is 25 years. So the total BOD load per unit over the life time of the treatment plant is 0.1725 kg/d/unit times 365 days/year times 25 years = 1574 kgBOD/unit.
- The development charge per unit is $3,226, which covers the capital cost of the WWTP over the 25 years.

The capital component of the hauled sewage fee is then obtained using the following formula:

$$Capital\ Component = Volume\ Discharged \cdot Concentration\ of\ Discharge \cdot \frac{Development\ Charge\ per\ Unit}{BOD\ Load\ per\ Unit\ over\ 25\ years}$$

$$Capital\ Component = V \cdot C_{BOD} \cdot \frac{\$3{,}226/unit}{1{,}574\ kgBOD/unit}$$

The calculation for the O&M component is based on the following assumptions:

- The total cost of wastewater operations (the operating budget) is divided by the total flow to all of the treatment facilities in the Region.
- Per the 2014 Wastewater Requisition slide presentation (included as part of the 2014 Budget Process) we see that the net 2014 budget was $64,928,122.
- From data we received from the Region, the total flows from all municipalities in 2013 were 79,893.965 ML.
- The total budget divided by the total flow corresponds to a cost per sewage volume of $\$0.81/m^3$.
- A per capita BOD loading of 75 g/cap/day (MOE, 2008) was assumed.
- From the Region's 2011 Master Plan the per capita flow design criteria is 365 L/cap/day (AECOM, 2011).
- Therefore, a one-person load equivalent is 75 g/cap/day divided by 365 L/cap/day = 206 mg/L.

The O&M component of the hauled sewage fee is obtained using the following formula:

$$O\&M\ Component = Volume\ Discharged \cdot Cost\ per\ Volume \cdot Person\ Equivalents$$

$$O\&M\ Component = V \cdot \$0.81/m^3 \cdot \frac{BOD\ Concentration}{206\ mg/L}$$

The overall hauled sewage fee per Alternative Approach 2 is calculated as follows:

$$Hauled\ Sewage\ Fee = Capital\ Component + O\&M\ Component$$

$$Hauled\ Sewage\ Fee = \frac{V \cdot C_{BOD}}{1{,}000} \cdot \frac{\frac{\$3{,}226}{unit}}{1{,}574\frac{kgBOD}{unit}} + V \cdot \frac{\$0.81}{m^3} \cdot \frac{C_{BOD}}{206\ mg/L}$$

$$Hauled\ Sewage\ Fee = V \cdot C_{BOD} \cdot \frac{1\ kg \cdot L}{1{,}000\ m^3 \cdot mg} \cdot \frac{\frac{\$3{,}226}{unit}}{1{,}574\frac{kgBOD}{unit}} + \frac{\$0.81}{m^3} \cdot \frac{1}{206\ mg/L}$$

$$Hauled\ Sewage\ Fee = V \cdot C_{BOD} \cdot R$$

Where,

V = Volume of discharge (m^3)
C_{BOD} = Average concentration of BOD for a given source/hauler (mg/L)
R = 0.00598 ($/mgBOD)

This approach requires that samples from a given hauler be regularly tested to determine the average BOD concentration. Each hauler would thus have a different rate depending on the type of discharge so highly loaded discharges would incur greater fees. Alternatively, a rate for each type of hauled sewage source (i.e. winery waste, septic, industrial wastewater) could be developed and charged based on the type of hauled sewage the truck is disposing.

The above approach uses a different formula than that used by the Region or that used in Alternative Approach 1. As shown in Section 4.4 the resulting hauled sewage fees are generally greater than those obtained using the approach in use at the Region, and closer in magnitude to the average fees from the other municipalities compared.

This approach takes into account the impact hauled sewage has on the capacity of the facilities and accounts for the corresponding capital cost as well as operating and maintenance costs resulting from treating sewage with higher organic loadings. Unlike other approaches, this method accounts for differences in BOD concentration quantitatively. However, this approach has disadvantages:

- This approach does not take into consideration the concentrations of TSS, TP and TKN in the hauled sewage. Thus, a discharge with high concentrations of TSS, TP and/or TKN, but relative low concentrations of BOD would be undercharged.
- This approach is more complex than Alternative Approach 1. Adding the TSS, TP and TKN components would increase the complexity of the calculation.
- This method requires regular testing (the Region currently tests two samples per plant per month) and regular monitoring of the BOD concentrations. A suggested approach would be to develop a rate for each type of hauled sewage source.
- This approach does not take into consideration trucks that haul sewage from multiple different sources, and it would be impractical in such situations

4.3 ALTERNATIVE APPROACH 3

This approach is based on the Region's existing industrial surcharge rate (WSP, 2014). There are currently wineries in the Region with industrial surcharge agreements that are also hauling winery waste to the Region's disposal stations. This approach considers the cost that hauled sewage would be charged if it were discharged under an industrial surcharge agreement instead of at a hauled sewage disposal station.

