Grand Marais Sewer Servicing Study

BACKGROUND

The Manitoba Water Services Board (MWSB) and the Rural Municipality (RM) of St. Clements have engaged the consulting engineering firm WSP to assess the potential of constructing a sewer system for the community of Grand Marais. Initial topographic surveys and geotechnical investigations were undertaken, conceptual designs prepared and a preliminary report has been submitted for consideration by the RM and the MWSB. The RM has has conducted preliminary survey of interest and initiated a public engagement process to inform the citizens of the results of the study.

SEWER SYSTEM ALTERNATIVES

There are three types of sewer system that could be implemented in Grand Marais. Alternative "A" is a conventional gravity sewer system where wastewaters, including both solids and liquids, are discharged from each connection to large diameter mains in the street. Alternative "B" is a low-pressure sewer (LPS) system where each house and building has a tank to receive wastewater, and a pump to discharge the liquid effluent through small diameter piping to small diameter pressure pipes installed along the roadway. Alternative "C" is a hybrid system consisting mainly of LPS with limited gravity sewers for larger water users along the PTH#12 commercial strip at the southeast corner of the community.

ALTERNATIVE A - GRAVITY SEWER SYSTEM

Gravity sewer pipes are laid at a downward slope from each house and building, to another larger sloped pipe under the road right-of-way. This pipe runs down the road and joining with other pipes in a network that gets deeper. Inevitably the pipes get so deep and costly to install that a pumping ("lift") station is needed to bring the pipes closer to ground level. The installation depth starts around 2.4m deep (8 ft), and by the time they approach 6m (20 ft), a lift station is normally installed. A total of four lift stations will be required for this type of system in Grand Marais. In addition to the depth, the piping, typically starting at 200mm (8") diameter, gets larger as the system goes downstream. From the last lift station at the southeast corner of the community, there will be a 250mm HDPE forcemain to convey pumped effluent to the existing municipal wastewater treatment facility. With the combination of deep large-diameter piping and lift stations, the costs are relatively high. The opinion of probable cost as presented in the sewer servicing study is $21.3 million, including service piping from the main to the front lot line of each property. It excludes the costs of constructing piping on private property (probable average around $5000), which will be the responsibility of each owner.

ALTERNATIVE B - LOW PRESSURE SEWER SYSTEM

LPS systems have been constructed in several dozen rural Manitoba communities over the past five decades. The LPS system includes each property having a tank, an effluent pump and piping extending either to a small diameter mainline on the front street or the backlane. In most cases, existing on-site tanks can be incorporated. Suitable tanks can be either two-compartment septic tanks or holding tanks to which a pumpout control chamber is added. The effluent pumps are usually submersible type, installed in a septic tank's second chamber or in the control chamber added to a holding tank. The submersible pump discharges the liquid effluent through a piping system consisting of 32mm (1¼") high-density polyethylene (HDPE) service piping to each tank/pump, then 75mm through 200mm HDPE piping laid at a consistent 2.5m - 3.0m depth. Because the system operates under pressure, the piping follows the contours of the ground rather than becoming deeper as with gravity sewers. At the edge of the community a pumping station will convey effluent through a 250mm HDPE forcemain to the existing municipal lagoon for treatment. It may be noted that because wastewater solids will settle out in the tanks, the accumulated sludge will need to be pumped out by septic tank truck once per year for year-round residences and businesses. The frequency of tank cleaning for seasonal residences will be much less, possibly once every five or 10 years,

depending on cottage usage. The opinion of probable cost as presented in the sewer servicing study is $9.7 million. It excludes the costs of constructing tanks, pumps, piping to property line, etc., on private property. For residential-sized connections, the probable average would be expected to be around $8000 if there is an existing usable holding tank; $5250 if there is a usable septic tank; $13,000 for a new septic tank, pump, controls, piping to property line; all of which will be the responsibility of each owner.

ALTERNATIVE C - HYBRID SEWER SYSTEM

The study also considered the possibility of a hybrid system whereby the community would be served by LPS sewers with a limited run of gravity sewer along the PTH#12 commercial district, to serve larger water users. The opinion of probable cost as presented in the sewer servicing study is $10.4 million. The costs for on-site piping, tanks, etc will be the same as the gravity and LPS alternatives.

