LWMP Wastewater Open House

Nov 23 2017

PREPARED BY: Paul Nash
DATE: November 23 2017

Review of 2017 Field Work and Presentation of Discharge and Treatment Options

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V0R 1S0

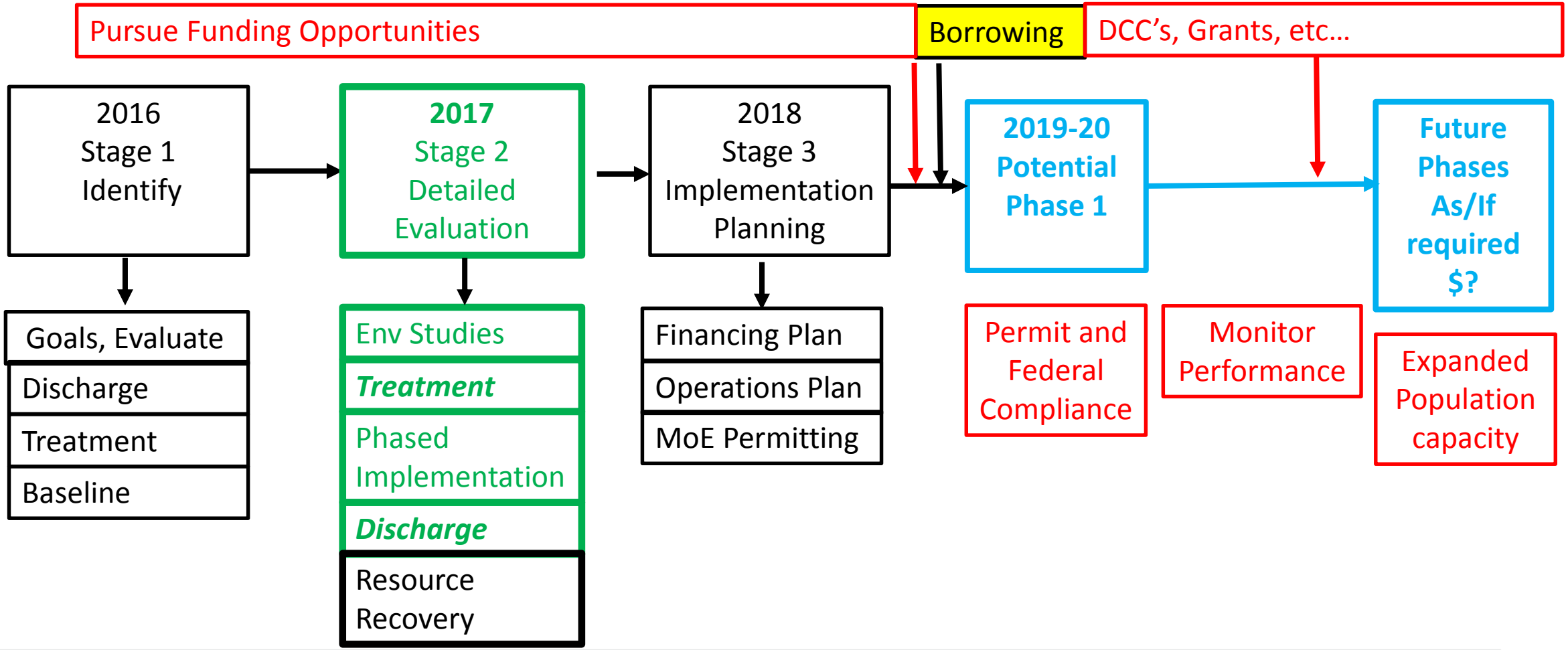
Original Mandate

"to develop an environmentally sustainable method to treat the liquid waste that is produced by the Village"

WAC expanded mandate

"to develop an environmentally sustainable method to **treat the liquid waste** that is produced by the Village, that is ***affordable***, and, ideally, economically *productive*, environmentally *enhancing* and socially *beneficial*"

Cumberland LWMP Road Map (Nov 2017)

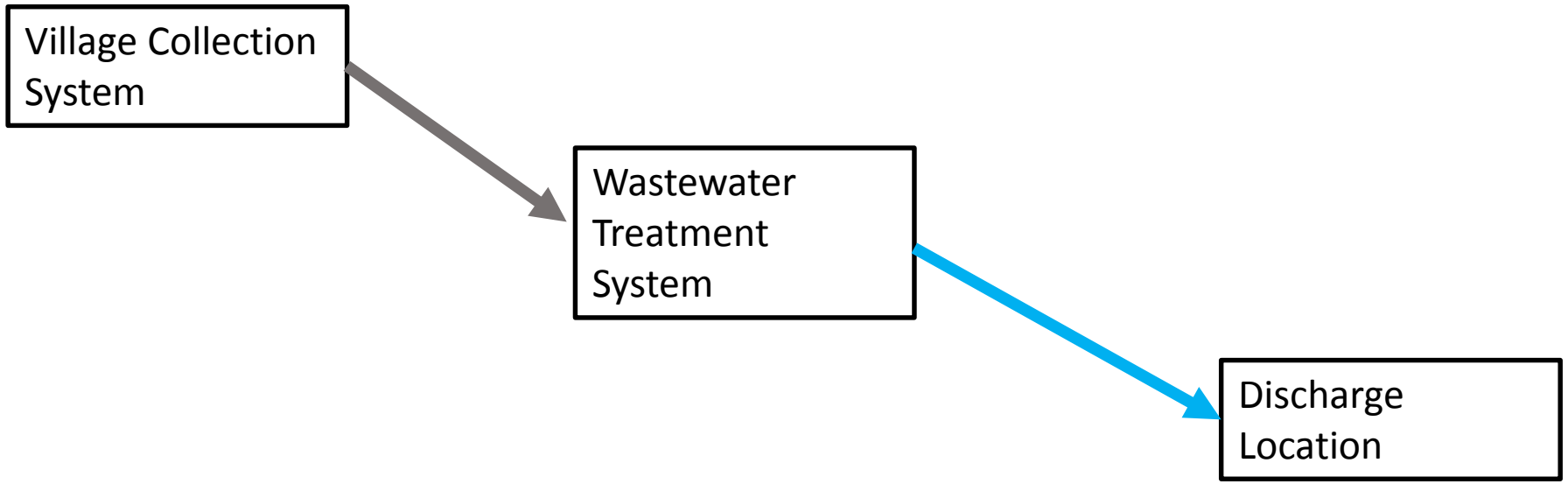


Today's Objectives

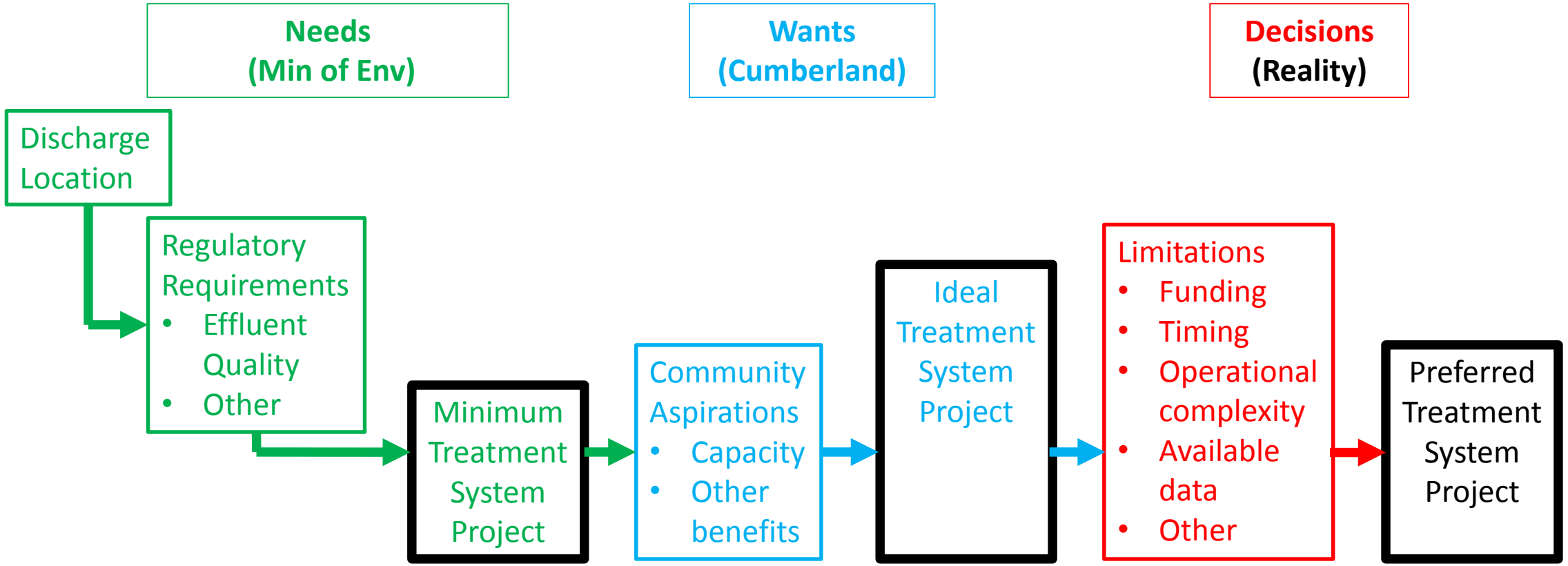
- Review the current Requirements
- Review the work done in 2017
- Select a Preferred Discharge Option
- Select a Preferred Treatment Option
- Discuss implementation and financing

And that's it!

