Appendix A

Projected Future Sewage Flows Technical Memorandum

Town of Hanover

Hanover Wastewater Treatment Plant (HWWTP) Upgrades Schedule C Class Environmental Assessment

Technical Memorandum
Projected Future Sewage Flows

FINAL

May 2023

Ainley GROUP CONSULTING ENGINEERS PLANNERS

Hanover WWTP Upgrades
Schedule C Class Environmental Assessment

Technical Memorandum
Projected Future Sewage Flows

Project No. 122059

Prepared for:
The Town of Hanover

Prepared By:

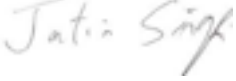


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1.0 Introduction

This Technical Memorandum has been prepared in support of the Town of Hanover Schedule C Class Environmental Assessment (Class EA) as 85% of rated capacity at the Hanover Wastewater Treatment Plant (HWWTP) has been reached, with approximately 34% of the wastewater flow received coming from Exceldor Foods Inc. The Town is anticipating steady growth within the urban area over the next 30 years and is also planning to pump leachate from the Hanover/Walkerton Landfill to HWWTP.

This Technical Memorandum outlines historical wastewater flows and anticipated future flows in the Town of Hanover. Based on the Municipal Servicing Needs Assessment completed in 2021, there are four (4) special policy areas (SPAs) within the Town's boundaries, and four (4) potential expansion areas (PEAs) outside the Town's boundaries which are also considered in this memorandum.

The Technical Memorandum has incorporated the conclusions and recommendations from the Municipal Servicing Needs Assessment (GM Blueplan Engineering, 2021) and the Hanover-Walkerton Waste Disposal Site Leachate Management Review (Cobide Engineering, Dec 2021).

2.0 Objectives

The objectives of this Technical Memorandum are as follows:

- Review historical findings from previous planning documentation,
- Identify wastewater flows from existing development in Hanover and anticipated wastewater flow from Hanover/Walkerton Landfill site over the study period of 30 years (2052),
- Identify wastewater flow received from Exceldor Food Inc.,
- Establish growth potential for the Town based on the Official Plan (OP) boundary and current housing density targets,
- Project future wastewater flows from new development within or outside of the OP boundary,
- Assess the impact of future wastewater flows on the capacity of the HWWTP.

3.0 Historical Documents Overview

3.1 Official Plan Amendment #11

The Official Plan Amendment #11(OPA#11) adopted by Grey County in October 2022 is an extensive update to the County's current official plan regarding growth projections, which has been compared to the 2021 census data and acknowledged as the most accurate growth projection document. The amendment includes population, employment and household growth across a 25-year planning horizon to 2046. Table 1 summarizes various projections in 5-year intervals from 2021 to 2046.

Table 1 – Population, Employment and Household Growth Projections

Year	2021	2026	2031	2036	2041	2046	Growth
Population	8,450[1]	9,180	9,870	10,540	11,190	11,870	3,420
Employment	5,120	5,410	5,690	5,970	6,280	6,590	1,470
Household	3,650	4,060	4,420	4,740	5,030	5,350	1,700

[1] 8,450 stated in OPA#11 is different from 2021 Census of Population (7,967). In this report, the growth projection (3,420) is adopted from OPA#11 to project forward from the actual 2021 census population.

This TM projects future growth in the next 30 years to 2052, therefore, evaluation needs to be extended for an additional 6 years, which will be discussed in Section 4.

3.2 2021 Municipal Servicing Needs Assessment

In 2021, the Town of Hanover initiated Municipal Servicing Needs Assessment to determine planning needs for water and wastewater servicing from 2021 to 2046, including four SPAs within the current municipal boundary and four PEAs beyond the current municipal boundary. This assessment was developed by Meridian Planning Consultants and GM BluePlan. The 2021 assessment is based on the Town of Hanover appeal of County Official Plan.

3.2.1 Special Policy Areas

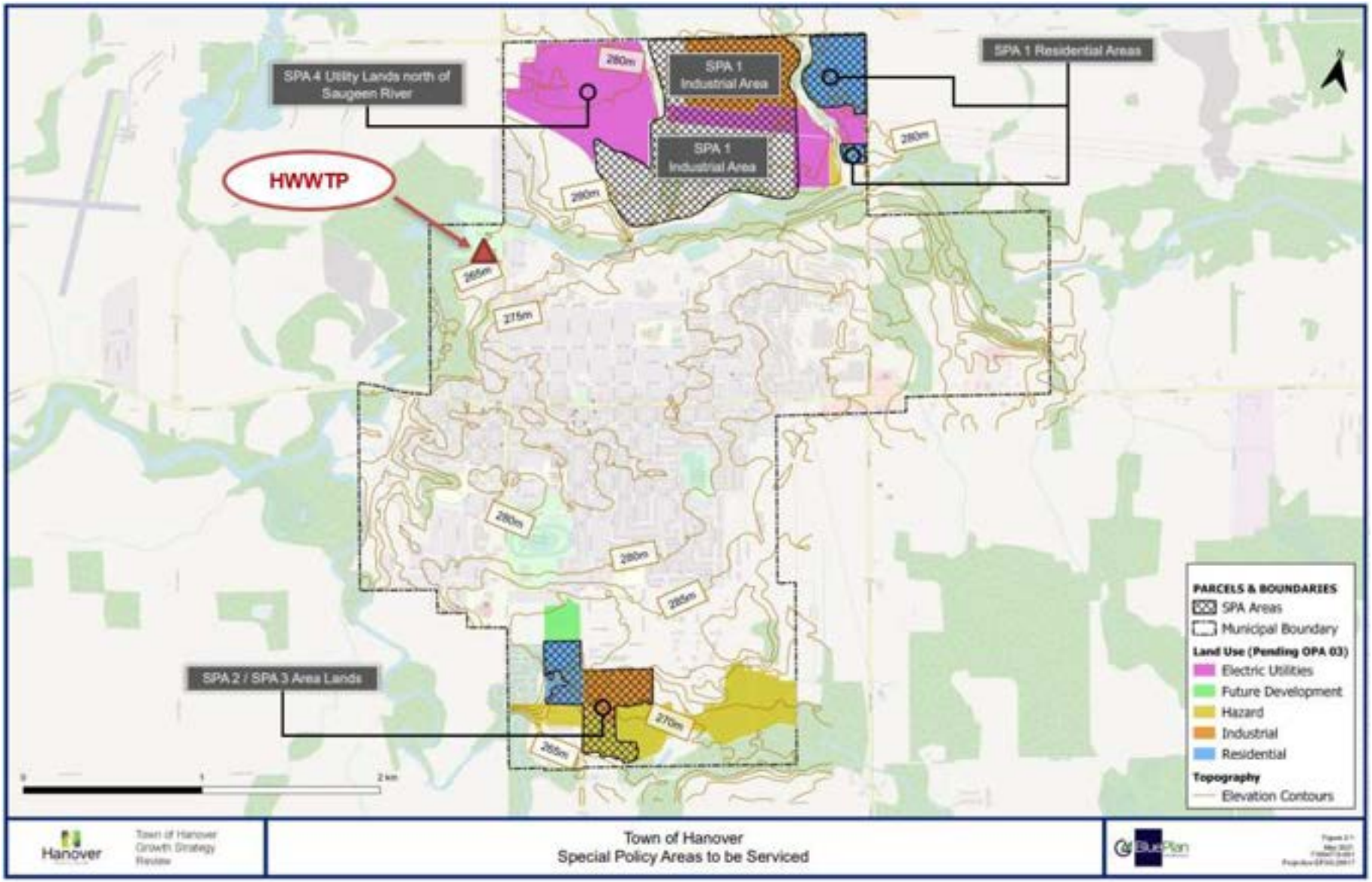
The 2016 Town's Official Plan stated that, to accommodate the long-term needs of certain land uses, a comprehensive review in 2011 determined four areas within the Town's boundary as designated Future Development areas. A Town-initiated amendment to the OP placed those four future development areas within four Special Policy Area designations.

Based on the Municipal Servicing Needs Assessment – Special Policy Areas completed by GM BluePlan, the designated future developable lands for industrial and residential uses within Special Policy Areas (SPAs) were sized and summarized in Table 2.

Table 2 – Summary of Special Policy Areas

	Approx. Area by Land Use (ha)	
	Industrial	Residential
SPA 1	83	14.3
SPA 2 and SPA 3	10.1	7.3
SPA 4	Designated Electric Utilities lands only as hydro electric transmission. Not developable.	

Locations and approximate land uses of four SPAs which are considered as future development lands within in the Town's boundary are shown in Figure 1.

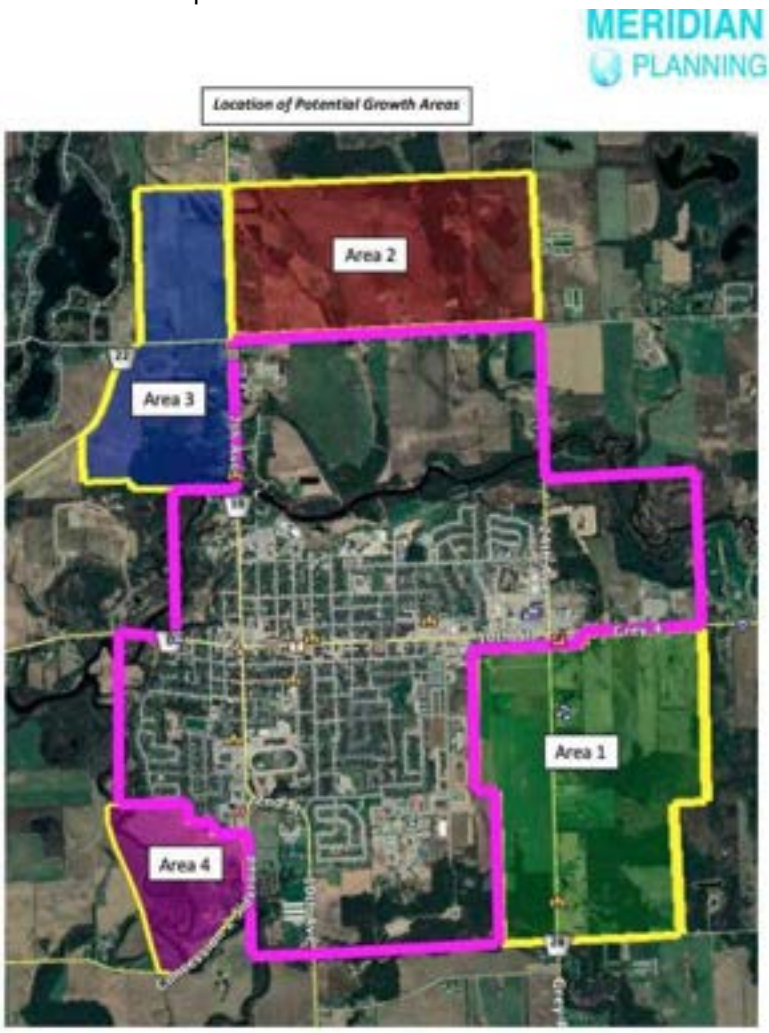


*Map from 2021 Municipal Servicing Needs Assessment

Figure 1 – Special Policy Area Locations

3.2.2 Potential Expansion Areas

The Potential Growth Areas outside of the current Hanover Boundary memorandum completed by Meridian Planning Consultants identified that developable lands within Town's boundary is not sufficient to accommodate growth to 2046. Therefore, lands outside of the current boundary need to be considered. Lands on North, Northwest, West and East of the Town of Hanover were reviewed as Potential Expansion Areas (PEAs) and as shown in Figure 2. At this point, the Town has not decided which area where development will proceed first. And also, County of Grey and Bruce County have no development plans yet. PEAs are lands for future development consideration.



*Map from Meridian Planning Memo

Figure 2 – Potential Expansion Area Locations

The total size of each Potential Expansion Area (PEA) is summarized in Table 3 below.

Table 3 – Summary of Potential Expansion Areas

Description	County	Total Land Area (ha)
PEA 1	West Grey County	277
PEA 2	West Grey County	209
PEA 3	Bruce County	150
PEA 4	Bruce County	68

The information for both SPAs and PEAs is from the 2021 Municipal Servicing Needs Assessment, which is slightly different than the map that Ainley developed based on property lines in Town's or Counties' zoning map. This TM is developed based on Ainley's zoning map as shown in Figure 6 in section 5.3.

3.3 Inflow and Infiltration

Over the last several years, the wastewater flows received at the HWWTP have exceeded the water supply flows in the Town, indicating infiltration and inflow (I/I) contribution to the sanitary sewers. In order to quantify and locate I/I sources within the Town's collection system, the Town hired Ainley Group in 2019 to conduct an I/I study. The study took place over an eight-month period from February 2020 to early of November 2020 in order to capture sufficient dry and wet weather flows. That study found that significant infiltration is generated within the southern (20-30 L/s) and north east (13-22 L/s) collection system of the Town. It is our understanding that the Town has initiated the rehabilitation of sewers and manholes to reduce I/I in the collection system. At present, the impact of the rehabilitation work on the flows at the plant is unknown.

4.0 Population Projection to 2052

The average population growth per year is calculated as 137 people based on total growth of 3,420 population over a 25-year period in OPA#11. This memorandum carries the assumed population split throughout for the purpose of calculating per person flow rates etc. While a direct count for projected 2052 population would be ideal for calculations within the report, this information is currently unavailable. The OPA#11 provides total projected population, employment, and households growth within Town of Hanover at the end of 2046. In addition, the memorandum projects future growth to the year 2052.

Growth between 2046 and 2052 is estimated on the basis of an additional 137 persons and 59 jobs per year. The detailed growth numbers in population, employment and household in 2021, 2046 and 2052 are provided in Table 4.

Table 4 – Growth Details in Town of Hanover

Description	2021	2046	2052	Total Growth
Population	7,967	11,387	12,209	4,242
Employment (Jobs)	5,120	6,590	6,944	1,824
Households	3,650	5,350	5,758	2,180

The year-over-year population, jobs, and future household projections described are shown graphically in Figure 3.

