

Table 1
Summary of Design Water Flows
Water & Sewage Works Study
Addendum Process No. 3
Town of South Bruce Peninsula

December 17, 2010

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DCA Area in Sauble Beach	Water Flows
Residential and Commercial Lots (equivalent of 356 units) @ 0.56 m ³ /d/unit	199 m ³ /d
Add 25% Safety Factor for Peak Weekend Use/Demand	50 m ³ /d
Add 10% Growth Factor for Some Re-Development/Intensification Within DCA Area	20 m ³ /d
Add One Communal Washroom	10 m ³ /d
Total Average Day Flows	279 m³/d
Maximum* Day Flows	698 m³/d (8 L/s or 106 IGPM)
Peak Flow*	1,046 m³/d (12 L/s or 160 IGPM)

* Maximum day and peak day water use factors are 2.5 and 3.75 respectively, based on equivalent population of 1,400 persons. Peak flows exclude fire flows.

**Table 2 - Evaluation of Alternative Solutions
Water and Sewage Works Study - Addendum No. 3
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ALTERNATIVE	Capital Cost	Operation and Reserve Fund Cost	NATURAL ENVIRONMENT IMPACTS	SOCIAL IMPACTS	ECONOMIC IMPACTS
<p><u>Option #1</u></p> <ul style="list-style-type: none"> • 303 existing lots • 6,805 m of sanitary sewer • two (2) pumping stations • wastewater treatment plant • serviced area consists primarily of Development Control Area (DCA) 	<p>\$12,736,000 total cost</p> <p>\$42,033 per lot</p> <p>\$21,440 per lot with grant*</p>	<p>\$374,000/year</p>	<ul style="list-style-type: none"> • Temporary environmental disturbances may result from initial construction phases. • Potential environmental impact from wastewater effluent discharge resulting from malfunctioning equipment and failure of redundancy at wastewater treatment plant • Elimination of malfunctioning or inadequate private septics could improve subsurface water quality in service area. • Removal of trees, at treatment plant site, may cause loss of habitat for migratory birds (dependent on final site). • Minimal protection of in-shore water quality with small sewer service area. 	<ul style="list-style-type: none"> • Would allow for residential, commercial and institutional growth in core area only. • Should assist in providing additional protection for sandpoint well sources for core area only. • Temporary roadway disturbances during construction • Temporary increase in noise activity during construction • Sauble Beach may be viewed as socially and environmentally responsible/progressive, though small sewer service area limits potential. 	<ul style="list-style-type: none"> • Residential, commercial and institutional growth may improve economy for core area only, including providing additional employment opportunities. • Potential for property values to increase, but in core sewer service area only. • Connection cost may be a financial hardship for households on a minimal fixed income. • High cost per connection for maintenance/reserve fund with small system. • Additional potential for severable lots in small area only.
<p><u>Option #2</u></p> <ul style="list-style-type: none"> • 710 existing lots • 15,965 m of sanitary sewer • two (2) pumping stations • wastewater treatment plant • serviced area consists of Option 1 area plus area north to Fourth St. N and south to Ninth St. S 	<p>\$24,253,000 total cost</p> <p>\$34,200 per lot</p> <p>\$25,400 per lot with grant*</p>	<p>\$646,000/year</p>	<ul style="list-style-type: none"> • Temporary environmental disturbances may result from initial construction phases. • Potential environmental impact from wastewater effluent discharge resulting from malfunctioning equipment and failure of redundancy at wastewater treatment plant • Elimination of malfunctioning or improperly installed private septics could improve subsurface water quality in adjacent areas. • Removal of trees, at treatment plant site, may cause loss of habitat for migratory birds (dependent on final site). • Minimal protection of in-shore water quality with small sewer service area. 	