Flow of wastewater...



Flow of information…



Regulatory Considerations

- Existing “discharge” governed by existing Discharge Permit updated in 1998
- New Federal regulations are already in effect
- Any “new” or enlarged discharge must meet the current BC Municipal Wastewater Regulation
- The main objective of a Liquid Waste Management Plan is to set a course to meet the MWR requirements
- Cumberland is out of compliance with the current Permit, and is now receiving enforcement notices.

After 20 years of planning, Cumberland now has to start doing!

BRITISH COLUMBIA

Report Date:December 06, 2016 File:197

Report Number:045572

Registered Mail

Corporation of the Village of Cumberland

Box 340
Cumberland, BC
V0R 1S0

Dear Corporation of the Village of Cumberland

Re: Warning Letter, Permit, 197

On November 28, 2016, Ministry of Environment, Environmental Protection Division staff conducted an inspection under *Environmental Management Act (EMA)*, 197. The inspection determined that Corporation of the Village of Cumberland is out of compliance with its Permit 197, and the section(s) listed below. This Warning Letter lists the compliance verification information contained below.

Failure to comply with the requirements set out in your Permit is an offence under the *Environmental Management Act (EMA)*. Section 120(6) of *EMA* states as follows:

> *120(6) A person who, holding a permit or approval issued to the person under this Act to introduce waste into the environment, introduces waste into the environment without having complied with the requirements of the permit or approval commits an offence and is liable on conviction to a fine not exceeding $1 000 000 or imprisonment for not more than 6 months, or both.*

It should also be noted that, as an alternative to prosecution of the offence referenced above, the Ministry may initiate action to impose an administrative penalty against Corporation of the Village of Cumberland. *The Administrative Penalties Regulation (EMA)* (B.C. Reg. 133/2014) (APR) was brought into force in 2014. The APR describes the prescribed provisions of the EMA as well as that of specified regulations under which administrative penalties can be assigned. Section 12(5) of the APR states as follows:

> *12(5) A person who fails to comply with a requirement of a permit or approval issued or given under the Act is liable to an administrative penalty not exceeding $40 000, unless the requirement the person failed to comply with is also a prescribed provision of the EMA or the regulations that is subject to a different maximum administrative penalty.*

If you fail to take the necessary actions to restore compliance, you may be subject to escalating enforcement action. This Warning Letter and the alleged violations and circumstances to which it refers, will form part of the compliance history of Corporation of the Village of Cumberland and will be taken into account in the event of future violations.

Finally, I request that Corporation of the Village of Cumberland immediately implement the necessary changes or modifications to correct the non-compliance(s) with the *Environmental Management Act*. Further, I request that Corporation of the Village of Cumberland notify this office in writing by email or letter within 30 days of this letter, advising what corrective measures have been taken, and what else is being done, to prevent similar non-compliances in the future.

Discharge Location– Maple Lake Creek

The BC MWR says…

For discharge to freshwater streams, where the dilution ratio is	BOD-TSS
>40:1	<45-45
>10:1	10-10
<10:1	Discharge prohibited

Summer dilution of effluent in Maple Lake Creek is near zero!

But there's an "out"

The BC MWR says…

- Water treated to Reclaimed Water quality can be used for "stream augmentation", and "maintaining wetlands and marshes"
- There does not need to be any dilution for adding reclaimed water to the stream

Reclaimed Water Category	Example Uses	BOD-TSS	Fecal Coliforms	Turbidity
Lower Exposure Potential "LEP"	Industrial	<45-45	NR	NR
Moderate Exposure Potential "MEP"	***Subsurface irrigation***, restricted public access area irrigation	<25-25	<100	NR
Greater Exposure Potential "GEP"	Irrigation of parks, golf courses, ***stream augmentation***	<10-10,	<1	<2
Indirect Potable Reuse "IPR"	Recharging drinking water aquifer	<5-5	<1	<1

Comparison of Discharge Requirements

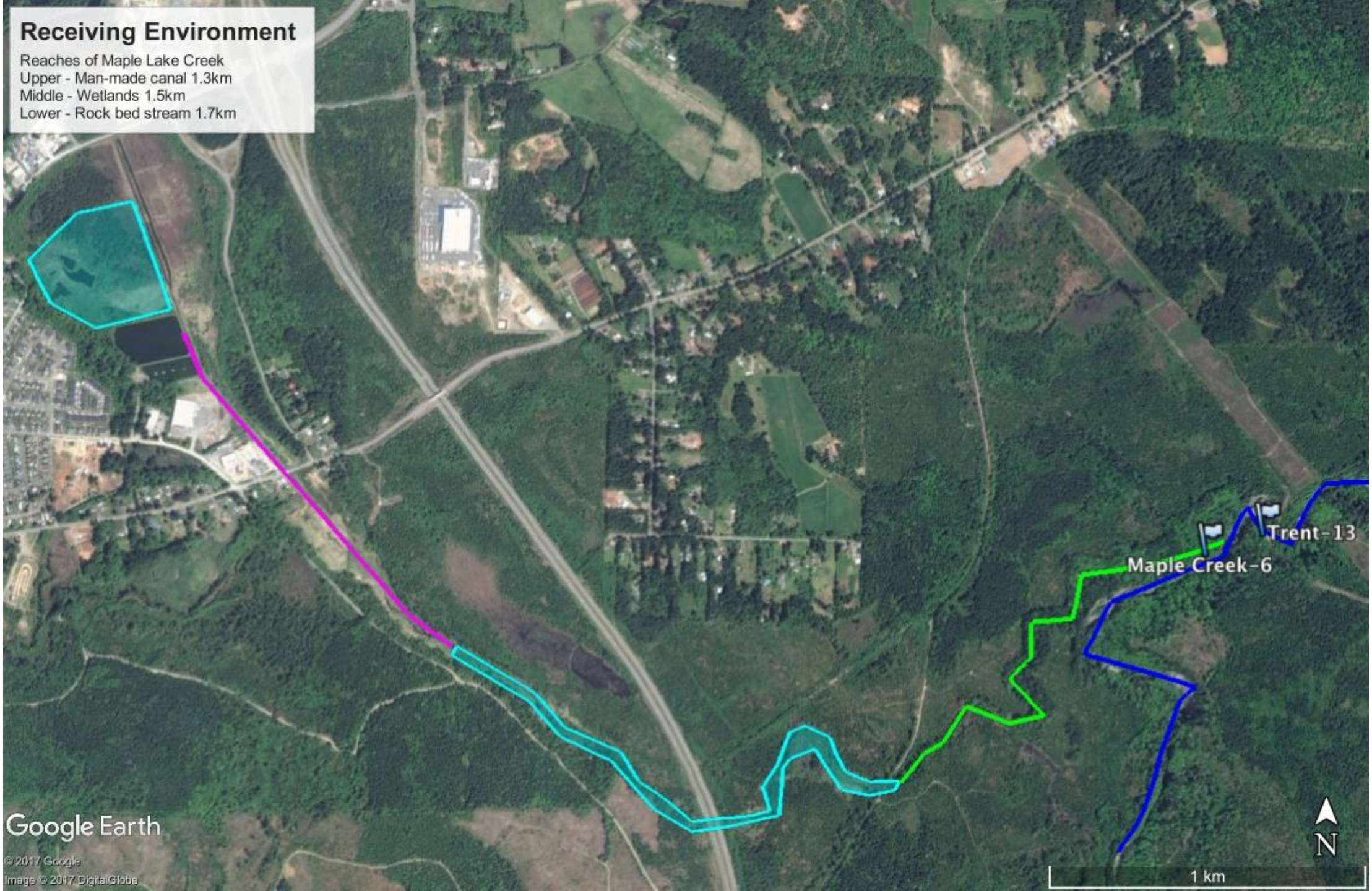
Requirements	BOD-TSS (mg/L)	Ammonia (mg/L)	Fecal Coliforms (CFU/100mL)	Total Phosphorus (mg/L)	Turbidity NTU
Incoming Wastewater	300-300	40	2,000,000	7	100
Current Summer Effluent Quality	40-70	20	5,000	5	50
Discharge Permit (1998) to MLC	**<30-30**	NR	**<200**	**<1**	NR
Permit + Federal Regulations to MLC	**<25-25**	**<1.25**	<200	<1	NR
BC MWR "MEP" – Indirect Discharge to MLC through North Wetlands	<25-25	<1.25	**<100**	<1	NR
BC MWR "GEP" Direct discharge to MLC	**<10-10**	<1.25	**<1**	<1	**<2**
Trent R. in-stream Phosphorus criteria				**<0.005**	

Receiving Environment

- Treated effluent currently flows to Maple Lake Creek,
- And subsequently the Trent River

Field investigations were needed to determine:

1. How well are the lagoons treating the water?
2. What is the flow (dilution) in Maple Lake Creek
3. What is happening to water quality in MLC?
4. What is the flow (dilution) in the Trent River
5. What is happening to water quality in the Trent River?