The Region's formula for determining surcharge fees is shown below.

$$S = R \cdot Q \cdot \left[0.45\left[\frac{C - L}{BOD}\right] + 0.45\left[\frac{C - L}{TSS}\right] + 0.1(C - L)_{TP}\right]$$

Where,

S = Surcharge fee payable during a given time period
R = Cost factor
Q = Volume of discharge of wastewater flow for the period being billed
C = Average concentration of the parameter during the time period
L = Concentration limit of the parameter listed in the by-law

The formula assumes that BOD removal corresponds to 45% of the total cost of treatment, while TSS and TP correspond to 45% and 10% of the costs, respectively. The cost factor (expressed in $/kg) is obtained by dividing the three-year average of the total operational costs for all of the Region's wastewater treatment plants (WWTPs) by the sum of the total mass of five-day carbonaceous biochemical oxygen demand at 20°C ($cBOD_5$ henceforth referred to as BOD), total suspended solids

(TSS) and total phosphorus (TP) removed at the plants. The value of the cost factor R currently used is $1.46/kg.

This approach requires that samples from a given hauler be regularly tested to determine the average BOD, TSS and TP concentrations. Each hauler would thus have a different rate depending on the type of discharge so highly loaded discharges would incur greater fees. Alternatively, a concentration profile including BOD, TSS and TP for each type of hauled sewage source (i.e. winery waste, septic, industrial wastewater) could be developed and charged based on the type of hauled sewage the truck is disposing.

This approach has disadvantages:

- This approach does not take into consideration the concentration of TKN in the hauled sewage.
- This approach requires regular testing (the Region currently tests two samples per plant per month) and regular monitoring of BOD, TSS and TP. A suggested approach would be to develop a concentration profile including BOD, TSS and TP for each type of hauled sewage source/hauler.

4.4 COMPARISON OF ALTERNATIVE APPROACHES

The hauled sewage fees for each source profile were calculated using the various municipalities approaches and compared to the Region's current approach and the alternative methods discussed above.

The same six hauled sewage source profiles discussed in Section 3.1.2 were applied to the different municipalities' surcharge calculations. The discharge profiles are repeated in Table 3-5 below for easy reference.

Table 4-5: Source Profiles Used for Benchmarking

HAULED SEWAGE SOURCE	VOLUME (m^3)	VOLUME (gallons)	TYPE OF HAULED SEWAGE	BOD Concentration (mg/L)
Source 1	4.54	998.66	Holding Tank Waste	1,500
Source 2	15.9	3,497.51	Mixed Waste	2,500
Source 3	22.7	4,993.3	Septic Tank Waste	3,500
Source 4	36.3	7,984.88	Septic Tank Waste	3,000
Source 5	45.4	9,986.6	Holding Tank Waste	1,000
Source 6	10.0	2,199.69	Winery Waste	5,800

The corresponding hauled sewage fees are shown in Table 4-6 and in Figure 4-1 below.

Table 4-6: Surcharge Fee Comparison

MUNICIPALITY	OTHER MUNICIPALITIES AVERAGE	NIAGARA – EXISTING APPROACH	ALTERNATIVE APPROACH 1	ALTERNATIVE APPROACH 2	ALTERNATIVE APPROACH 3
Source 1	$58.76	$39.95	$59.43	$40.80	$35.90
Source 2	$195.91	$139.92	$208.13	$238.16	$136.16
Source 3	$348.25	$199.76	$297.14	$476.02	$209.31
Source 4	$574.42	$319.44	$475.17	$652.47	$322.79
Source 5	$676.00	$399.78	$594.68	$272.19	$344.28
Source 6	$135.90	$88.00	$130.90	$347.51	$107.32
TOTAL	**$1,989.24**	**$1,186.85**	**$1,765.45**	**$2,027.15**	**$1,155.76**