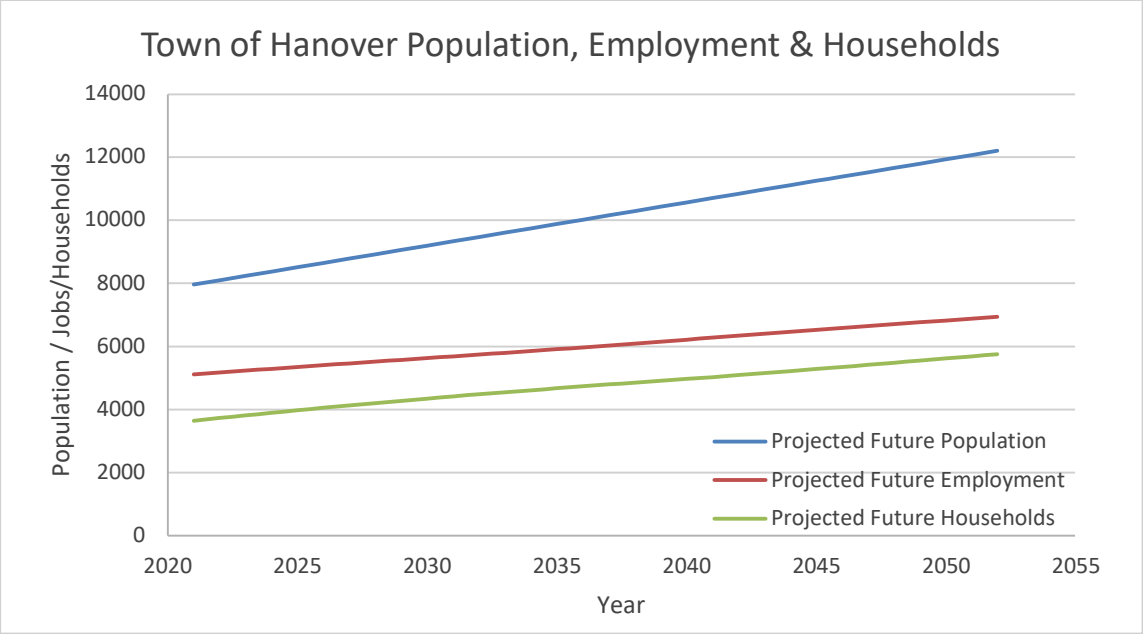


Figure 3 – Population, Employment and Household Projections in Town of Hanover

5.0 Wastewater Flow Design Basis

5.1 Flows from Existing Service Area in Town of Hanover

There is no influent flowmeter at the HWWTP and flows are recorded from the effluent flow meter (parshall flume). Instantaneous flows are not measured at the plant. The flow trends at the HWWTP were reviewed over the 2017-2022 time period. Over the 6-year time period the wastewater treatment plant has experienced an average day flow (ADF) of 5,374.7 m^3/d with a corresponding average per capita flow rate of approximately 438 L/cap/day (34% contribution is from Exceldor foods as noted in Table 14). The observed average day flow rate is on the high-end of expected average day flow rates. The 2008 MOE Design Guideline for Sewage Works recommends an average residential flow per capita of 225-450 L/c/d, with 225-350 L/c/d typically used by municipalities in Southern Ontario. The average day flow rate varied significantly over the time period, a summary of the flow data for this period is presented in Table 5. Population data used within the table is based on the information from the OPA#11.

Table 5 – Hanover Historical Wastewater Flow Data Summary

Year	Population	Jobs	ADF (m^3/d)	Peak Day Flow (m^3/d) [2]
2017	-	-	5,802.7	10,578.0
2018	-	-	5,619.0	17,541.0
2019	-	-	5,296.6	11,375.0
2020	-	-	5,055.6	11,962.0
2021	7,967	5,120	5,185.9	13,963.0
2022	8,104[1]	5,178[1]	5,288.7	10,294.0
Average	**-**	**-**	**5,374.7**	**12,618.8**

[1] Projected number.
[2] Maximum flow recorded during any month of the year.

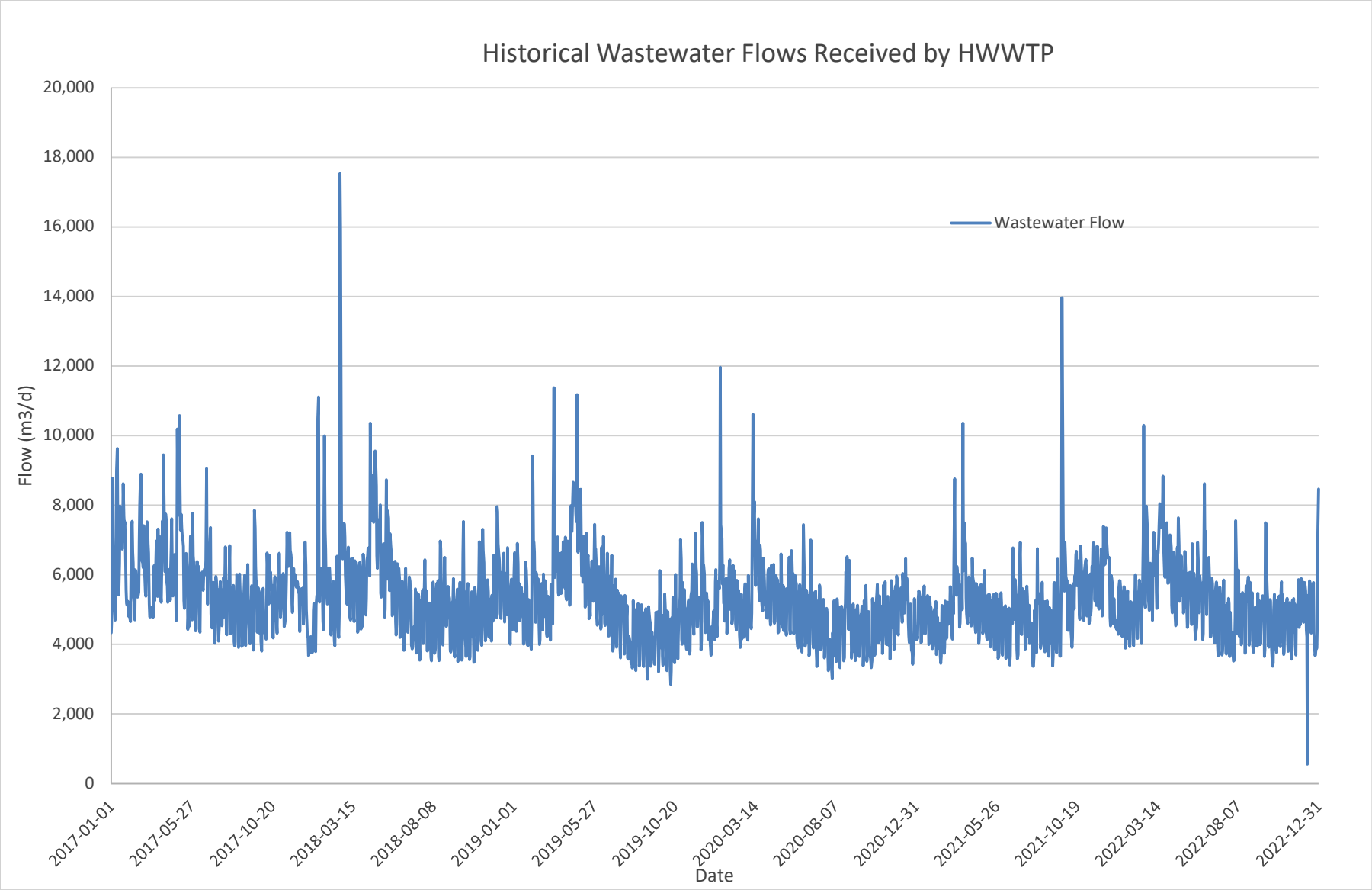


Figure 4 – Hanover Wastewater Flow Trend (2017-2022)

The daily flow data to the HWWTP over the 2017-2022 time period is presented in Figure 4. The wastewater data show a consistent trend of elevated flows between February and May during the spring freshet conditions.

In order to clearly show the trend, a plot of the aggregated monthly averages over the time period is presented in Figure 5.

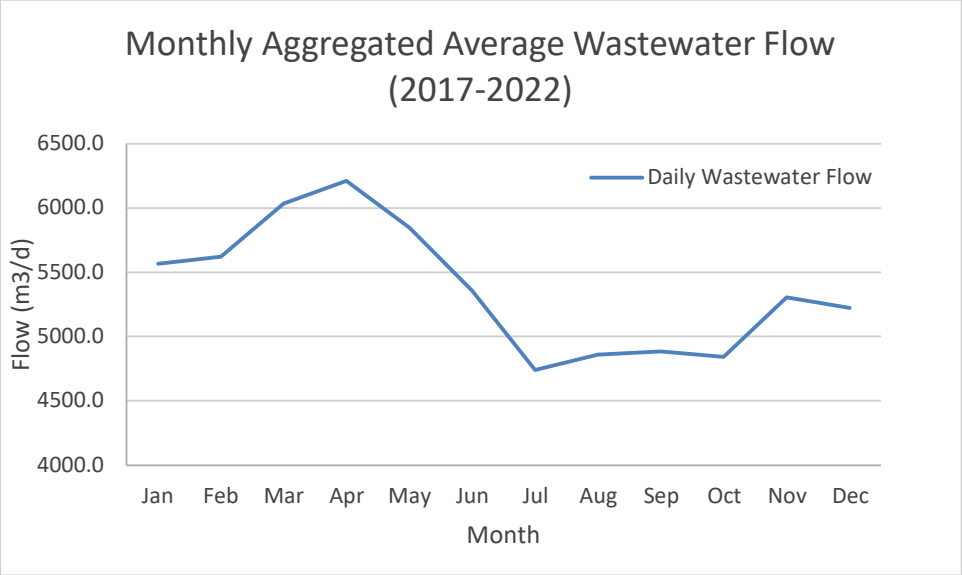


Figure 5 – Aggregated Monthly Average Flow Trends

From Figure 5, it can be seen that monthly average day flows between March and May are higher than flows in other months.

5.2 Design Assumptions

For the purpose of evaluating wastewater flow for future residential areas, the density assumptions provided in 2021 Municipal Servicing Needs Assessment are applied and listed in the following Table 6:

Table 6 – Density Assumption

Description	Rate
Resident Density (units/ha)	25
Persons per Unit (PPU)	3
Job Density (Jobs/ha)	12

Table 7 outlines the design assumptions used to generate the estimated average daily flow and peak day flow for new residential, institutional, commercial and industrial development as well as inflow and infiltration from development in Hanover.

Table 7 – Design Criteria

Description	Rate
Residential Flow[1]	350 L/c/d
Industrial Flow[2]	35 m^3/ha/d

Description	Rate
Commercial Flow[3]	28 m^3/ha/d
Industrial, Commercial and Institutional (ICI) Flow[4]	31.5 m^3/ha/d
Average Inflow and Infiltration (I&I)[5]	0.1 L/ha/s
Peak I&I[5]	0.21 L/ha/s
ICI Peaking Factor (PF)[2]	2.6
Residential PF[6]	2.9

[1] 2008 MOE Design Guideline for Sewage Works recommend an average residential flow per capita of 225-450 L/c/d, with 225-350 L/c/d typically used by municipalities in Southern Ontario.
[2] Based on 1985 MOE Guideline for the Design of Sanitary Sewage Systems. The 2008 MOE Guidelines do not provide typical value for these parameters as they can vary significantly. The 1985 Guideline do provide values that can be used and these have been applied to the new development in Hanover.
[3] Based on 2008 MOE Design Guideline for Sewage Works, a minimum allowance of 28 m^3/ha/d should be used in the absence of reliable flow data.
[4] Average value of industrial flow and commercial flow.
[5] Based on a recent development application submitted to the Town.
[6] Based on 2008 MOE Design Guidelines for Sewage Works Harmon Formula.

The volume of wastewater generation from new development areas and Hanover/Walkerton Landfill Site (HWLS), presented in the following sections, are calculated on an area-by-area basis using the per capita flow assumptions established herein.

Harmon PF of 2.9 for residential is calculated based on the total population of 12,209, which will be applied to further peak flow calculations.

5.3 Build-out of Special Policy Areas

The build-out of the Town's SPAs is defined as complete development of all available parcels within the Town's boundary to serve the long-term needs of Hanover.

SPAs are designated in the Town's Official Plan (OP), and further defined in the 2021 Municipal Servicing Needs Assessment. These areas were confirmed with the Town of Hanover and are illustrated in Figure 6. Also based on discussions with the Town of Hanover, the assumed density of residential development is 25 units/hectare with 3 persons per unit, which is consistent with what applied in the previous assessment for future growth estimation. The 2021 assessment defines the land uses and density of development within four SPAs (note that SPA 4 is Utility corridor and considered as non-developable) as shown in Table 8.

