TREATING WASTEWATER IN THE NORTH

INSPECT AND MONITOR FOR:

DAMAGE TO SIGNS, FENCES, AND TRUCK AREA

BLOCKED OUTLETS

FLOATING DEBRIS

ODOUR

EROSION, SLUMPING, LIFTING

COLOUR CHANGE

ALGAE

CRACKED BERMS

SIGNS OF LEAKING

REPORT AND FIX

WASTEWATER BROUGHT IN TRUCKS OR PIPES

SEWAGE TRUCK

CHUTES

WASTEWATER DEPOSITED IN LAGOON

LINER

>1m

MAKE SURE THERE IS AT LEAST 1 METRE OF SPACE BETWEEN THE WASTEWATER AND TOP OF THE LAGOON

WASTEWATER RESTS IN LAGOON

PUMP

BERM

SIGNAGE

FENCING

EFFLUENT IS "DECANTED" FROM THE LAGOON TO THE WETLAND, USUALLY BY PUMP OR SIPHON

LAGOON

"WHAT'S GOING ON IN THERE?"

SEDIMENTATION!

PARTICLES SINK TO THE BOTTOM OF THE LAGOON...

AND BECOME SLUDGE

SAMPLES ARE TAKEN AND TESTED ALL THROUGH THE SYSTEM AND BEFORE RELEASING ANYTHING TO THE ENVIRONMENT

SLOWED BY PLANTS AND SOIL, THE WATER FLOWS THROUGH WETLAND WHILE BEING TREATED NATURALLY

WETLAND

"WHAT'S GOING ON IN HERE?"

WATER IS FILTERED BY THE SOIL, GRASSES AND OTHER PLANTS

MORE SEDIMENTATION!

NUTRIENTS ABSORBED

* BY PLANTS
* INTO SOIL AND SEDIMENT
* BY MICROBES

PROPERLY TREATED EFFLUENT IS RETURNED TO THE ENVIRONMENT

CSA GROUP™

scc ccn

ECOLOGY NORTH

This is a user friendly guide to CAN/CSA W203-19: *Planning, design, operation, and maintenance of wastewater treatment in northern communities using lagoon and wetland systems.*

Changes to the climate, community populations, and environmental standards are impacting the way we deal with wastewater in the north. Ecology North made this guide to help communities understand their wastewater treatment systems and to help adapt to the changes.

USE THIS GUIDE TO:

* Learn how wastewater is treated in the north
* Keep an existing system working well
* Start planning for a new system

ECOLOGY NORTH

(867) 873-6019
WWW.ECOLOGYNORTH.CA

Ecology North is a charitable organization, founded in 1971 to support sound environmental decision-making on an individual, community, and regional level.

Contact us or visit our website for information and other guides in this series.

Poster on the inside

Printed on recycled paper 2021

WASTEWATER

Northern context

Wastewater is any water used in a home, business, or industry. Greywater comes from sinks, showers, washers, etc. Blackwater comes from toilets. In most systems, they get mixed together into regular sewage.

We need to treat wastewater before it goes back into the environment, to prevent polluting the land and water. The best water treatment systems take into account the unique challenges of the north.

NORTHERN CHALLENGES

* Small, isolated communities
* Extremely cold climate
* Lack of money and human resources
* Bedrock and permafrost

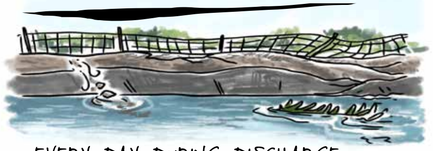
Existing water treatment systems have to make changes to account for the changing climate, and any new treatment systems will need to take these challenges into account.

SOME EFFECTS OF CLIMATE CHANGE

* More rain and snow
* Increased risk of flooding
* Faster erosion and rising sea level
* Thawing permafrost
* Changes to groundwater flow

MAINTAIN THE SYSTEM

What and when to monitor



EVERY DAY DURING DISCHARGE

* Check outlets for erosion or blockage

ONCE A WEEK DURING ICE-FREE TIME

* Remove floating debris, algae, and plants
* Track water levels. Let someone know if there is less than 1m of room from water surface to lagoon edge

ONCE A YEAR

* Check berms for leaking
* Check signs, fences, and truck areas for damage.
* Remove large vegetation
* Remove any non-sewage waste
* Check berms, dams, and liners. Look for erosion, cracking, slumping, and lifting

EVERY 5 YEARS

* Measure depth and quality of sludge

LEARN THE LINGO

Lagoon, effluent, wetland, sludge

A **sewage lagoon** is a large pond that holds and treats wastewater. It is the first step in the water treatment system, and primarily uses gravity to settle out solids. Wastewater enters the lagoon from the sewage system through a pipe or from a truck.

Waste material that settles to the bottom of a lagoon is called **sludge**. When it builds up, there is less space in the lagoon and the treatment process doesn't work as well.

After the sewage lagoon, wastewater is released into a **wetland treatment area.** This wetland is usually a shallow lowland close to the sewage lagoon, made to remove organic material and settle out more solids from the wastewater.