Receiving Environment
Reaches of Maple Lake Creek
Upper - Man-made canal 1.3km
Middle - Wetlands 1.5km
Lower - Rock bed stream 1.7km
Trent-13
Maple Creek-6
Google Earth
© 2017 Google
Image © 2017 DigitalGlobe
N
1 km

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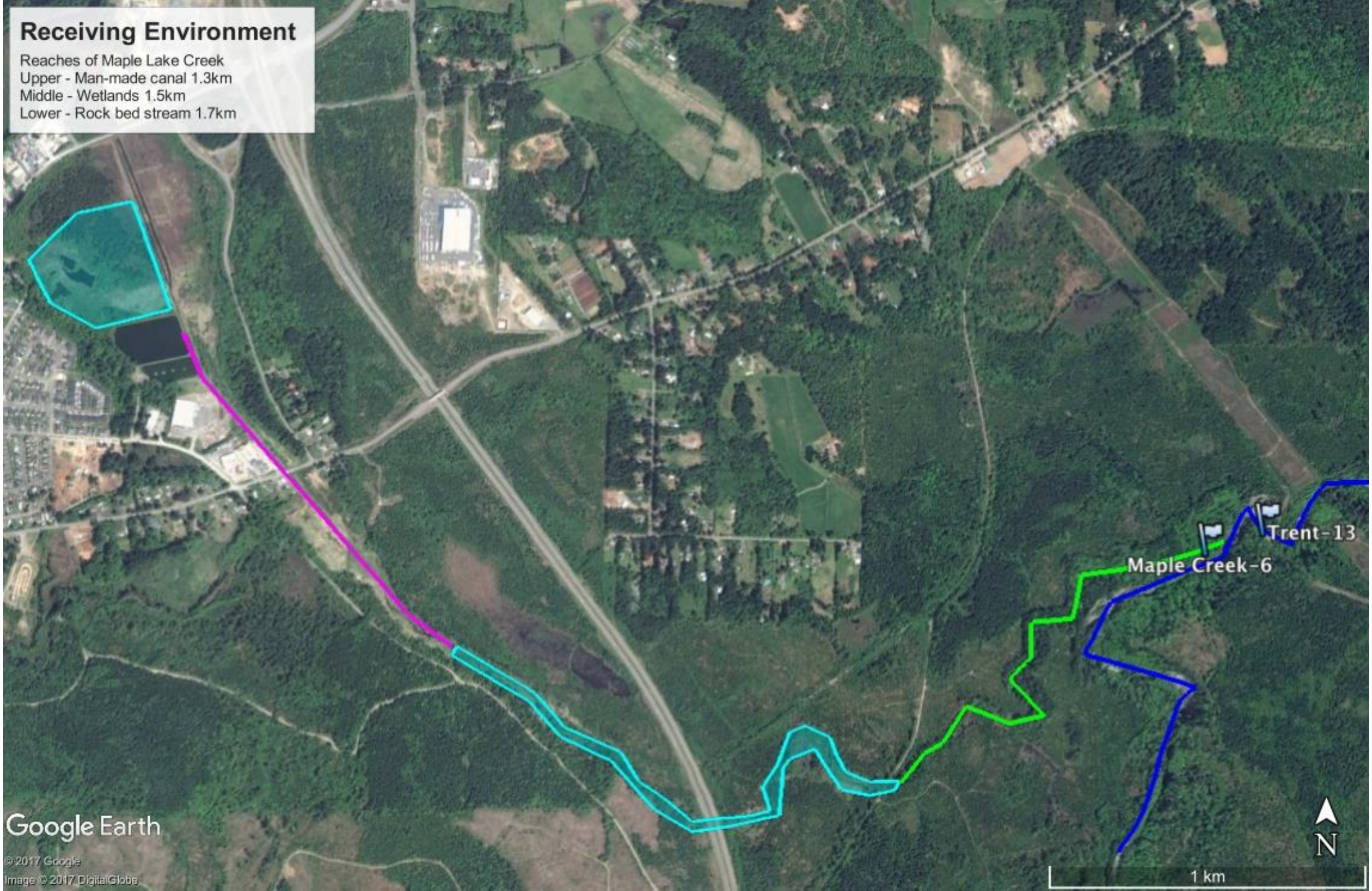
Flow Measurement at end of Maple Lake Creek Wetlands (site 6A, Aug 2, 2017)

What does the water look like? (Aug 2, 2017)

Flow Measurement at Trent River at Hwy 19 (Aug 2, 2017)

Lagoon Performance

LOCATION	Total BOD (mg/L)	Soluble BOD (mg/L)	TSS (mg/L)	TP (mg-P/L)	$NH4^+$ (mg-N/L)	Fecal Colif. CFU/100mL
Influent	292	175	282	6.8	41.4	2,176,750
Aerated Lagoon	38	8	100	6.4	43.2	115,500
Facultative Lagoon	17	< 6	49	4.7	24.6	12,618
Wetland Treatment	< 6	< 6	< 4	0.2	0.366	398
Trent 200 m U/S	< 6	< 6	<4	< 0.005	0.235	34
Trent 100 m D/S	< 6	< 6	< 4	0.035	0.132	55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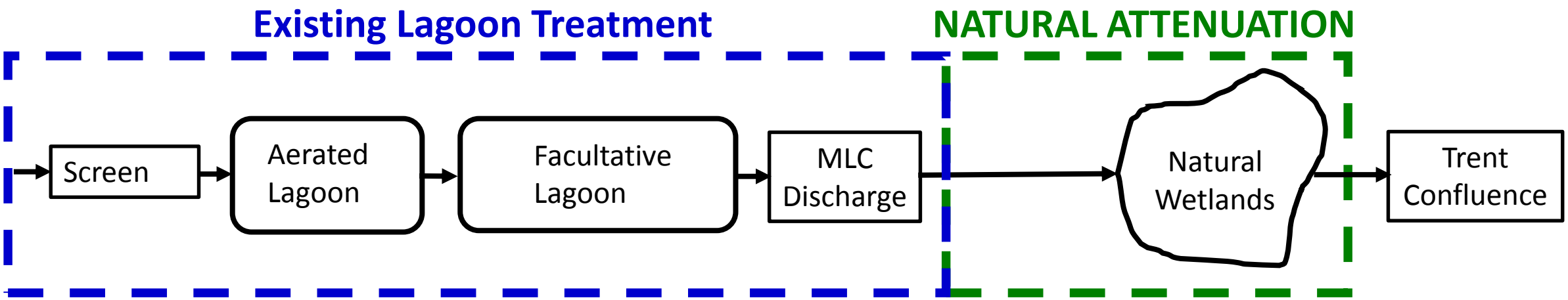
Maple Creek-6
Google Earth
© 2017 Google
Image © 2017 DigitalGlobe
N
1 km

Flow Study

Location	Flow (m^3/d)	Measurement	Dilution
MLC upstream of lagoons	Effectively zero	Visual observation	
Lagoon discharge	800	Lagoon Measuring weir	0:1
End of MLC wetland reach (1 km upstream of Trent)	660	Temporary measuring weir	
Trent River at Hwy 19 (1 km upstream of MLC)	660	Temporary measuring weir	1:1
Estimated flow in Trent downstream of MLC confluence	1,320	Visual observation	

Maple Lake Creek Phosphorus

Location	Avg. Total P (mg/L)	Objective	Total P Load (kg/day)	% Removal
MLC upstream of lagoons			0	
Lagoon discharge	5.6	<1	4.5	Effluent
End of MLC	0.2		0.16	97%
Trent River 100m upstream of MLC)	< 0.005	<0.005	< 0.004	Trent Baseline
Trent 100m downstream of MLC	0.035	<0.005	0.063	99%


Existing Lagoon Treatment
NATURAL ATTENUATION
Screen
Aerated Lagoon
Facultative Lagoon
MLC Discharge
Natural Wetlands
Trent Confluence

What did we learn?

1. There is zero dilution in Maple Lake Creek in summer
2. There is near zero dilution in the Trent in summer
3. Withdrawal of summer flow (to storage or other creek) would be severe for MLC and the Trent
4. The MLC south (downstream) wetlands are doing a better job of phosphorus removal than most treatment plants
5. The wetlands are doing a good job of algae removal
6. There are still some fecal coliforms in Maple Lake Creek
7. There does not appear to be a major algae problem in the Trent

2016 Shortlist of Discharge Options

Summer Discharge Location
Deep Ground Discharge (Coal Mines)
Conventional Ground Discharge
Ocean (via CVRD system)
Storage Wetland
Storage Reservoir (near Teal Lake)
Maple Lake Creek -direct
Maple Lake Creek –indirect (via North Wetland)

