

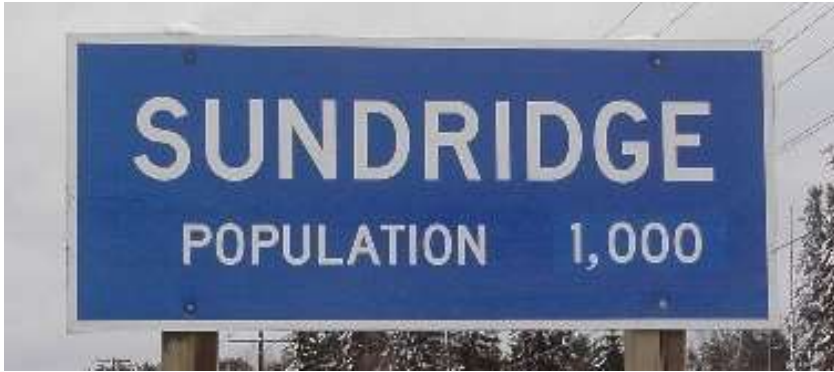
UPGRADING FOR COLD- CLIMATE NUTRIENT REMOVAL: THE CASE OF SUNDRIDGE, ONTRARIO

Nick Janous, EIT
Director of Sales



Sundridge, Ontario





Nexom™

Existing WWTF

2-cell facultative lagoon

- Constructed in **1970s**
- WWTF serviced by **2 pumping stations**
- Design capacity for **1,200 residents**
- **Seasonal discharge** to Bernard Creek