Table 8 – Density Assumptions for SPAs in 2021 Municipal Servicing Needs Assessment

Land Uses	Description	SPA 1	SPA 2 and 3
Industrial	Target Job Density (Jobs/ha)	12	12
	Areas (ha)	83	10.1
	Total Job Growth	1,000	120
Residential	Density (unit/ha)	25	25
	PPU	3	3
	Areas (ha)	14.3	7.3
	Population	1,070	550

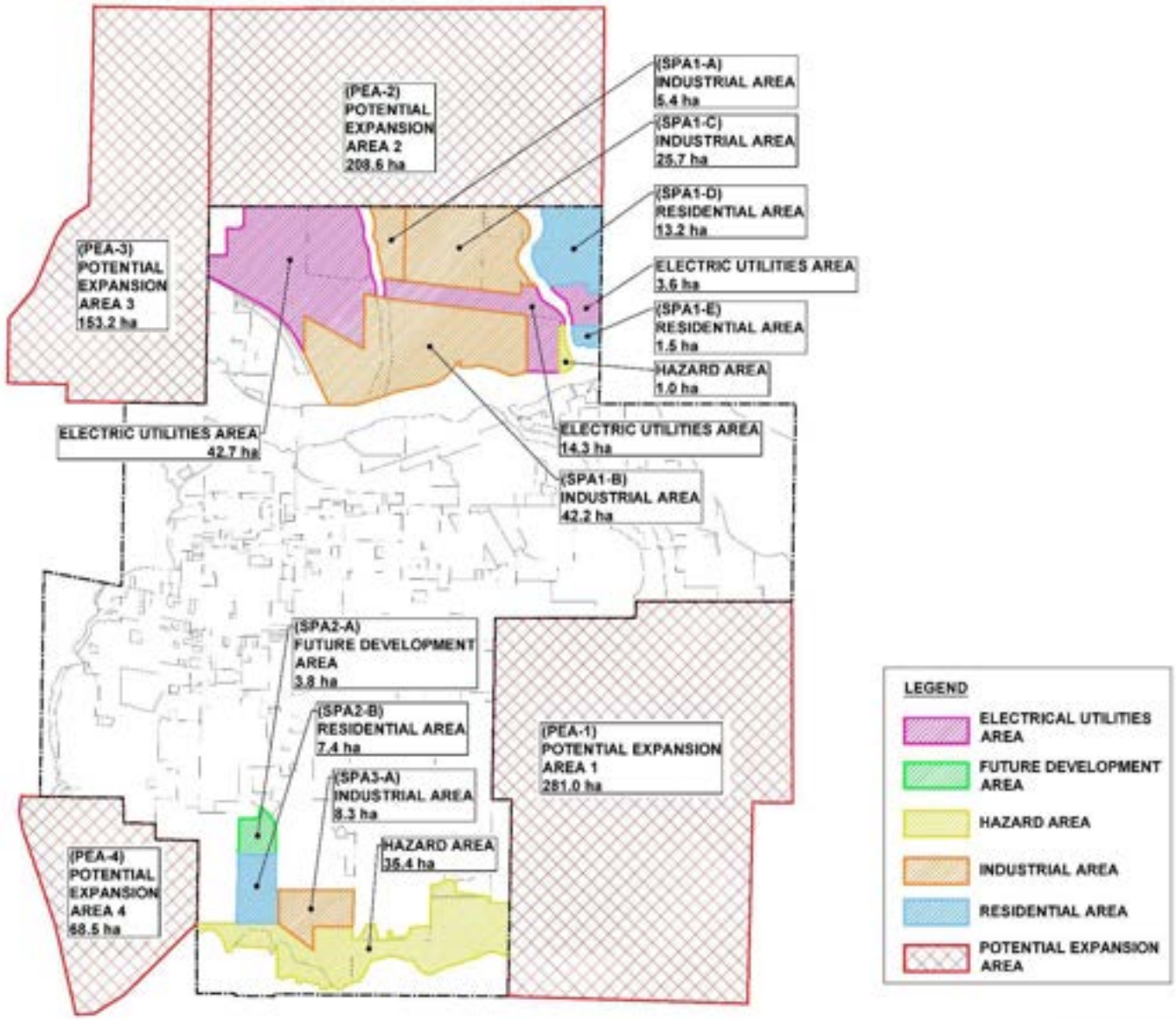


Figure 6 – Hanover Planned Development and Potential Development Areas

Equivalent total population and employment that three developable SPAs can infill are determined by population and job density assumptions. Flow contributions from institutional/commercial/industrial growth areas are calculated based on the design criteria provided in Table 7 and Table 8. The growth areas considered within the analysis are listed in Table 9 and are reflected in Figure 6.

Residential ADF estimates are calculated on the following basis:

$$Residential\ ADF = Area * Population * Per\ Capita\ Flow\ + Area * Average\ I\&I\ Criteria$$

Industrial ADF estimates are calculated on the following basis:

$$Industrial\ ADF = Area * ICI\ Design\ Criteria\ + Area * Average\ I\&I\ Criteria$$

Residential Peak Day Flow estimates are calculated on the following basis:

$$Residential\ Peak\ Day\ Flow = Residential\ ADF * Residential\ PF + Area * Peak\ I\&I\ Criteria$$

Industrial Peak Day Flow estimates are calculated on the following basis:

$$Industrial\ Peak\ Day\ Flow = Industrial\ ADF * ICI\ PF + Area * Peak\ I\&I\ Criteria$$

Table 9 – Wastewater Flows from SPAs

Identification	Designation	Area (Ha)	Population	Jobs	ADF Estimate (m^3/d) [1]	Peak Day Flow (m^3/d) [1]
SPA1-A	Industrial	5.4	-	65	216.8	540.2
SPA1-B	Industrial	42.2	-	506	1,693.9	4,221.9
SPA1-C	Industrial	25.7	-	308	1,031.6	2,571.1
SPA1-D	Residential	13.2	990	-	460.5	1,260.9
SPA1-E	Residential	1.5	113	-	52.5	143.8
SPA2-A	Future Development	3.8	-	-	-	-
SPA2-B	Residential	7.4	555	-	258.2	706.9
SPA3-A	Industrial	8.3	-	100	333.2	830.4
Total		**107.5**	**1,658**	**979**	**4,046.7**	**10,275.2**

The total population and jobs that could be filled in SPAs are 1,658 persons and 979 jobs respectively. Therefore, SPAs won't satisfy the growth projections provided in section 4.0, which means further development into potential expansion areas are necessary.

This represents full build-out potential of Special Policy Areas and does not reflect any allocations or timing of any development.

5.4 Build-out of Potential Expansion Areas

There are four PEAs outside of the Town boundaries with potential for infill development were identified by the Town of Hanover appeal of County Official Plan Amendment 80 and are shown graphically in Figure 6. The future wastewater flow volumes for PEAs are calculated in the same manner as those for SPAs, as

described in Section 5.3. In addition, for PEAs without an existing development plan, the area-based assumptions for density were again applied in favour of actual unit counts.

By the end of 2052 (study period), the remaining population and employment growth that have not been allocated to SPAs are 2,584 and 845 separately as shown in Table 10.

Table 10 – Population and Employment to be Allocated to PEAs (2052)

Description	Projected Number in 2052	Existing Number in 2021	Total Number Allocated to SPAs	Remaining Number to be Allocated to PEAs
Population	12,209	7,967	1,658	2,584
Employment	6,944	5,120	979	845

Based on the population and employment in PEAs, Table 11 below summarizes calculated wastewater flow that will be contributed by PEAs at the end of study period.

Table 11 – Wastewater Flows in PEAs at the end of study period (2052)

Description	Estimated Land Size (ha)	ADF Estimate (m^3/d)	Peak Day Flow (m^3/d)
2,584 Persons	34.5	1,202.1	3,219.1
845 Jobs	70.4	2,825.9	7,043.1
Total	**104.9**	**4,027.9**	**10,262.2**

Table 12 below illustrates assumed land uses within four PEAs based on the 2021 Municipal Servicing Needs Assessment.

Table 12 – Total Land Uses in Potential Expansion Areas

	PEA-1	PEA-2	PEA-3	PEA-4
Total Land Area (ha)	277	209	150	68
Hydro Lands (ha)	0	11	3	0
Environmental Protection Lands (ha)	92	40	29	55
Net Developable Lands (ha)	185	158	118	13
Net Industrial, Commercial and Institutional Area (ha)	51.8	44.2	33	0
Net Residential Area (ha)	72.2	61.6	46	8.5

The ability of development within four PEAs and total projected wastewater flow after they are fully developed are summarized in Table 13.

Table 13 – Development Ability and Total Wastewater Flows after PEAs Fully Developed

ID	Designation	Area (Ha)	Eq. Population	Employment	ADF Estimate (m^3/d)
PEA-1	ICI	51.8	-	622	2,078.2
	Residential	72.2	5,415	-	2,517.6

ID	Designation	Area (Ha)	Eq. Population	Employment	ADF Estimate (m^3/d)
PEA-2	ICI	44.2	-	530	1,773.3
	Residential	61.6	4,620	-	2,148.0
PEA-3	ICI	33	-	396	1,324.0
	Residential	46	3,450	-	1,604.0
PEA-4	ICI	0	-	0	0
	Residential	8.5	637.5	-	296.4
Total		**317.3**	**14,123**	**1,548**	**11,741.5**

Therefore, PEAs with full capacity of serving 14,123 persons and 1,548 jobs are capable to satisfy the growth needs in Town of Hanover.

5.5 Wastewater Flows from Exceldor Foods Inc.

The wastewater flow from Exceldor Foods Inc., a meat processing plant, located in Hanover contributes significant flow to the total wastewater flow received by HWWTP each year.

The plant discharges wastewater to HWWTP typically five days a week, which is 260 days a year. Since, there is no effluent flow meter to monitor wastewater flows and, flows were calculated based on the total annual water consumption provided by the Town of Hanover.

Historical Flow from Exceldor Foods Inc. and the percentage it contributes to the total flow received by HWWTP are summarized in Table 14 form 2017-2022.

Table 14 – Historical Wastewater Flows from Exceldor Foods Inc.

Year	ADF from Exceldor (m^3/d)	Total ADF received by HWWTP	%
2017	1,573.5	5,802.7	27
2018	2,015.0	5,619.0	36
2019	1,851.2	5,296.6	35
2020	1,938.9	5,055.6	38
2021	1,793.3	5,185.9	35
2022	1,784.0	5,288.7	34
Average	**1,826.0**	**5,374.7**	**34**

This memorandum assumes steady 34% contribution from Exceldor until the year of 2052 as Exceldor has no expansion plan for now (based on information provided by the Town), resulting in no additional wastewater flow to HWWTP in the future.

5.6 Leachate Flows from Hanover/Walkerton Landfill Site

The HWLS is currently hauling 50% leachate to HWWTP and rest of the 50% to Walkerton Wastewater Treatment Plant (WWWTP). Table 15 below summarizes the historical l annual volume of leachate hauled to HWWTP and WWWTP along with estimated daily volumes of leachate.

Table 15 – Historical Leachate Flows

Year	Annual Volume (m^3)	Estimated Daily Flow (m^3/d)
2017	3,010.0	8.2
2018	3,118.5	8.5
2019	4,351.5	11.9
2020	5,535.0	15.2
2021	8,329.5	22.8
2022	6,669.0	18.3

The HWLS is undergoing an EA process with Cobide Engineering Inc. to direct all flows to HWWTP, which results additional half of leachate produced in HWLS to be transferred to HWWTP in the future. The leachate flows contribution to HWWTP is calculated based on the HWLS cell development progression provided by Cobide Engineering Inc.

Projected annual leachate volume, daily leachate flow, additional contribution to HWWTP, and peak leachate day flow to the year of 2052 provided by the Town are presented in Table 16. The peak leachate day flow is only expected to occur few times a year, not on a monthly basis.

Table 16 – Leachate Flow Projection

Year	Annual Volume (m^3)	Average Daily Flow (m^3/d)	Additional Contribution to HWWTP (m^3/d)	Peak Leachate Day Flow (m^3/d)
2023-2025	6,669.0	18.3	9.1	270.0
2026-2038	10,500.0	28.8	14.4	405.0
2039-2051	13,500.0	37.0	18.5	510.0
2052	8,400.0	23.0	11.5	510.0

5.7 Approved New Development Wastewater Flow

Based on the updated development information provided by Town of Hanover, there are approved lots that are currently under development/construction which are not connected to the Town's collection system. Wastewater flows from these unconnected approved lots will be added after the proposed service year. Calculated flows from these developments are summarised in Table 17. Note that the Town has number of unconnected approved lots in the Town; however, there is no construction timeline on the approved developments other than those listed in the Table below. It is assumed that construction of other approved developments will be as per growth rate indicated in Section 4 (137 people/year).

Table 17 – Wastewater Flows from Unconnected New Development

Approved Developments Under Construction	Service Year	Units	Population	ADF Estimate (m^3/d)	Peak Day Flow (m^3/d)
Saugeen Cedar Heights West Subdivision	June 2023	123	369	171.7	463.8
(Phase 1) at 651 23rd Avenue	June 2024	71	213	99.1	267.7
10th St/7th Ave intersection	End of 2024	109	327	152.1	411.0

Approved Developments Under Construction	Service Year	Units	Population	ADF Estimate (m^3/d)	Peak Day Flow (m^3/d)
Splash Pad Flow	-	-	-	55	55
Total		**303**	**909**	**477.9**	**1,197.5**

5.8 30-Year Wastewater Flow Summary

Based on the historical wastewater flows, population and employment projections, this TM evaluates population, jobs, ADF and peak day flow on 2052 horizon. Growth between 2046 and 2052 is estimated on the basis of an additional 137 population and 59 jobs year over year. Table 18 summaries important future ADFs and peak day flows till 2052 (the study period).

Table 18 – Wastewater Flow Projections on 2052 Horizon

Year	ADF (m^3/d)	Peak Day Flow (m^3/d)
2022 (existing)	5,288.7	10,294.0
2024	**6,333.0**	**13,158.8**
2027	7,256.9	15,670.2
2032	8,512.2	18,877.9
2037	**9,827.6**	**22,121.5**
2042	11,147.3	25,657.4
2047	12,490.5	29,045.6
2052	13,789.0	32,329.2

The total ADF in 2024 is estimated as 6,333.0 m^3/d, which will approach to the rated capacity of HWWTP (6,360 m^3/d). Based on projected population in 2024 (8,378) and existing population in 2021 (7,967), a total of 411 people (137 units @ 3ppu) can be accommodated in the Town without increasing the plant capacity. The estimated total wastewater flow within the Town's boundary is 9,827.6 m^3/d, which includes; existing settlement area, SPAs, and additional leachate flow. Based on the current growth rate, in 2037, the development ability within the Town's current boundary will be reached. At this point, expansion to PEAs outside of the existing boundary needs to be considered.

To better present the trend, a graphical summary of average day wastewater flows over time is provided in Figure 7.

