

Creating Healthy Lagoons with Waste Go®

A Brazeau County Case Study



Region: Buck Creek, Alberta
Client: Brazeau County, Alberta
Year: 2018-2019
Duration: 1 Year

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Executive Summary

Many wastewater lagoons suffer from excess sludge accumulation. Excess lagoon sludge can lead to higher effluent levels of BOD, TSS, ammonia, phosphorous and a host of other issues. Not to mention the unpleasant odors. With environmental regulations becoming ever tighter and the issuing of monetary penalties, wastewater lagoon treatment is a common challenge among wastewater operators.

To combat these issues, operators are left with minimal choices and are most commonly dredging their lagoons due to excess buildup of undigested sludge. The costs associated with dredging a lagoon and the disposal of sludge that hasn't been properly biodegraded can be extremely high. Treating a lagoon with Waste Go bioaugmentation can restore its health, mitigate costs and postpone dredging for incredibly lengthy periods of time. Eventually, even the healthiest of wastewater lagoons will require dredging as their capacity will be met with biodegraded sludge. Sludge that has been properly treated with Waste Go will meet or exceed all environmental standards thus

"Excess lagoon sludge can lead to higher effluent levels of BOD, TSS, ammonia, phosphorous and a host of other issues."

making it readily available for disposal without further treatment or penalties; saving the treatment facility substantial costs.

In this study, treating with Waste Go proved that in just 8 weeks, the health of a lagoon can be vastly improved and in one year almost completely rejuvenated. The increased sludge digestion achieved will prolong the time between dredging significantly by adding capacity with superior sludge settling. At a fraction of the cost of mechanical dredging, the Waste Go formula will change the way lagoon operators go about desludging and treating their wastewater lagoons.



Buck Creek wastewater lagoon aerial photo



Buck Creek wastewater lagoon Cell 1

Challenge

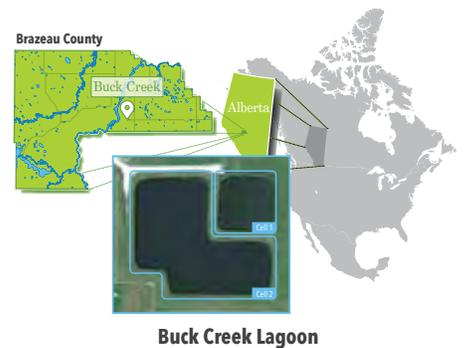
To deliver results without disruption to daily operations. Show results including reductions in volatile sludge, BOD, TSS, Ammonia, Phosphorous, improved PH and more, in a fully operational non-aerated lagoon of Brazeau County's choosing.

To prove Waste Go is a viable and cost saving biological alternative to standard dredging and chemical additives, resulting in extended long-term lagoon health and functionality.

Location

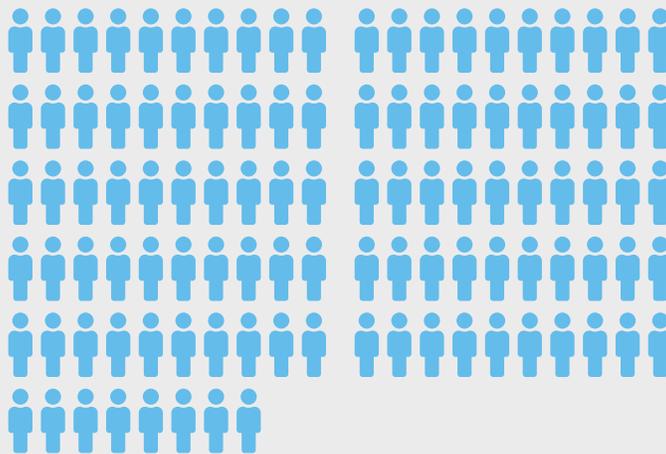
Buck Creek is a hamlet in central Alberta, Canada within Brazeau County.[1] It is located 3 km (1.9 mi) west of Highway 22, approximately 106 km (66 mi) southwest of Edmonton.

The number one cell receives daily wastewater from approximately 118 people and 3 septic trucks.



118
PEOPLE
AND
3 SEPTIC
TRUCKS

Approximate amount of waste water the number one cell receives daily





Test Methods Provided by Hydrasurvey

Hydrasurvey uses sub-bottom profiling technology and RTK GNSS positioning to map both the top of sludge layer and lagoon bottom. Hydrasurvey uses both an infrared sludge interface detector and a sludge judge to correlate actual field measurements with acoustic reflectors measured using the sub-bottom profiler. Hydrasurvey also collects sludge samples and tests them for total solids and total volatile solids for computation of dry material volumes.