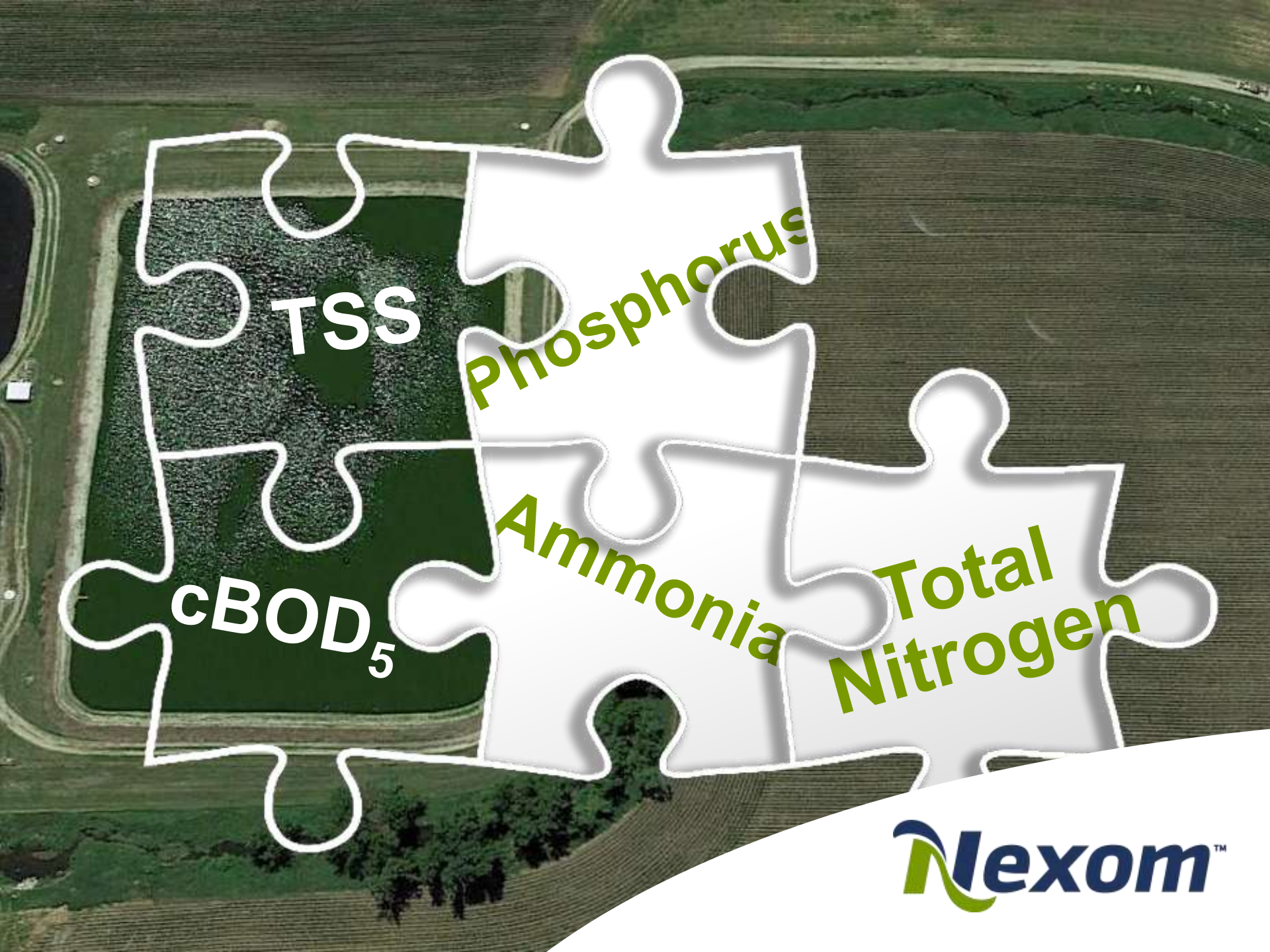
Existing WWTF

- Reached **full hydraulic loadings**.
- Had to be converted to **continuous winter discharge**.
- Meet **MOECC requirements** year-round.
- **Summer effluent storage**.

Upgrade challenges

- Shallow lagoons
- Low alkalinity levels
- Storage in summer
- TAN & TP limits
- Operate continuously through winter
- Keep the process simple





TSS

Phosphorus

cBOD₅

Ammonia

Total Nitrogen

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Why lagoon nitrification stops in winter

1. $cBOD_5$ consumption slows, **increasing competition**
2. **Surfaces** remain at a premium
3. **Near-freezing water** slows nitrifier metabolism and reproduction

Treatment processes



optAER

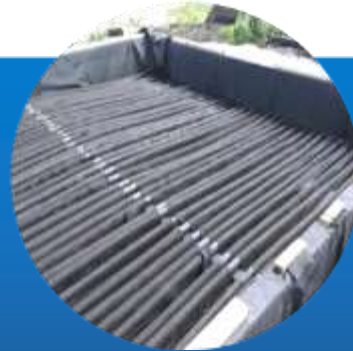
Aerated Lagoons

BOD/TSS Removal



SAGR

Nitrification



Effluent Recycle

Denitrification



infini-D

**ZERO-DOWNTIME
PHOSPHORUS REMOVAL SYSTEM**

TP Removal



Treatment processes



optAER

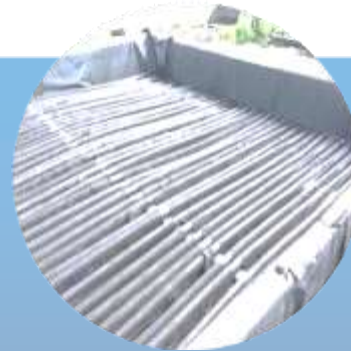
Aerated Lagoons

BOD/TSS Removal



SAGR

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Effluent Recycle

Denitrification



infini-D

**ZERO-DOWNTIME
PHOSPHORUS REMOVAL SYSTEM**

TP Removal



Aerated Lagoon

Subdivide existing facultative pond into three cells using floating baffle curtains.



Nexom[™]

optAER[®] fine-bubble aeration

- Excellent oxygen transfer rate at a wide range of airflows
- Specifically designed for **cold climate** lagoon applications



Aerated Lagoon

optAER fine-bubble aeration with floating laterals



Nexom[™]

Treatment processes



optAER

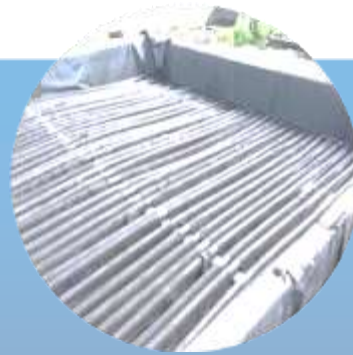
Aerated Lagoons

BOD/TSS Removal



SAGR

Nitrification



Effluent Recycle

Denitrification



infini-D

ZERO-DOWNTIME
PHOSPHORUS REMOVAL SYSTEM

TP Removal



Nitrifying Ammonia with **SAGR**[®]



What is a **SAGR**?

Fully-aerated **coarse gravel** bed reactor

- Water flows **horizontally**
- **Not susceptible** to temperature shock
- Provides post-lagoon **cold water nitrification**
- Provides **BOD/TSS polishing** & disinfection



Nexom™

Why does the **SAGR**[®] work?