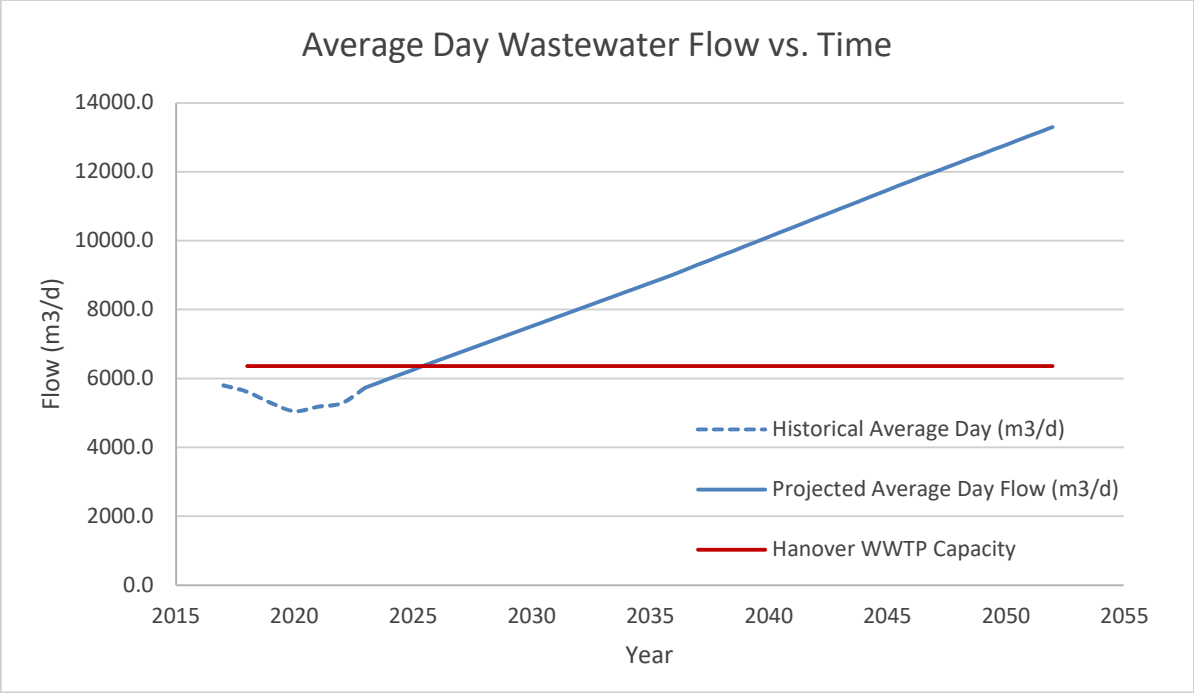


Figure 7 – Wastewater Flow over Time based on Official Plan Amendment #11

6.0 Conclusions and Recommendations

This Technical Memorandum, prepared in support of the Town of Hanover Class Environmental Assessment for treatment Capacity at the Hanover Wastewater Treatment Plant (HWWTP Class EA), provides:

- A review of historical findings from previous planning documentation.
- An overview of historical wastewater flows from existing development in Hanover.
- A comprehensive review of growth potential for the Town.
- An assessment of the impact of future wastewater flows on the capacity of the WWTP.

This Technical Memorandum concludes the following:

- The density of development anticipated into the future is expected to be approximately 25 units/ha.
- Per the 2021 assessment, the occupancy per housing unit is anticipated to be 3.
- The following design parameters are proposed based on previous Biosolids Storage Capacity Assessment completed in 2017:

Table 19 – Flow assumptions for preliminary design

Description	Rate
Residential Flow	350 L/c/d
Industrial, Commercial and Institutional (ICI) Flow	31.5 m^3/ha/d
Average Inflow and Infiltration	0.1 L/ha/s
Peak Inflow and Infiltration	0.21 L/ha/s
ICI Peaking Factor	2.6

- A total of 107.5 ha of Special Policy Areas is identified within the existing Town's boundary.
- A total of 704 ha of Potential Expansion Areas is identified outside of the existing Town's boundary, including a 317.5 ha of net developable lands to account for residential, industrial, commercial and institutional uses.
- Based on the assessment of wastewater servicing within the existing servicing area, the following wastewater average flows in 2052 have been identified:
    - To service Special Policy Areas Defined in Town Official Plan 4,046.7 m^3/d
    - To service remaining population and employment growth infill Potential Expansion Areas outside of the Town boundary 4,027.9 m^3/d
    - Additional Leachate flow from Hanover/Walkerton Landfill Site 11.5 m^3/d
    - Wastewater Flows from Unconnected Approved New Development 477.9 m^3/d
    - Resulting in a total estimated wastewater flow 13,789.0 m^3/d
- Servicing the existing communities and new development areas would result in the following residential populations:
    - Existing Communities in 2021 7,967 persons
    - SPAs in 2037 1,658 persons
    - PEAs in 2052 2,584 persons
    - Resulting in a total residential population in 2052 12,209 persons
- Servicing the existing communities and new development areas would result in the following employments:
    - Existing Communities in 2021 5,120 jobs
    - SPAs in 2037 979 jobs
    - PEAs in 2052 845 jobs
    - Resulting in a total employment number in 2052 6,944 jobs
- Based on the projected pace of development the HWWTP has insufficient ADF (rated) capacity to treat future wastewater flows. Rated capacity of HWWTP will be reached in 2024 and estimated total wastewater average flows to HWWTP in 2052 is double the current design capacity.
- Based on projected population in 2024 (8,378) and existing population in 2021 (7,967), a total of 411 people (137 units @ 3ppu) can be accommodated in the Town without increasing the plant capacity
- Since peak instantaneous flows are not measured at the plant and considering there is high inflow and infiltration in the Town, a reasonable peak instantaneous factor should be assumed during design.

Appendix B
Assimilative Capacity Study

Final Report –
Assimilative Capacity Study to Support the Expansion of the Hanover WWTP

November 25, 2024
Updated April 2, 2026

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Appendix B – Recommended Modifications to ECA-Stipulated Effluent Monitoring Requirements

Appendix C – Correspondence from MECP Regarding Effluent TAN and E. coli Requirements

1. Introduction

1.1 Overview

The Town of Hanover (Town) is currently undertaking a Schedule C Class Environmental Assessment (Class EA) for the Hanover Wastewater Treatment Plant (WWTP). The objective of the Class EA study is to determine the most cost effective and sustainable option to increase wastewater servicing capacity for the community of Hanover.

Blue Sky Energy Engineering & Consulting Inc. (Blue Sky) has been retained to conduct a desk-top assimilative capacity study (ACS) of the Saugeen River to support the Hanover WWTP Class EA study. This report summarizes the results of the ACS.

1.2 Objectives

The specific objectives of the ACS are to:

- Document data sources and assumptions used;
- Define ambient water quality and verify low flow conditions in the Saugeen River;
- Develop recommendations for future effluent requirements for an upgraded Hanover WWTP at the 2052 design average daily flow (ADF) capacity of 13,789 m^3/d.

2. Background

2.1 Current Effluent Requirements

The existing Hanover WWTP is a secondary level conventional activated sludge treatment system operated under amended Environmental Compliance Approval (ECA) No. 6173-BKNLVM (dated March 2, 2020) and has a rated capacity of 6,360 m^3/d. The facility discharges directly to the Saugeen River. Effluent is discharged continuously. Table 2.1 presents the CofA effluent discharge concentration objectives / limits.

Table 2.1 – Existing Effluent Objectives and Limits – Hanover WWTP (6,360 m^3/d)

Parameter	Objective		Limit	
	Averaging Period	Value	Averaging Period	Value
$cBOD_5$	Monthly	15.0 mg/L	Monthly	25
TSS	Monthly	15.0 mg/L	Monthly	25
TP	Monthly	0.8 mg/L	Monthly	1.0
TRC	Single Sample	Not detectable	Single Sample	0.02
E. coli May 15 – Sep 15	Monthly (1)	150 CFU/100 mL	Monthly (1)	200 CFU/100 mL
pH	Single Sample	6.5 – 8.5	Single Sample	6.0 – 9.5

Notes:
$cBOD_5$ – 5-day biochemical oxygen demand
TSS – total suspended solids
TP – total phosphorus
1. Monthly geometric mean

In addition to the above, the ECA specifies annual average loading limits for $cBOD_5$, TSS and TP. These are summarized in Table 2.2, and are based on the concentration limit (Table 2.1) and ADF capacity of 6,360 m^3/d.

Table 2.2 – Existing Effluent Loading Limits – Hanover WWTP (6,360 m^3/d)

Parameter	Averaging Period	Limit
$cBOD_5$	Annual	159.0 kg/d
TSS	Annual	159.0 kg/d
TP	Annual	6.4 kg/d

2.2 Existing Outfall Configuration

The existing Hanover WWTP outfall consists of a 600 mm diameter open, submerged pipe discharging directly to the Saugeen River at the east shore. Details are shown in Figure 2.1.

The existing Hanover WWTP's effluent disposal facilities include effluent pumping to provide additional discharge capacity in the event of high levels in the Saugeen River. It is understood that the existing effluent outfall will be maintained for the upgraded and expanded Hanover WWTP.

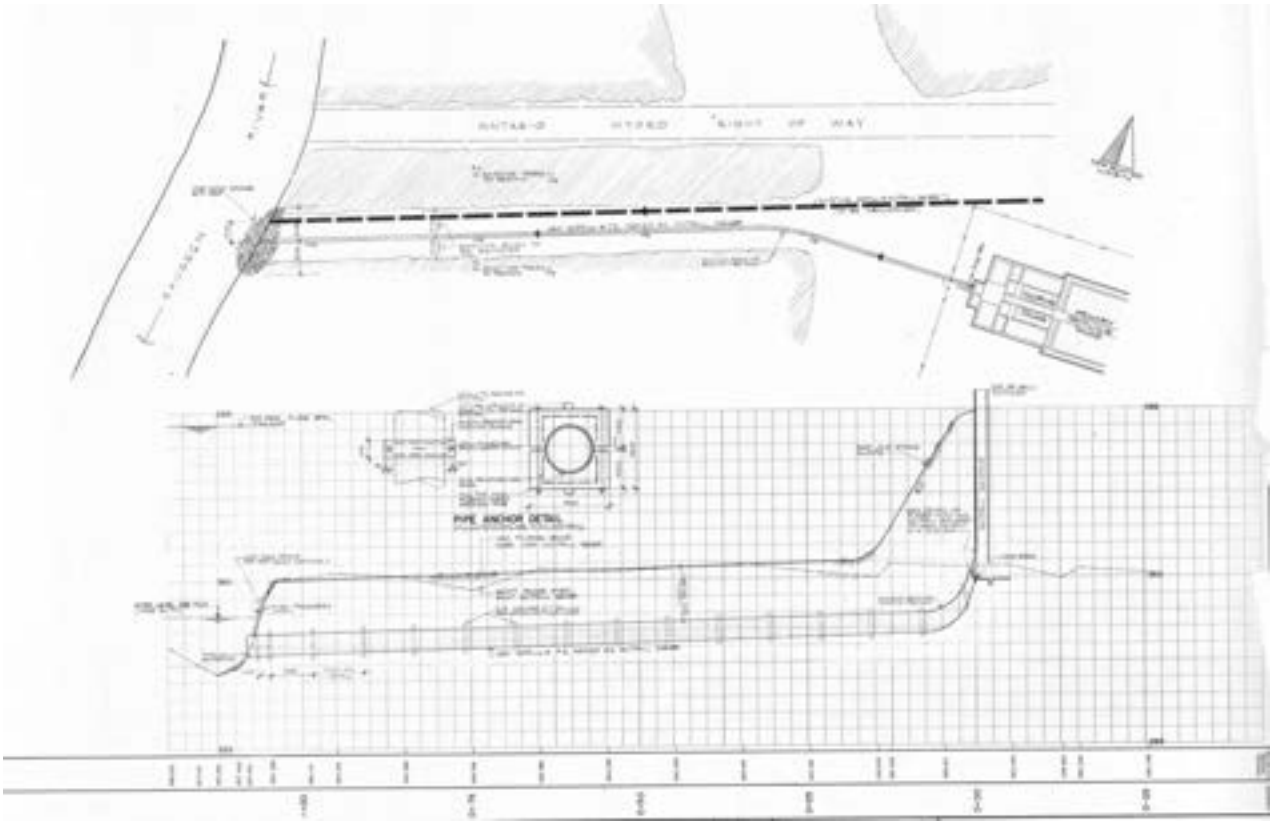


Figure 2.1 – Existing Hanover WWTP Outfall (from 1981 As-Built Drawings)

2.3 Available Data

In establishing ambient water quality and flow for a receiver, recent data available in the vicinity of the effluent discharge location is reviewed to establish ambient conditions. In the case of the Hanover WWTP, a nearby Provincial Water Quality Monitoring Network (PWQMN) station is located approximately 19 km downstream of the outfall on the Saugeen River. With respect to receiver flows, there is no nearby Water Survey of Canada (WSC) gauge located upstream of the outfall. However, there is a WSC gauge located on the Saugeen River downstream of both the outfall and its confluence with the South Saugeen River. A separate WSC gauge is available approximately 10 km upstream of its confluence with the Saugeen River. Information regarding the PWQMN and WSC stations is presented in Table 2.3, while their locations are presented in Figure 2.2.

Table 2.3 – Summary of Key Data Sources to Assess Ambient Conditions

Data Source	Location	Distance Relative to Hanover WWTP Outfall	Period of Record Used in this Study
PWQMN Station No. 8012300202	Saugeen River at Walkerton	19 km downstream	1980 – 2020
WSC Gauge No. 02FC002	Saugeen River near Walkerton	11 km downstream	1914 – 2021
WSC Gauge No. 02FC012	South Saugeen River near Hanover	~10 km upstream	1914 – 2021



Figure 2.2 Locations of the Outfall, WSC Gauges and PWQMN Station

3. Ambient Conditions

3.1 Water Quality

Representative background water quality can be defined by examining Saugeen River water quality in the vicinity of the Hanover WWTP outfall. For analysis purposes, the 75th percentile threshold is applied to characterize ambient conditions, as recommended by the Ministry of the Environment (MOE), now Ministry of the Environment, Conservation and Parks (MECP). The MOE states, "Normally the 75th percentile is used to determine background quality…".[1] The receiving water quality is assigned Policy 1 if the ambient concentration is less than the Provincial Water Quality Objective (PWQO) and Policy 2 if the ambient concentration exceeds the PWQO. The implication of being a Policy 1 or Policy 2 receiver is described briefly below.