ADVANTAGES OF EACH ALTERNATIVE

ALT A - GRAVITY SEWER		ALT B - LOW PRESSURE SEWER	
Advantage	**Disadvantage**	**Advantage**	**Disadvantage**
No on-site tanks to clean	Mains constructed in deep excavated trenches on front streets – major road impacts	Mains installed by directional drilling, mostly in back lanes – minimal road damage	On-site tanks require sludge removal: 1/yr for permanent residences, 1/ 5-10 yrs seasonal
No on-site pumps to maintain	Costly manholes required approx. every 120m (400 ft)	Lower-cost cleanouts mostly required only at deadens	On-site pumps (power needed; replacement every 10-15 years
	Multiple lift (pumping) stations to maintain	Only one lift station	
	Mains require high pressure cleaning for sludge removal (4 yrs)	Mains usually do not need flushing	
	Larger diameter, deeper pipes	Smaller diameter, shallower pipes	
	Much higher capital and municipal operation & maintenance costs	Lower capital and municipal operation & maintenance costs	

The hybrid option (Alternative C) has a combination of the gravity and LPS advantages and disadvantages.

WASTEWATER TREATMENT UPGRADING

The study also considered the potential need to upgrade the existing wastewater treatment lagoon system which is a two-cell lagoon with a wetland for nutrient removal, located near the intersection of PR#500 and Municipal Road 103N. Currently the primary cell has adequate capacity to assimilate all the organic loading from the community sewer system including projected growth over the next 20 years, as well as remaining holding tanks in the district. The secondary (storage) cell has capacity to accommodate about 60% of the anticipated long-term hydraulic loading. Therefore, at some point during the period when properties are connected to the sewers, an additional secondary storage cell will be needed to meet the criteria imposed by Environment Act licencing. The existing wetland system will also need upgrading to improve its current effectiveness in phosphorus reduction, which is a key criterion in the efforts to limit algae blooms on Lake Winnipeg. The opinion of probable cost of another secondary cell and wetland upgrading as presented in the study is $2.7 million if a synthetic liner is required or $1.9 million if suitable clay is available.

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GOVERNMENT GRANTS

MWSB has been providing grants for construction of municipal water and sewer systems for 50 years. In addition, there have been other federal-provincial funding assistance programs over the years. If the RM implements a sewer project for Grand Marais, it will apply for whatever assistance is available, to reduce the costs to property owners.

MUNICIPAL FINANCING ALTERNATIVES

The RM will need to borrow their share of capital construction costs. In Manitoba, these are normally financed by a debenture repaid over a 20 year amortitisation period (like a mortgage). The revenue for annual payments is recovered through a levy on properties in the benefitting area, which is established as a Local Improvement District (LID). Municipalities have the option of charging levy which may consist of a mill rate on assessed property value; a frontage charge; a fixed equal fee for properties of each class; or a combination. There is also an option for property owners to prepay the entire amount after construction, rather than paying over 20 years, to save on interest charges.

MANDATORY CONNECTION POLICY

Provincial Regulators have the authority to mandate the immediate connection of all properties but usually do not do so unless there is a confirmed threat to the environment or public health. In the absence of such an imminent threat, the RM may mandate that properties be connected over a longer period of time, up to a maximum of ten years as provincially legislated.

SUMMARY OF COSTS OF SEWER SYSTEM ALTERNATIVES

	ALT A - GRAVITY	ALT B - LPS
Sewer mains	$6,765,000	$2,690,000
Lift stations & forcemains	$3,395,000	$1,710,000
Lot service connections & road repairs	$5,625,000	$2,780,000
SUBTOTAL	$15,785,000	$7,180,000
Engineering, contingencies, financing & administration costs	$5,525,000	$2,513,000
TOTAL	**$21,310,000**	**$9,693,000**
Typical on-lot residential connection costs	$5,000	$8,000

The opinion of probable total cost of the hybrid option (Alternative C) is $10,365,000.

SUMMARY OF COSTS OF LAGOON UPGRADING ALTERNATIVES

	ALT A – CLAY LINER	ALT B - SYNTHETIC
New secondary cell	$1,006,000	$1,585,000
Wetland upgrading	$500,000	$500,000
SUBTOTAL	$1,506,000	$2,085,000
Engineering, contingencies, financing & administration costs	$527,000	$730,000
TOTAL	**$2,033,000**	**$2,815,000**

Note: All opinions of probable cost are based upon currently available information, including some future inflation factors, but actual costs will depend upon prevailing market conditions.