Figure 1: Storage Wetland Concept

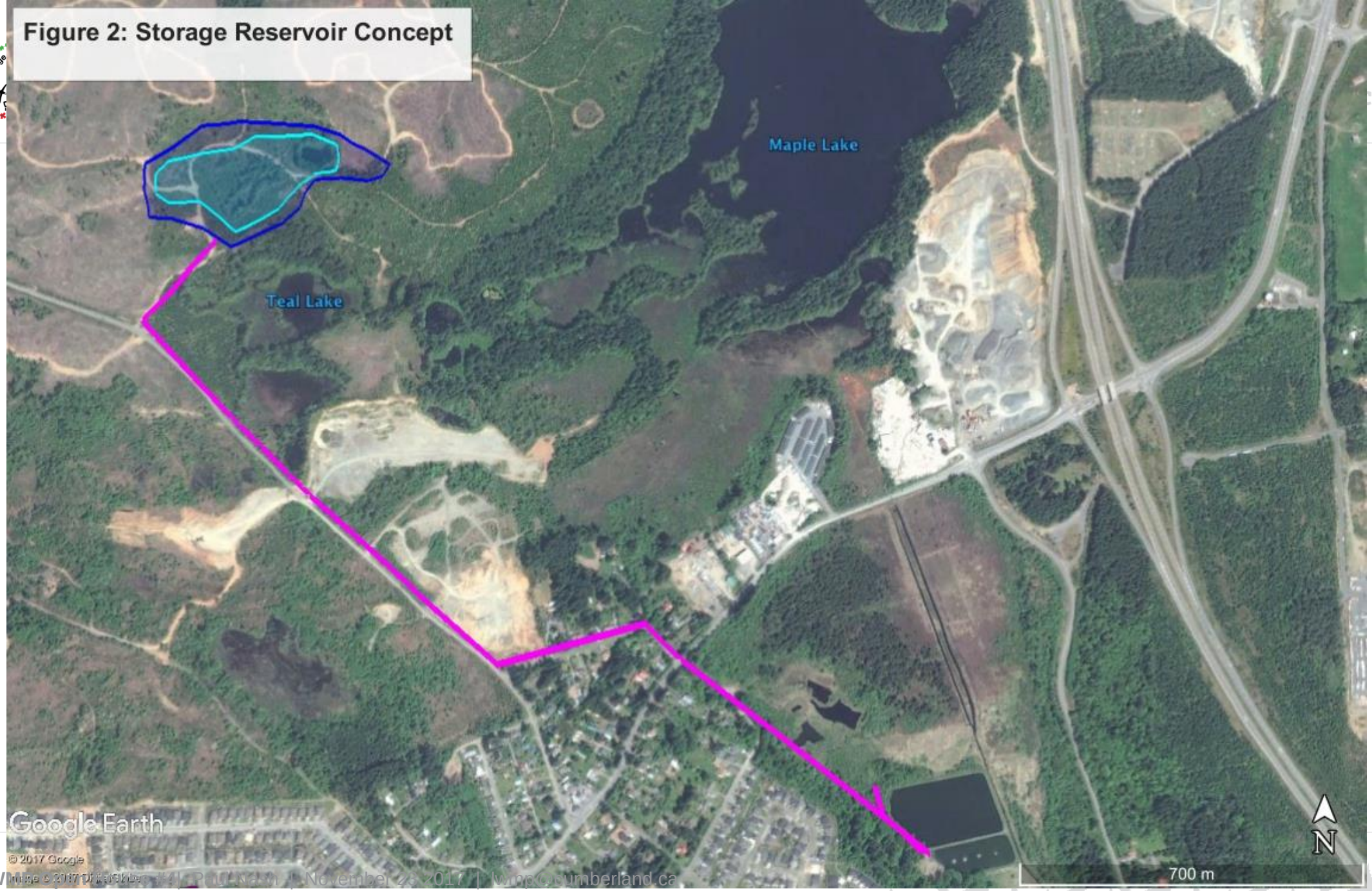


Figure 2: Storage Reservoir Concept
Maple Lake
Teal Lake
Google Earth
© 2017 Google
700 m
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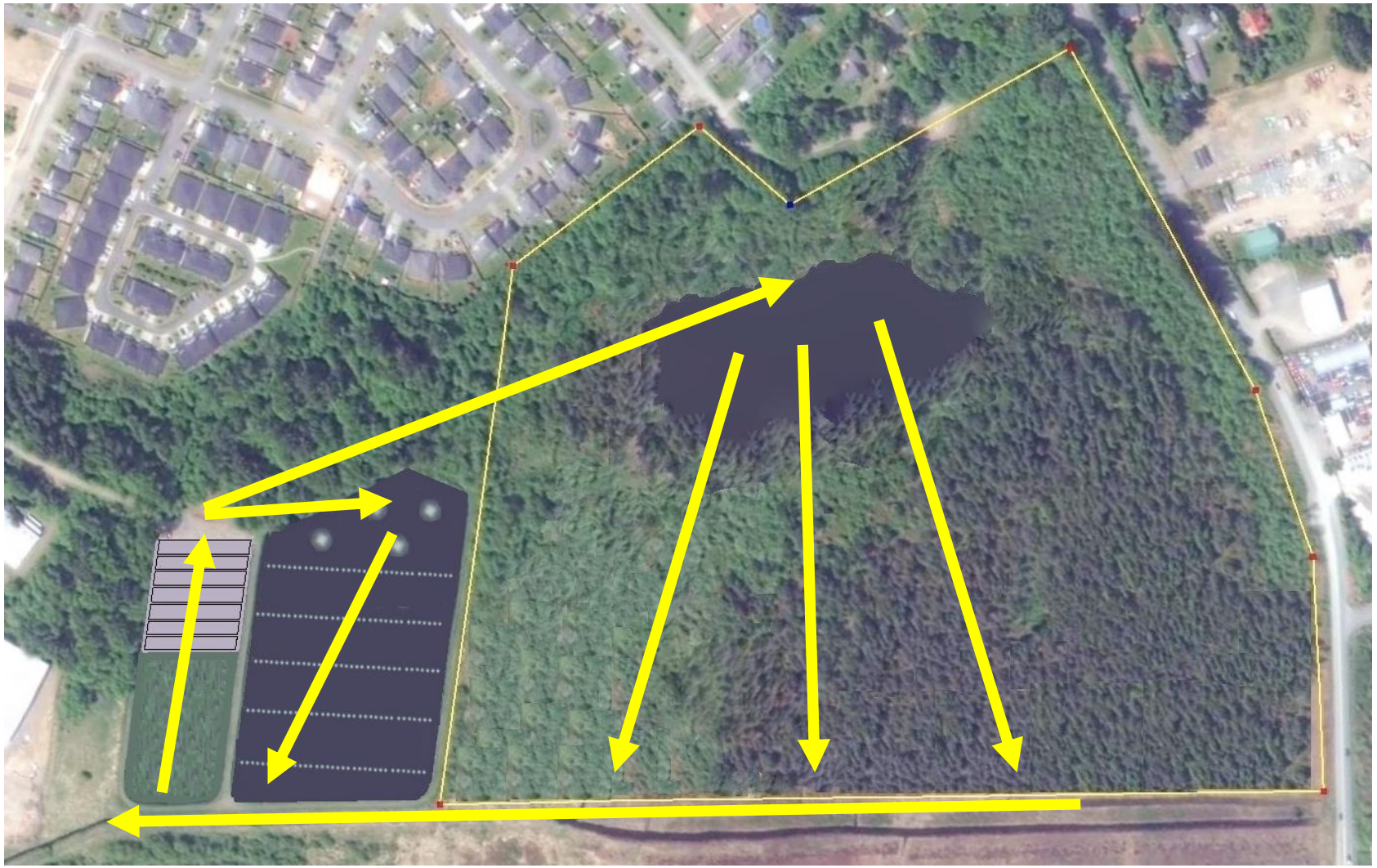
Conceptual Layout of enhanced lagoon and wetland application



2016 Shortlist of Discharge Options

Summer Discharge Location	Result
Deep Ground Discharge (Coal Mines)	X Impractical
Conventional Ground Discharge	X Would take summer flow away from MLC
Ocean (via CVRD system)	X Would take summer flow away from MLC
Storage Wetland	X Would take summer flow away from MLC
Storage Reservoir (near Teal Lake)	X Would take summer flow away from MLC
Maple Lake Creek -direct	Y Keeps summer flow in MLC. & Trent
Maple Lake Creek –indirect (via North Wetland)	Y Keeps summer flow in MLC. & Trent

Cumberland Aspirations – "the Wants"

1. To have capacity for population growth for 20 years
2. Affordability
3. Attract grant funding
4. Reclaimed water ready
5. Environmental leadership and innovation
6. Support health of waterways with robust treatment
7. Use of natural ecosystems
8. A solution Cumberland can be proud of

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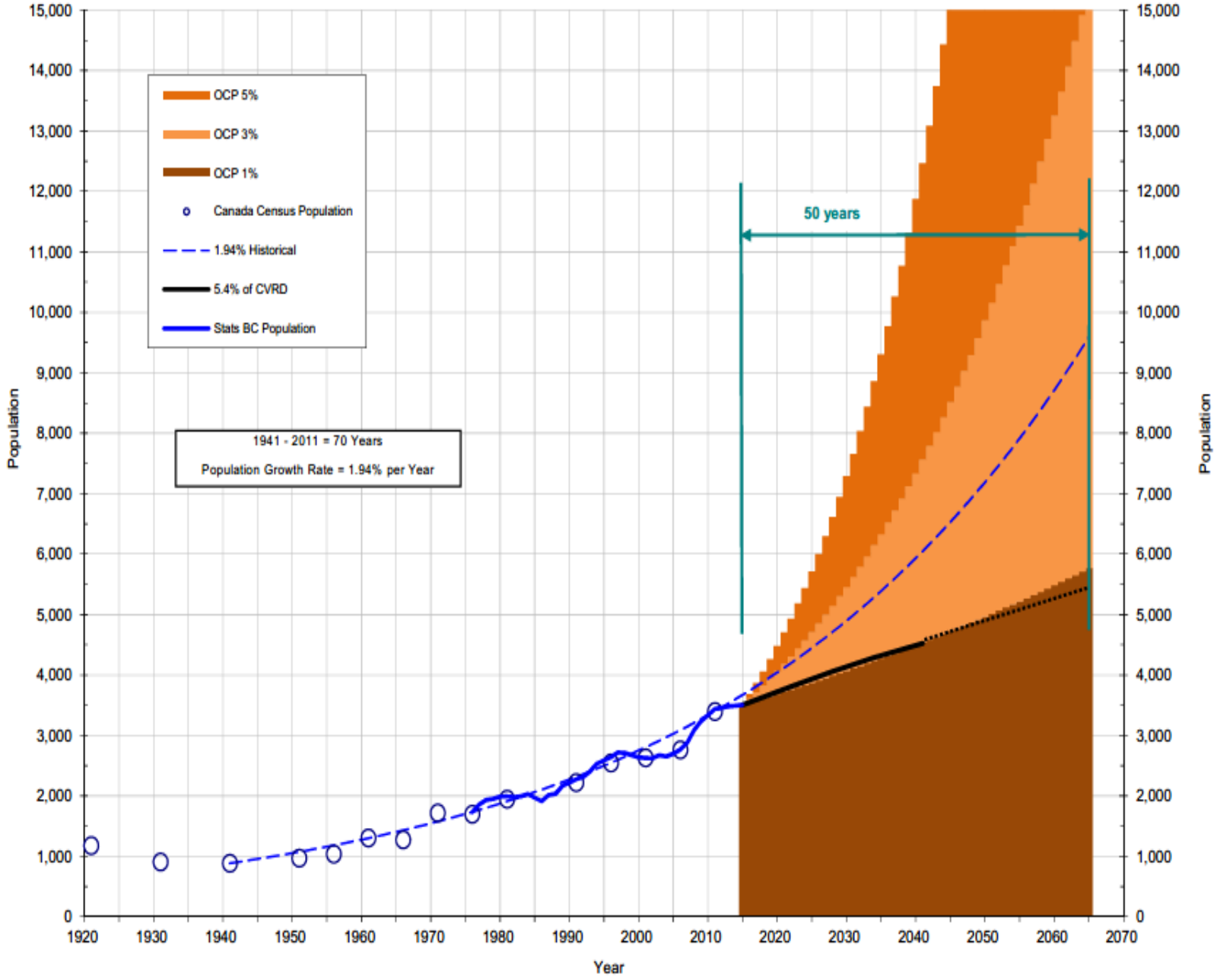
Populatio n Growth