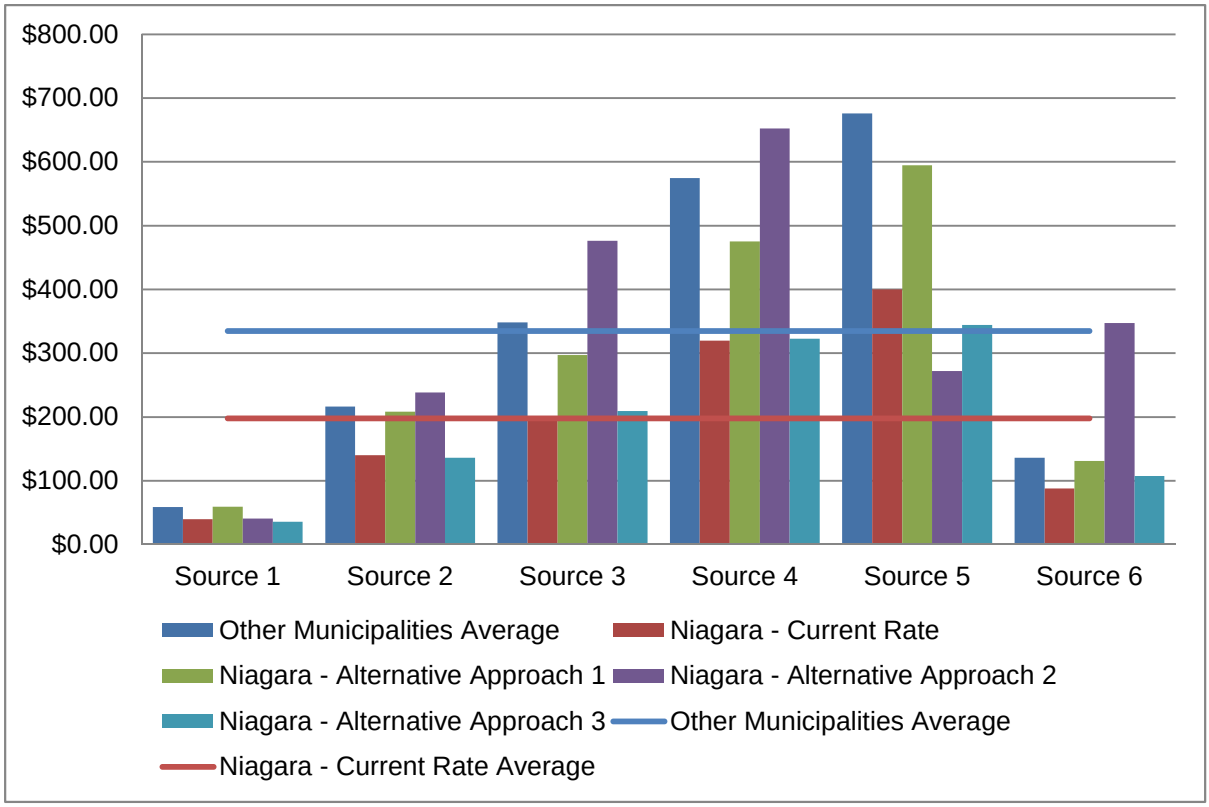

Figure 4-1 Comparison of Alternative Approaches for Surcharge Calculation

Alternative Approach 1 generally results in fees slightly lower than the average of the other municipalities reviewed. However, for smaller discharge volumes (i.e. Sources 1, 2 and 3 which are under 22.7 m³), Alternative Approach 1 produces hauled sewage fees that are very similar to the average of the other municipalities. The disadvantage of this approach is that it does not take into consideration the strength of the sewage (septic tank waste is charged the same as winery waste on a per volume basis).

Alternative Approach 2 uses a different approach to determine haulage fees as it seeks to capture the true cost of treatment of the hauled sewage. It takes into account the capacity that hauled sewage takes up at the various treatment plants and how this capacity results in a reduced ability to service new development. The formula also takes into account differences in BOD concentration so stronger sewage results in higher fees than lower strength discharges.

Figure 4-1 shows that the fees obtained using this approach are generally within the average for other municipalities. However, this approach results in higher charges for sewage sources with higher concentrations.

Alternative Approach 3 is based on the Region's existing industrial surcharge rate and seeks to capture the cost that hauled sewage would be charged if it were discharged under an industrial surcharge agreement instead of at a hauled sewage disposal station. It results in fees significantly lower than the average of the other municipalities reviewed.

Table 4-7 below shows a qualitative evaluation of the Region's current rate and the alternative approaches.

Table 4-7: Hauled Sewage Rate Summary

ITEM	CURRENT RATE	ALTERNATIVE APPROACH 1	ALTERNATIVE APPROACH 2	ALTERNATIVE APPROACH 3
Parameters subject to rate determination	Unknown	BOD, TSS, TP, TKN	BOD	BOD, TSS, TP
Cost Recovery	It is believed that the current approach does not lead to cost recovery	Captures O&M costs related to treatment. However, it does not take into account the strength of the sewage.	Captures treatment cost since it considers the total operating costs at all facilities and BOD concentrations specific to sources	Does not explicitly consider TKN. Full cost recovery – calculation of parameter surcharge rates based on the total operating costs at all facilities
Cost Similarity to Other Municipalities	Significantly lower than average	Slightly lower than average	Close to average of other municipalities. Results in higher charges for higher concentrations sewage.	Significantly lower than average
Simplicity	Unknown	Somewhat Complicated Requires plant loading data to determine mass fractions for each parameter, breakdown of operating costs and hauler loading data	Complicated Requires regular testing of samples from various haulers to determine average BOD concentration	Somewhat Complicated Requires plant loading data and total operating costs C = operations cost ($) / total kg removed (kg)

5 CONCLUSIONS AND RECOMMENDATIONS

A review of the Region's hauled sewage rate was conducted to examine whether it reflects the costs associated with the treatment of the wastewater and leads to cost recovery. The review also involved a comparison of the rates used at other municipalities.

HAULED SEWAGE RATE

There is no information on the approach followed to establish the Region's current rate, $40/1000 imperial gallons.

The majority of the other municipalities considered use a higher hauled sewage rate than the Region. Five discharge profiles (variations of discharge volume based on the ranges that the City of Hamilton uses to distinguish which rate is applied) were used to calculate the hauled sewage fees that would apply at each of the municipalities compared. It was found that the Region's current rate results in surcharge fees that would be significantly less than the other municipalities.