- **Policy 1:** In areas which have water quality better than the Provincial Water Quality Objectives, water quality shall be maintained at or above the Objectives.
- **Policy 2:** Water quality which presently does not meet the Provincial Water Quality Objectives shall not be degraded further and all practical measures shall be taken to upgrade the water quality to the Objectives.

For the purposes of this analysis, PWQMN data collected over the period 1980 to 2020 were used. The findings for each parameter of interest are summarized in the sections below.

3.1.1 BOD_5 / Dissolved Oxygen

For dissolved oxygen (DO), low concentrations are indications of degraded water quality; therefore 25th percentiles are typically used, rather than 75th percentiles, to characterize ambient conditions. Assuming the Saugeen River is a cold water fishery, the PWQO for DO ranges from 5 to 8 mg/L from season-to-season based on temperature: cooler temperatures have a higher PWQO for DO than warmer temperatures.

Average, median and 25th percentile DO concentrations are presented in Table 3.1 along with the seasonal PWQO (based on ambient temperature data shown in Table 3.6). Based on the available data, the Saugeen River is Policy 1 with respect to DO in the vicinity of Hanover. This demonstrates that there is adequate assimilative capacity available for future BOD_5 loads from an upgraded and expanded Hanover WWTP.

[1] Ministry of Environment and Energy, *Water Management: Policies, Guidelines, Provincial Water Quality Objectives.* July 1994 (MOE Blue Book).

Table 3.1 – DO Concentrations in the Saugeen River in the Vicinity of Hanover

Season	Average (mg/L)	Median (mg/L)	25th Percentile (mg/L)	Number of Observations
Spring (Mar – May)	11.8	11.5	10.8	38
Summer (Jun – Sep)	9.8	9.8	9.2	24
Fall (Oct – Nov)	11.8	12.0	11.0	35
Winter (Dec – Feb)	12.8	12.5	12.0	11
PWQO (1)	–	–	Spring: 6.0 mg/L Summer: 5.0 mg/L Fall: 6.0 mg/L Winter: 8.0 mg/L	–

Notes:

1. PWQOs based on a cold water biota, and 75th percentile seasonal temperatures as shown in Table 9.

In addition to DO data, ambient concentrations of BOD_5 were also available over the review period, as shown in Table 3.2. Ambient (75th percentile) concentrations are at or below 1.23 mg/L for all seasons, suggesting low background concentrations of oxygen depleting constituents.

Table 3.2 – BOD_5 Concentrations in the Saugeen River in the Vicinity of Hanover

Season	Average (mg/L)	Median (mg/L)	75th Percentile (mg/L)	Number of Observations
Spring (Mar – May)	0.90	0.62	1.23	12
Summer (Jun – Sep)	0.65	0.50	0.75	4
Fall (Oct – Nov)	0.85	0.86	1.03	8
Winter (Dec – Feb)	0.99	0.70	1.10	11
Overall	**0.83**	**0.70**	**1.10**	**35**

3.1.2 Total Suspended Solids

There are no PWQO values for total suspended solids (TSS), however the Canadian Water Quality Guidelines for the Protection of Aquatic Life (CWQG) recommend a maximum average increase of 5 mg/L from background levels for long-term exposures. Reported PWQMN TSS concentrations vary seasonally, with the highest values in the Winter and Spring seasons. A statistical summary of TSS concentrations is provided in Table 3.3.

Since there is no PWQO, it is not possible to define a Policy status for the Saugeen River in relation to TSS. However, to be consistent with the objectives of the CWQG, the discharge of effluent from the WWTP should not increase downstream fully-mixed concentrations by more than 5 mg/L.

Table 3.3 – TSS Concentrations in the Saugeen River in the Vicinity of Hanover

Season	Average (mg/L)	Median (mg/L)	75th Percentile (mg/L)	Number of Observations
Spring (Mar – May)	13.9	6.9	16.4	76
Summer (Jun – Sep)	7.4	5.0	6.7	35
Fall (Oct – Nov)	8.0	4.8	7.4	59
Winter (Dec – Feb)	11.6	5.0	10.8	42
Overall	**9.7**	**5.0**	**8.7**	**212**

3.1.3 Unionized Ammonia

The percentage of unionized ammonia in aqueous solution varies depending on the temperature and pH of the water. Ambient total ammonia, pH, and temperature are summarized in Table 3.4, Table 3.5, and Table 3.6, respectively. Synoptic pH and temperature data were used to determine daily dissociation ratios; using the daily dissociation ratios and associated daily total ammonia concentrations, it was possible to calculate daily unionized ammonia (UIA) concentrations in the Saugeen River. The average, median and 75th Percentile unionized ammonia concentrations are presented in Table 3.7.

Ambient total ammonia concentrations showed limited seasonal variation. While also showing limited seasonal trends, pH in the Saugeen River is elevated, which increases the ammonia dissociation ratio for this receiver. As expected, temperature varies seasonally and is quite high (>22°C) over the Summer season (Jun – Sep), also increasing the dissociation ratios for those months.

Despite this, ambient (75th) percentile UIA concentrations were well below the PWQO during all seasons. Therefore, the receiver can be characterized as Policy 1 for UIA.

Table 3.4 – TAN Concentrations in the Saugeen River in the Vicinity of Hanover

Season	Average (mg/L)	Median (mg/L)	75th Percentile (mg/L)	Number of Observations
Spring (Mar – May)	0.024	0.020	0.033	66
Summer (Jun – Sep)	0.023	0.020	0.033	34
Fall (Oct – Nov)	0.016	0.010	0.020	53
Winter (Dec – Feb)	0.034	0.024	0.033	28
Overall	**0.023**	**0.020**	**0.030**	**181**

Table 3.5 – pH in the Saugeen River in the Vicinity of Hanover

Season	Average (–)	Median (–)	75th Percentile (–)	Number of Observations
Spring (Mar – May)	8.28	8.31	8.38	74
Summer (Jun – Sep)	8.30	8.31	8.37	39
Fall (Oct – Nov)	8.28	8.29	8.35	61
Winter (Dec – Feb)	8.17	8.27	8.24	40
Overall	**8.28**	**8.29**	**8.36**	**214**

Table 3.6 – Temperature Concentrations in the Saugeen River in the Vicinity of Hanover

Season	Average (°C)	Median (°C)	75th Percentile (°C)	Number of Observations
Spring (Mar – May)	9.1	8.7	13.3	72
Summer (Jun – Sep)	19.7	20.0	22.0	35
Fall (Oct – Nov)	7.5	7.6	10.0	62
Winter (Dec – Feb)	0.9	1.0	1.0	39

Table 3.7 – Unionized Ammonia Concentrations in the Saugeen River in the Vicinity of Hanover

Season	Average (ug/L as NH_3)	Median (ug/L as NH_3)	75th Percentile (ug/L as NH_3)	Number of Observations
Spring (Mar – May)	1.16	0.64	1.45	54
Summer (Jun – Sep)	2.17	1.90	2.93	30
Fall (Oct – Nov)	0.68	0.35	0.63	50
Winter (Dec – Feb)	0.53	0.39	0.48	25
Overall	**1.45**	**0.90**	**2.07**	**159**
PWQO	–	–	20	–

3.1.4 Total Phosphorus

The MOE PWQO state that, as an interim guideline for streams and rivers, total phosphorus (TP) should not exceed 0.030 mg/L to prevent excessive plant growth. The statistical summary for total phosphorus concentration is shown in Table 3.8. The monthly and annual 75th percentile concentrations are below the PWQO. Therefore, the receiver can be characterized as Policy 1 in the vicinity of Hanover with respect to TP.

Table 3.8 – Total Phosphorous Concentrations in the Saugeen River in the Vicinity of Hanover

Season	Average (mg/L)	Median (mg/L)	75th Percentile (mg/L)	Number of Observations
Spring (Mar – May)	0.021	0.012	0.025	78
Summer (Jun – Sep)	0.016	0.010	0.015	38
Fall (Oct – Nov)	0.014	0.010	0.015	64
Winter (Dec – Feb)	0.019	0.010	0.020	42
Overall	**0.019**	**0.010**	**0.020**	**222**
PWQO	–	–	0.030	–

Notes:

Excludes three sample results from February 18, 1985, May 21, 1985 and August 19, 1985 of 0.19 mg/L, 0.23 mg/L and 0.25 mg/L. These sample results were an order of magnitude higher than other results for that calendar year, and did not coincide with elevated TSS concentrations (analysis of TP vs TSS concentrations included below).

The available dataset of water quality in the Saugeen River was analyzed to determine if any correlation exists between TP and TSS concentrations in the receiver. A scatterplot of synoptic TP and TSS values (over the period 1980 to 2020) is presented in Figure 3.1.

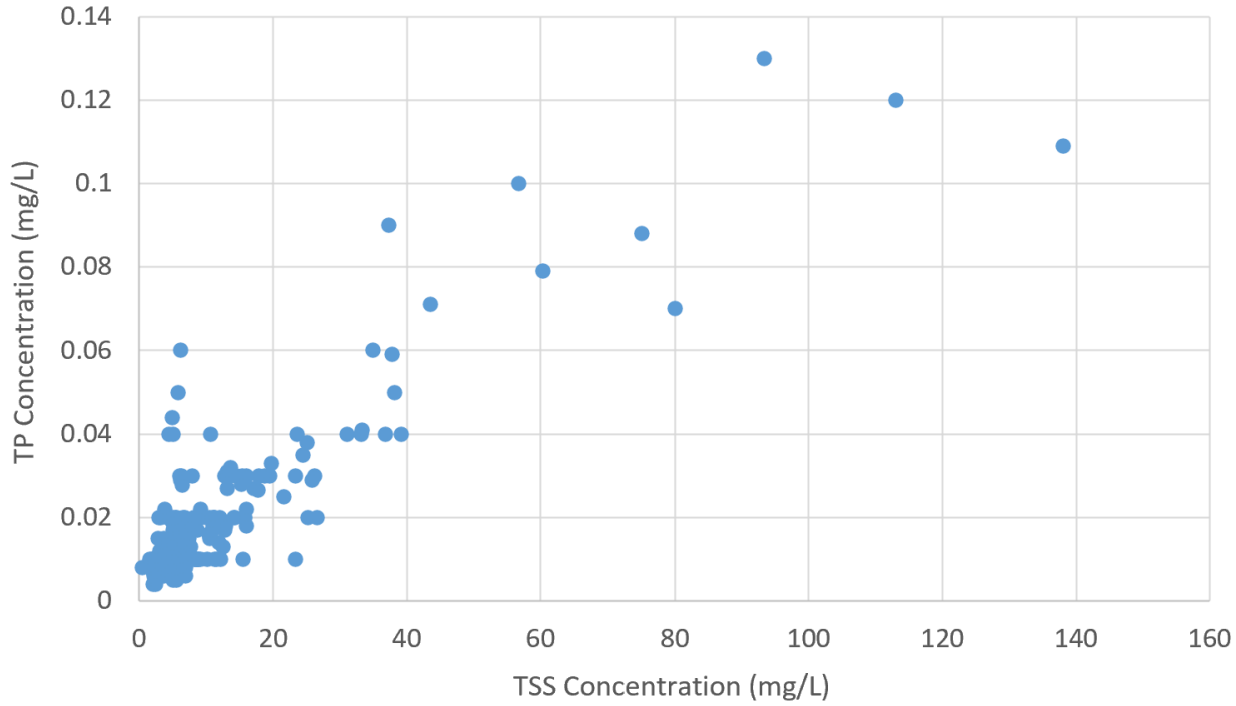


Figure 3.1 TP Concentration vs. TSS Concentration in the Saugeen River (1980 – 2020)

Based on the results of Figure 3.1, it is clear that elevated TP concentrations were correlated with elevated TSS concentrations. This suggests that elevated TP concentrations in the Saugeen River are due, at least in part, to increased concentrations of particulate phosphorus rather than variations in soluble phosphorus species. This is also reflected in the elevated ambient TSS concentrations in the Spring and Winter (see Section 3.1.2), which is consistent with higher ambient TP concentrations in those seasons.

Based on experience elsewhere, elevated TSS concentrations in Ontario rivers and streams often coincide with high flows in the receiver. Often, this can be attributed to run-off and disturbed sediments due to wet weather events. To determine if this could also be a factor in the Saugeen River, the PWQMN TSS data were plotted against daily recorded flows at the WSC gauge near Walkerton (i.e. the gauge closest to the PWQMN station). This analysis focussed on samples collected during the Spring season, and is presented in Figure 3.2.