Sludge Survey Equipment:

Vessel: Inshore survey vessel (Commercial grade inflatable) outfitted with survey system mount and electric motor

Positioning: RTK Base and Rover GNSS system

Sonar: Mutli-frequency sub-bottom profiler (High Frequency at 100kHz, Low Frequencies at 15kHz, 12kHz, 10kHz, 8kHz, 6kHz, 5kHz and 4kHz)

Sound Velocity: Portable sound velocity profiler (temperature, depth, conductivity)

Sludge measurement devices: Infrared sludge interface detector, sludge judge and Ekman grab sampler



RTK Base Station



Sound Velocity Profiler



Sub Bottom Profiler



Treatment Plan - Inoculation

Inoculation using Waste Go of Cell 1 at Buck Creek for 5 days. Desludging dosage of Waste Go for 20 days thereafter. It is important to note that the desludging process will continue long after the desludging dosage is applied, depending on temperature and added wastewater content conditions. A maintenance dosage is required to keep the process ongoing.



Applying Waste Go to lagoon

The recommended dosage to be split between the two application points; Septic Truck Receiving Station and the Manhole Structure that receives wastewater from Hamlet.

Week 1 Dosage:

10 pails of Waste Go mixed with water applied each day for 5 consecutive days.

10 PAILS
APPLIED DAILY FOR 5 CONSECUTIVE DAYS



Weekly Dosage:

5 pails of Waste Go (mixed with water) applied each week for 4 weeks (20 pails total).

5 PAILS
APPLIED WEEKLY FOR 4 WEEKS



Application to rest for 3 weeks without pump operation before final test samples taken. Maintenance dosage will be determined by flow rate after the test phase is completed.

INITIAL APPLICATION



For best results in non-aerated Lagoons, we use a pump for better circulation and aeration to maximize results.

MAINTENANCE APPLICATION



Maintenance applications can be applied directly, from a manhole, or from a lift station weekly.

When Aeration is not available, adding a 2-4" pump during application will provide excellent circulation and increase performance.

Application Time for Operator(s):

During the inoculation phase (1st week) 2 hours

Application time after inoculation 30 minutes



Note:

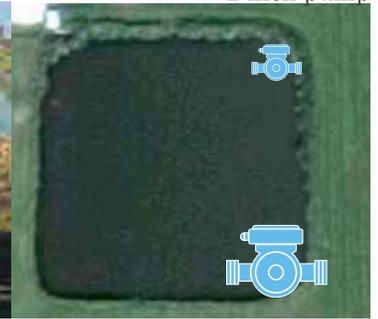
The Buck Creek Lagoon system consists of primary (cell 1) and secondary (cell 2) non-aerated ponds. Only cell 1 received treatment during this study.

Additional Setup

Cell 1 was outfitted with two pumps. A 4 inch for application/circulation and a 2 inch strictly for circulation. They ran 5 days a week for the duration of the application.



4 inch pump



Pump Locations

2 inch pump
4 inch pump

Application Notes

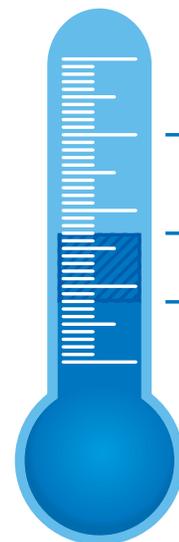
Before discussing the findings, it is worth noting that the following results were taken after only 7 weeks instead of 8, due to unexpected poor weather conditions. While biological action was still occurring in the lagoon, we thought it better to take the test samples early due to below freezing temperatures and snowfall occurrences.

It is also worth mentioning that Waste Go achieves maximum performance in an optimal water temperature of 35 degrees Celsius.

In this study, Waste Go delivered impressive results, in average weekly water temperatures ranging from 17.1 to 7.8 degrees Celsius.

Waste Go delivered impressive results at more than

17°C
BELOW
OPTIMAL WATER
TEMPERATURES



optimal water temperature 35°C
Water temperature ranged from 17.1 to 7.8°C



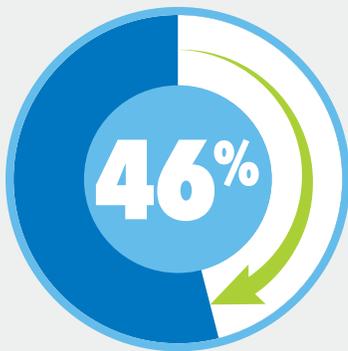
Results after 8 weeks

Waste Go was successfully applied without any disturbance to daily operation of the lagoon. No bypasses or shutdowns were required during the Waste Go Treatment Plan.