<ul style="list-style-type: none"> • Would allow for residential, commercial and institutional growth in relatively small area only. • Should assist in providing additional protection for sandpoint well sources for relatively small area only. • Temporary roadway disturbances during construction. • Temporary increase in noise activity during construction. • Sauble Beach may be viewed as socially and environmentally responsible/progressive, though small sewer service area limits potential. 	<ul style="list-style-type: none"> • Residential, commercial and institutional growth may improve economy for small area, including providing additional employment opportunities. • Potential for property values to increase, but in relatively small sewer service area only. • Connection cost may be a financial hardship for households on a minimal fixed income. • High cost per connection for maintenance/reserve fund with small system. • Additional potential for severable lots in small area only.
<p><u>Option #3</u></p> <ul style="list-style-type: none"> • 1,505 existing lots • 32,845 m of sanitary sewer • two (2) pumping stations • wastewater treatment plant • certain areas will require servicing by grinder pumps • serviced area consists of Option 2 area in addition to areas north of Sauble Falls Road and most areas west of Sauble Falls parkway. Also includes Carsons Campground, Woodland Park, and Sauble Falls Tent and Trailer Camp. Also includes D-Line/Main Street intersection 	<p>\$43,418,000 total cost</p> <p>\$28,900 per lot</p> <p>\$24,700 per lot with grant*</p>	<p>\$1,293,000/year</p>	<ul style="list-style-type: none"> • Temporary environmental disturbances may result from initial construction phases. • Potential environmental impact from wastewater effluent discharge resulting from malfunctioning equipment and failure of redundancy at wastewater treatment plant • Elimination of malfunctioning or improperly installed private septics could improve subsurface water quality in adjacent areas. • Removal of trees, at treatment plant site, may cause loss of habitat for migratory birds (dependent on final site). • Increased protection of in-shore water quality with larger sewer service area. 	<ul style="list-style-type: none"> • Would allow for residential, commercial and institutional growth in much larger area. • Should assist in providing additional protection from sandpoint well sources for overall larger service area. • Temporary roadway disturbances during construction • Temporary increase in noise activity from construction • Sauble Beach may be viewed as socially and environmentally responsible/progressive, with larger sewer service area. 	<ul style="list-style-type: none"> • Residential, commercial and institutional growth may improve economy for larger area, including providing additional employment opportunities. • Potential for property values to increase for larger sewer service area. • Connection cost may be a financial hardship for households on a minimal fixed income. • Lower cost per connection for maintenance/reserve fund with larger system. • Additional potential for severable lots in larger area.