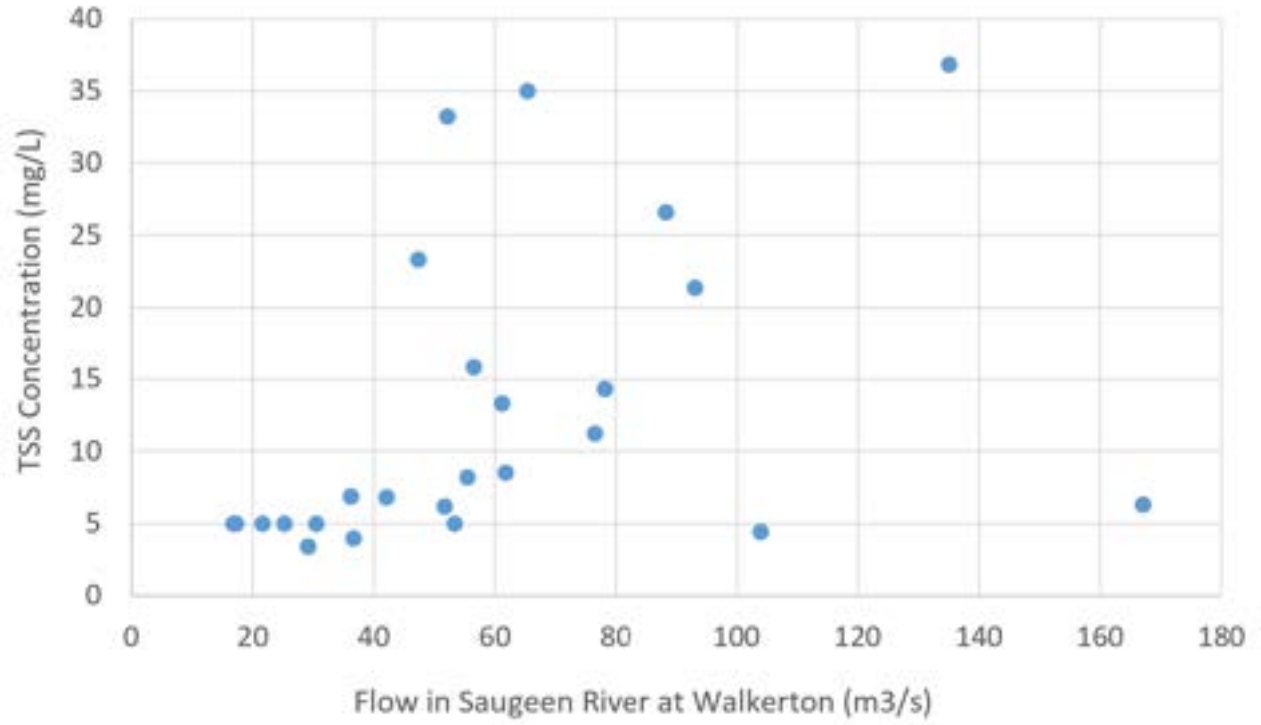


Figure 3.2 TSS Concentration vs. Daily Recorded Flow of the Saugeen River at Walkerton over the Spring Season (1985 – 2020)

From the scatterplot in Figure 3.2, it can be concluded that TSS concentrations remain relatively low during low flow conditions, and become more variable at higher flows. This suggests that it is unlikely that elevated TSS concentrations (>10 mg/L) would be experienced during low flow periods in the Saugeen River.

The Spring 7Q20 flow for the Saugeen River near Walkerton (WSC gauge 02FC002) was determined to be 9.21 m^3/s (see Appendix A). The available PWQMN TP data were re-analyzed for the Spring period to develop an estimated low-flow ambient background concentration, with "low-flow" in this context defined as five times the 7Q20 flow (or 46.05 m^3/s at the gauge near Walkerton). Using this approach, the Spring "low flow" ambient (75^{th} percentile) TP concentration was calculated to be 0.013 mg/L (based on a total of 36 sample results), which is consistent with the ambient concentrations for Summer and Fall (Table 3.8).

3.1.5 Nitrate

There is no PWQO for nitrate, however the CWQG recommends a long-term exposure limit of 3.0 mg/L as N, and a short-term (acute) exposure limit of 124 mg/L. A statistical summary of reported PWQMN nitrate concentrations is provided in Table 3.9.

For all seasonal periods, the ambient (75th percentile) nitrate concentration is below the CWQG long-term exposure limit of 3.0 mg/L. As such, nitrate is not considered to be a parameter of concern for the Saugeen River in the vicinity of Hanover.

Table 3.9 – Nitrate Concentrations in the Saugeen River in the Vicinity of Hanover

Season	Average (mg/L as N)	Median (mg/L as N)	75th Percentile (mg/L as N)	Number of Observations
Spring (Mar – May)	1.28	1.36	1.59	49
Summer (Jun – Sep)	0.95	0.93	1.13	28
Fall (Oct – Nov)	1.29	1.24	1.52	39
Winter (Dec – Feb)	1.70	1.54	1.71	17
Overall	**1.15**	**1.10**	**1.41**	**133**

3.2 Flow

A low flow analysis was completed to develop seasonal 7Q20 flow estimates for the Saugeen River in the vicinity of the Hanover WWTP. Two nearby Water Survey of Canada (WSC) gauges were used for the assessment (Gauge No. 02FC002 – Saugeen River Near Walkerton; Gauge No. 02FC012 – South Saugeen River Near Hanover). The location of these gauges is shown in Figure 2.2. The results of the low flow analysis are summarized in Table 3.10, while details are provided in Appendix A.

Table 3.10 – Low (7Q20) Flow Estimates for the Saugeen River at the Hanover WWTP Outfall

Season	7Q20 Flow (m^3/s)
Spring (Mar – May)	5.20
Summer (Jun – Sep)	2.55
Fall (Oct – Nov)	2.45
Winter (Dec – Feb)	3.37

There is considerable variability in seasonal 7Q20 flows in the Saugeen River, with the highest value in the Spring, and lowest values in the Summer and Fall. This is consistent with impacts associated with increased precipitation and snow melt in the Spring period, and lower flows and groundwater recharge over the Summer and Fall periods.

4. Mixing Zone Modelling

The expert system mixing zone model CORMIX was applied to define mixing zones for the projected 2052 ADF (13,789 m^3/d). As-built outfall schematics dated March 1979 (Figure 2.1) were applied to establish the approximate river cross-section and the discharge configuration (600 mm submerged discharge pipe). CORMIX modelling results are summarized in Table 4.1, and shown graphically in Figures 4.1 to 4.4. Completely mixed conditions are achieved at downstream distance of 500 m or less with 10% dilution being reached within 182 m or less for all seasons. The results indicate that a reasonable mixing zone size will be maintained at the design ADF.

Table 4.1 – Summary of CORMIX Modelling Results

Season	Distance to		
	10% Dilution	5% Dilution	Completely Mixed
Spring	38 m	163 m	424 m
Summer	170 m	n/a	475 m
Fall	182 m	n/a	478 m
Winter	109 m	n/a	465 m

Notes:

1. Completely mixed dilutions are 3%, 6%, 6% and 4.5% for Spring, Summer, Fall and Winter, respectively.

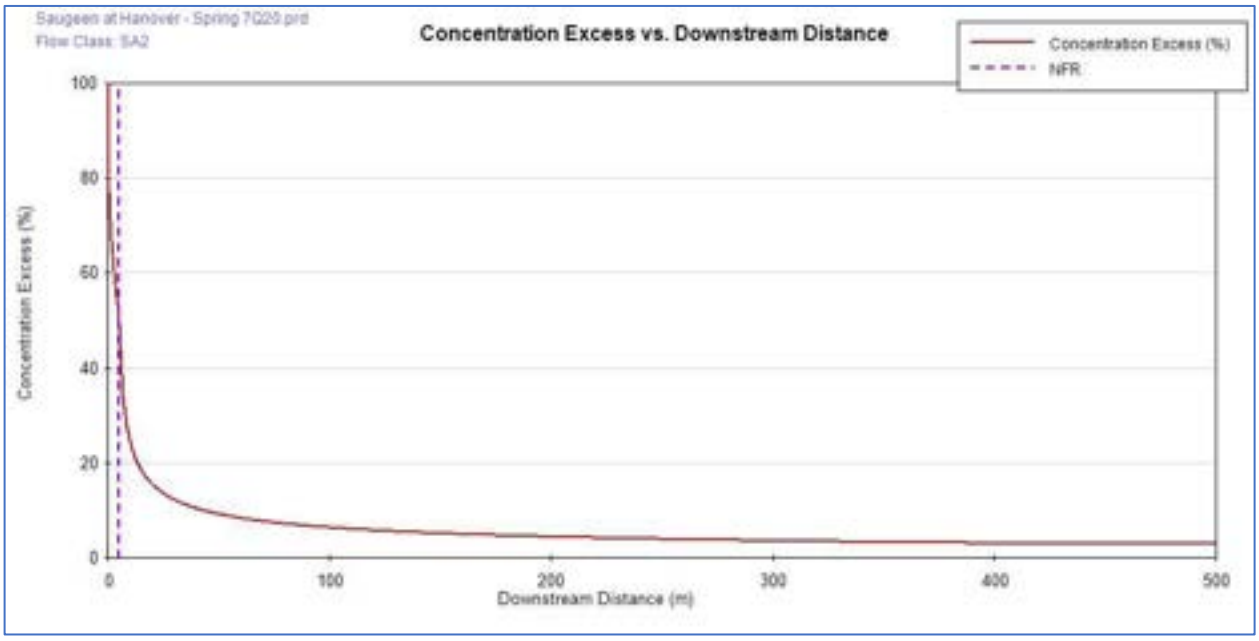


Figure 4.1 – Plume Centreline Effluent Concentration at Spring 7Q20 Flows

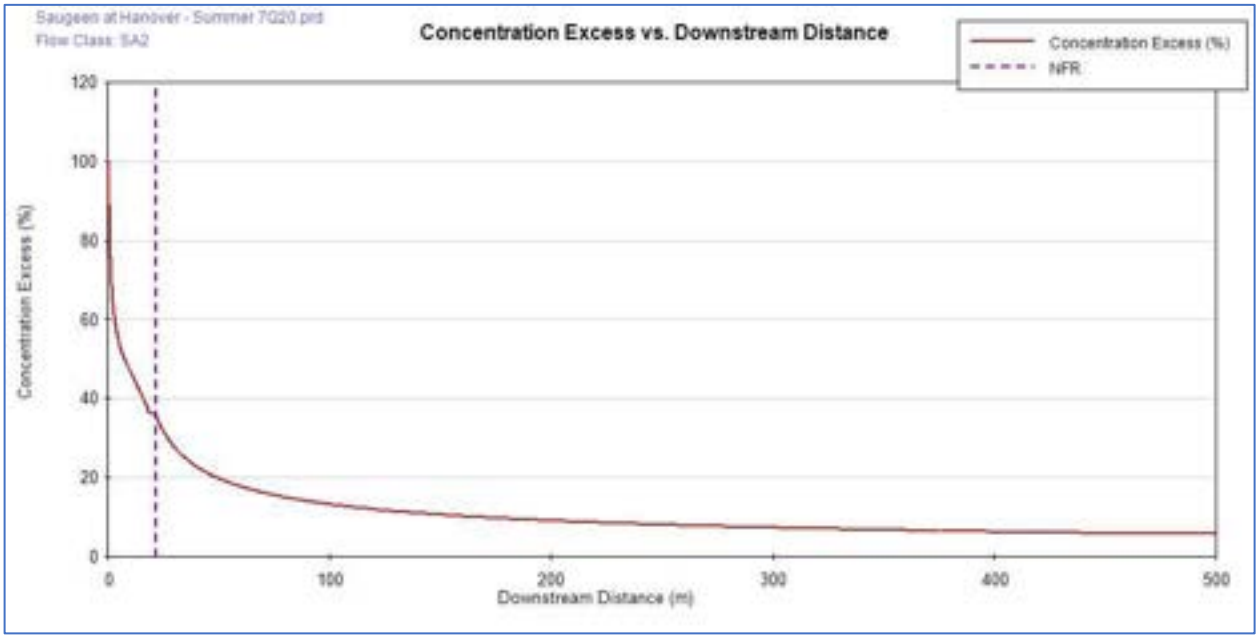


Figure 4.2 – Plume Centreline Effluent Concentration at Summer 7Q20 Flows

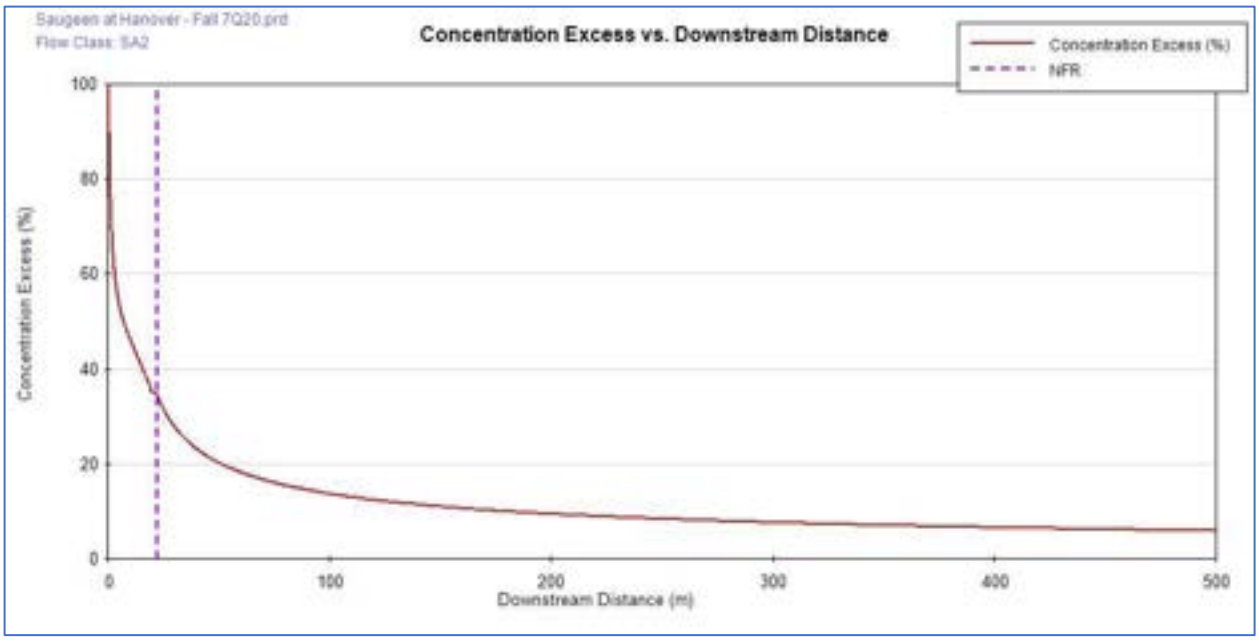


Figure 4.3 – Plume Centreline Effluent Concentration at Fall 7Q20 Flows

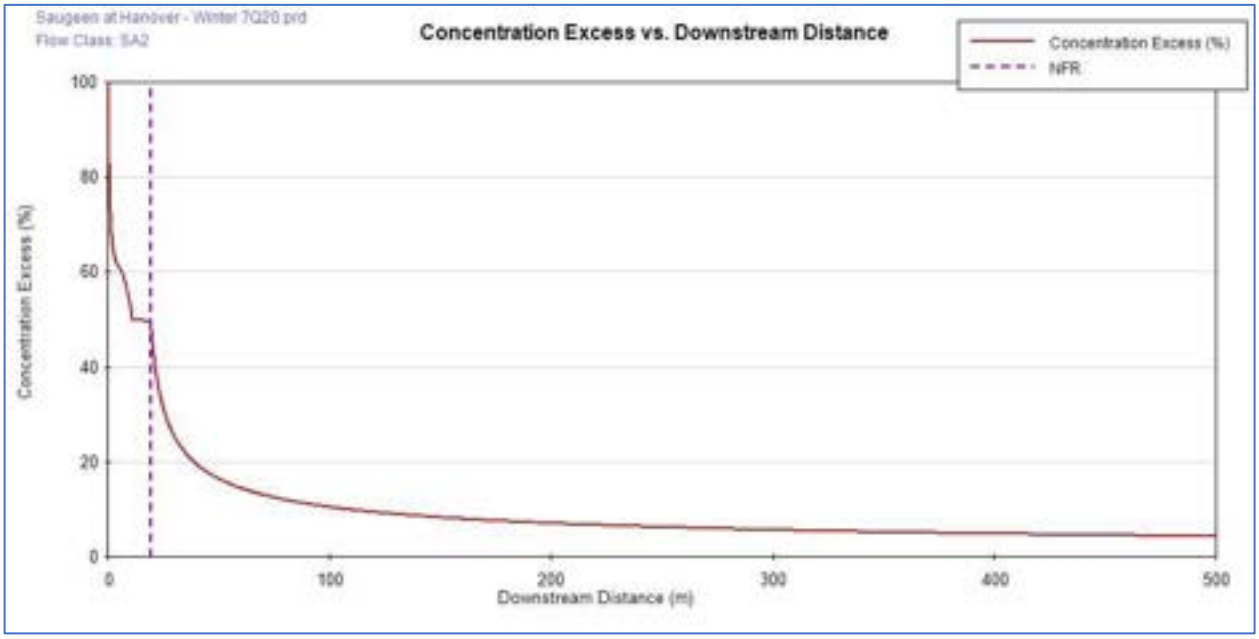


Figure 4.4 – Plume Centreline Effluent Concentration at Winter 7Q20 Flows

5. Determination of Effluent Limits

5.1 Methodology

The following approach was used for the development of proposed effluent requirements for an upgraded and expanded Hanover WWTP:

- Potential impact on downstream DO associated with both $cBOD_5$ and TAN in the effluent were considered.
- Effluent TAN objectives / limits were evaluated on a seasonal basis, given the relationship between UIA, pH and temperature. In addition, it was ensured that downstream fully-mixed UIA concentrations are at or below the PWQO.
- The annual TP loading limit was maintained at or below the current ECA limit of 6.4 kg/d, and that the impacts of effluent discharge on the downstream fully-mixed TP concentration were minimized, particularly during the critical Summer period.
- Nitrate is not currently a parameter of concern for the Saugeen River. As a result, no effluent nitrate targets were proposed.
- Effluent pH and E. coli targets are consistent with targets for other municipal WWTPs in Ontario.

The following sub-sections present details associated with the development of effluent targets associated with key parameters.

5.2 Effluent $cBOD_5$

There are no PWQO or CWQG targets specified for $cBOD_5$. However, the presence of carbonaceous and nitrogenous biochemical oxygen demand (cBOD and nBOD, respectively) can affect downstream DO concentrations.

An assessment of ambient water quality (see Section 3.1.1) concluded that the Saugeen River is Policy 1 for DO, with historic 25th percentile concentrations at least 4.2 mg/L greater than the PWQO for all seasons. Furthermore, the available ambient BOD_5 concentration (ambient seasonal 75th percentile concentrations ranging from 0.75 to 1.23 mg/L) suggest low background concentrations of oxygen depleting constituents.

Effluent $cBOD_5$ requirements of 9.0 mg/L (design objective) and 11.5 mg/L (design limit) are being proposed in conjunction with year-round nitrification (see Section 4.4). This would maintain $cBOD_5$ loadings to the current ECA limit of 159.0 kg/d. At the design limit and low flow conditions, the fully mixed $cBOD_5$ concentration in the Saugeen River would increase by up to 0.64 mg/L (Fall), which would have minimal impact on the downstream DO concentrations.

5.3 Effluent Total Suspended Solids

There is no PWQO target specified for TSS. The CWQG recommends a maximum short-term (< 24 h period) increase of 25 mg/L above background, and a maximum increase of 5 mg/L over long-term exposures (up to 30 days).

Effluent TSS requirements of 9.0 mg/L (design objective) and 11.5 mg/L (design limit) are proposed. These are consistent with the proposed $cBOD_5$ limits (see Section 4.2), and would maintain $cBOD_5$ loadings at the current ECA limit of 159.0 kg/d. Finally, these would result in a maximum downstream TSS increase of 0.28 mg/L (Summer), which meets the CWQG recommendation.

5.4 Effluent Total Ammonia Nitrogen

In developing TAN limits, two factors were considered: ensuring non-toxic effluent at end-of-pipe, and ensuring downstream conditions within the Saugeen River meet the PWQO un-ionized ammonia (UIA) limit of 20 µg/L as NH_3 (16 µg/L as N).

Extensive research by the US EPA and others has demonstrated that a non-toxic limit for UIA ranges between 0.1 mg/L and 0.5 mg/L as NH_3, depending on the aquatic species present in the receiver. The federal Wastewater Systems Effluent Regulations (WSER) under the Fisheries Act set effluent UIA toxicity to 1.25 mg/L (at 15°C). Therefore, selecting a value of 0.15 mg/L as NH_3 at end-of-pipe, which is near the low end of the US EPA range, is more conservative than, and consistent with, the requirements of WSER.

The percentage of UIA in aqueous solution varies depending on the temperature and pH of the water. In order to determine the in-stream UIA concentration, it is necessary to specify anticipated ambient temperature and pH values that can be used to estimate the ammonia dissociation ratio. As a conservative measure, the seasonal ambient (75th percentile) pH and temperature values in the Saugeen River were used to develop seasonal dissociation ratios.

To confirm non-toxicity at end-of-pipe, it was necessary to define anticipated WWTP effluent temperature and pH values. As a conservative measure, it was assumed that the WWTP effluent pH could reach 7.5, which is conservative for a nitrifying mechanical plant. In addition, it was assumed that effluent temperatures of 20°C, 25°C, 20°C and 15°C represent conservative estimates of high Spring, Summer, Fall and Winter temperatures, respectively.

For the proposed effluent TAN limits to be acceptable, the resultant downstream UIA concentration must be less than or equal to the PWQO of 20 µg/L (as NH_3), while also meeting the non-toxicity threshold of 0.15 mg/L (as NH_3) at end of pipe. The proposed effluent ammonia limits and resulting downstream UIA concentrations are shown in Table 5.1.

Table 5.1 – Fully Mixed Un-ionized Ammonia Under Proposed Effluent TAN Limits

Discharge Period	Effluent TAN Limit (mg/L as N)	Ambient UIA (µg/L as NH_3)	Dissociation Ratio (%) (1)	Fully-Mixed UIA (µg/L as NH_3)	End-of-Pipe UIA (ug/L as NH_3)
Spring (Mar – May)	9.0	1.45	5.2%	18.3	0.14
Summer (Jun – Sep)	2.7	2.93	8.8%	19.8	0.06
Fall (Oct – Nov)	7.0	0.63	3.6%	19.3	0.11
Winter (Dec – Feb)	13.0	0.48	1.6%	11.9	0.14

Notes:
1. Based on the 75th percentile of synoptic measurements of pH and temperature for each seasonal period.

The proposed effluent TAN criteria presented in Table 5.1 were developed based on an assessment of the assimilative capacity of the Saugeen River with respect to UIA in the vicinity of the outfall. The proposed criteria did not take into account the liquid treatment train technology(ies) that will be utilized by an upgraded and expanded Hanover WWTP. Therefore, a more stringent effluent TAN criteria could apply based on the selected treatment technology.

In correspondence with MECP (see Appendix C), the following effluent TAN limits were defined for the upgraded and expanded Hanover WWTP based on the selected liquid treatment train technology of conventional activated sludge (CAS):

- Summer (Jun – Sep): 2.0 mg/L (objective) and 4.0 mg/L (limit)
- Winter (Oct – May): 4.0 mg/L (objective) and 6.0 mg/L (limit)

The Winter (Oct – May) limit stipulated by MECP is more stringent than the proposed values developed for the Fall (Oct – Nov), Winter (Dec – Feb) and Spring (Mar – May) periods presented in Table 5.1. Conversely, the Summer (Jun – Sep) limit stipulated by MECP (4.0 mg/L) is less stringent than the proposed limit presented in Table 5.1 (2.7 mg/L) which was calculated based on meeting the downstream PWQO for UIA.

Taking the most conservative seasonal values, the following effluent TAN targets are proposed for an upgraded and expanded Hanover WWTP:

- Summer (Jun – Sep): 2.2 mg/L (objective) and 2.7 mg/L (limit)
- Winter (Oct – May): 4.0 mg/L (objective) and 6.0 mg/L (limit)

5.5 Effluent Total Phosphorus

The Saugeen River was determined to be Policy 1 for TP (see Section 3.1.4); therefore, ambient (75th percentile) concentrations are below the PWQO of 0.030 mg/L for all seasons. Despite this, there appears to be limited assimilative capacity in the Spring, with an ambient (75th percentile) concentration of 0.025 mg/L. However, as noted in Section 3.1.4, TP concentrations in the receiver tend to increase with increasing stream flow. Therefore, a “low flow” Spring ambient concentration was also considered and determined to be 0.013 mg/L.

The overall approach used to develop a proposed effluent TP limit includes ensuring fully-mixed TP concentrations are at or below the PWQO under low (7Q20) flow conditions. Using this approach, a future effluent TP limit of 0.25 mg/L is proposed. The resulting seasonal downstream fully-mixed TP concentrations are shown in Table 5.2.

Table 5.2 – Fully Mixed TP Concentration Under Proposed Effluent TP Limits

Discharge Period	Effluent TP Limit (mg/L)	Ambient TP (mg/L)	Fully-Mixed TP (mg/L) at 7Q20 Receiver Flows
Spring (Mar – May)			
All Data	0.25	0.025	0.033
"Low Flow"	0.25	0.013	0.020
Summer (Jun – Sep)	0.25	0.015	0.029
Fall (Oct – Nov)	0.25	0.015	0.029
Winter (Dec – Feb)	0.25	0.020	0.030

Under low (7Q20) flows, the fully-mixed TP concentration would be at the PWQO (0.030 mg/L) in the Winter, and slightly below the PWQO during the critical Summer and Fall seasons (0.029 mg/L). Similarly, using the "low flow" Spring ambient TP concentration, the fully-mixed TP concentration would be below the PWQO during the Spring season under low flow conditions (0.020 mg/L). Only under the unlikely event of combined Spring low (7Q20) flows and elevated background TP concentrations (0.025 mg/L) would the fully-mixed TP concentration be slightly above the PWQO (0.033 mg/L). Finally, the proposed TP limit of 0.25 mg/L would be equivalent to an annual TP loading limit of 3.6 kg/d, which is well below the current ECA limit of 6.4 kg/d.

5.6 Effluent E. coli

An E. coli compliance limit of 100 CFU/100 mL and a design objective of 80 CFU/100 mL (based on geometric mean) are proposed as future effluent requirements for an upgraded Hanover WWTP. These are based on requirements stipulated in correspondence from MECP (see Appendix C).

5.7 Effluent pH

A compliance limit pH range of 6.0 to 9.5 is proposed as a single-sample limit, with a corresponding design objective of 6.5 to 8.5. This is consistent with the pH requirements stipulated in the current ECA.

5.8 Effluent Total Residual Chlorine

At this time, the disinfection technology for an upgraded and expanded Hanover WWTP has not yet been selected. It is possible that disinfection could consist of chlorination / dechlorination. If this technology is selected, a total residual chlorine (TRC) compliance limit of 0.02 mg/L is proposed as a single grab sample limit, with a corresponding objective of Non-Detect.

If UV disinfection is selected, it will not be necessary to identify a TRC objective or limit.

This approach is consistent with the Wastewater Systems Effluent Regulations (SOR/2012-139), which states that the concentration of total residual chlorine in the effluent should not exceed 0.02 mg/L "if chlorine, or one of its compounds, was used in the treatment of [the] wastewater." It is also consistent with TRC requirements stipulated in the existing ECA.

6. Summary

Proposed effluent objectives and limits were developed for an upgraded Hanover WWTP for a design ADF capacity of 13,789 m^3/d. These are summarized in Table 6.1.

In addition, recommended modifications to the ECA-stipulated effluent monitoring requirements are presented in Appendix B.

Table 6.1 – Proposed Effluent Objectives and Limits for the Hanover WWTP at a Future ADF Capacity of 13,789 m^3/d

Parameter	Averaging Period	Objective (mg/L unless noted otherwise)	Limit (mg/L unless noted otherwise)
$cBOD_5$	Monthly	9.0	11.5
TSS	Monthly	9.0	11.5
TAN (1)			
Summer (Jun – Sep)	Monthly	2.2	2.7
Winter (Oct – May)	Monthly	4.0	6.0
TP	Monthly	0.20	0.25
E. coli	Monthly	80 CFU/100 mL	100 CFU/100 mL
pH	Single Grab	6.5 to 8.5	6.0 to 9.5
TRC (2)	Single Grab	Non-Detect	0.02

Notes:

1. Summer TAN targets based on ensuring the downstream PWQO for UIA is met, while Winter TAN targets were stipulated by MECP based on the selected liquid treatment train technology for the upgraded and expanded Hanover WWTP. See Section 5.4 for details.
2. TRC objective and limit would only apply if the upgraded and expanded Hanover WWTP utilizes chlorination / dechlorination for disinfection.

7. References

MOEE (1994). Policy B-1-5 – Deriving Receiving Water Based Point Source Effluent Requirements for Ontario Waters.