Water Quality

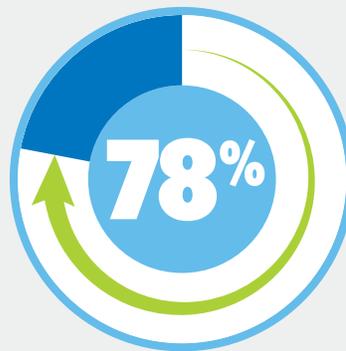
Following the five-week Waste Go Treatment Plan and two weeks of rest, Exova reported the following:

BOD REDUCTION



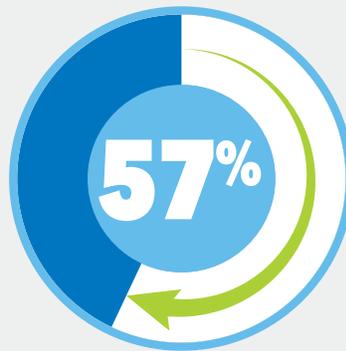
Biochemical Oxygen Demand

FOG REDUCTION



Fats, Oil and Grease

TSS REDUCTION



Total Suspended Solids

AMMONIA REDUCTION



Total Ammonia

A small adjustment in pH towards neutral was measured accounting for a drop of 0.24 to 7.79. Waste Go has a stabilizing action to help optimize its performance which over time will help neutralize the lagoon.

Inorganic Non-metallic Parameters are not considered important in this study as Waste Go is not formulated to cause an effect in such regards. Waste Go is only formulated to interact with Organic Metallic Parameters.

Waste Go's superior sludge digestion enabled better settling and increased hydraulic capacity.

Results (continued) Sludge Amounts -

After five weeks of treatment, two weeks of settling and constant delivery of daily wastewater, the Hydraulic Capacity of Cell 1 was increased by 6 cubic meters (m³) due to the digestion of the estimated volume of sludge to be removed. Effectively, Waste Go digested a cubic meter of sludge per week.

The lagoon achieved much better settling and a total decrease in volatile solids of 16%. The floating scum layer was eliminated and an increase in



6 CUBIC METRES

The increased Hydraulic Capacity of Cell 1 due to digestion of sludge

total volume of dry sludge to be removed of 22.7m³ was achieved.

This is beneficial as it means the lagoon has settled better and has fewer volatile solids. Every cubic meter digested onsite will not need to be dredged or

hauled. This sludge is fully biodegraded and is considered a high-quality sludge.

The total estimated volatile solids quantity decreased by 6m³ due to the digestion of sludge.



September 8th - The Scum layer is gone



Results (continued)

Detailed Sludge Survey Findings, Before Treatment



Cattails are growing out into the lagoon along the north shore. The image above shows the vac truck dump area with metal sheet piling and cattail growth into lagoon.



A floating layer of scum is present on the lagoon at the NE corner.

Most sludge build-up occurring at NW and SE corners. Forcemain inlet enters lagoon at SE corner and vac truck dump area is at NW corner.

Most sludge build-up occurs at NW and SE corners. Forcemain inlet enters lagoon at SE corner and vac truck dump area is at NW corner. When probing at these locations the sludge feels significantly denser than at other locations in this lagoon. Better mixing in these areas may help to digest sludge. However, there appears to be a notable reduction of sludge in both these locations.



There was no apparent floating layer of scum on cell 1 any longer. Cattails and vegetation were removed since the initial survey. The image above is looking north along the east shoreline of Cell 1.