ALTERNATIVE	Capital Cost	Operation and Reserve Fund Cost	NATURAL ENVIRONMENT IMPACTS	SOCIAL IMPACTS	ECONOMIC IMPACTS
<p><u>Option #4</u></p> <ul style="list-style-type: none"> 2,300 existing lots 53,705 m of sanitary sewer two (2) main pumping stations with three (3) or more additional pumping stations required (to be confirmed) wastewater treatment plant Certain areas will require servicing by grinder pumps serviced area consists of Option 3 plus residential areas near Silver Lake and areas east of Sauble Falls Parkway in Fedy Drive and Jewel Bridge areas. Also includes Main St. to Municipal Road, Winding River Campground and Sauble Beach Resort Camp. 	<p>\$64,005,000 total cost</p> <p>\$27,800 per lot</p> <p>\$25,100 per lot with grant*</p>	\$1,907,000/year	<ul style="list-style-type: none"> Temporary environmental disturbances may result from initial construction phases. Potential environmental impact from wastewater effluent discharge resulting from malfunctioning equipment and failure of redundancy at wastewater treatment plant Elimination of malfunctioning or improperly installed private septic systems could improve subsurface water quality in adjacent areas. Removal of trees, at treatment plant site, may cause loss of habitat for migratory birds (dependent on final site). Increased protection of in-shore water quality with larger sewer service area. 	<ul style="list-style-type: none"> Would allow for residential, commercial and institutional growth in much larger area. Should assist in providing additional protection for sandpoint well sources for much larger area. Temporary roadway disturbances during construction Temporary increase in noise activity during construction Sauble Beach may be viewed as socially and environmentally responsible/progressive with larger sewer service area. 	<ul style="list-style-type: none"> Residential, commercial and institutional growth may improve economy for larger area, including providing additional employment opportunities. Potential for property values to increase for larger sewer service area. Connection cost may be a financial hardship for households on a minimal fixed income. Lower cost per connection for maintenance/reserve fund with larger system. Additional potential for severable lots in larger area.
<p><u>Option #5</u></p> <ul style="list-style-type: none"> 2,510 existing lots 59,845 m of sanitary sewer two (2) main pumping stations with three (3) or more additional pumping stations required (to be confirmed) wastewater treatment plant certain areas will require servicing by grinder pumps serviced area consists of Option 4 area plus area east of Silver Lake to Municipal Board and along Sauble Falls Parkway 	<p>\$69,500,000 total cost</p> <p>\$27,700 per lot</p> <p>\$25,200 per lot with grant*</p>	\$2,079,000/year	<ul style="list-style-type: none"> Temporary environmental disturbances may result from initial construction phases. Potential environmental impact from wastewater effluent discharge resulting from malfunctioning equipment and failure of redundancy at wastewater treatment plant Elimination of malfunctioning or improperly installed private septic systems could improve subsurface water quality in adjacent areas. Removal of trees, at treatment plant site, may cause loss of habitat for migratory birds (dependent on final site). Increased protection of in-shore water quality with larger sewer service area. 	<ul style="list-style-type: none"> Would allow for residential, commercial and institutional growth in much larger area. Should assist in providing additional protection for sandpoint well sources for core area only in large area. Temporary roadway disturbances during construction Temporary increase in noise activity during construction Sauble Beach may be viewed as socially and environmentally responsible/progressive with larger sewer service area. 	<ul style="list-style-type: none"> Residential, commercial and institutional growth may improve economy for larger area, including providing additional employment opportunities. Potential for property values to increase for larger sewer service area. Connection cost may be a financial hardship for households on a minimal fixed income. High cost per connection for maintenance/reserve fund with larger system. Additional potential for severable lots in larger area.
<p><u>Option 5A</u></p> <ul style="list-style-type: none"> 2,435 existing lots 58,540 m of sanitary sewer Two (2) min. pumping stations with seven (7) additional pumping stations required Wastewater treatment plant Certain areas will require servicing by grinder pumps Serviced area consists of Option 5 area with deferred areas east of Silver Lake Subdivision and north along Sauble Falls Parkway Outfall to Lake Huron 	<p>\$69,660,000 total cost</p> <p>\$28,600 per lot</p> <p>\$26,045 per lot with grant*</p>	\$2,079,000/year**	<ul style="list-style-type: none"> Temporary environmental disturbances may result from initial construction phases. Potential environmental impact from wastewater effluent discharge resulting from malfunctioning equipment and failure of redundancy at wastewater treatment plant Elimination of malfunctioning or improperly installed private septic systems could improve subsurface water quality in adjacent areas. Removal of trees, at treatment plant site, may cause loss of habitat for migratory birds (dependent on final site). Increased protection of in-shore water quality with larger sewer service area. 	<ul style="list-style-type: none"> Would allow for residential, commercial and institutional growth in much larger area. Should assist in providing additional protection for sandpoint well sources in large area. Temporary roadway disturbances during construction Temporary increase in noise activity during construction Sauble Beach may be viewed as socially and environmentally responsible/progressive with larger sewer service area. 	<ul style="list-style-type: none"> Residential, commercial and institutional growth may improve economy for larger area, including providing additional employment opportunities. Potential for property values to increase for larger sewer service area. Connection cost may be a financial hardship for households on a minimal fixed income. High cost per connection for maintenance/reserve fund with larger system. Additional potential for severable lots in larger area. Capital cost reflects \$2,000,000 savings without filtration at the wastewater treatment plant.
<p><u>Option #6</u></p> <p>Do Nothing</p>	\$0	\$0	<ul style="list-style-type: none"> Lack of sewers may contribute to contamination of sandpoint well sources for drinking water Potential for poor inshore water quality along beach without sewers 	<ul style="list-style-type: none"> Lack of sewers may hamper residential, commercial and institutional growth. Lack of sewers may hamper long term job creation. 	<ul style="list-style-type: none"> Tourism may decrease if pollution concerns become more frequent without sewers. Potential for stagnating real estate values if pollution concerns increase without sewers.

