WELCOME

Public Information Centre #2
5 pm to 7 pm
Wednesday, February 5th 2014

The Town of Perth welcomes you to the second Public Information Center (PIC) about the capacity expansion of the Perth wastewater treatment system. Alternative solutions were presented at PIC #1, held October 29, 2013.

PLEASE SIGN IN

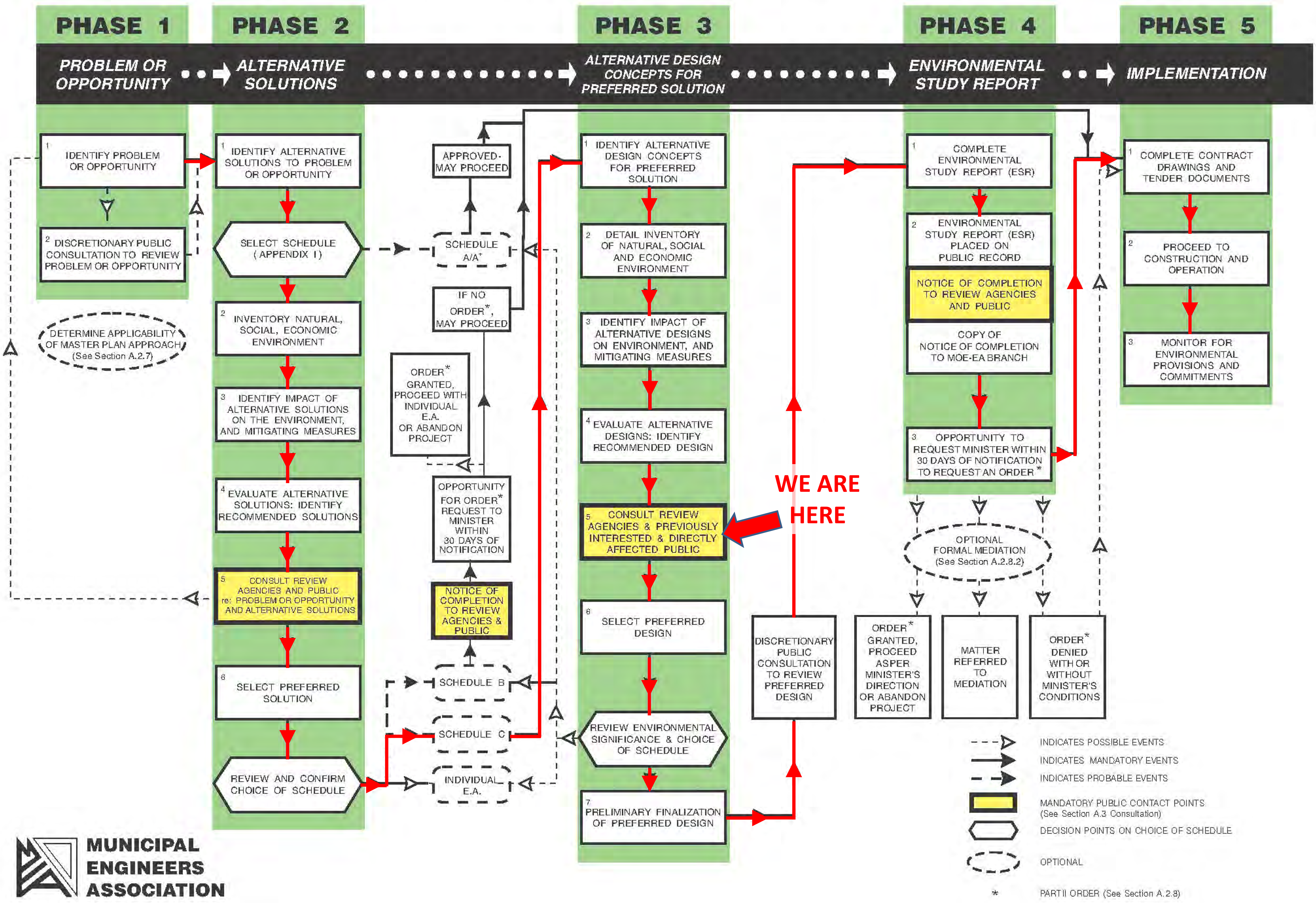
Review the materials and please provide your comments on the sheets available. Staff are available to answer your questions.

Problem Definition

The Corporation of the Town of Perth seeks to provide cost effective wastewater treatment capacity to serve a potential build out population for the year 2041. A Class 'C' Environmental Assessment has been undertaken to identify the preferred solution and design for the Town in accordance with the Municipal Class Environmental Assessment, 2011.