1. Fully aerated
2. Post-lagoon/sized for **BOD polishing**
3. Ample **surface area** in non-turbulent environment
4. Patented **Step-Feed** prebuilds/stores nitrifiers with built-in temperature buffering



SAGR[®] O&M

Operations &
Maintenance similar to
aerated lagoon

- **No solids return** to monitor/adjust
- **Only moving parts** are blowers
- Takes operators **avg. 10 mins/day**



SAGR® project examples

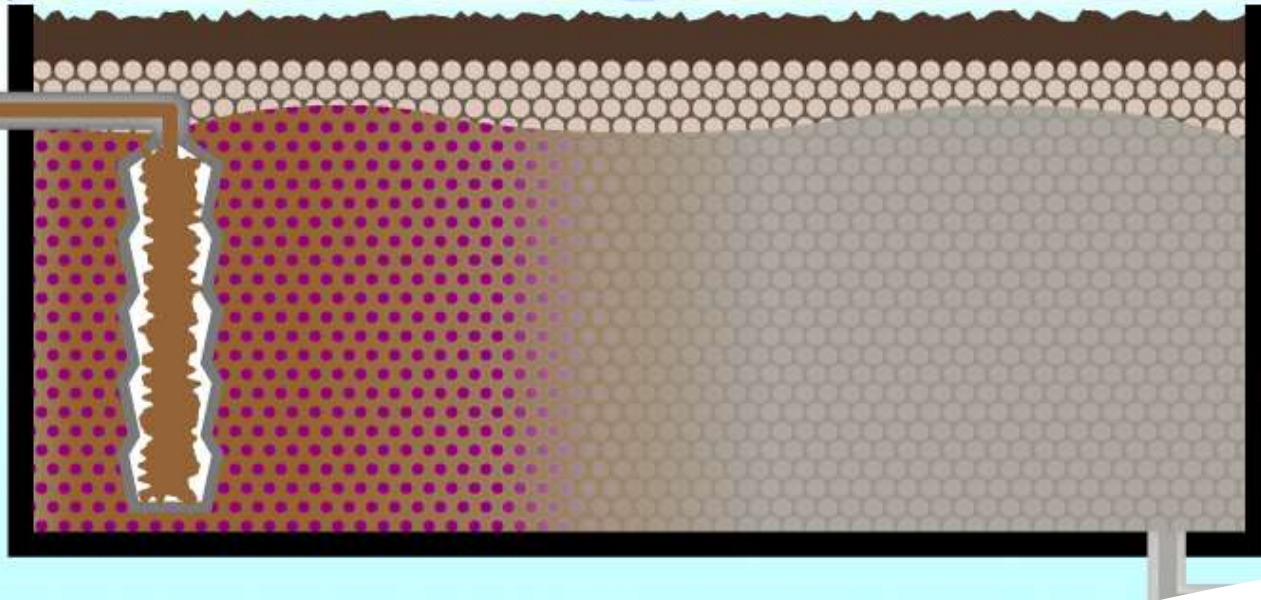


SAGR[®]

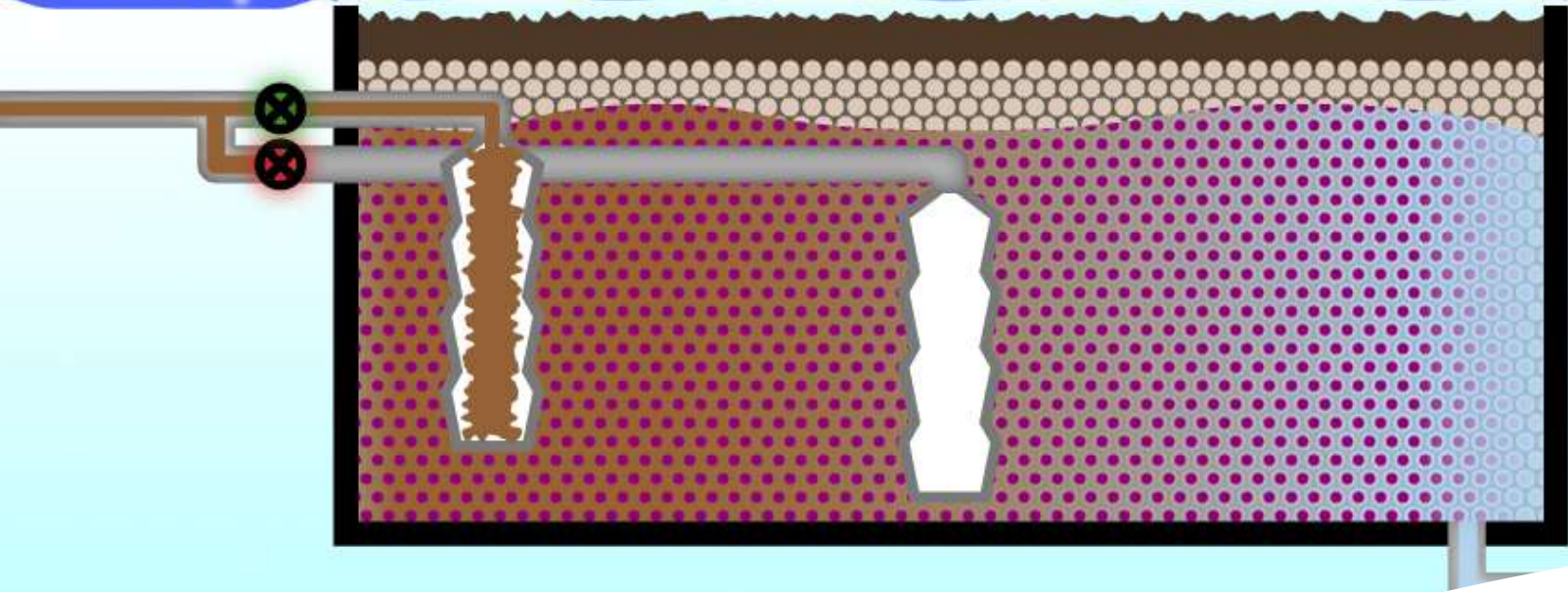
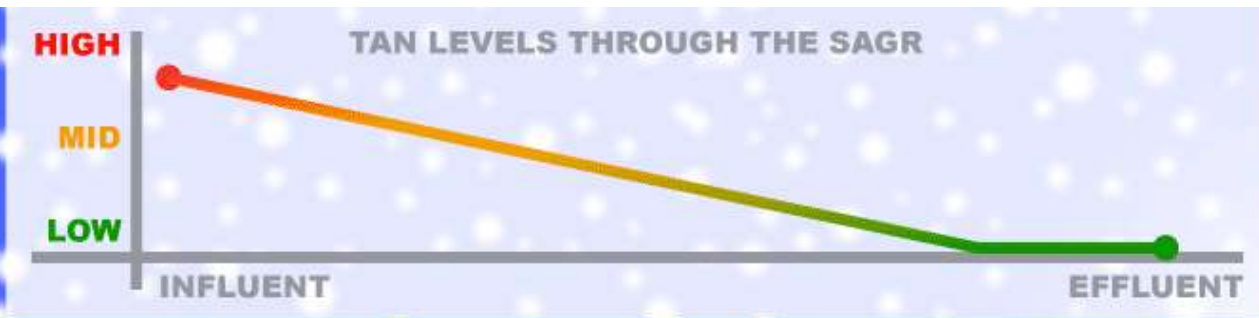