* Based on available grant of \$6,240,000.00

** Costs could reduce by \$30,000 to \$60,000/year if no filtration required with Lake Huron outfall

Table 3
Cost Estimate – Water Treatment and Distribution System
Water and Sewage Works Study
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1.	6,700 m of 150 mm diameter and 200 mm diameter DR18 PVC watermain, including fittings 6,700 m @ \$325/m	\$2,177,500
2.	75 hydrant assemblies including watermain, tee and 150 mm diameter isolation Valves 75 @ \$4,500 each	\$337,500
3.	356 – 19 mm diameter copper water service connections @ \$1,800 each	\$641,000
4.	Interconnecting pipe with Amabel-Sauble school water system 300 m @ \$400/m	\$120,000
5.	Development of new well point system for 106 IGPM flow	
-	Initial well development	\$25,000
-	Hydrogeologic investigation and application for Permit To Take Water	\$50,000
-	Construct new 150 mm diameter municipal well to bedrock with backup well – 120 m of well @ \$600/m	\$72,000
-	Well head security plan	\$50,000
-	New well pumps, piping, etc., including electrical service	\$50,000
		\$247,000
6.	Construct raw water transmission line to water plant 500 m @ \$250/m	\$125,000
7.	Water treatment plant expansion for 106 IGPM additional capacity	\$1,380,000
-	2 membrane units	\$400,000
-	UV upgrade.....	\$150,000
-	Building expansion – 6 m x 10 m @ \$2,500/m ²	\$150,000
-	Chemical/process control	\$180,000
-	Additional clearwell volume	\$150,000
-	Miscellaneous electrical.....	\$150,000
-	Additional pumping/piping system	\$200,000
	Subtotal	\$5,028,000
	15% Contingencies	\$754,000
	12% Engineering	\$603,000
	Total Cost	\$6,385,000

Servicing is for 356 units. Cost per unit is \$17,935 per unit plus costs for home owner to hook up home to water service at lot line.

Note: above costs based on finding additional raw water supply near existing Amabel-Sauble school site. If new municipal wells developed south east of Sauble Beach, likely higher costs for extended treated water trunk watermain.

Table 4**Sewage Flow Estimates – Option 5A****With Overall Construction Completed in 4 Phases**

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	Phase 1	Phase 2	Phase 3	Phase 4
Number of Lots	719	1,025	1,960	2,435
Approx. No. of Equivalent Residential Connections	1,343	1,810	3,225	3,865
Average Flow per Equivalent Connection	0.75 m ³ /d	0.75 m ³ /d	0.75 m ³ /d	0.75 m ³ /d
Average Day Flow	1,010 m ³ /d	1,360 m ³ /d	2,420 m ³ /d	2,900 m ³ /d
Maximum Average Day Flow During Busy Summer Period	1,770 m ³ /d (1.75 times annual average)	2,244 m ³ /d (1.65 times annual average)	3,390 m ³ /d (1.4 times annual average)	3,770 m ³ /d (1.3 times annual average)
Peak Flow Factor for Average Flow During Summer	6.0 times	5.5 times	4.2 times	4.0 times
Peak Flow During Summer	125 L/s	145 L/s	165 L/s	175 L/s

Notes Number of lots above approximate only based on current Bruce County lot fabric detail. For Phase 1 and 2, Equivalent Residential Units based on 10% increase for additional commercial/institutional equivalent connections and 10% future growth factor (total of 20% extra). Add 480 and 580, respectively, equivalent trailer park sites for Phase 1 and Phase 2 based on +/- 3:1 ratio.

For Phases 3 and 4, Equivalent Residential Units based on 10% increase for additional commercial/institutional equivalent connections and 20% future growth factor (30% extra). Add 675 and 700 equivalent trailer park sites, respectively, for Phases 3 and 4.

Grand Bend average day sewage flows in summer 1.2 to 1.9 times the annual average day flow for 2006, 2007 and 2008. No instantaneous peak flow data available. Number of connections not available. Annual flow is 750 to 850 m³/day.