Municipal Class Environmental Assessment (MCEA)

NOTE: This flow chart is to be read in conjunction with Part A of the Municipal Class EA

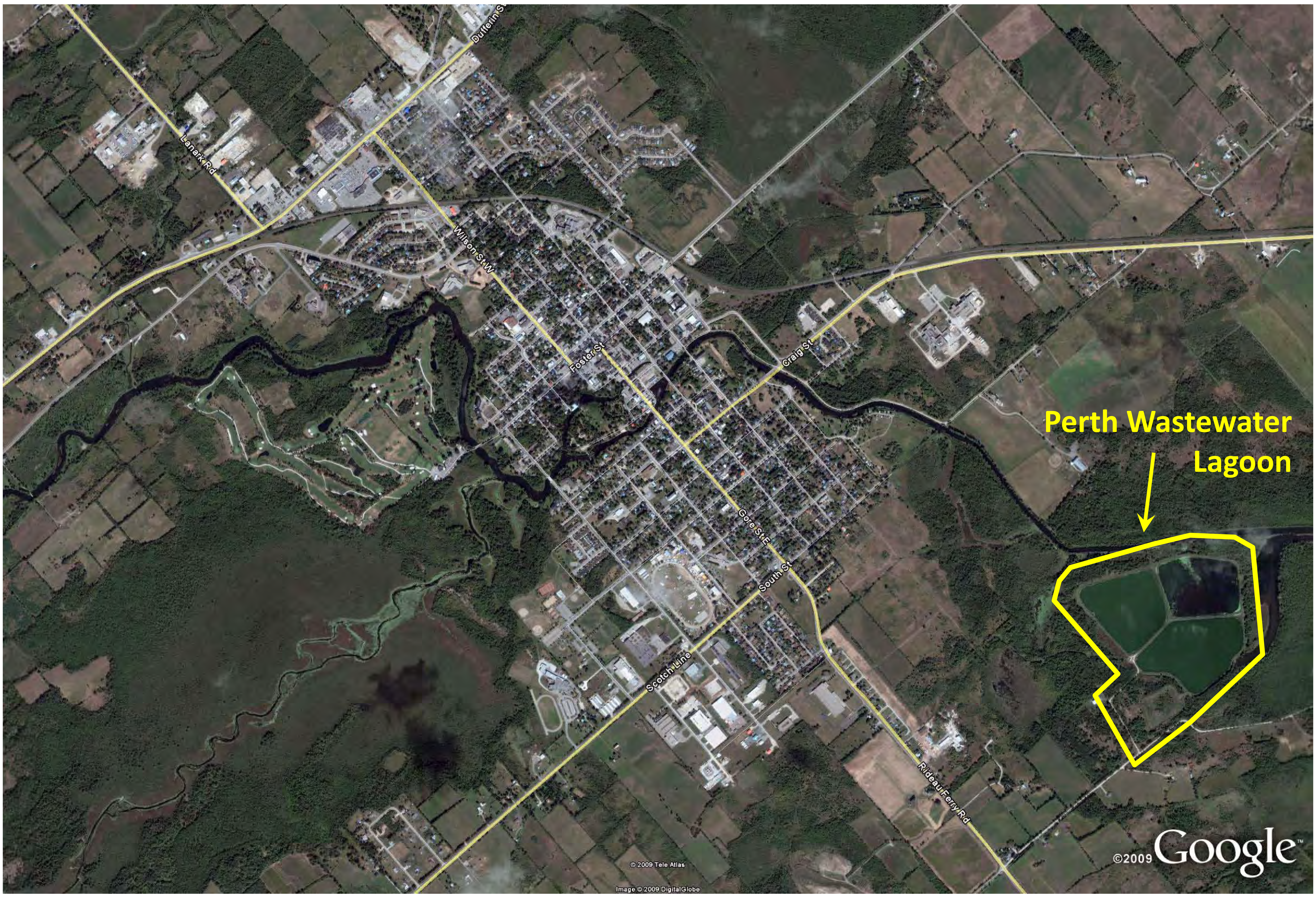


Class 'C' Environmental Assessment

The capacity expansion of the Perth wastewater treatment system is classified as a Schedule 'C' MCEA project. It is subject to the full Five Phase Process in which the problem is identified, alternative solutions are identified, a preferred solution is selected, preliminary preferred design is completed, and an Environmental Study Report (ESR) is completed to document the rationale, planning, design and consultation process.

Upon completion of the ESR, a Notice of Completion will be filed, followed by a 30-day public review & comment period, after which the Town may proceed with the design and construction of the project.