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Without Step-Feed: Winter



SAGR® Step-Feed: Winter



SAGR® Third-Party Winter Operation Verification Data

January 13 – April 21, 2010	Influent Avg (mg/L)	Effluent Avg (mg/L)	Removal
cBOD	47	2.1	95.5%
TSS	30	1.3	95.7%
TAN	24.9	0.12	99.5%
TKN	32.5	1.8	94.5%
FC (cfu/100mL)	253,000	13.5	99.99%
Avg water temp (°C)	0.3	1.0	

SAGR[®]

Average Low Temperature of Coldest Month (°F)



Completed

Under Construction

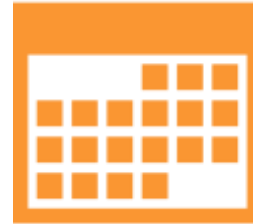
As of 11/26/18

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Use caution before accepting pilot data at face value



Can miss coldest winter



Lagoon Nitrification varies seasonally



Variability of water flows and chemistry



More media doesn't mean more removal

Why a demonstration site in Steinbach MB?

<1°C

water for 5 months

full scale

with actual layout

full year

3 full years, actually

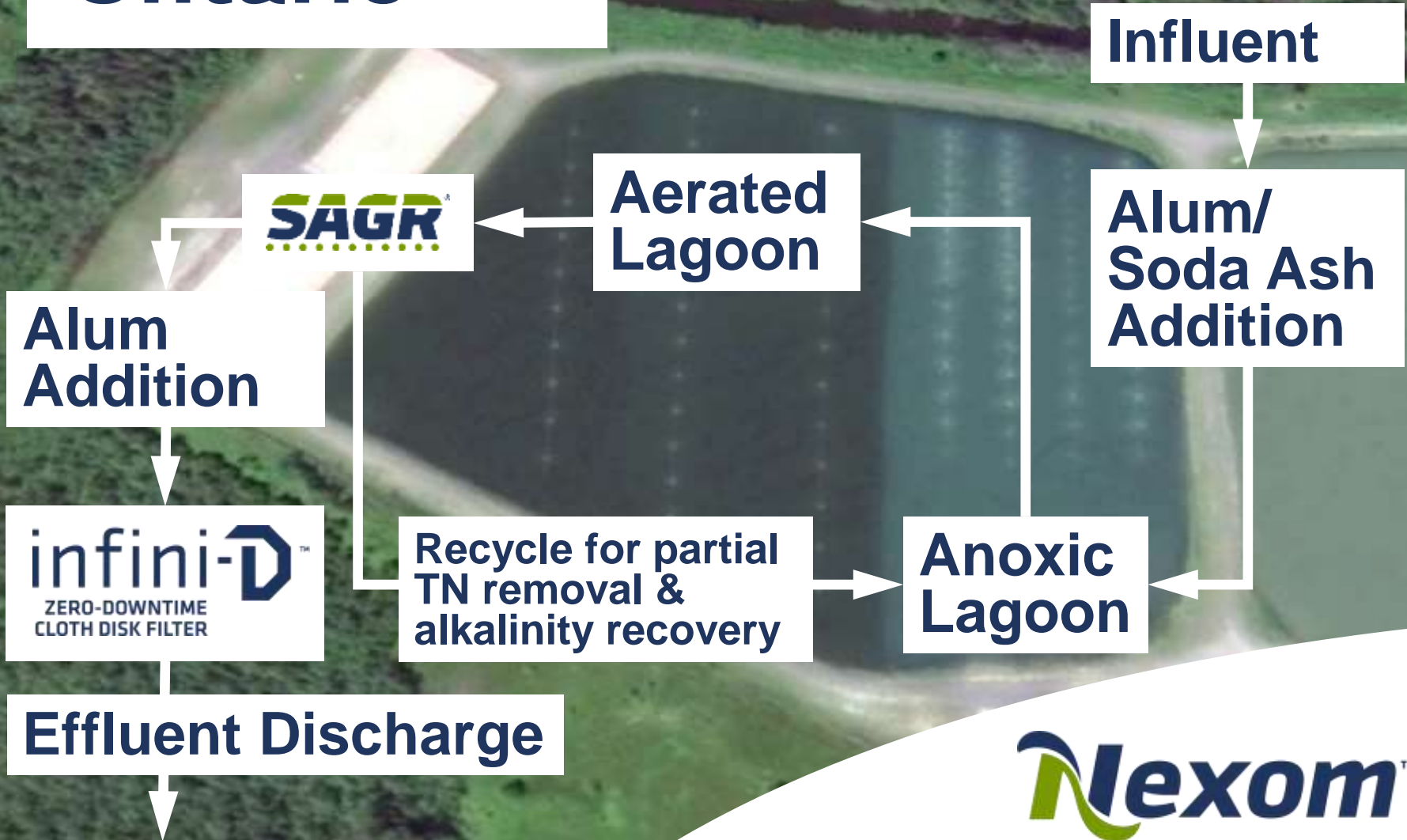
parallel

trains: test & control

Denitrifying Nitrates/ Total Nitrogen with Effluent Recycle



Sundridge, Ontario



De-nitrification

Phosphorus limits algae in **freshwater**.

Nitrogen is the limiting factor in **marine waters**.

- Often as **nitrates**.

Dead zones

2015 Gulf of Mexico
dead zone: **6,747**
square miles

- Second largest
in the world

Removing Phosphorus with Chemicals and Disk Filters



Sundridge, Ontario



Alum & polymer
dosing



Nexom[™]

Sundridge, Ontario



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Project Type:
Municipal
Wastewater

Design Flow:
0.315 MGD



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Sundridge **SAGR**

Two SAGR beds were built following the aerated lagoon for:

- **Ammonia** removal
- Effluent **polishing**
- **Disinfection**



Sundridge, Ontario



Sundridge Treatment

December 2015 – January 2018

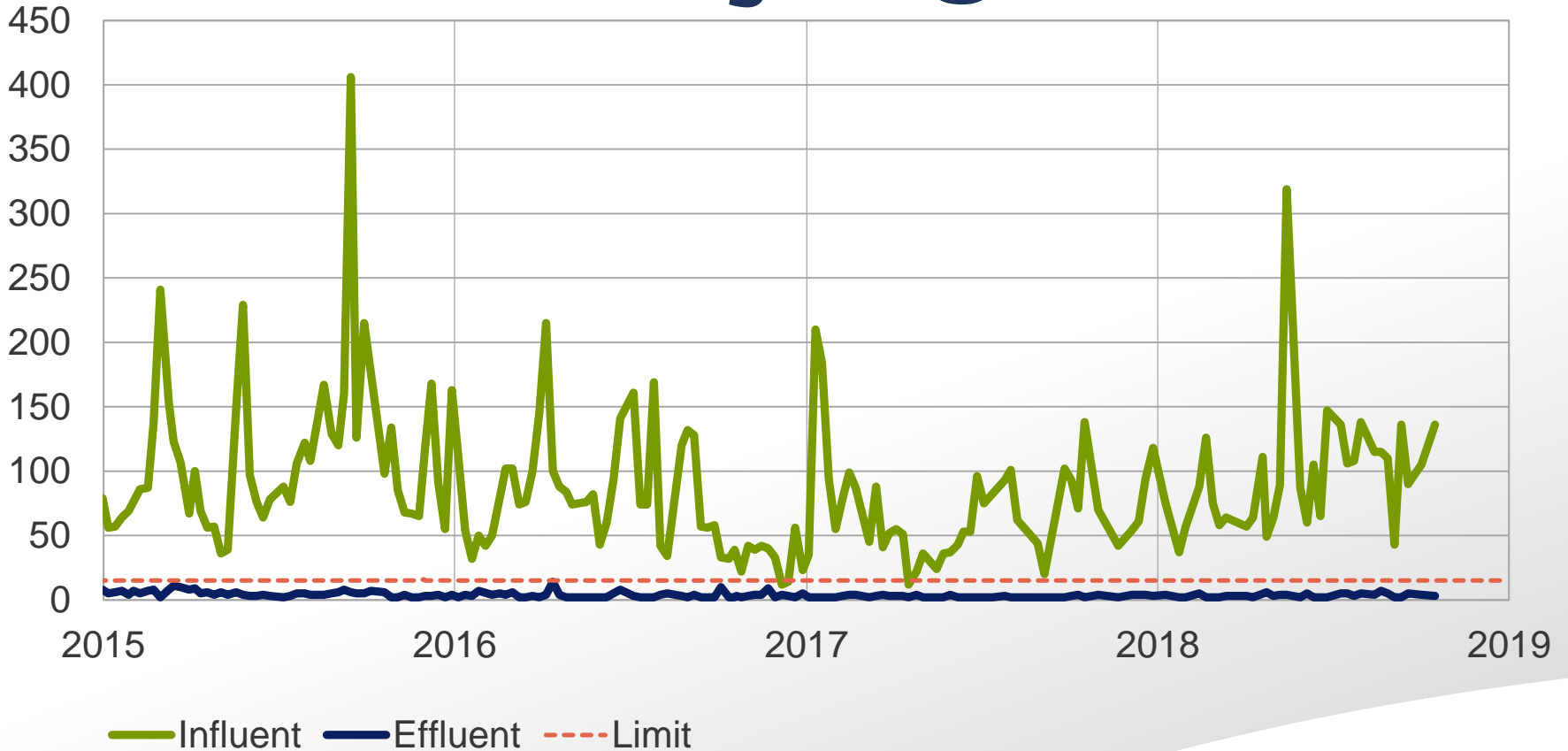
Parameters (mg/L)	Influent	Effluent	Removal
