



Village of Lake Isabella

Wastewater Collection, Treatment and Disposal Feasibility Study

For The Areas of: Lake Isabella South, Lake Isabella Golf Estates II, and several un-platted areas in the vicinity

Drafted by:



**ROWE PROFESSIONAL
SERVICES COMPANY**

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Purpose of Feasibility Study:

The Village of Lake Isabella has requested that ROWE Professional Services Company prepare a follow up study from the wastewater system studies completed in 2009. See the attached letter from the Village of Lake Isabella in Appendix A. The village has requested Rowe to prepare an analysis for the most cost effective wastewater collection, treatment and disposal system to serve Lake Isabella South, Lake Isabella Golf Estates II and several un-platted areas in the vicinity. The cost analysis will be broken down into a two part cost structure as follows:

- Projected costs for wastewater collection, treatment and disposal, with associated operation and maintenance costs.
- Projected costs for on-lot collection or conversion of an existing failed system, with associated operation and maintenance costs.

Assumptions:

Based upon previous feasibility studies and reports, the apparent cost effective wastewater solution for the Village of Lake Isabella includes an on-lot Septic Tank Effluent Pump (STEP) system that transports wastewater utilizing pressurized forcemain to the "Lagoon Site". The wastewater will be treated in aerated lagoons, with chemical addition. The treated wastewater will then be discharged into the Chippewa River.

Final disposal of the wastewater can be accomplished by either a groundwater discharge or a surface water discharge. The actual discharge method utilized by the proposed system will not be known until further discussions with the Michigan Department of Natural Resources & Environment (MDNRE), and preliminary design is completed and approval from the MDNRE is granted for a discharge method. For the purpose of this analysis, we are assuming that the eventual disposal method will be a surface water discharge, with winter time storage required.

The feasibility study assumes that a total of 277 parcels will be served as part of the wastewater system. The number of parcels identified is based upon lot ownership. In other words, if someone owns three contiguous lots, they would be considered one parcel. Of the 277 parcels, 261 are residential. The remaining 16 parcels are commercial properties. Typically, commercial properties produce more wastewater on a daily basis than a typical residence. Therefore, we have assumed that each of the commercial properties will produce a wastewater stream equivalent to approximately 3 residences. The total residential equivalent units (REU's) used for the study is 310 REU's. We are also assuming that each REU will produce on average 250 gallons per day, (gpd).

The feasibility study assumes that when an existing residence connects to the system, their existing system will need to be converted over to a STEP system and abandoned in accordance with State of Michigan requirements. The costs to abandon an existing septic tank/tile field system are not included in the on-site cost estimate. This is due to the fact that each lot will be different and actual abandonment cost could vary greatly.

A key component to the on-site STEP system will be the electrical service connection for the effluent pump. It is common that the electrical panel for many existing home will be inadequate for safe operation of the effluent pump, and therefore will need to be upgraded. This cost can also vary greatly and is not included in the cost of the On-Site cost estimate.

Assuming a surface water discharge, there are several variables for sizing the treatment lagoons based upon wastewater detention times and the duration of the discharge. In other words, if the treatment facility can only discharge to the river from April through November, then the facility will need to store flows from December through March. For the purpose of this feasibility study, we are assuming the lagoons will need to be sized to store 120 days of wastewater, (from December through March). If the surface water discharge can be a continuous discharge, then the size and cost of the lagoons can be reduced. This could also influence eventual treatment method, (IE. lagoons vs. packaged mechanical treatment).

The soils information available for the lagoon site indicates at least 10 feet of granular sand material exists. We are assuming that this sandy material will be adequate to form the basis of the proposed lagoon ponds. We are assuming that none of the existing lagoon berms formed will be usable for a new proposed lagoon system. We are also assuming that groundwater is deep enough so that a balanced cut and fill method could be utilized for lagoon construction. We are assuming the lagoons will be lined with a PVC liner membrane. We are also assuming that clay will need to be hauled in for the construction of the lagoons to form a second impermeable layer.

Cost Estimates:

Collection, Treatment & Disposal – This includes all components necessary for the collection of effluent from individual residences and businesses, transport of the effluent to the treatment facility, treatment of the effluent and disposal of the treated wastewater. The estimated cost for this portion of the system is \$9,929 per REU. The estimated monthly Operation and Maintenance cost for the collection, treatment and a disposal system is anticipated to be around \$18 to \$23.

On-Lot STEP Systems – This includes all components necessary for a septic tank and effluent pump along with piping to pump effluent to the collection system in the right of way. The estimated cost for this portion of the system is \$6,131 per REU. The estimated monthly Operation and Maintenance cost for the on-lot STEP systems is anticipated to be around \$12 to \$15.

The unit price cost estimates are attached in Appendix B.

Considerations:

- Ground water at the Lagoon Site is assumed to be at least 10 feet deep. If actual groundwater elevations are shallower, overall cost of the lagoon construction could increase. Soil borings identifying groundwater elevations and soil types will be needed for design, to verify actual construction costs of a lagoon type treatment system. Soil borings can also help to locate an on-site clay source suitable for lagoon construction.
- A continuous wastewater discharge will allow for reduced lagoon construction costs and could possibly change the recommended/cost effective treatment process.
- Preliminary discussions with the Michigan Department of Natural resources & Environment regarding details of specific requirements will allow for a more accurate cost estimate of the treatment process.
- The collection system, as proposed for this study, will have capacity to receive additional wastewater flows above the 310 REU's identified. It is anticipated that the system could conservatively accept flows from an additional 150 to 200 REU's. However, the treatment system is sized for 310 REU's and a storage volume of 120 days.

Treatment & Disposal for 310 REU's				
Item	Unit	Quantity	Unit Price	Total
Gen. Conditions/Site Work	ls	1	25000	\$ 25,000
Building	ls	1	15000	\$ 15,000
Elec, Plumb, Mech & Misc.	ls	1	45000	\$ 45,000
Aeration & Chemical	ls	1	165000	\$ 165,000
Lined Lagoons system	ls	1	1150000	\$ 1,150,000
Equalization Structure	ls	1	20000	\$ 20,000
Discharge Structure	ls	1	20000	\$ 20,000
8" Gravity Discharge sewer	ft	2000	40	\$ 80,000
Manhole Structures	ea	6	2500	\$ 15,000
Outfall Structure	ls	1	15000	\$ 15,000
Inlet structure	ls	1	10000	\$ 10,000
Easement, Misc.	ls	1	20000	\$ 20,000
		Subtotal		\$ 1,580,000
				\$ 158,000
				\$ 237,000
		Total		\$ 1,975,000

total treat & dispose / 310 = \$ 6,371

Collection System for 310 REU's				
Item	Unit	Quantity	Unit Price	Total
2" FM	ft	10650	14	\$ 149,100
2.5 FM	ft	7200	16	\$ 115,200
3 FM	ft	7000	18	\$ 126,000
4 FM	ft	7000	20	\$ 140,000
6 FM	ft	8850	25	\$ 221,250
Structures	ea	17	2000	\$ 34,000
Laterals	ea	277	350	\$ 96,950
		Subtotal		\$ 882,500
				\$ 88,250
				\$ 132,375
		Total		\$ 1,103,125

total Collection per REU = \$ 3,558

On-site STEP System for 310 REU's				
Item	Unit	Quantity	Unit Price	Total
STEP SYS	ea	310	4500	\$ 1,395,000
Installation	ea	310	1000	\$ 310,000
				\$ -
				\$ -
		Subtotal		\$ 1,705,000
				\$ 170,500
				\$ 25,000
		Total		\$ 1,900,500

total On-Site/ 310 = \$ 6,131