Study Area and Current Infrastructure



Wastewater Collection and Treatment

The Town's sanitary sewer system consists of approximately 42 km of sanitary sewers and two sewage pumping stations. The sewage is treated at a facultative sewage lagoon operated by the Town located at Wildlife Road.

The Perth sewage lagoon was designed in 1961 and is comprised of three stabilization cells and a vacant dry cell covering 80 acres. The Ministry of the Environment Certificate of Approval (C of A) allows an annual average daily sewage inflow of 7,718 m^3/day. The average discharge to the lagoon over the past three years (2011-2013) was 5,762 m^3/day (75% of maximum rated capacity). Currently, there are no issues with wastewater volumes being received at the lagoon and annual average C of A discharge parameters are being met.

Assimilative Capacity Study

An assimilative capacity study (ACS) for the Tay River at Perth was completed by Hutchinson Environmental Sciences Ltd. Loadings to the Tay River at Perth were assessed and limits for effluents parameters were recommended to maintain present water quality.

Water quality in the Tay River at Perth is good and it is considered a Policy 1 stream under MOE policy for management of water quality. Effluent limits were determined on the basis of:

- Flow of 2,093 L/sec for the Tay River
- Daily discharge of 8,418 m^3 corresponding to a population of 11,500
    - Average effluent flow of 97 L/sec
    - Available dilution in the river is 2,093/97 = 21.5X

Recommended Effluent Limits

Parameter	Current Effluent Limit	Suggested Effluent Limit
Total Phosphorus	1.0 mg/L	0.23 mg/L
$cBOD_5$	30 mg/L	20 mg/L
Total Ammonia	-	Summer: 2 mg/L Winter: 4 mg/L
Nitrate	-	53 mg/L

The limits presented are suggestions only. The MOE will review and set effluents limits when issuing any and all future Certificates of Approval for changes to the wastewater treatment system.

Population Growth Analysis

In December 2013, a growth analysis study was completed by Strategic Projections Inc. to re-evaluate the Town's growth potential to the year 2041. The analysis considered historical growth in Perth and in the rest of Lanark County, and projected growth in the surrounding areas. Other factors considered include supply and demand, population age, employment potential, proximity to other growth areas, property value, and development potential.

Three growth scenarios were presented as part of this analysis:

Population Growth Scenarios to 2041

Growth Scenario	Description	2041 Population Projection
Low Case	No population growth in next 3 decades.	5,840
Base Case	Mid-way point between Low and High Cases.	8,180
High Case	All lands available for development become fully developed and occupied.	10,500

Consistent with municipal Best Practices, the High Case scenario was used, consistent with the Town's Official Plan and lands recently annexed for future development.

Wastewater Flows

Wastewater flows come from the following sources:

Residential: Water that goes down the drain in your home. Sources include sinks, toilets, showers, dishwashers, washing machines, etc.

Industrial, Commercial, Institutional (ICI): Process and cooling water from industries, and commercial buildings and institutions such as shopping centres, offices, stores, hotels, schools, hospitals, etc.

Inflow & Infiltration (I/I): Water that seeps into the sewer system through joints, cracks, manholes and service connections. Water sources include groundwater (infiltration) and storm water (inflow) through runoff, ponding, downspouts, sump pump connections, snow melt, etc.

In the past, Perth has experienced excessive I/I to the sanitary system. Since 2007, a wet weather flow reduction program has been in place, including sealing and repair work of sewers, elimination of combined sewers and elevating manholes. These efforts have successfully reduced average inflows to the lagoon and further improvements are expected.

Wastewater Flows for Perth Lagoon (2006 – 2013)

	2006	2009	2011	2012*	2013
Capacity as per C of A (m^3/day)	7,718	7,718	7,718	7,718	7,718
Average Lagoon Inflows (m^3/day)	7,278	6,219	6,264	5,042	5,981
Percentage of Lagoon Capacity	94%	81%	81%	65%	77%

*Note: 2012 was a drought year

New developments are expected to have less I/I as new sewer systems have better sealing mechanisms than older systems.

Future Wastewater Flows

Design flows for a future population of 10,500 by 2041 were calculated based on flows from existing development and Best Practices for new development areas. It was assumed that 25% of flow from new development is from new industrial, commercial, and institutional development.

Wastewater Flow Components

Component	Flow (l/c/d)
Existing Development	
Residential + ICI + I/I	987
New Development	
Residential	350
ICI	115
Inflow & Infiltration	90

Based on these flow components, future wastewater flows were generated for future build out scenarios. Flows from existing development was assumed to stay constant. This approach is conservative as no efficiency gain or reduction of I/I in older areas was assumed.