Nitrates & Nitrites		4.19	
TKN	14.2	1.03	92.7%
TN		5.08	64.2%
TAN	11.7	0.54	95.4%
cBOD ₅	74.7	3.16	95.8%
TSS	299	5.23	98.3%
E.Coli (CFU/100mL)		26.1	
Water temp (°C)		1-24	

Sundridge, Ontario

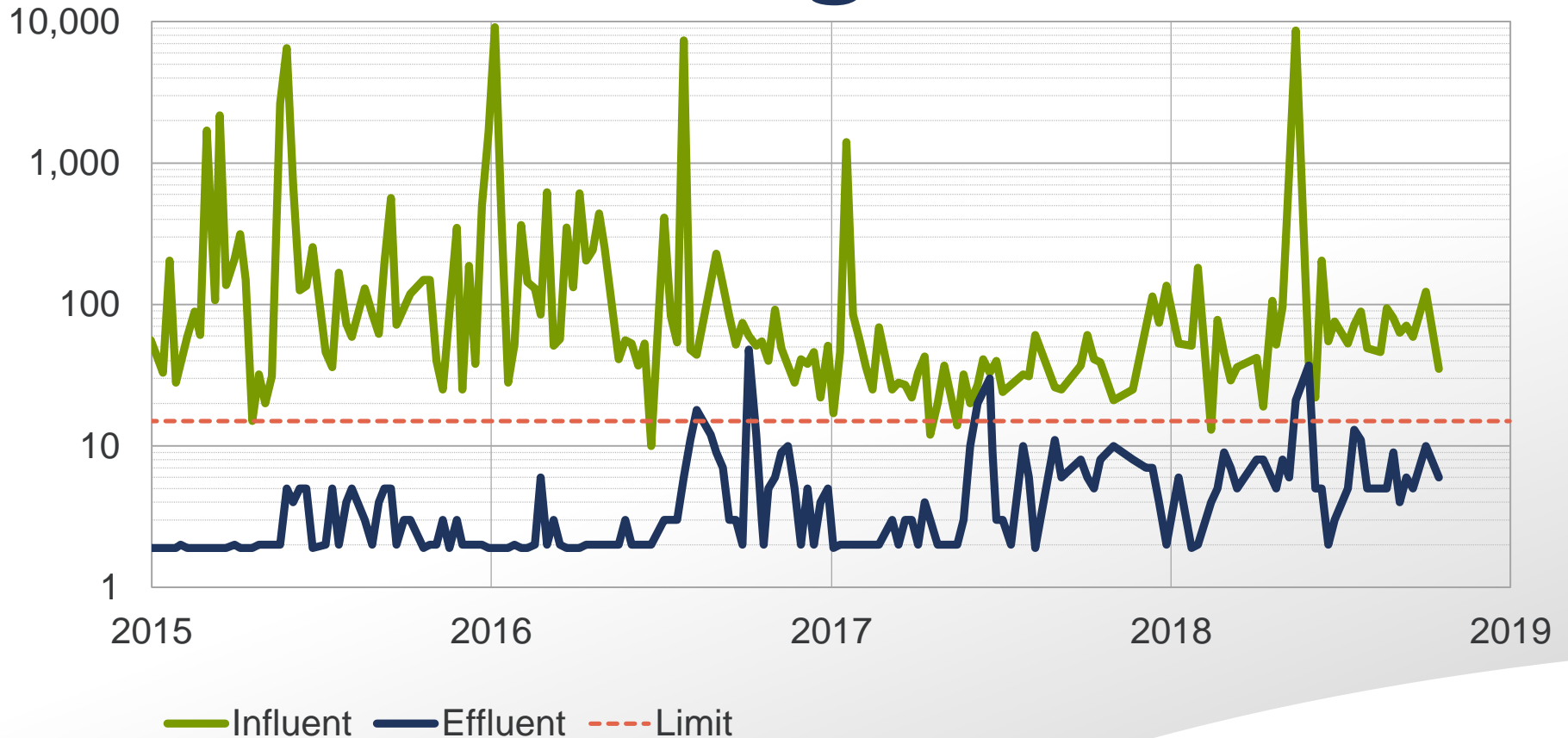
SAGR TAN (mg/L)