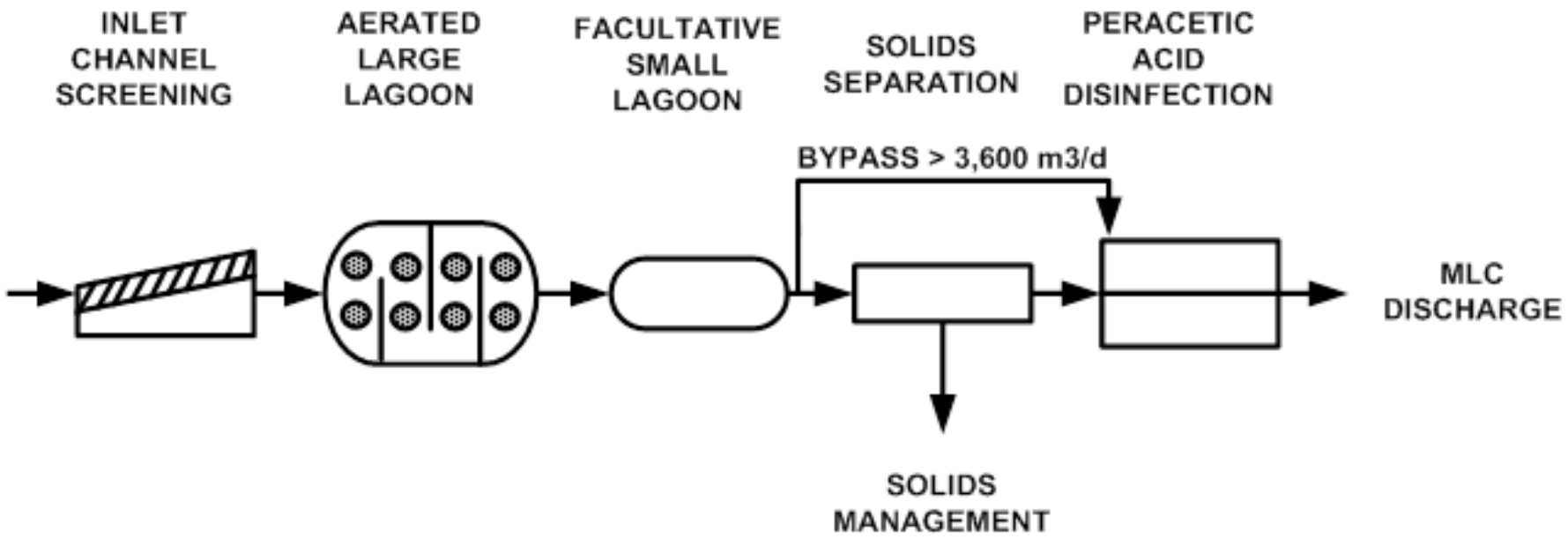
Flow and Load Model

Year	Population	ADWF	PWWF	Peaking Factor	Comments
	3% growth	cu.m/day	cu.m/day		
2016	3650	745	14,500	17	Baseline year
2017	3760	770	14,500	17	
2019	4000	785	14400	16	Commissioning Year
2023	4500	910	12400	12	Permit ADWF (910 cu.m/day) reached
2029	5000	1001	11400	11	Permit +10% (1001 cu.m/day) exceeded
2038	6994	1800	7200	4.0	End of 20 year Design Horizon

Conceptual Treatment Options

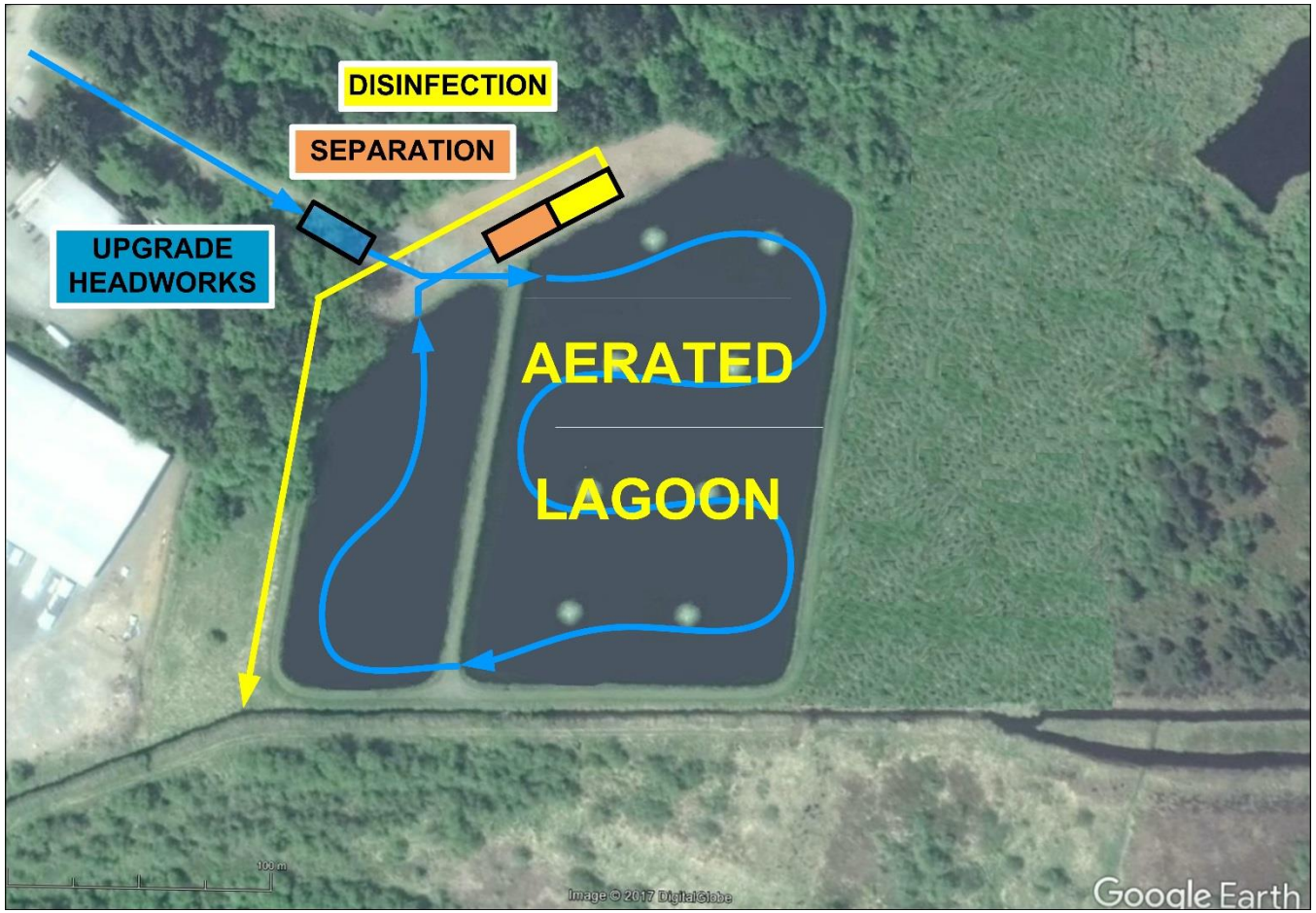
All options include Chemical Disinfection, for all Flows