Wasaga Beach average day sewage flows in summer 1.1 to 1.25 times the annual average day flow. Peak daily flow 1.3 to 2.5 times maximum, summer average day flow. Annual average day flow is 5,000 to 6,000 m³/day for 2007, 2008 and 2009. Number of connections is approximately 10,300. Average day flow per connection is approximately 0.53 m³/day.

Table 5

**Summary of Social, Economic and Environmental Impacts
Wastewater Treatment Plant Locations**

December 16, 2010

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Location	Social Impacts	Economic Impacts	Environmental Impacts
<p><u>Option 1</u> Municipal Road Location (Site H-1) Discharge of Tertiary Effluent to Sauble River</p>	<ul style="list-style-type: none"> • Concerns over possible visual impacts, odour and noise impacts from adjacent property owners. • Concerns expressed by adjacent property owners over impacts to campground users • No loss of established recreational usage of existing lands (currently cultivated farmland). 	<ul style="list-style-type: none"> • No adverse economic impacts other than concerns raised by neighbouring property owners. 	<ul style="list-style-type: none"> • Concern with impacts from high-quality tertiary quality effluent on Sauble River expressed by area residents. • Minimal dilution of tertiary effluent if plant were expanded for larger service area (Option 5A, Phases 1 through 4). • Potential phosphorus enrichment in river with Phase 4 effluent flows during low flow summer periods.
<p><u>Option 2</u> Sauble Falls Parkway North Site (Site A-1) Discharge of Tertiary Effluent to Sauble River at Boat Launch</p>	<ul style="list-style-type: none"> • Minimum social impacts with location of new treatment plant in well-forested area at Site A-1. • Some concern over discharge of tertiary (or secondary) quality effluent near river mouth at boat launch site. 	<ul style="list-style-type: none"> • Likely effluent filtration should be provided for discharge at Sauble River mouth at boat launch site. • Increases capital cost of treatment plant. 	<ul style="list-style-type: none"> • More dilution available at river mouth site than at Municipal road site. • Possible enrichment of very lower section of river with additional phosphorus/ ammonia during low flow summer flows for Phase 4 effluent flows.
<p><u>Option 3</u> Sauble Falls Parkway South Side (Site C-1) Discharge of Secondary Effluent to Sauble River</p>	<ul style="list-style-type: none"> • No identified social impacts with new treatment plant at Site C-1. Site well buffered from all adjoining properties. 	<ul style="list-style-type: none"> • 800 m length (or more) of large diameter effluent pipe in Lake Huron will significantly increase capital costs • Lake Huron effluent discharge not likely to require tertiary (filtration). Secondary treatment with UV likely adequate. • Elimination of filtration requirement will provide some offsetting capital cost savings, including reduced costs to operate filtration system. 	<ul style="list-style-type: none"> • Massive dilution and very low background phosphorous concentrations in Lake Huron should result in no measureable impact of effluent on in-shore Lake Huron water quality with marine outfall to Lake Huron.

Table 6

Treatment Plant at Municipal Road Site

Summary of Impacts on Water Quality in Sauble River
Following Full Dilution of Tertiary EffluentPhase 1 Condition

Maximum, Average Day, Summer Effluent Flow - 1,770 m³/d
 Minimum Dry Weather Flow in Sauble River - 24,797 m³/d

Parameter	Background Value in Sauble River (mg/L)	Expected Effluent Value (Objective Limit) (mg/L)	Expected Effluent Value (Compliance Limit) (mg/L)	Dilution Ratio	Water Quality in Sauble River After Dilution Based on Compliance Limit (mg/L)	MOE Water Quality Objectives (mg/L)
Total Phosphorus	0.020	0.1	0.3	14:1	0.039	0.030
Total Ammonia	0.020	1.0	3.0	14:1	0.22	N/A
Unionized Total Ammonia*	0.0017	0.0825	0.248	14:1	0.018	0.020
Nitrate	0.040	20**	20**	14:1	1.7	N/A
BOD	1.0	5	10	14:1	1.6	N/A
Suspended Solids	5.0	5	10	14:1	5.3	N/A

Phase 4 Condition

Maximum Average Day, Summer Flow - 3,770 m³/d
 Minimum Dry Weather Flow in Sauble River - 24,797 m³/d