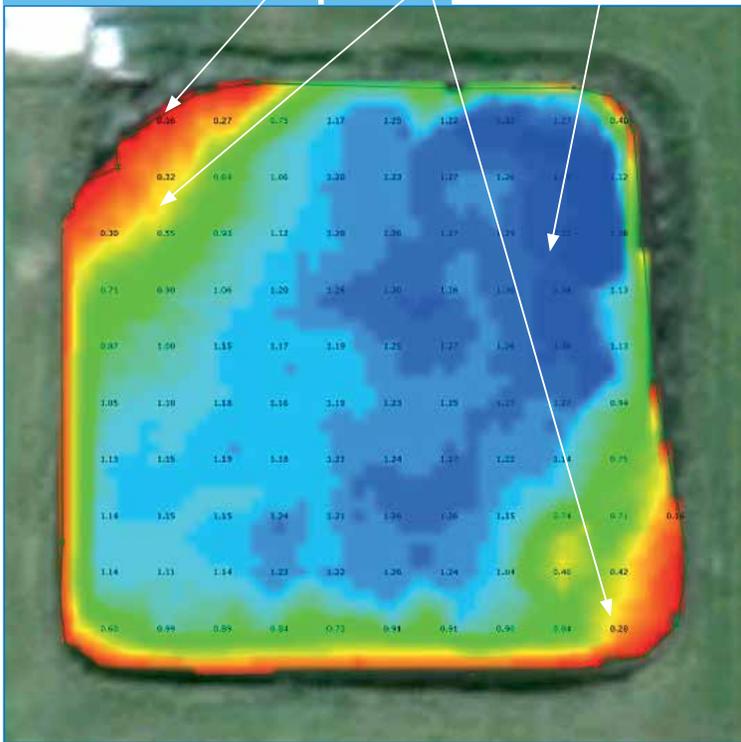


Figure 1A - Cell 1 depths to top of sludge (m) Before Treatment

Initial survey August 7, 2018

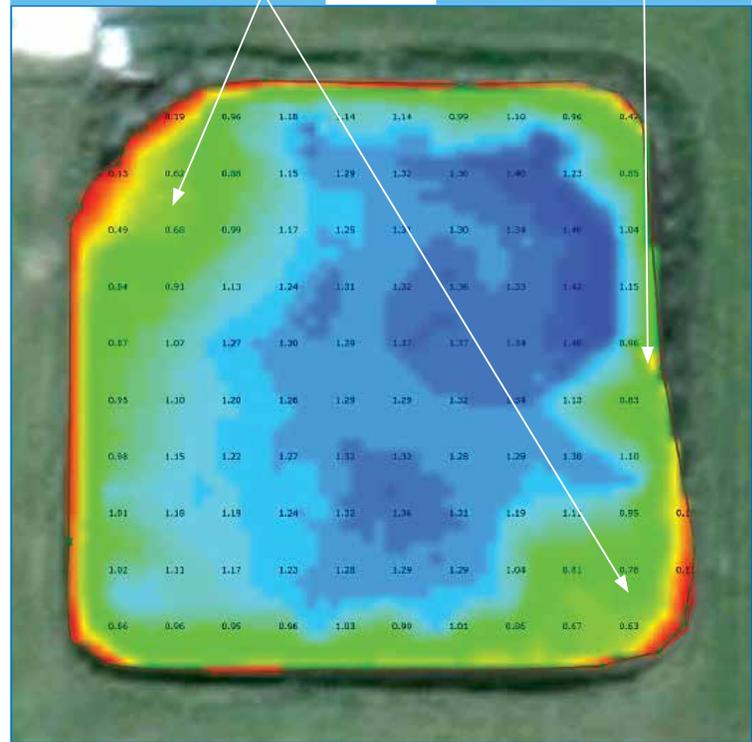
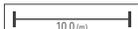


Figure 1B - Cell 1 depths to top of sludge (m) After Treatment

Follow-up survey October 1, 2018

0.00	0.06	0.12	0.18	0.24	0.30	0.36	0.42	0.48	0.54	0.60	0.66	0.72	0.78	0.84	0.90	0.96	1.02	1.08	1.14	1.20	1.26	1.32	1.38	1.44	1.50
0.06	0.12	0.18	0.24	0.30	0.36	0.42	0.48	0.54	0.60	0.66	0.72	0.78	0.84	0.90	0.96	1.02	1.08	1.14	1.20	1.26	1.32	1.38	1.44	1.50	1.56



Results (continued)