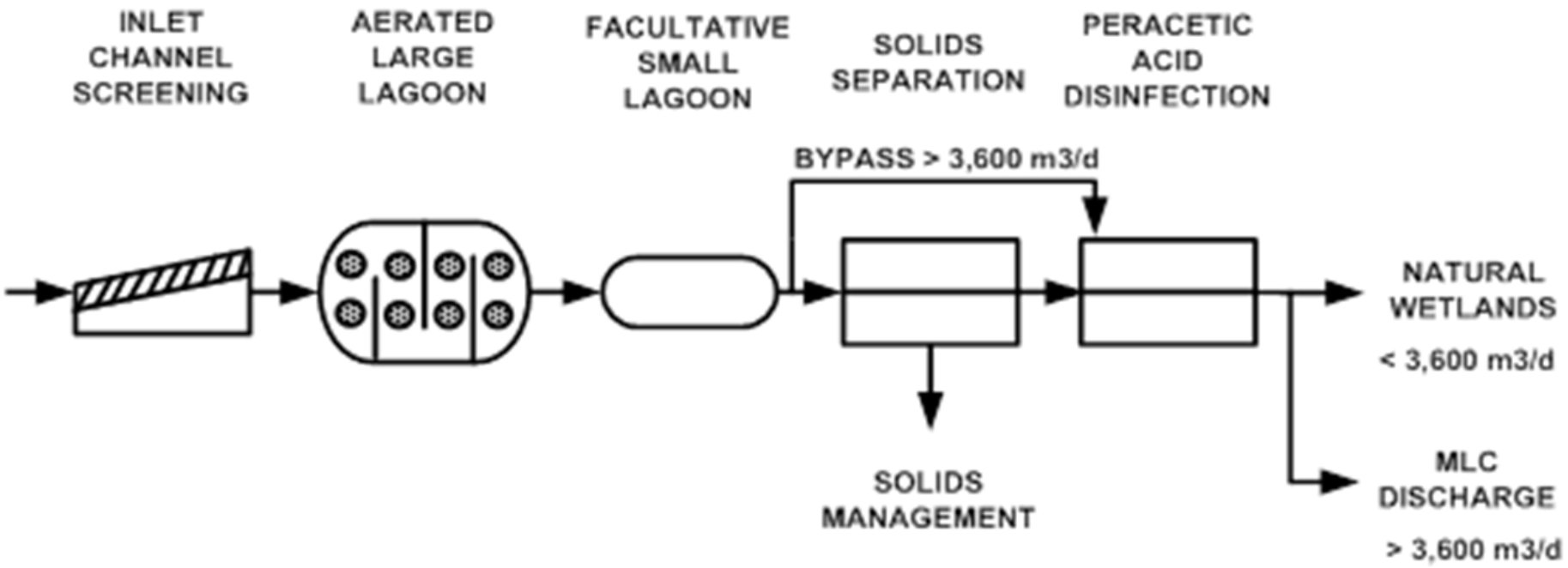
- **Phase 1** Upgraded Lagoon to Meet Permit
- **Option 1A** Upgraded Lagoon to meet MWR MEP
- **Option 1B** Upgraded Lagoon to meet MWR GEP
- **Option 2** “Base Flow” mechanical (up to 2x ADWF, 3600 cu.m/day), excess to lagoons
- **Option 3** “Full Flow” mechanical, (up to 8xADWF, 14,400 cu.m/day) lagoons decommissioned



LAGOON
Phase 1

LAGOON
Phase 1





LAGOON OPTION 1A

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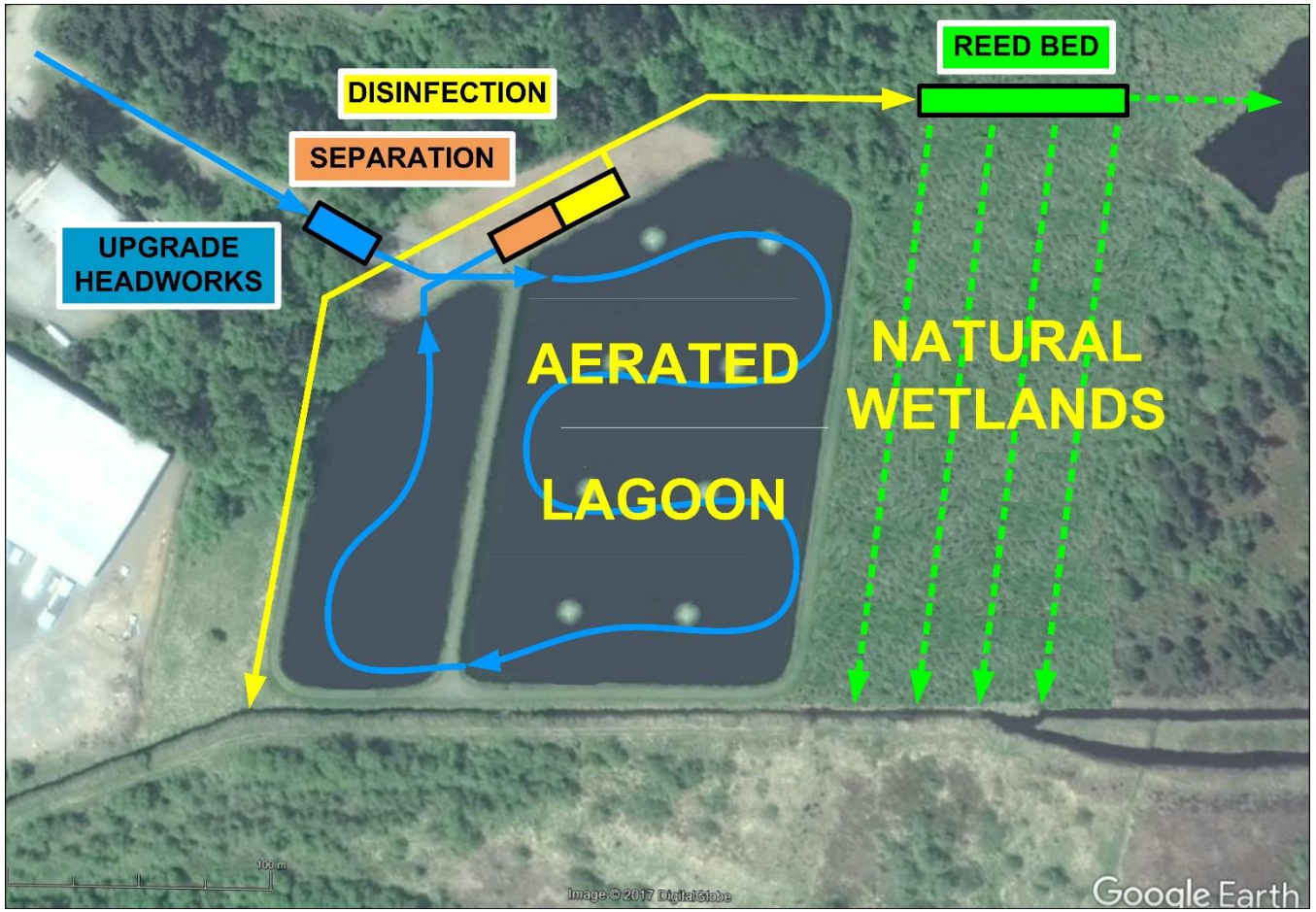
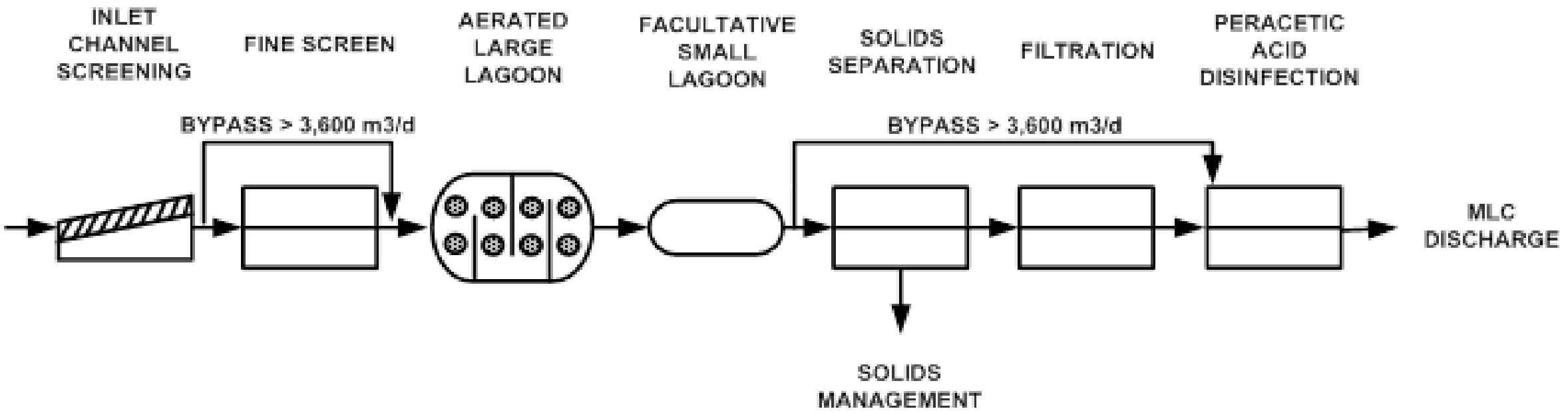
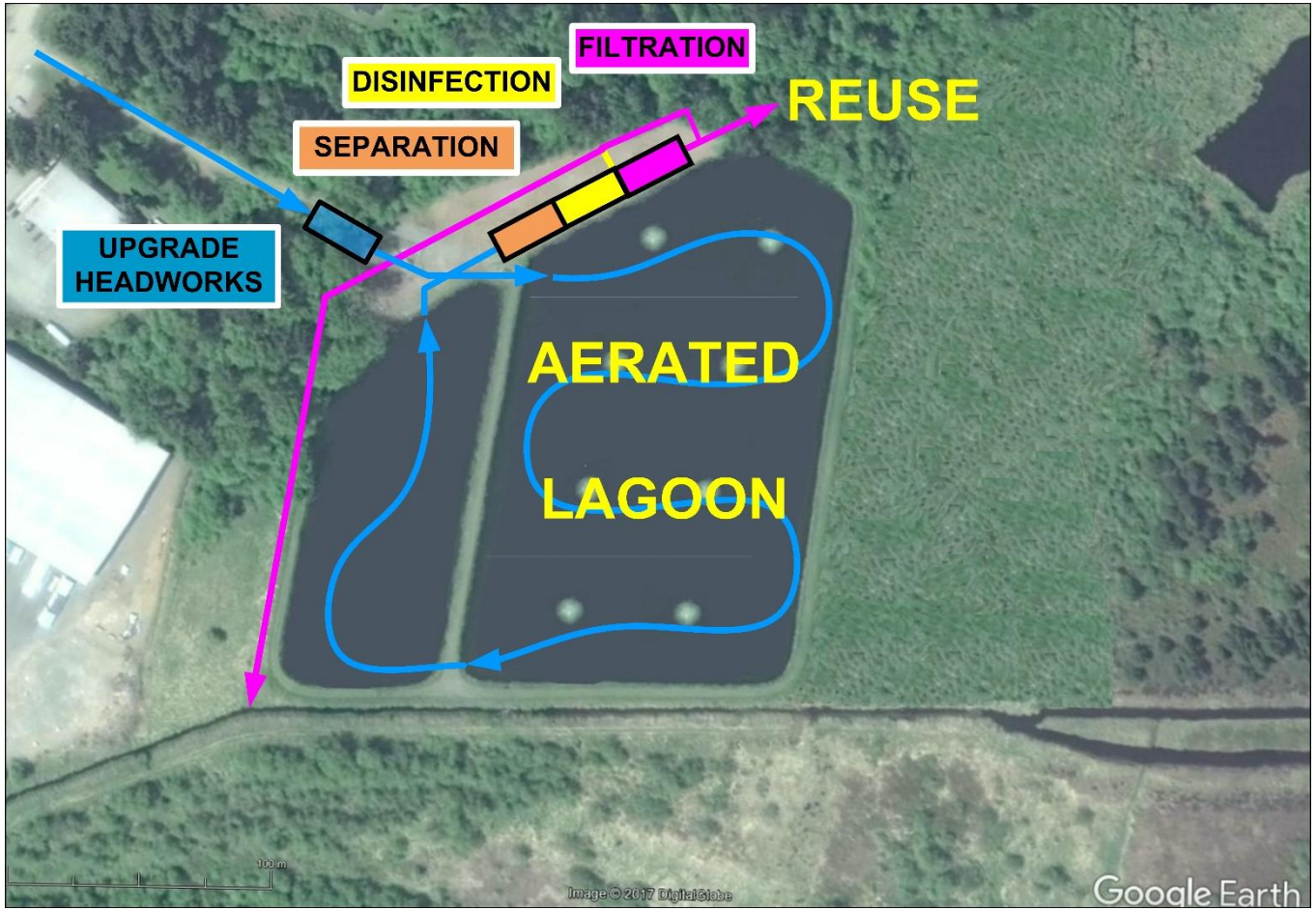
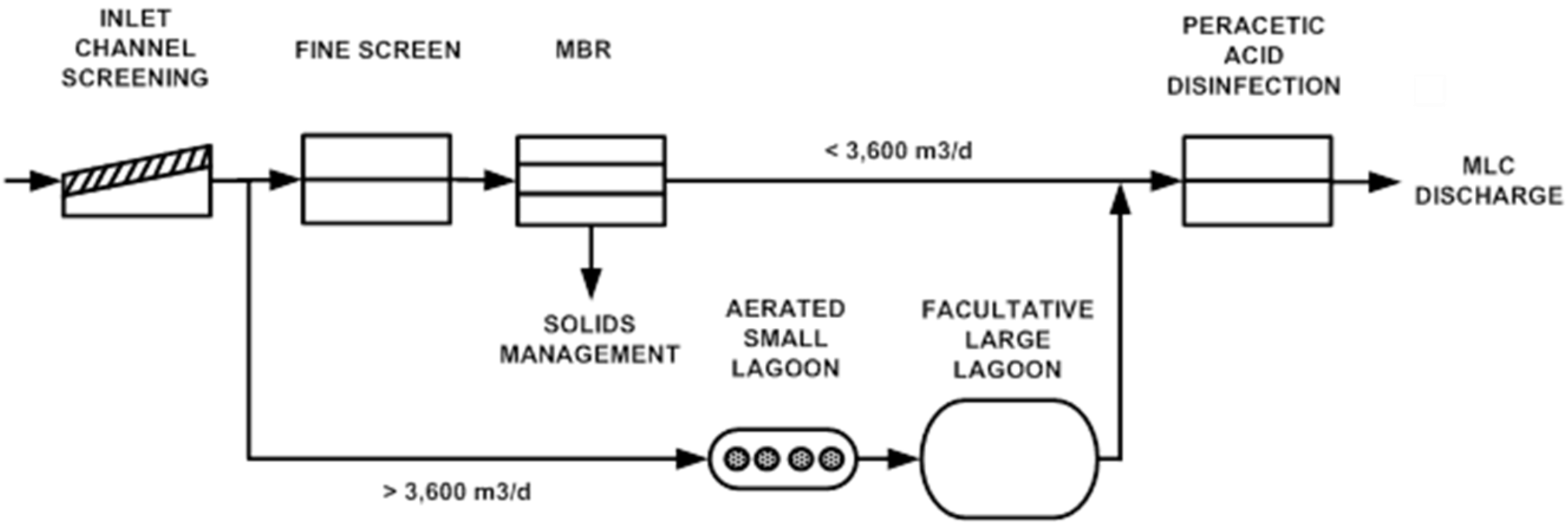