Parameter	Background Value in Sauble River (mg/L)	Expected Effluent Value (Objective Limit) (mg/L)	Expected Effluent Value (Compliance Limit) (mg/L)	Dilution Ratio	Water Quality in Sauble River after Dilution Based on Compliance Limit (mg/L)	MOE Water Quality Objective (mg/L)
Total Phosphorus	0.020	0.1	0.3	6.5:1	0.051	0.030
Total Ammonia	0.020	1.0	3.0	6.5:1	0.42	N/A
Unionized Total Ammonia*	0.0017	0.0825	0.248	6.5:1	0.035	0.02
Nitrate	0.40	20**	20**	6.5:1	3.0	N/A
BOD	1.0	5	10	6.5:1	2.2	N/A
Suspended Solids	5.0	5	10	6.5:1	5.7	N/A

*Based on 8.25% unionized ammonia assuming river pH of 8.2 and summer water temperature of 25°C.

** No C of A Objective or Compliance Limit expected. Value is approximate only.

N/A - Not applicable.

Table 7

Treatment Plant at Site C-1

Summary of Impacts on Water Quality in Lake Huron
Following Dilution of Secondary Effluent

Phase 1 Condition

Maximum, Average Day, Summer Effluent Flow - 1,770 m³/d
Assumed Bulk Water Movement at Effluent Discharge - 250,000 m³/d

Parameter	Background Value in Lake Huron (mg/L)	Expected Effluent Value (Objective Limit) (mg/L)	Expected Effluent Value (Compliance Limit) (mg/L)	Dilution Ratio	Water Quality in Lake Huron After Dilution Based on Compliance Limit (mg/L)	MOE Water Quality Objectives (mg/L)
Total Phosphorus	0.002	0.5	1.0	141:1	0.009	0.02
Total Ammonia	0.01	1.0	3.0	141:1	0.03	N/A
Unionized Total Ammonia*	0.0009	0.0825	0.248	141:1	0.002	0.020
Nitrate	0.1	20**	20**	141:1	0.24	N/A
BOD	< 3.0	10	20	141:1	3.1	N/A
Suspended Solids	< 3.0	10	25	141:1	3.1	N/A

Phase 4 Condition

Maximum Average Day, Summer Flow - 3,770 m³/d
Assumed Bulk Water Movement at Effluent Discharge - 250,000 m³/d

Parameter	Background Value in Lake Huron (mg/L)	Expected Effluent Value (Objective Limit) (mg/L)	Expected Effluent Value (Compliance Limit) (mg/L)	Dilution Ratio	Water Quality in Lake Huron after Dilution Based on Compliance Limit (mg/L)	MOE Water Quality Objectives (mg/L)
Total Phosphorus	0.002	0.5	1.0	66:1	0.017	0.02
Total Ammonia	0.01	1.0	3.0	66:1	0.055	N/A
Unionized Total Ammonia*	0.0009	0.0825	0.248	66:1	0.005	0.020
Nitrate	0.1	20**	20**	66:1	0.45	N/A
BOD	< 3.0	10	20	66:1	3.3	N/A
Suspended Solids	< 3.0	10	25	66:1	3.3	N/A

*Based on 8.25% unionized ammonia assuming lake pH of 8.2 and summer water temperature of 20°C.

** No C of A Objective or Compliance Limit expected. Value is approximate only.

N/A - Not applicable

Table 8
Estimated Capital Cost for Phase 1 – Option 5A
Water and Sewage Works Study
Addendum Process No. 3
Town of South Bruce Peninsula

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Component	Cost
Sewer Collection System (17,285 m)	\$11,221,422.00
Pumping Stations (2)	\$2,050,000.00
Forcemains	\$1,798,380.00
Treatment Plant and Outfall	\$8,805,000.00
Engineering	\$1,500,000.00
Hydro One Estimate	\$160,000.00
Land Costs	\$535,000.00
Other Costs (legal, geotechnical, etc.)	\$420,000.00
Subtotal	\$26,489,802.00
5% Contingency	\$1,324,490.00
Total Project Cost	\$27,814,292.00