Future Wastewater Flow Scenarios

	Year	Population	Average Flow (l/c/d)	Average Flow (m^3/d)	Annual Volume (m^3)
Existing 3-Yr Avg.	2011 - 2013	5,840	987	5,762	2,103,250
Phase I	2030	8,170	864	7,055	2,575,250
Phase II	2041	10,500	795	8,349	3,047,250

Alternative Solutions

Alternative solutions and evaluation were presented at PIC #1 on October 29th 2013. The alternatives considered are listed below.

1. **Do Nothing:** Required for evaluation under the MCEA.
2. **Biomechanical WWTP:** Full scale biomechanical WWTP including mechanical, physical and biological processes.
3. **Membrane Bio Reactor (MBR):** A suspended growth biological reactor integrated with a microfiltration or ultra filtration membrane system
4. **Sequencing Batch Reactors (SBR):** Activated sludge process, similar to the biomechanical WWTP.
5. **Additional Lagoon Cell:** New cell to establish more capacity.
6. **Lagoon Aeration:** Additional oxygen to supplement photosynthetic activity and natural surface re-aeration.
7. **Rotating Biological Contactor (RBC):** Fixed-film process used to provide secondary treatment.
8. **New Hamburg Process:** Intermittent sand filter system.
9. **Peatland /Wetland:** Constructed wetland located downstream of lagoon.
10. **Submerged Attached Growth Reactor (SAGR):** Post lagoon biological filter that uses submerged attached growth medium to polish the effluent and reduce the required residence time in the lagoon.

Evaluation Matrix

	Criteria	Alt 1 Do Nothing	Alt 2 Biomechanical WWTP	Alt 3 MBR	Alt 4 SBR	Alt 5 Lagoon Cell Addition	Alt 6 Lagoon Aeration	Alt 7 RBC	Alt 8 New Hamburg	Alt 9 Peatland/ Wetland	Alt 10 SAGR
Socio-Economic (20%)	Land Use Disruption	Grey	Red	Red	Red	Yellow	Green	Green	Green	Red	Green
	Property Acquisition	Grey	Red	Red	Red	Yellow	Green	Green	Green	Yellow	Green
	Archeological / Natural Heritage Impacts	Grey	Green	Green	Green	Green	Green	Green	Green	Green	Green
	First Nations Impacts	Grey	Green	Green	Green	Green	Green	Green	Green	Green	Green
Natural Env. (20%)	Surface Water and Discharge Quality	Grey	Green	Green	Green	Yellow	Yellow	Yellow	Yellow	Yellow	Green
	Aquatic / Terrestrial Habitat Impacts	Grey	Yellow	Yellow	Yellow	Yellow	Green	Yellow	Yellow	Yellow	Green
	Geotechnical Conditions	Grey	Yellow	Yellow	Yellow	Yellow	Green	Yellow	Yellow	Yellow	Green
	Odour and visual	Grey	Yellow	Yellow	Yellow	Yellow	Green	Green	Green	Green	Green
Costs (30%)	Capital Cost	Grey	Red	Red	Yellow	Green	Green	Yellow	Green	Green	Green
	O&M Costs	Grey	Red	Red	Yellow	Green	Yellow	Yellow	Green	Green	Green
	Life Cycle Cost	Grey	Red	Red	Yellow	Green	Yellow	Yellow	Green	Green	Green
	Potential for Partnership Funding	Grey	Red	Red	Red	Red	Red	Red	Red	Red	Green
Technical (30%)	Operational Ease	Grey	Red	Red	Red	Green	Green	Yellow	Green	Green	Green
	Optimization of Existing System	Grey	Red	Red	Red	Green	Green	Red	Green	Green	Green
	Ease of Construction	Grey	Red	Red	Red	Red	Yellow	Yellow	Yellow	Yellow	Green
	Permits and Approvals	Grey	Red	Red	Red	Yellow	Green	Red	Red	Yellow	Yellow

Red: **Poor Ranking:** high socio-economic/environmental impact, high cost, technical difficulties leading to excessive cost or requiring special services

Yellow: **Fair Ranking**: Some socio-economic/environmental impacts (non-detrimental), mid-range cost, some technical challenges

Green: **Good Ranking**: Very minor or no socio-economic/ environmental impacts, low cost, few technical challenges

Preferred Solution:
Submerged Attached Growth Reactor (SAGR)

The SAGR is a patented process designed to provide nitrification (ammonia removal) in cold to moderate climates. The SAGR is a clean aggregate media bed with evenly distributed wastewater flow across the width of the cell, and a horizontal collection chamber at the back end of the system. Linear aeration throughout the floor of the SAGR provides aerobic conditions that are required for nitrification. The gravel bed is covered with a layer of peat or mulch to prevent freezing.