Three alternative approaches were evaluated. Alternative Approach 1 results in a volumetric rate of $59.51/1000 gallons. Alternative Approach 2 involves the use of a formula that includes the volume and concentration of the discharge. Alternative Approach 3 involves the use of the formula currently used to calculate the Region's industrial surcharge fees.

Alternative Approach 2 results in fees slightly higher than the average for neighboring municipalities. We believe this approach has a better technical basis.

It is recommended that the Region adopt the formula corresponding to Alternative Approach 2 on a cost recovery basis. However, Alternative Approach 2 is not practical for the Region to implement at this time as it requires regular testing of the hauled sewage. Alternative Approach 3 would also require regular testing of the hauled sewage. Therefore, it is recommended that the Region implement Alternative Approach 1 corresponding to a new hauled sewage rate of $13.09/m³ or $59.51/1000gal.

VOLUME USED FOR FEE CALCULATION

There is insufficient information to determine whether charging for 80% truck capacity guarantees that the Region is neither overcharging nor undercharging for the volumes of hauled sewage disposed. Based on Region's staff, this approach is believed to be a fair approach.

NON-COMPLIANCE

The review revealed that many hauled discharges exceed the Region's by-law limits for heavy metals including copper and zinc. The Region should consider treating such discharges as industrial surcharges and thus make them subject to Industrial Surcharge Agreements. The following enforcement policy could be utilized to discourage non-compliance:

- First Violation – Suspension of discharge privileges for 10 consecutive days
- Second Violation – Suspension of discharge privileges for 30 consecutive days
- Third Violation – Revocation of permit

Penalties specific to haulers are outlined in the Region's Sewage Hauler Manual (Niagara Region, 2011). This includes penalties for non-payment of fees, disposal of a non-approved source, disposal without a valid permit, failure to leave a hauled sewage sample, failure to submit a Hauled Sewage Record and failure to adequately complete a Hauled Sewage Record. However, there are no penalties specific to hauled sewage generators and non-compliance with by-law limits for metals.

RECREATIONAL VEHICLE SEWAGE DISPOSAL

A survey was undertaken to determine whether other municipalities accept sewage disposal from recreational vehicles (RVs). Half of the municipalities consulted accept sewage disposal from RVs. With the exception of the City of Hamilton, these municipalities do not apply a charge for RV sewage disposal.

There are policies for RV sewage disposal at some of the municipalities. Some municipalities specify that only residents may dispose sewage from RVs. Furthermore, RV owners must call to get access to the disposal facility if the gate is locked.

This last approach was recently adopted at the Region's facilities.

OTHER RECOMMENDATIONS

The following also is recommended:

→ It is recommended that the Sewage Hauler Manual (Niagara Region, 2011) be updated to reflect the new hauled sewage rate, $13.09/m³ or $59.51/1000gal, if the Region chooses to adopt Alternative Approach 1.

- It is recommended that the Region regularly test hauled sewage samples for BOD or COD as the concentration of BOD or COD is used to determine the hauled sewage rate for all alternative approaches.
- It is recommended that the hauled sewage rate be reviewed at least every 5 years to ensure they continue to reflect the Region's operating costs.
- It is also recommended that the hauled sewage rate be reviewed again when the new Niagara-on-the-Lake WWTP has been fully operational for two years to account for any additional operational costs and ensure full cost recovery.
- It is recommended that the hauled sewage rate review be coordinated with the Water and Wastewater Master Planning Process and Development Charges Review.

6 BIBLIOGRAPHY

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Appendix A

OPERATING STATEMENTS FOR 5000C WASTEWATER SYSTEMS

Niagara Region

Operating Statement by Object of Expenditure
For the Calendar Period Ended
December + Adjustment 2009

Dept-Agency	Department	Division
4000A Public Works Department	5000B Self Supporting Services	5000C Wastewater Treatment