Sundridge, Ontario SAGR cBOD₅ (mg/L)



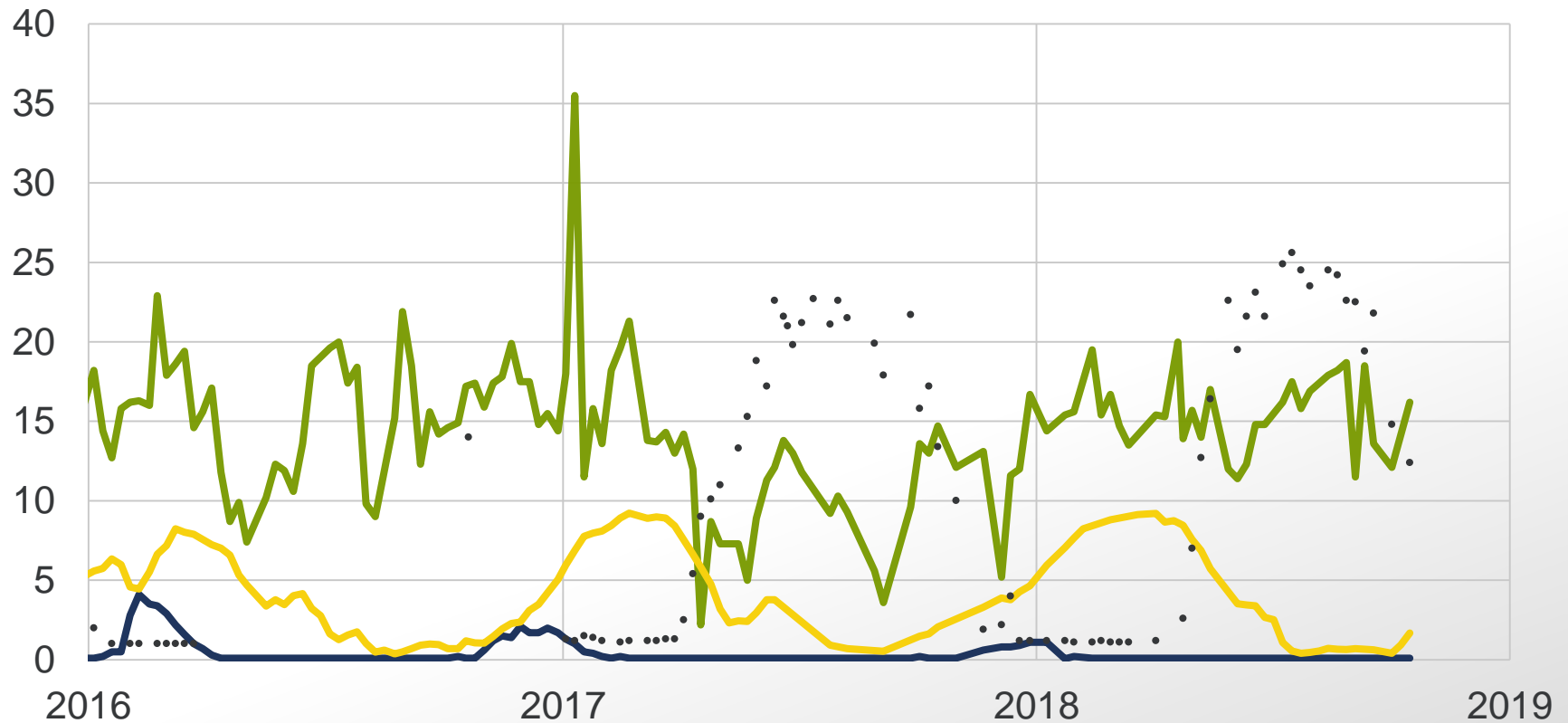
Sundridge, Ontario SAGR TSS (mg/L)