LAGOON OPTION 1B

LAGOON OPTION 1B




INLET
CHANNEL
SCREENING
FINE SCREEN
MBR
PERACETIC
ACID
DISINFECTION
< 3,600 m3/d
MLC
DISCHARGE
SOLIDS
MANAGEMENT
AERATED
SMALL
LAGOON
FACULTATIVE
LARGE
LAGOON
> 3,600 m3/d

OPTION 2

PRELIMINARY DRAWING

NOT TO BE USED FOR CONSTRUCTION

TETRA TECH

DOCUMENT CONTROL NUMBER
735-1671900100-GAD-J0007

DWG. NO.	REFERENCE DRAWINGS	DWG. NO.	REFERENCE DRAWINGS

REV. No.	REVISION DESCRIPTION	BY	DESIGN	CHECK	APPROVED	DATE
0	ISSUED FOR COST ESTIMATE	AO	LS	VB	LS	2016/11/25

SCALE: NONE		DATE
DESIGNED BY:	L.SAWCHYN	2016/11/08
DRAWN BY:	A.OZTURK	2016/11/08
CHECKED BY:	V.BENJAMIN	2016/11/08
APPROVED BY:	L.SAWCHYN	2016/11/08
COST APPROVAL		

VILLAGE OF CUMBERLAND

LIQUID WASTE MANAGEMENT PLAN
GENERAL ARRANGEMENT DRAWING
PROPOSED SITE PLAN
BASED ON OPTION 3.1

DRAWING NUMBER: 735-1671900100-GAD-J0007

REV: 0

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DETAIL SHEET

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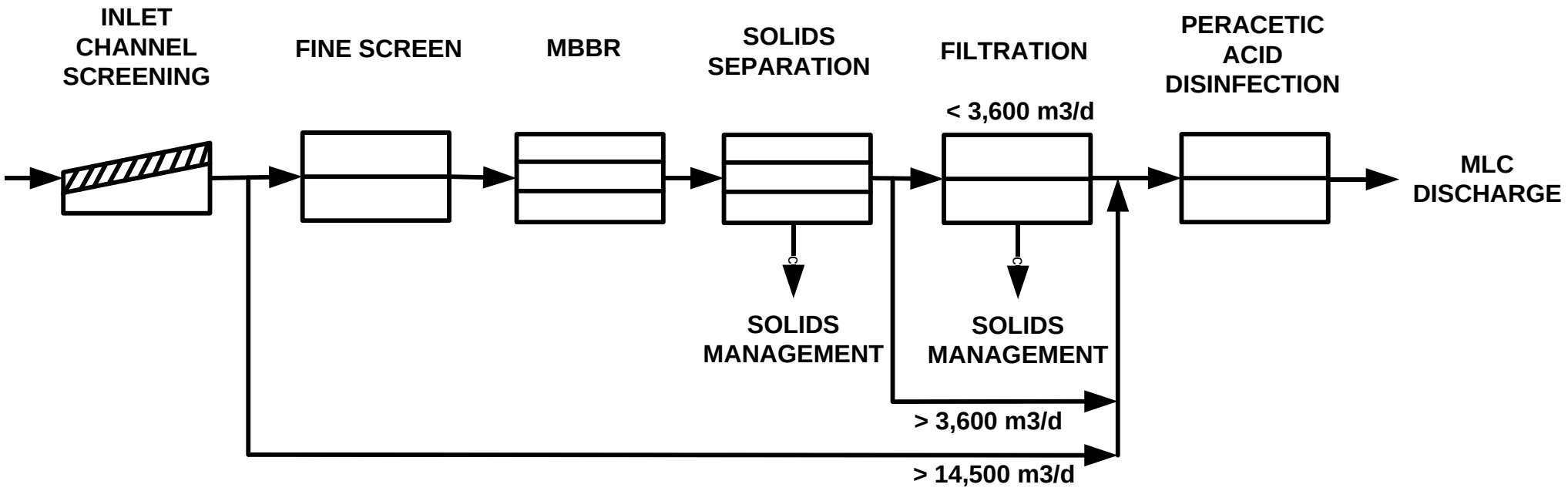
INLET CHANNEL SCREENING
FINE SCREEN
MBBR
SOLIDS SEPARATION
FILTRATION
< 3,600 m3/d
PERACETIC ACID DISINFECTION
MLC DISCHARGE
SOLIDS MANAGEMENT
SOLIDS MANAGEMENT
> 3,600 m3/d
> 14,500 m3/d