% of Yr Elapsed : 100%

Object of Expenditure	Object of Expenditure Description	Current Period Budget $	Current Period Actual $	Year to Date Budget $	Year to Date Actual $	Variance Favourable/ (Unfavourable) $	Annual Budget $	Budget Remaining $	Year to Date %
Expenditure									
OE11	Personnel Costs	713,473.00	863,173.89	8,544,014.00	8,689,753.32	(145,739.32)	8,544,014.00	(145,739.32)	101.7%
OE12	Administrative Expenses	28,922.00	8,104,320.62	344,655.00	8,346,676.67	(8,002,021.67)	344,655.00	(8,002,021.67)	2,421.7%
OE13	Materials, Supplies & Utilities	780,323.00	1,010,060.23	9,353,045.00	8,849,634.48	503,410.52	9,353,045.00	503,410.52	94.6%
OE14	Repairs & Maintenance	352,320.00	4,562,368.27	4,225,398.00	7,615,108.85	(3,389,710.85)	4,225,398.00	(3,389,710.85)	180.2%
OE15	Purch. Serv. & Other Operating Exp.	719,091.00	1,883,442.85	8,624,967.00	9,137,969.75	(513,002.75)	8,624,967.00	(513,002.75)	105.9%
OE17	Financial Expenditures	-	1,250,411.75	-	1,250,411.75	(1,250,411.75)	-	(1,250,411.75)	0.0%
OE18	Capital Equipment & Renovations	4,085.00	9,823,585.45	48,239.00	9,946,171.20	(9,897,932.20)	48,239.00	(9,897,932.20)	20,618.5%
OE19	Interfunctional Transfers	359,644.00	393,912.49	4,315,838.00	4,237,157.90	78,680.10	4,315,838.00	78,680.10	98.2%
OE20	Recoveries - Interfunctional Transfers	(38,011.00)	(288.00)	(456,000.00)	(469,999.49)	13,999.49	(456,000.00)	13,999.49	103.1%
	Total Gross Expenditure	2,919,847.00	27,890,987.55	35,000,156.00	57,602,884.43	(22,602,728.43)	35,000,156.00	(22,602,728.43)	164.6%
Revenue									
OE33	Fees & Service Charges	(84,911.00)	(464,080.80)	(1,018,800.00)	(1,237,482.24)	218,682.24	(1,018,800.00)	218,682.24	121.5%
OE34	Other Revenue	(425.00)	(19,388,824.94)	(5,100.00)	(19,419,786.87)	19,414,686.87	(5,100.00)	19,414,686.87	380,780.1%
OE35	Transfers from Other Funds	(226,784.00)	(226,784.00)	(2,721,067.00)	(3,367,549.15)	646,482.15	(2,721,067.00)	646,482.15	123.8%
	Total Revenue	(312,120.00)	(20,079,689.74)	(3,744,967.00)	(24,024,818.26)	20,279,851.26	(3,744,967.00)	20,279,851.26	641.5%
	Net Expenditure/(Revenue) before Indirect Allocation	2,607,727.00	7,811,297.81	31,255,189.00	33,578,066.17	(2,322,877.17)	31,255,189.00	(2,322,877.17)	107.4%
	Net Expenditure/(Revenue) after Indirect Allocation	2,607,727.00	7,811,297.81	31,255,189.00	33,578,066.17	(2,322,877.17)	31,255,189.00	(2,322,877.17)	107.4%

Niagara Region

Operating Statement by Object of Expenditure
For the Calendar Period Ended
December + Adjustment 2010

Dept-Agency	Department	Division
4000A Public Works Department	5000B Water & Wastewater Services	5000C Wastewater Operations

% of Yr Elapsed : 100%

Object of Expenditure	Object of Expenditure Description	Current Period Budget $	Current Period Actual $	Year to Date Budget $	Year to Date Actual $	Variance Favourable/ (Unfavourable) $	Annual Budget $	Budget Remaining $	Year to Date %
Expenditure									
OE11	Personnel Costs	751,522.00	895,887.42	9,008,969.00	9,341,709.99	(332,740.99)	9,008,969.00	(332,740.99)	103.7%
OE12	Administrative Expenses	29,749.00	837,993.10	354,524.00	1,024,754.57	(670,230.57)	354,524.00	(670,230.57)	289.1%
OE13	Materials, Supplies & Utilities	770,260.00	934,138.61	9,230,778.00	9,106,613.73	124,164.27	9,230,778.00	124,164.27	98.7%
OE14	Repairs & Maintenance	319,018.00	568,319.44	3,830,516.00	4,455,387.72	(624,871.72)	3,830,516.00	(624,871.72)	116.3%
OE15	Purch. Serv. & Other Operating Exp.	766,040.00	1,774,229.10	9,600,179.00	10,110,370.89	(510,191.89)	9,600,179.00	(510,191.89)	105.3%
OE18	Capital Equipment & Renovations	5,594.00	10,263,920.17	66,204.00	10,316,149.93	(10,249,945.93)	66,204.00	(10,249,945.93)	15,582.4%
OE19	Interfunctional Operating Charges	371,561.00	489,253.67	4,457,254.00	4,491,366.80	(34,112.80)	4,457,254.00	(34,112.80)	100.8%
OE20	Interfunctional Operating Recoveries	(1,674.00)	(161,727.01)	(20,000.00)	(165,782.79)	145,782.79	(20,000.00)	145,782.79	828.9%
OE23	Transfers to Reserves & Reserve Funds	-	287,000.00	-	287,000.00	(287,000.00)	-	(287,000.00)	0.0%
OE25	Capital Recoveries	(23,837.00)	(58,443.00)	(286,000.00)	(551,569.55)	265,569.55	(286,000.00)	265,569.55	192.9%
	Total Gross Expenditure	**2,988,233.00**	**15,830,571.50**	**36,242,424.00**	**48,416,001.29**	**(12,173,577.29)**	**36,242,424.00**	**(12,173,577.29)**	**133.6%**
Revenue									
OE33	Fees & Service Charges	(84,911.00)	(421,670.33)	(1,018,800.00)	(1,220,519.82)	201,719.82	(1,018,800.00)	201,719.82	119.8%
OE34	Other Revenue	(425.00)	(19,345,218.50)	(5,100.00)	(19,396,467.67)	19,391,367.67	(5,100.00)	19,391,367.67	380,322.9%
OE35	Transfers from Reserves & Reserve Funds	(225,534.00)	(1,609,021.47)	(2,706,067.00)	(4,448,526.47)	1,742,459.47	(2,706,067.00)	1,742,459.47	164.4%
	Total Revenue	**(310,870.00)**	**(21,375,910.30)**	**(3,729,967.00)**	**(25,065,513.96)**	**21,335,546.96**	**(3,729,967.00)**	**21,335,546.96**	**672.0%**
	Net Expenditure/(Revenue) before Indirect Allocation	**2,677,363.00**	**(5,545,338.80)**	**32,512,457.00**	**23,350,487.33**	**9,161,969.67**	**32,512,457.00**	**9,161,969.67**	**71.8%**
	Net Expenditure/(Revenue) after Indirect Allocation	**2,677,363.00**	**(5,545,338.80)**	**32,512,457.00**	**23,350,487.33**	**9,161,969.67**	**32,512,457.00**	**9,161,969.67**	**71.8%**

