

FACULTATIVE LAGOON

All lagoons use natural processes to treat wastewater. Wind and sunlight on the lagoon surface play an important role as do the microbes that live in the wastewater. Naturally, lagoons are made up of three layers, aerobic (layer with oxygen), anaerobic (layer with no oxygen) and facultative (mixed layer). This natural environment is what makes a facultative lagoon.



Facultative Lagoon with long term storage located in Whitehorse, Yukon

Odours

The bottom of a facultative lagoon is anaerobic (absence of oxygen). As the anaerobic bacteria metabolize the wastewater they produce methane and other gases that contribute to the strong odour created by facultative lagoons.

Facultative Lagoons in Cold Climates

Lagoons have proven to be very adaptable and well suited to Northern climates. An example of a facultative lagoon in the Yukon is Whitehorse, YT.

When temperatures drop and sunlight disappears in the winter the microbes that do the work of processing waste in the lagoons slow down. This does not mean that the lagoon stops working. Microbes are still active and solids can settle at the bottom of the pond. When spring returns the microbes in the aerobic level of the pond become very active again.

How does the system deal with seasonal flow?

Lagoons are resilient and adaptable to variations in seasonal flows because of the size of the ponds.

LOCATION CONSIDERATIONS

Land Area

- A facultative Lagoon in Dawson City would require approx 82 acres or 33 hectares.

Type of Land

- Requires stable, permafrost-free and level ground where berms and structures can be built. All potential lagoon locations have very challenging soil conditions due to discontinuous permafrost. All proposed lagoons would be lined with a protective membrane.
- The Callison 'A' site is most likely of all the locations to have ice-rich permafrost. If permafrost is found, construction would be delayed until the permafrost soil had been

thawed, removed and replaced with non-frost susceptible soil. A lagoon cannot be built on soil with permafrost for the safety of residents and the environment.

Infrastructure

- Facultative lagoons may produce odours and must be located away from public facilities and residential areas.
- Many factors need to be considered when calculating the cost of each of these systems. The following is a list of some of the major cost factors required for the infrastructure of each of the options
 - Length of forcemain and effluent pipes (see below)
 - Heating forcemain and effluent pipes
 - Construction of Access Road
 - Elevation of location
 - Small facility building
- The Callison 'A' site will be a total of 6500 metres from then nearest liftstation and 1000 meters from the dredge pond it will discharge into.

Drainage Location

- The facultative lagoon would drain into a nearby dredge pond. This pond may be connected to the Klondike River at a point that is located upstream of the potable water intake for the City of Dawson. Wastewater being drained into the dredge pond would be tested to ensure it meets the requirements of the water license. Water in the river would also be tested.

PROPOSED DAWSON LOCATION

See attachment

OPERATION AND MAINTENANCE

Facultative lagoons use entirely natural processes. No equipment is used to speed-up the process. Operators are needed only to perform routine check-ups.

CONSTRUCTION COSTS

Facultative Lagoons are big and need a lot of land to operate. This means that construction costs are higher than aerated lagoons.

OPERATION AND MAINTENANCE COSTS

The costs to operate and maintain facultative lagoons is much lower than aerated lagoons or mechanical plants because they do not depend on any equipment to speed up the process treatment process or reduce the amount of land they need.