Detailed Sludge Survey Findings

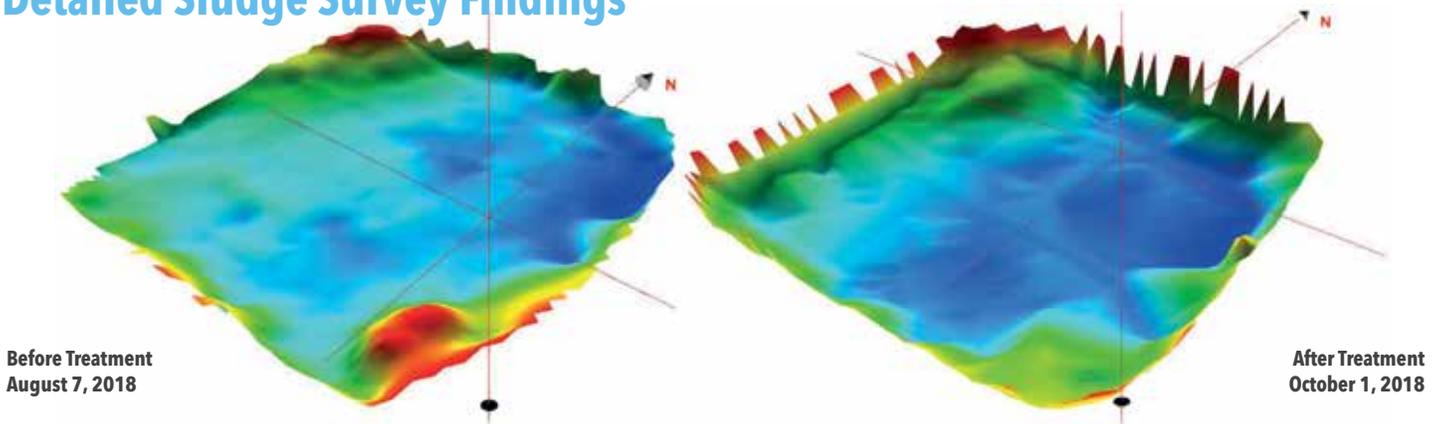


Figure 2 - Cell 1 top of sludge before and after 3D isometric view looking NW

As depicted by the imaging, you can see a noticeable reduction of buildup in the northwest and southeast corners. This is due to Waste Go quickly digesting volatile sludge. Total solids/

mL increased due to the superior settling and the reduction of volatile solids by the Waste Go formula. In fact, Waste Go nearly doubled the settling of the lagoon in just 7 weeks!

A major achievement of the preceding results is that we are now holding and settling significantly more solids/mL within the same Lagoon capacity. The higher the concentration per mL, the longer the Lagoon can operate without the need for mechanical dredging.

Sludge Quality - Per results, Nitrogen is down, and this is because Waste Go uses Nitrogen to operate. Ammonia Nitrogen is also down, and this is because Waste Go is using up the Nitrogen as a nutrient that typically becomes Ammonia Nitrogen.

Phosphorus, Chromium, Nickel and Zinc, all show reductions and we can attribute this to Waste Go as our bacteria use the elements as nutrients during their life cycle.

Heavy metals were down due to weight/grouping and how the tests are taken. Waste Go is not formulated to reduce these metals, but we usually see a reduction as we do here when treating lagoons.

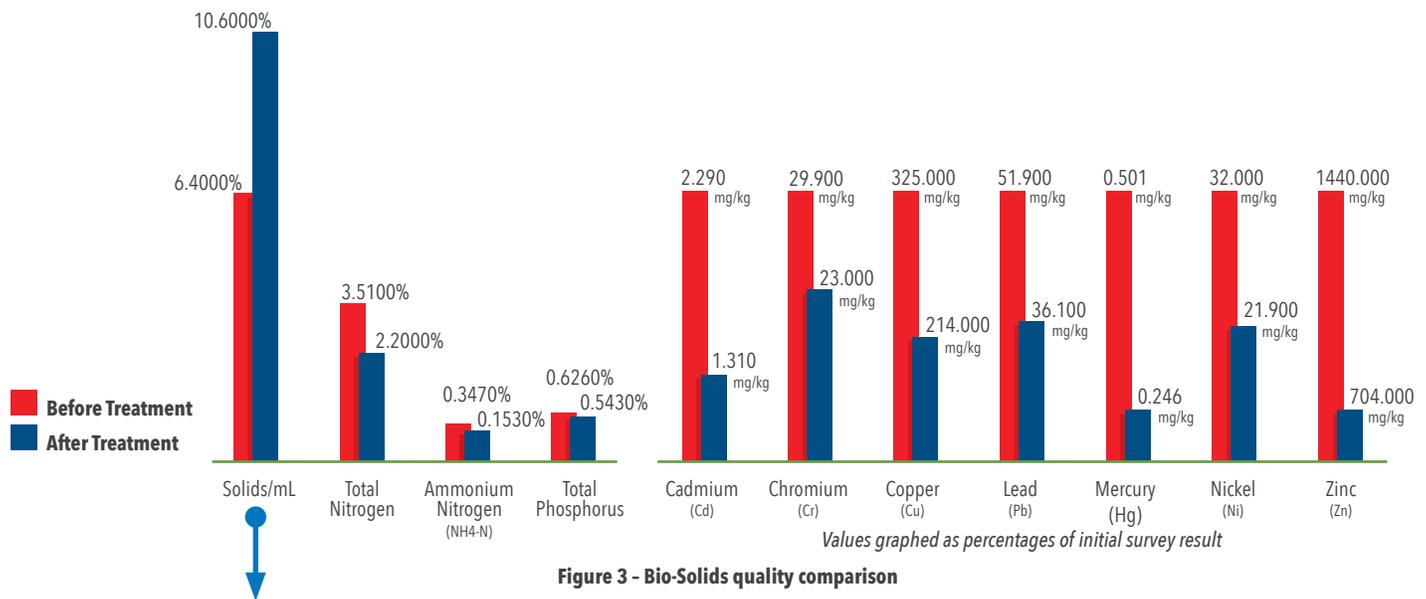
Odor Control - Due to Waste Go digesting the proteins, fats and utilizing nitrogen (that would have become Ammonia) which produces the unpleasant odors associated with wastewater lagoons, operators detected a drop in odor of over 60% in just 7 weeks. Although no scientific metering devices were used, operators noted that at the beginning of treatment, odor was at what they described as 8/10. During the 7th week of observation, odors had reduced to 2/10. As they say, the nose knows best.