Niagara Region

Operating Statement by Object of Expenditure
For the Calendar Period Ended
December + Adjustment 2011

Dept-Agency	Department	Division
4000A Public Works Department	5000B Water & Wastewater Services	5000C Wastewater Operations

% of Yr Elapsed : 100%

Object of Expenditure	Object of Expenditure Description	Current Period Budget $	Current Period Actual $	Year to Date Budget $	Year to Date Actual $	Variance Favourable/ (Unfavourable) $	Annual Budget $	Budget Remaining $	Year to Date %
Expenditure									
OE11	Personnel Costs	771,131.00	1,000,214.45	9,228,944.00	9,873,539.86	(644,595.86)	9,228,944.00	(644,595.86)	107.0%
OE12	Administrative Expenses	28,865.00	3,782,967.21	343,399.00	3,967,886.90	(3,624,487.90)	343,399.00	(3,624,487.90)	1,155.5%
OE13	Materials, Supplies & Utilities	813,302.00	1,332,509.29	9,746,380.00	9,986,928.86	(240,548.86)	9,746,380.00	(240,548.86)	102.5%
OE14	Repairs & Maintenance	318,977.00	312,520.05	3,825,315.00	3,978,666.13	(153,351.13)	3,825,315.00	(153,351.13)	104.0%
OE15	Purch. Serv. & Other Operating Exp.	882,819.00	3,856,329.97	10,089,132.00	12,123,961.33	(2,034,829.33)	10,089,132.00	(2,034,829.33)	120.2%
OE18	Capital Equipment & Renovations	5,340.00	12,668,125.54	63,244.00	12,711,871.13	(12,648,627.13)	63,244.00	(12,648,627.13)	20,099.7%
OE19	Interfunctional Operating Charges	366,597.00	226,416.76	4,398,911.00	4,407,530.47	(8,619.47)	4,398,911.00	(8,619.47)	100.2%
OE20	Interfunctional Operating Recoveries	-	(230.40)	-	(3,049.60)	3,049.60	-	3,049.60	0.0%
OE23	Transfers to Reserves & Reserve Funds	-	812,765.00	-	812,765.00	(812,765.00)	-	(812,765.00)	0.0%
OE25	Capital Recoveries	(23,837.00)	(33,353.02)	(286,000.00)	(464,672.69)	178,672.69	(286,000.00)	178,672.69	162.5%
	Total Gross Expenditure	**3,163,194.00**	**23,958,264.85**	**37,409,325.00**	**57,395,427.39**	**(19,986,102.39)**	**37,409,325.00**	**(19,986,102.39)**	**153.4%**
Revenue									
OE32	Ontario/Canada Grants	-	-	-	(8,191.15)	8,191.15	-	8,191.15	0.0%
OE33	Fees & Service Charges	(85,748.00)	(359,019.60)	(1,028,800.00)	(1,362,399.56)	333,599.56	(1,028,800.00)	333,599.56	132.4%
OE34	Other Revenue	(425.00)	(17,800,821.46)	(5,100.00)	(17,969,848.96)	17,964,748.96	(5,100.00)	17,964,748.96	352,350.0%
OE35	Transfers from Reserves & Reserve Funds	-	-	-	(287,000.00)	287,000.00	-	287,000.00	0.0%
	Total Revenue	**(86,173.00)**	**(18,159,841.06)**	**(1,033,900.00)**	**(19,627,439.67)**	**18,593,539.67**	**(1,033,900.00)**	**18,593,539.67**	**1,898.4%**
	Net Expenditure/(Revenue) before Indirect Allocation	**3,077,021.00**	**5,798,423.79**	**36,375,425.00**	**37,767,987.72**	**(1,392,562.72)**	**36,375,425.00**	**(1,392,562.72)**	**103.8%**
	Net Expenditure/(Revenue) after Indirect Allocation	**3,077,021.00**	**5,798,423.79**	**36,375,425.00**	**37,767,987.72**	**(1,392,562.72)**	**36,375,425.00**	**(1,392,562.72)**	**103.8%**