OPTION 3

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	Today	Phase 1	1A	1B	2	3
Description	Aerated Lagoons	Upgraded Lagoon to Permit	Upgraded Lagoon to MEP	Upgraded Lagoon to GEP	Base flow mechanical to GEP	Full flow mechanical to GEP
Population capacity	<4,000	5,000	7,000	7,000	7,000	7,000
Discharge Location	Maple Lake Creek	Maple Lake Creek	North Wetlands	Maple Lake Creek	Maple Lake Creek	Maple Lake Creek
Effluent Quality (BOD-TSS)	25-25 (winter) 50-50 (summer)	25-25	25-25	10-10	10-10	10-10
PAA Disinfection	None	<100CFU/100mL	<100CFU<100mL	<1CFU/100mL	<1CFU/100mL	<1CFU/100mL
Biosolids Withdrawal	Periodic dredging (last done 2009)	Periodic dredging + low vol. continuous	Periodic dredging + low vol. continuous	Periodic dredging + low vol. continuous	Continuous	Continuous
Operational Complexity	1	2-3	2-3	3	4	3-4
Energy use	Low	Moderate	Moderate	Moderate	High	Highest
CO2Footprint	Very Low	Low	Low	Low	High	Highest
Land Reclaim	No	No	No	No	No	Lagoons -4Ha

Option Cost Summary

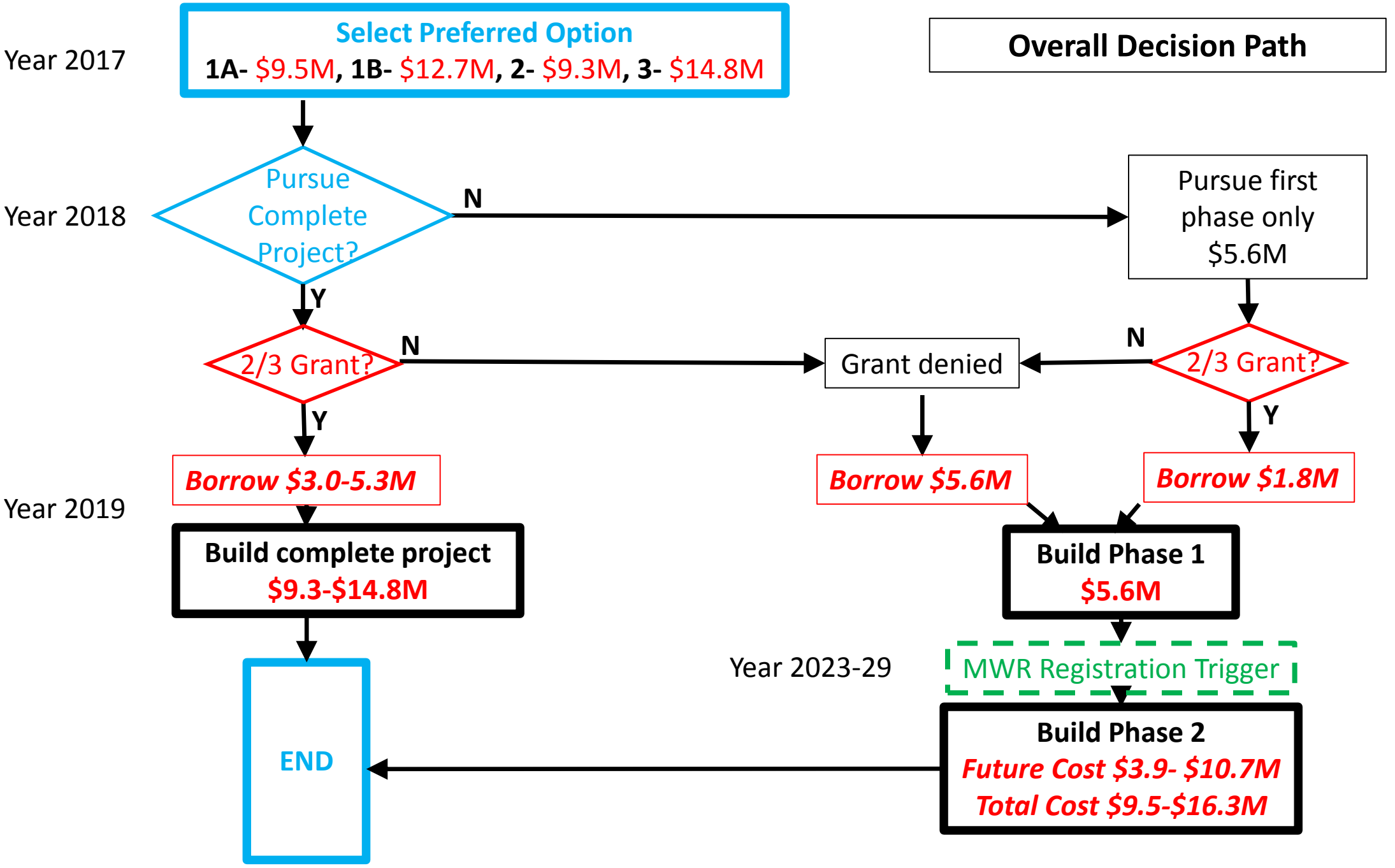
Cost Item	Phase 1	Option 1A	Option 1B	Option 2	Option3
As Complete Project	-	**$8.7M**	**$11.6**	**$9.3**	**$14.8M**
Phased - First phase	$5.6M	$5.6M	$5.6M	$5.6M	$5.6M
Second Phase	-	$3.9M	$7.1M	$5.1M	$9.2M
Total for Two Phase		**$9.5M**	**$12.7M**	**$10.7M**	**$16.8M**
Annual Operating Cost	$350k	$375k	$425k	$450k	$500k
Net Present Value of 20Yr of Operating Cost	$7M	$7.5M	$8.5M	$9M	$10M
Total NPV, Single Phase		**$16.3M**	**$20.1M**	**$18.3**	**$24.8M**
Total NPV, Two Phase		**$17M**	**$21.2**	**$19.7M**	**$26.8M**

Financial Limitations

1. Cumberland has $650k in Reserves
2. $500k of this is committed to projects
3. DCC is set at $9.4k per house, collected as houses are approved
4. Cumberland has a maximum borrowing capacity of $7.1M
5. There are regular grant funding opportunities
6. There are ***no guarantees*** of receiving grant funding
7. But Cumberland ***must*** make upgrades to meet Permit requirements

Financial Limitations

1. Any project greater than $7m must wait until reserves have built up and/or grant funding is received
2. Cumberland can say “yes” to a project of less than $7M
3. Cumberland would like to leave some borrowing capacity for other projects


Overall Decision Path
Year 2017
Select Preferred Option
1A- $9.5M, 1B- $12.7M, 2- $9.3M, 3- $14.8M
Year 2018
Pursue Complete Project?
N
Pursue first phase only $5.6M
Y
2/3 Grant?
N
Grant denied
N
2/3 Grant?
Y
Y
Borrow $3.0-5.3M
Borrow $5.6M
Borrow $1.8M
Year 2019
Build complete project $9.3-$14.8M
Build Phase 1 $5.6M
Year 2023-29
MWR Registration Trigger
END
Build Phase 2
Future Cost $3.9- $10.7M
Total Cost $9.5-$16.3M

Preliminary Tax Burden Calculation

Notes

- Tax calculations are for comparison purposes only,
- The Tax Burden calculation assumes borrowing for 20 years, at 4% interest, this cost is distributed among the existing 1500 properties in 2017
- 2023 costs are distributed amongst 1800 properties
- *Future replacement cost is not included*, but must considered in future rate structures

Preliminary Tax Burden Calculation

Scenario	Phase 1	Option 1A	Option 1B	Option 2	Option 3
First Phase in 2019, with 2/3 Grant	$325	-	-	-	-
Second Phase in 2023		$365	$524	$501	$755
Complete Project in 2019, 2/3 Grant		$397	$474	$468	$591
First Phase in 2019, No Grant	$508				
Second Phase in 2023		$518	$677	$654	$908

Evaluation…

- Discharge Option is set – Maple Lake Creek, directly or indirectly
- Treatment Option - Select your preference
- Phasing/implementation – give your preference.

Fall 2017 meeting schedule

- Nov 30 - **Wastewater Advisory Committee** (1-4pm) review feedback, formal Evaluations, finalise Recommendations.
- Dec 11 – present recommendations to Council

2018

- Determine Implementation Plan
  - Preference for phased or single project?
- Financing Plan
  - **Grants**
  - User fees
  - DCC’s
  - Borrowing
- Decision to proceed?

Thank You!