“Even with the colder temperatures while de-sludging Buck Creek lagoon, we observed good results. We are planning on using this product in the future to meet our lagoon de-sludging needs.”

-Darcy Mulroy, Utilities Supervisor

Results (continued) Bio-Solids Quality Report

Overall, the sludge quality report shows us a much healthier lagoon system.



The higher the better!

The higher solids/mL bar shows far better sludge settling. Better sludge settling means a greater lagoon capacity. In this instance, Waste Go has nearly doubled the capacity of the lagoon. This translates into an estimated additional 20+ year lifespan for the lagoon at present daily influent.

Soil Matrix

Positive results were also found within the matrix tests. Waste Go reduced:

- Kjeldahl by 1.31
- Good reduction in Strong Acid Leachable Metals
- **Ammonia was reduced by more than half from 3470 to 1630.**

20 YEARS



The additional lifespan for the lagoon at present daily influent due to Waste Go's digestion of Solids.

Cell 2 Enhancements

Cell 2 Volatile Solids decreased by 50% without direct treatment! Dry Sludge and volatile sludge were lower per lesser amounts of solids transferring from cell 1 due to the excellent biological breakdown of sludge while treating with Waste Go.

50%
AMOUNT VOLATILE SOLIDS REDUCED IN CELL 2 WITHOUT DIRECT TREATMENT

Water depth also increased while the lagoon operated at normal capacity levels. An increase of 8 inches was recorded, showing a biological activity increase. We can confidently attribute this increase to the fact that as Waste Go biodegrades sludge, water molecules are released. During the seven-week test, with limited precipitation, the results showed a big increase in Hydraulic Capacity. This increase was achieved in a short period of time due to the biological activity of Waste Go.