Niagara Region

Operating Statement by Object of Expenditure
For the Calendar Period Ended
December + Adjustment 2012

Dept-Agency	Department	Division
4000A Public Works Department	5000B Water & Wastewater Services	5000C Wastewater Operations

% of Yr Elapsed : 100%

Object of Expenditure	Object of Expenditure Description	Current Period Budget $	Current Period Actual $	Year to Date Budget $	Year to Date Actual $	Variance Favourable/ (Unfavourable) $	Annual Budget $	Budget Remaining $	Year to Date %
Expenditure									
OE11	Personnel Costs	907,924.00	934,965.92	9,596,120.00	9,703,256.46	(107,136.46)	9,596,120.00	(107,136.46)	101.1%
OE12	Administrative Expenses	25,445.00	434,574.58	302,843.00	656,664.94	(353,821.94)	302,843.00	(353,821.94)	216.8%
OE13	Materials, Supplies & Utilities	820,089.00	1,311,080.77	9,828,308.00	9,040,028.65	788,279.35	9,828,308.00	788,279.35	92.0%
OE14	Repairs & Maintenance	370,199.00	400,443.04	4,439,858.00	4,126,350.27	313,507.73	4,439,858.00	313,507.73	92.9%
OE15	Purch. Serv. & Other Operating Exp.	896,824.00	1,429,777.58	10,769,453.00	9,419,589.69	1,349,863.31	10,769,453.00	1,349,863.31	87.5%
OE18	Capital Equipment & Renovations	6,011.00	14,865,984.06	71,252.00	14,948,239.41	(14,876,987.41)	71,252.00	(14,876,987.41)	20,979.4%
OE19	Interfunctional Charbegacks/Recoveries	110,799.00	110,191.04	1,329,621.00	1,322,580.58	7,040.42	1,329,621.00	7,040.42	99.5%
OE23	Transfers to Reserves & Reserve Funds	-	3,492,487.00	-	3,492,487.00	(3,492,487.00)	-	(3,492,487.00)	0.0%
OE26	Allocations Between Departments	69,608.00	104,506.55	835,076.00	897,760.52	(62,684.52)	835,076.00	(62,684.52)	107.5%
OE27	Allocations Within Departments	206,139.00	(27,867.32)	2,465,349.00	2,257,228.36	208,120.64	2,465,349.00	208,120.64	91.6%
OE36	Allocations to Capital Program	(23,837.00)	(28,927.93)	(286,000.00)	(286,287.44)	287.44	(286,000.00)	287.44	100.1%
	Total Gross Expenditure	**3,389,201.00**	**23,027,215.29**	**39,351,880.00**	**55,577,898.44**	**(16,226,018.44)**	**39,351,880.00**	**(16,226,018.44)**	**141.2%**
Revenue									
OE33	Fees & Service Charges	(85,748.00)	(394,833.62)	(1,028,800.00)	(1,485,923.30)	457,123.30	(1,028,800.00)	457,123.30	144.4%
OE34	Other Revenue	(425.00)	(11,921,961.00)	(5,100.00)	(12,177,644.31)	12,172,544.31	(5,100.00)	12,172,544.31	238,777.3%
OE35	Transfers from Reserves & Reserve Funds	(25,000.00)	(25,000.00)	(300,000.00)	(717,162.00)	417,162.00	(300,000.00)	417,162.00	239.1%
	Total Revenue	**(111,173.00)**	**(12,341,794.62)**	**(1,333,900.00)**	**(14,380,729.61)**	**13,046,829.61**	**(1,333,900.00)**	**13,046,829.61**	**1,078.1%**
	Net Expenditure/(Revenue) before Indirect Allocation	**3,278,028.00**	**10,685,420.67**	**38,017,980.00**	**41,197,168.83**	**(3,179,188.83)**	**38,017,980.00**	**(3,179,188.83)**	**108.4%**
	Net Expenditure/(Revenue) after Indirect Allocation	**3,278,028.00**	**10,685,420.67**	**38,017,980.00**	**41,197,168.83**	**(3,179,188.83)**	**38,017,980.00**	**(3,179,188.83)**	**108.4%**

Niagara Region

Operating Statement by Object of Expenditure
For the Calendar Period Ended
December + Adjustment 2013

Dept-Agency	Department	Division
4000A Public Works Department	5000B Water & Wastewater Services	5000C Wastewater Operations