Sundridge, Ontario **SAGR**[®] Effluent E.Coli (CFU/100 mL)

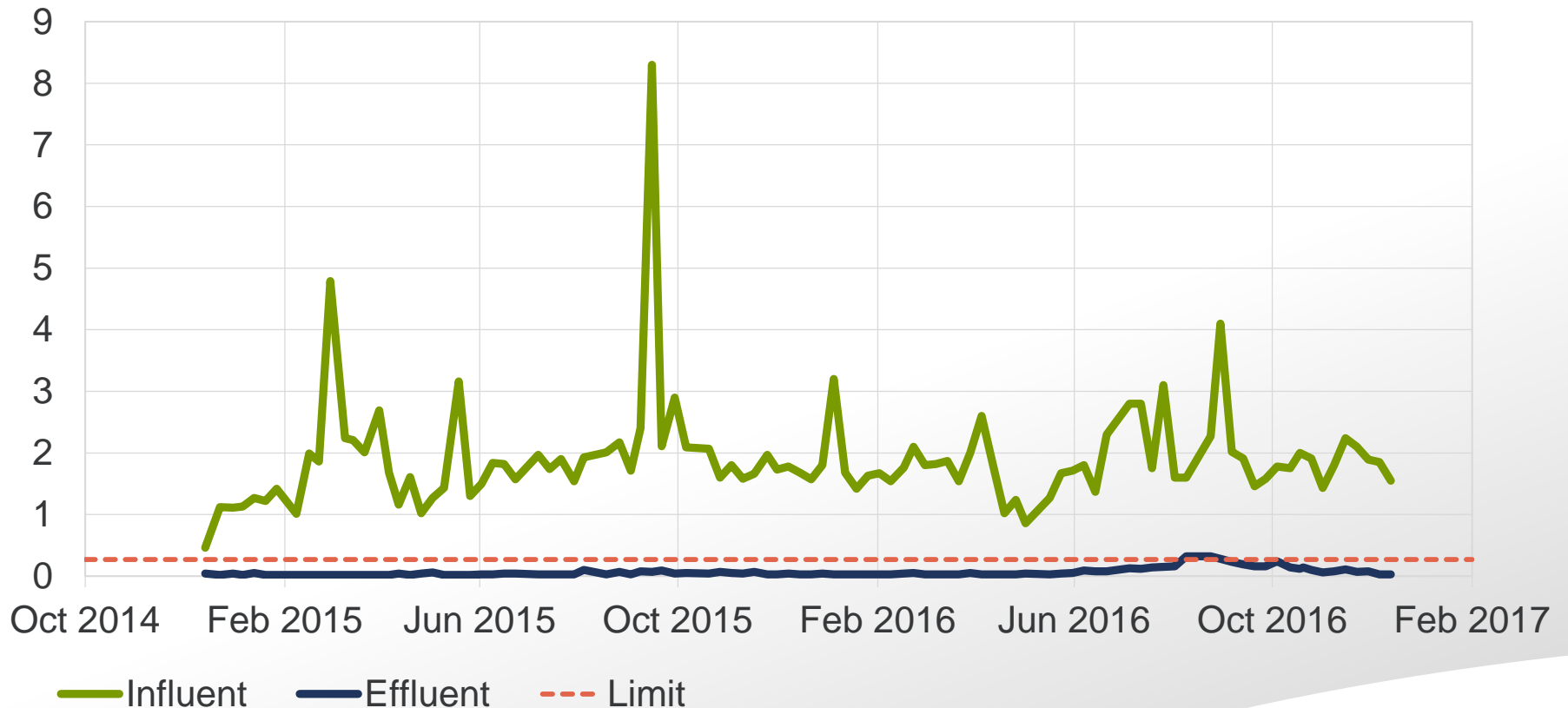



Sundridge, Ontario WWTF Total Nitrogen



- Lagoon Influent TKN (mg/l)
- SAGR Effluent TAN (mg/l)
- SAGR Effluent Nitrates & Nitrites (mg/l)
- Effluent Water Temp (Celsius)

Sundridge, Ontario Total Phosphorus (mg/L)





Q?



A!

questions?

www.nexom.com



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