The technology has a small footprint and can act as an additional treatment step to the existing lagoon with the objective of ammonia reduction, fecal and total coliform reduction as well as CBOD/TSS polishing. This system would allow for increased hydraulic flows and influent loads.

Benefits of the SAGR include:

- Low socio-economic and environmental impacts,
- No increase to site footprint (no additional lands required),
- No change in land use required,
- Low life cycle costs,
- Potential for FCM partnership funding,
- Easy to operate and construct, and
- Optimizes existing lagoon system.

SAGR Field Test

In 2012, the Town received support from the FCM Green Fund to conduct a one year Field Test for a SAGR. It included 2 parallel SAGR trains operating under different design conditions. Train 1 was designed with conventional SAGR design principles and Train 2 was undersized by approximately 40%. It was a closed loop system where the effluent from the SAGR was discharged back to the lagoon.

Field Test Findings:

1. Achieved and surpassed cBOD/TSS objectives.
2. Train 1 met TAN objective less than two weeks after start-up.
3. Not designed as a phosphorus removal technology. Additional process steps or equipment may be required to meet effluent phosphorus limits.
4. Significant E.coli and total coliform reductions observed, but removal levels were not consistently below effluent discharge requirements. Full scale system design should consider supplementary disinfection equipment.
5. Power failure can cause a lack of dissolved oxygen within SAGR beds and a spike in effluent TKN, TAN and cBOD5, but the system recovers quickly once power is restored.

Design Alternatives

Design alternatives for two (2) locations are proposed for the SAGR system. Implementation of the system is proposed in two phases.

Option A: Construct SAGR beds in Dry Cell (Cell 4)

Location: Southwest lagoon cell (Cell 4), currently vacant (dry cell)

Dimensions: 7 SAGR beds, 24m x 75m x 2.5m

Process: Wastewater flows through Cells 1-3, then pumped to the SAGR beds, and discharged by gravity to the existing outfall. Lagoon aeration to be added in Phase II.

Option B: Construct SAGR beds in Wet Cell (Cell 3)

Location: Northeast cell (Cell 3), currently in use (wet)

Dimensions : 20 SAGR beds, 18m x 87.5m x 1.1m

Process: Wastewater flows through Cells 1 & 2 (with lagoon aeration), then proceeds by gravity to SAGR, and discharged by gravity to the existing outfall.

Option A

Option B

Comparison of Design Alternatives

		Option A (Cell 4)	Option B (Cell 3)

Advantages		• Greater bed depth
		  • Higher aeration efficiency
		  • Fewer beds required
		• Retention time in existing lagoons is maintained
		• Minimal impact to lagoon operation during construction
			• Within existing lagoon Cell 3
			• No change to footprint of existing lagoon required
			• No pumps required, gravity flow

Disadvantages		• Low lift pump station required to move water to the SAGR beds (not entirely gravity flow system)
		• Outside of existing lagoon footprint
			• Shallow beds required
			  • Increased power for aerators
			  • Higher gravel volume
			  • More complex distribution piping and valves
			• Reduces treatment volume of lagoon system (higher TSS and BOD loading to SAGR)
			• Unknown site conditions (i.e. sludge removal and existing clay liner condition)

Costs	Capital	Phase I: $2,443,000 Phase II: $1,558,000 TOTAL: $4,001,000	Phase I: $5,775,000 Phase II: $1,100,000 TOTAL: $6,875,000
	O&M	Phase I: $58,845 Phase II: $120,494	Phase I: $135,592 Phase II: $177,352

Phasing

A phasing approach is suggested for the SAGR system. Phase timing can be adjusted based on actual population growth and recorded flows. The Town should closely monitor average flows to gauge when to begin Phase II construction.

	Description	Timing
Phase I	*Option A:* Construct 6 SAGR beds in Cell 4 *Option B:* Construct 16 SAGR beds in Cell 3 Add aeration to Cells 1 & 2	Upon completion of EA (Spring 2014)
Phase II	*Option A:* Construct 1 additional SAGR bed in Cell 4 (total of 7 beds) Add aeration to Cells 1 & 2 *Option B:* Construct 4 additional SAGR bed in Cell 3 (total of 20 beds) Increase aeration blower speed	When flows reach 7,055 m^3/d. Estimated to be year 2030 (to be determined based on actual population growth)

Next Steps

No.	Task	Timeline
1	Public Comment Incorporation and ESR Finalization	February 2014
2	Notice of Completion & ESR Filing	March 2014
3	30-day Review & Comment Period	March-April 2014
4	Project Implementation	May 2014

Thank you for attending!
Please fill in a comment sheet.