THE MANITOBA WATER SERVICES BOARD

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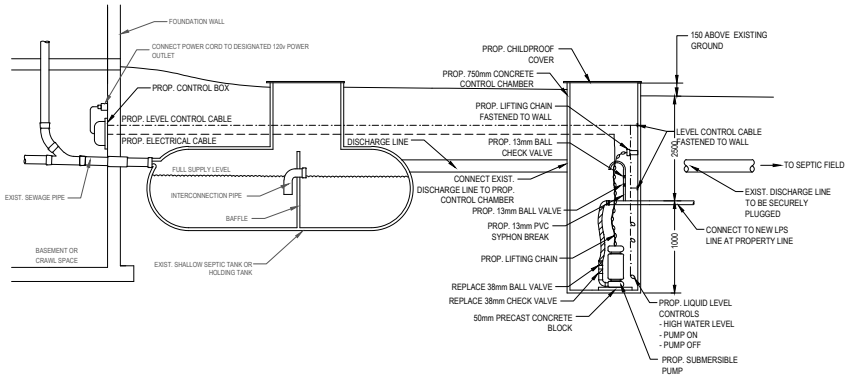
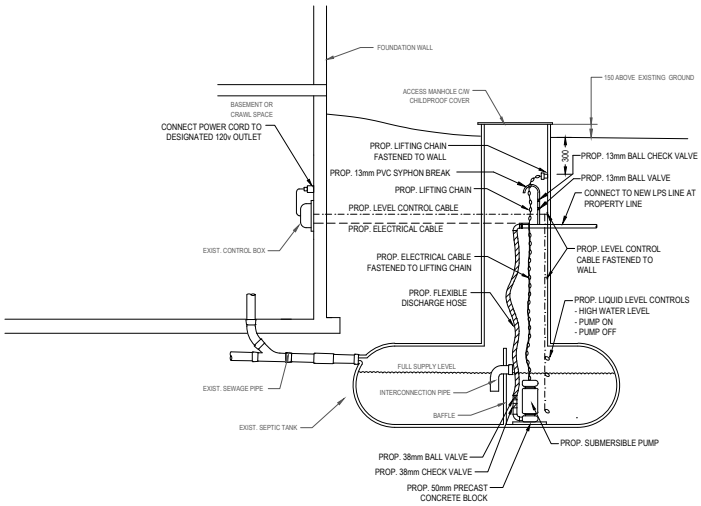
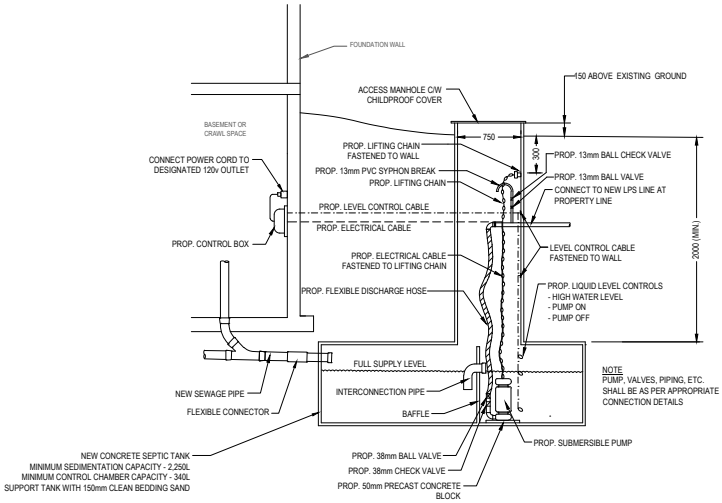


1 C501 TYPICAL LPS SERVICE CONNECTION (TYPE A - EXISTING HOLDING TANK WITH PUMP OUT CONTROL CHAMBER ADDED)
SCALE: NTS



2 C501 TYPICAL LPS SERVICE CONNECTION (TYPE B - EXISTING SEPTIC TANK)
SCALE: NTS



3 C501 TYPICAL LPS SERVICE CONNECTION (TYPE C - NEW SEPTIC TANK)
SCALE: NTS

NOT FOR CONSTRUCTION
FOR PUBLIC CONSULTATION ONLY

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DRAWN BY: B.R.

PROJECT: GRAND MARAIS SEWER STUDY

TITLE: CONNECTION DETAILS

DRAWING: 00