Treated wastewater flows from a wetland into the **receiving environment** - the natural surrounding lands and waters.

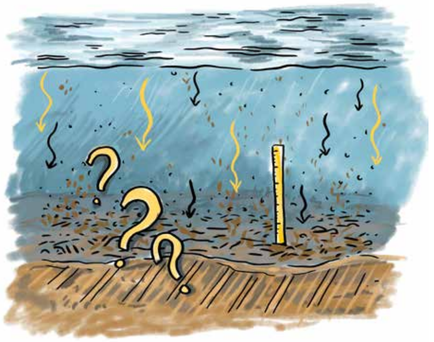
Water released from lagoons and wetlands is called **effluent**. It is important to test effluent to make sure things are working properly and limit pollution.

MANAGING SLUDGE

Sludge builds up over the years

As more and more waste material settles to the bottom of a lagoon, it will start to reduce the lagoon's storage size and negatively impact the effluent quality.

Measure the depth and quality of sludge every five years and make a plan to remove it if it is causing major impacts to the effluent quality and storage capacity. Sludge should be put into a landfill or processed into biosolids. Biosolids can be used in revegetation projects or as a landfill cover material if it meets quality standards.



TWO-STEP SYSTEM

The typical flow of wastewater

Sewage lagoons and wetland treatment areas are the most common type of wastewater treatment system across the north. These passive systems work well on their own, are relatively simple, and don't cost too much to build, operate, and maintain. They do not use any chemicals.

This guide focuses on lagoons and wetlands for wastewater treatment, but there are other ways of treating wastewater in the north. Another effective system is to use two sewage lagoons, one after another. As long as there are *at least* two water treatment steps (two sewage lagoons or one lagoon and one wetland), wastewater can be treated effectively.

SELECTING A NEW SITE

Plan for capacity needs

Planning a new wastewater treatment system can take years. Before looking for a site, it is important to do some planning.

The regional land and water boards should be identified and consulted early on in the process of planning a new water treatment area. Other municipal, territorial/provincial, or federal regulations may apply.

Community consultation should be part of all stages of development, including the collection of background mapping, identifying potential sites, and determining the objectives of the water treatment system.

CONSIDER WHEN SELECTING A SITE:

* Impacts of climate change
* Important local areas
* Odour and visibility
* Impacts on fish, birds, and other wildlife
* Distance to drinking water sources
* Distance from airports
* Ground conditions

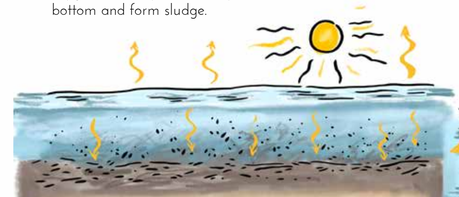
Identify a site that will be able to hold wastewater AND precipitation for up to 12 months. Account for rain, snow, ice jamming, potential flooding as well as sludge accumulation.

STEP 1: SEWAGE LAGOON

Higher temps + more sun = more breakdown and better treatment

A sewage lagoon holds and treats wastewater. During ice-free seasons, effluent flows out of the lagoon and into a wetland treatment area. This timing helps to ensure maximum treatment in the lagoon.

A lagoon primarily uses gravity to settle out solids, it also slows down the flow of wastewater. In warmer weather, natural processes break down the sewage and absorb nutrients. Sun and wind supply heat, light, and oxygen, and help water evaporate. Solids sink to the bottom and form sludge.



In the past, sewage lagoons were created by dumping wastewater into existing lagoons or lakes, or by digging a big hole in the ground to put wastewater in, and letting the ground act as a filter. Many of these types of lagoon still exist throughout the north.

Newer sewage lagoons are designed and built to treat wastewater, and do not let any of the untreated wastewater into the ground.

STEP 2: WETLAND

Slower flow rates + higher temperatures = better treatment

Natural processes in the wetland treat the wastewater, beyond what happens in the lagoon. More sediments settle out, surface soils absorb pollutants, plants take up nutrients, and micro-organisms break things down.

In the north, most wetland treatment areas are open and spread out, with unclear boundaries. They follow the natural landscape. Flow rates rise and fall with changing rainfall.

The main challenge is to make sure the wetland treatment area is big enough. It must hold the effluent from the lagoon and keep it long enough to properly treat the wastewater. Plants growing in the wetland help to slow down the flow of the water, which lets more treatment happen.

In the past, wetland treatment areas were created wherever lagoon effluent was released. Now they are created on purpose as an extra step in treating wastewater.

Some wetlands are constructed for wastewater treatment. This can be a good option if there is money to do it, but most northern wetlands are still somewhat natural and rely on the geology and shape of the land.

SCC CCN

This guide was funded by the Standards Council of Canada, as part of the Northern Infrastructure Standardization Initiative with input from the Northern Advisory Committee (NAC).

CSA GROUP™

TREATING WASTEWATER IN THE NORTH