Detailed Sludge Survey Findings

Initial survey August 7, 2018

Follow-up survey October 1, 2018

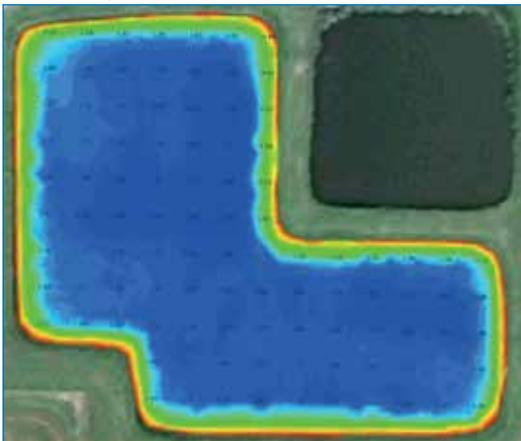


Figure 2A - Cell 2 depths to top of sludge (m) Before Treatment

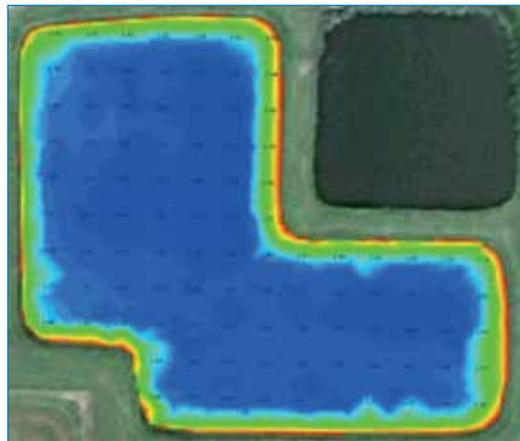


Figure 2B - Cell 2 depths to top of sludge (m) After Treatment

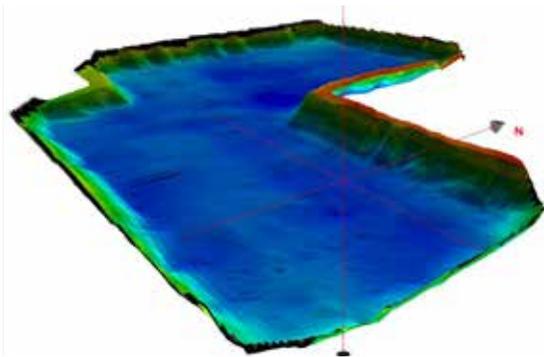
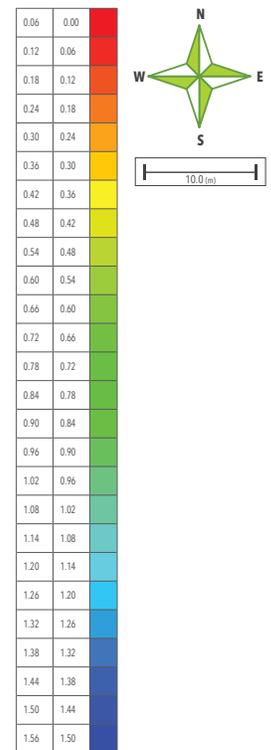


Figure 3A - Cell 2 top of sludge 3D isometric view looking NW Before Treatment

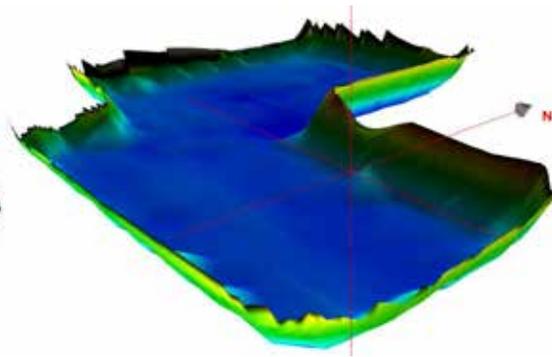


Figure 3B - Cell 2 top of sludge 3D isometric view looking NW After Treatment

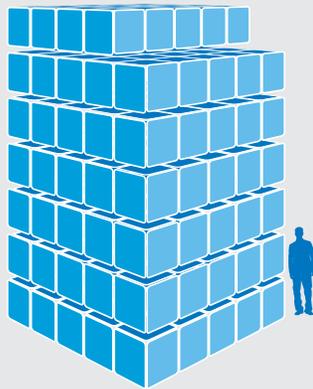
Results after 1 year maintenance

Total Sludge Reduction:

After completing the initial Waste Go treatment program and following the recommended maintenance dosage for the rest of the year, the scum layer on cell 1 was eliminated and the overall water quality was easily noted by the echogram data collection. Have a look at the impressive sludge digestion:

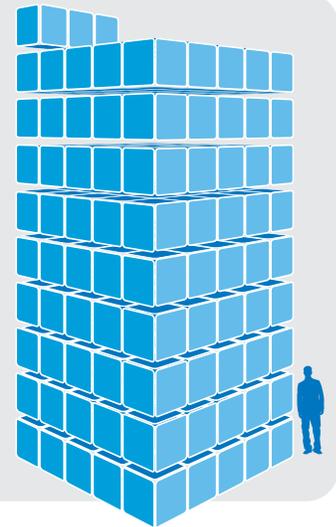
CELL 1

Cell 1 showed a **170 m³ reduction** in total sludge volume over the one-year period. Initial applications were made directly to the cell over a two month period. Weekly maintenance dosages were applied over ½ km away in a lift station!



CELL 2

Cell 2 showed a remarkable **228 m³ reduction** in total sludge volume over the one-year period without any direct application!