% of Yr Elapsed : 100%

Object of Expenditure	Object of Expenditure Description	Current Period Budget $	Current Period Actual $	Year to Date Budget $	Year to Date Actual $	Variance Favourable/ (Unfavourable) $	Annual Budget $	Budget Remaining $	Year to Date %
Expenditure									
OE11	Personnel Costs	1,010,617.00	1,212,082.24	10,024,380.00	10,308,614.00	(284,234.00)	10,024,380.00	(284,234.00)	102.8%
OE12	Administrative Expenses	24,794.00	2,814,309.78	295,306.00	3,029,503.15	(2,734,197.15)	295,306.00	(2,734,197.15)	1,025.9%
OE13	Materials, Supplies & Utilities	842,344.00	1,529,758.97	10,096,699.00	9,765,583.09	331,115.91	10,096,699.00	331,115.91	96.7%
OE14	Repairs & Maintenance	383,885.00	381,045.49	4,604,827.00	4,829,796.46	(224,969.46)	4,604,827.00	(224,969.46)	104.9%
OE15	Purch. Serv. & Other Operating Exp.	856,161.00	1,992,544.11	10,285,655.00	9,321,088.72	964,566.28	10,285,655.00	964,566.28	90.6%
OE18	Capital Equipment & Renovations	5,324.00	14,495,111.08	63,096.00	14,642,566.70	(14,579,470.70)	63,096.00	(14,579,470.70)	23,206.8%
OE23	Transfers to Reserves & Reserve Funds	-	1,678,669.00	-	1,678,669.00	(1,678,669.00)	-	(1,678,669.00)	0.0%
OE26	Allocations Between Departments	73,670.00	109,930.98	885,030.00	943,436.74	(58,406.74)	885,030.00	(58,406.74)	106.6%
OE27	Allocations Within Departments	199,043.00	(33,216.08)	2,387,845.00	2,157,294.81	230,550.19	2,387,845.00	230,550.19	90.3%
OE36	Allocations to Capital Program	(24,756.00)	(44,438.24)	(297,006.00)	(252,621.78)	(44,384.22)	(297,006.00)	(44,384.22)	85.1%
	Total Gross Expenditure	**3,371,082.00**	**24,135,797.33**	**38,345,832.00**	**56,423,930.89**	**(18,078,098.89)**	**38,345,832.00**	**(18,078,098.89)**	**147.1%**
Revenue									
OE32	Ontario/Canada Grants	-	-	-	(7,438.00)	7,438.00	-	7,438.00	0.0%
OE33	Fees & Service Charges	(85,761.00)	(94,370.86)	(1,035,500.00)	(1,032,766.43)	(2,733.57)	(1,035,500.00)	(2,733.57)	99.7%
OE34	Other Revenue	(425.00)	(6,042,318.40)	(5,100.00)	(6,056,438.27)	6,051,338.27	(5,100.00)	6,051,338.27	118,753.7%
OE35	Transfers from Reserves & Reserve Funds	-	-	-	(477,460.00)	477,460.00	-	477,460.00	0.0%
	Total Revenue	**(86,186.00)**	**(6,136,689.26)**	**(1,040,600.00)**	**(7,574,102.70)**	**6,533,502.70**	**(1,040,600.00)**	**6,533,502.70**	**727.9%**
	Net Expenditure/(Revenue) before Indirect Allocation	**3,284,896.00**	**17,999,108.07**	**37,305,232.00**	**48,849,828.19**	**(11,544,596.19)**	**37,305,232.00**	**(11,544,596.19)**	**130.9%**
Indirect Allocation									
OE31	Indirect Allocation	157,991.00	411,159.30	1,896,297.00	1,678,350.06	217,946.94	1,896,297.00	217,946.94	88.5%
OE37	Debt Allocation	4,016.00	4,886.00	175,827.00	288,822.00	(112,995.00)	175,827.00	(112,995.00)	164.3%
	Total Indirect Allocation	**162,007.00**	**416,045.30**	**2,072,124.00**	**1,967,172.06**	**104,951.94**	**2,072,124.00**	**104,951.94**	**94.9%**

Niagara Region

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For the Calendar Period Ended
December + Adjustment 2013

Dept-Agency	Department	Division
4000A Public Works Department	5000B Water & Wastewater Services	5000C Wastewater Operations

% of Yr Elapsed : 100%

Object of Expenditure	Object of Expenditure Description	Current Period Budget $	Current Period Actual $	Year to Date Budget $	Year to Date Actual $	Variance Favourable/ (Unfavourable) $	Annual Budget $	Budget Remaining $	Year to Date %
Net Expenditure/(Revenue) after Indirect Allocation		3,446,903.00	18,415,153.37	39,377,356.00	50,817,000.25	(11,439,644.25)	39,377,356.00	(11,439,644.25)	129.1%

Summary of Appendix B to Hauled Sewage Rate Review, Final Report, dated December 2014

Hauler Sample Data

	Hauled Sewage Concentration (mg/L)				
Item	T BOD	TP	TKN	TSS	Totals
Average Concentration (mg/L)	5789.98	75.99	426.48	11169.80	-
Average Concentration (kg/1000 gallons)	26.3218	0.3455	1.9388	50.7789	-
Weighted by Fraction (kg/1000 gallons)	11.0053	0.0034	0.1056	26.2875	-
Sum (kg/gallons)	-	-	-	-	37.4018
Cost per kg Removed	-	-	-	-	1.59
New Hauled Sewage Rate ($1000 gallons)	-	-	-	-	59.51

Note: This summary data table excludes confidential/proprietary information on samples collected that was contained in the original report table.