Water Quality Improvements:

BOD REDUCTION

Biochemical Oxygen Demand dropped from 176 to 40 mg/L



FOG REDUCTION

Fats, Oil and Grease dropped from 124 to 16 mg/L



TSS REDUCTION

Total Suspended Solids dropped from 302 to 54 mg/L



PHOSPHORUS REDUCTION

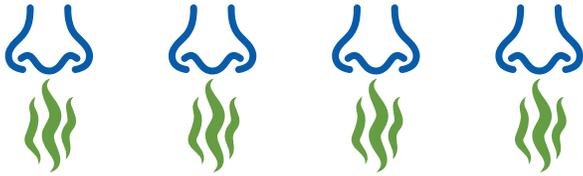
Phosphorus dropped from 6260 to 541 mg/kg



Ammonia discharge was 28.6 mg/L prior to treatment. After one year of maintenance, 3.92 mg/L. That's an 86% reduction!

Odor Reduction:

BEFORE APPLICATION



AFTER APPLICATION



By speeding up organic digestion, we drastically reduce odors in Lagoons

Cost Comparison:



- VS -



\$40,000

Estimated investment for Waste Go Treatment



\$125,000

Estimate to dredge Cell 1

On average, Waste go is 1/3 the cost of mechanical lagoon cleaning!

Waste Go also improves your water quality making discharge safe. Mechanical can't do that for you!

Regular maintenance using Waste Go will keep Buck Creek healthy and postpone the need for mechanical dredging by an estimated 20+ years

Cost comparison Mechanical VS Waste Go

There are a few different methods of lagoon dredging, all of which involve mechanically removing sludge from the lagoon. Once the sludge is removed, it is dried and is transported to either a landfill or a land application facility. This is extremely laborious, costly and disruptive to regular operations. Recently quoted costs in Alberta, Canada were received at \$125,000.00 to dredge cell 1 at the Buck Creek Lagoon Facility.

Waste Go treatment will require an investment of \$40,000.00. For Buck

Creek, this includes an estimated 80 pails of Waste Go in the first year of treatment.

Other less obvious savings/benefits include non-disruption of service (Operator expenses) and exceeding

environmental regulations.

To continue the treatment and ensure a long healthy life of the lagoon, Buck Creek will be required to add an estimated 8 – 12 pails per year plus application costs per annum.



\$125,000

Estimate to dredge Cell 1



\$40,000

Estimated investment for Waste Go Treatment



Applying Waste Go to Cell 1



Cell 1 at beginning of treatment phase

Conclusion

Waste Go succeeded in delivering high quality results, in a short period of time and in less-than-optimal weather conditions. After initial inoculation and maintenance treatments over the last year, the overall health of the lagoon has been vastly improved. From the quality of the sludge and increased capacity of the lagoon, to the water quality and complete elimination of foul odors, cell 1 and 2 at Buck Creek have begun their journey to an increased life span and enhanced biological breakdown for as long as Waste Go is used. By increasing hydraulic capacity and creating a much healthier and environmentally friendly lagoon system, Waste Go will postpone mechanical intervention for possibly decades until capacity becomes limited due to biodegraded material. When the need for dredging does finally occur, the high-quality biodegraded sludge can be easily disposed of, creating additional savings.

Waste Go has recommended a continual maintenance dose (weekly) for Buck Creek that will see to the continued biological breakdown of sludge, new incoming wastewater and healthy water quality levels. Brazeau County has agreed to continue ongoing maintenance doses and Waste Go will have Hydra Survey or another third-party lagoon tester takes new samples and tests every 2-3 years for analysis. Waste Go proves that for a fraction of the cost of traditional treatments and mechanical dredging, biological augmentation can be a long-term solution to a healthy lagoon system



A much healthier lagoon after treatment



Acknowledgments

Thank you to the entire wastewater team from Brazeau County.

Special thanks to Darcy Mulroy and Rick Evans who shared our vision of creating healthier lagoons and helping give Waste Go the opportunity to prove it's effectiveness in an environment that all Canadian Operators can relate to.

Thank you to HydraSurvey for their timely and professional services prior to and after initial treatment.

Finally, a special thank you to our Western Canadian Waste Go Distributor, Mr. Norm Grexton (NGInc.) whose dedication, commitment and expertise in the field, contributed to this project above and beyond expectations.

Waste Go is a registered trade-mark of Superior BioSolutions LLC

All third party test data available in pdf format at:

<https://www.wastego.ca/pdf>



www.wastego.ca

1-866-286-5931