Appendix A

Low Flow Analysis

A.1. Summary

A regional low-flow analysis was completed in order to generated reliable low flow estimates at the discharge location in Hanover. Two Water Survey of Canada gauges were applied for this analysis, the first, Station 02FC012 (South Saugeen River near Hanover) and the second, Station 02FC002 (Saugeen River Near Walkerton). Both gauges are located within the lower Saugeen River watershed and as such, are suitable for regional assessment of watershed specific low-flow. Station 02FC012 has a drainage area of 635 km^2, while Station 02FC002 has a drainage area of 2,140 km^2. The drainage area at the Hanover discharge locations, as determined using Ontario's Watershed Information Tool (OWIT) is approximately 1,490 km^2.

Seasonal low-flow estimates for each Water Survey of Canada gauge are provided in Tables A.1 and A.2. Low-flow estimates were generated by fitting four low-flow frequency distributions (Gumbel Three-Parameter, EV3, Three-Parameter Log-Pearson, LP3, Log-Normal, LN, and Weibul Two-Parameter, W2). Three distribution fitting techniques were applied: Method of Moments, Method of Lowest-Observed Drought and Method of Maximum Likelihood. Final distribution selection was achieved by visual inspection of goodness-of-fit, as well, as by a comparison of the estimate uncertainty associate with the 20-year low flow estimate. The final distributions applied for each season, and each gauge, are listed in Tables A.1 and A.2. The average seasonal pro-rated low-flow for both gauged locations was applied in order to estimate seasonal low-flow for the Hanover discharge location. The final results are summarized in Table A.3.

Table A.1 – Seasonal Low-Flow Analysis for the South Saugeen River near Hanover (635 km^2)

Season	Best-Fit Frequency Distribution	7Q20 Flow (m^3/s)
Spring (Mar-May)	Log-Pearson Type III Method of Moments	1.64
Summer (Jun-Sep)	Log-Normal Method of Moments	0.54
Fall (Oct-Nov)	Log-Normal Method of Moments	0.83
Winter (Dec-Feb)	Log-Normal Method of Moments	1.72

Table A.2 – Seasonal Low-Flow Analysis for the Saugeen River near Walkerton (2,140 km^2)

Season	Best-Fit Frequency Distribution	7Q20 Flow (m^3/s)
Spring (Mar-May)	Extreme-Value Method of Lowest Observed Drought	9.21
Summer (Jun-Sep)	Log-Normal Method of Moments	4.21
Fall (Oct-Nov)	Extreme-Value Method of Moments	4.40
Winter (Dec-Feb)	Log-Normal Method of Moments	6.67

Table A.3 – Regional 7Q20 Low Flow Assessment

Season	Saugeen River near Walkerton (m^3/s)	South Saugeen near Hanover (m^3/s)	Estimated Low-Flow Difference for Remaining 1,490 km^2) ($m^3/s/km^2$)	7Q20 Flow Estimate at Hanover WWTP (m^3/s)
Spring (Mar-May)	9.21	1.64	0.0051	5.20
Summer (Jun-Sep)	4.21	0.54	0.0025	2.55
Fall (Oct-Nov)	4.40	0.83	0.0024	2.45
Winter (Dec-Feb)	6.67	1.72	0.0033	3.37

A.2. Detailed Plots

The final distributions applied for each season, and each gauge, are provided in Figures A1 through A.8.

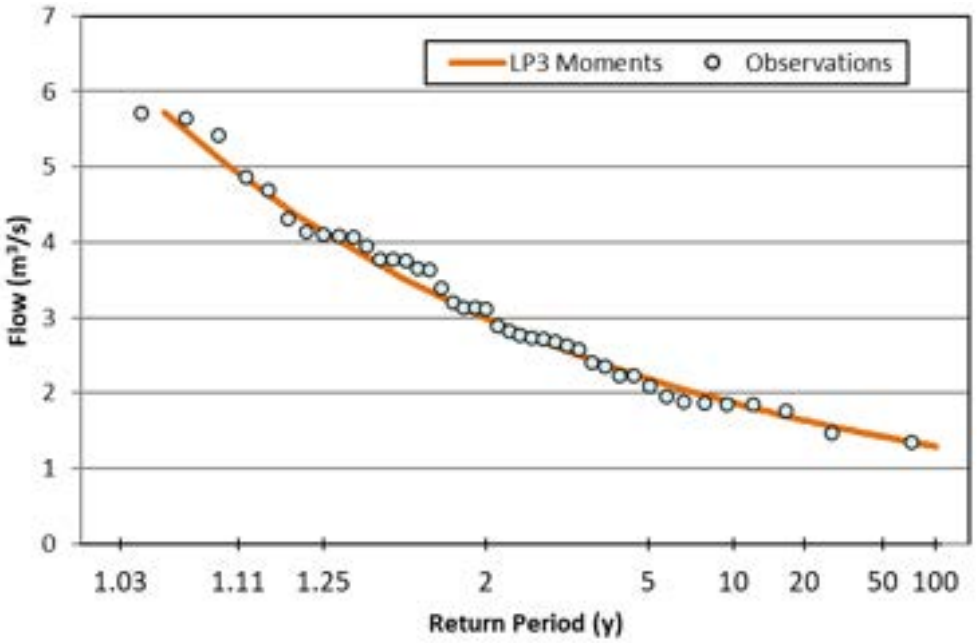


Figure A.1 – Spring Low-Flow Frequency Plot for the South Saugeen River in the Vicinity of Hanover (WSC Gauge No. 02FC012)

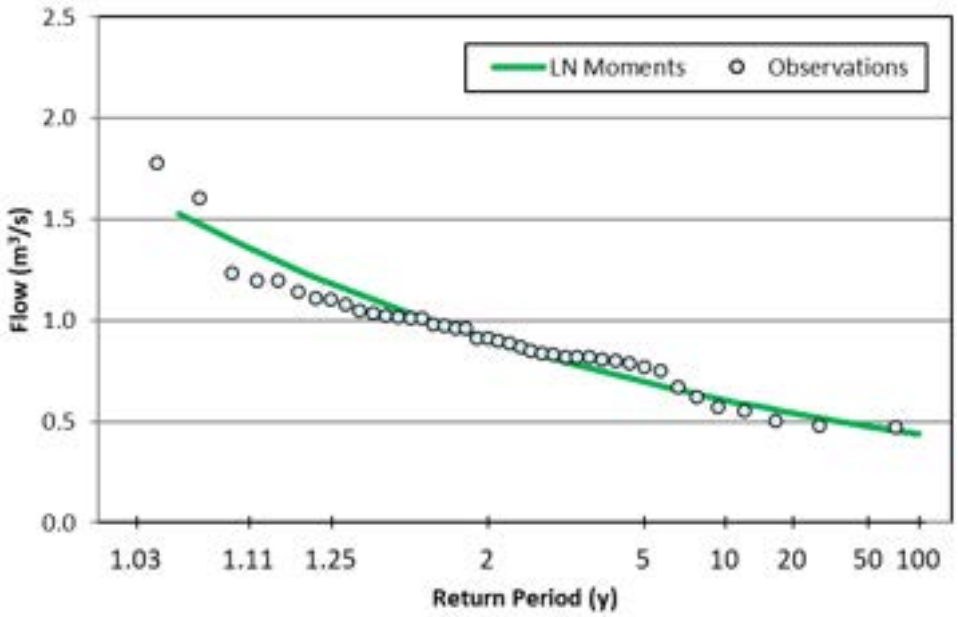


Figure A.2 – Summer Low-Flow Frequency Plot for the South Saugeen River in the Vicinity of Hanover (WSC Gauge No. 02FC012)

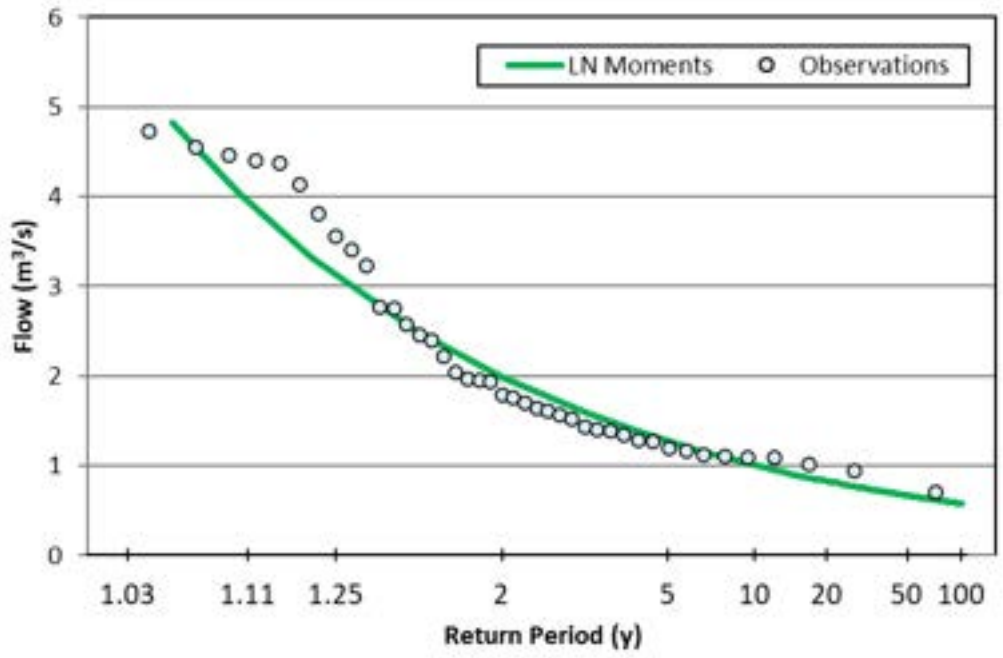


Figure A.3 – Fall Low-Flow Frequency Plot for the South Saugeen River in the Vicinity of Hanover (WSC Gauge No. 02FC012)

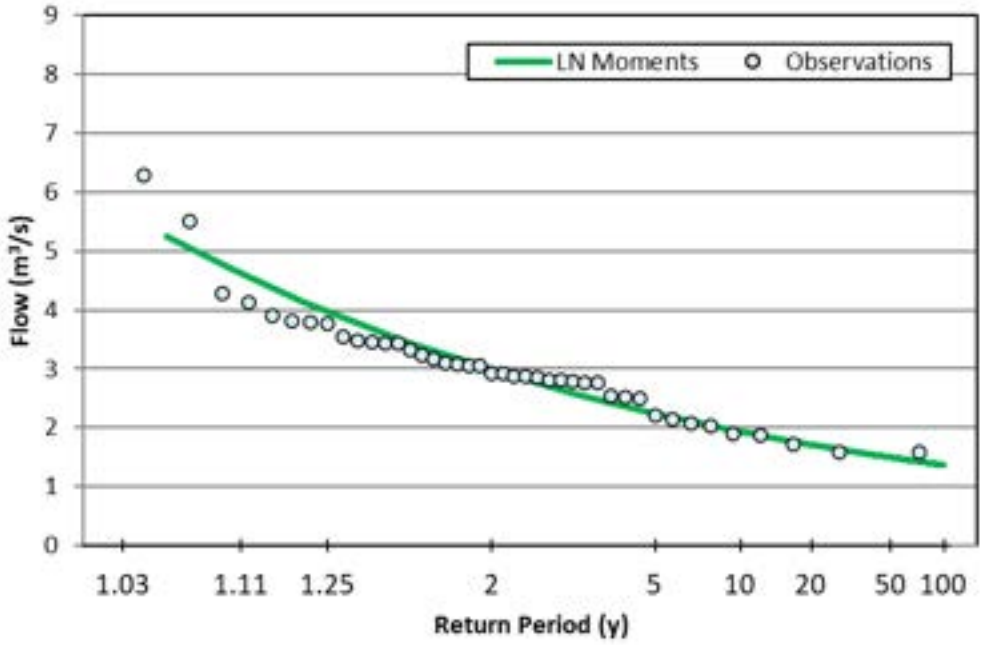


Figure A.4 – Winter Low-Flow Frequency Plot for the South Saugeen River in the Vicinity of Hanover (WSC Gauge No. 02FC012)

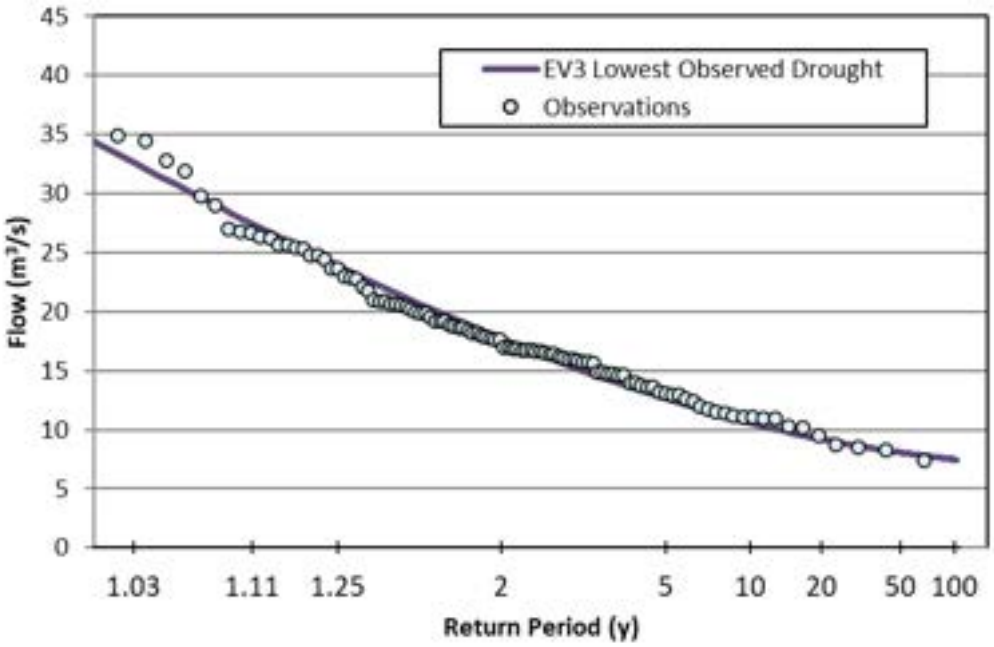


Figure A.5 – Spring Low-Flow Frequency Plot for the Saugeen River in the Vicinity of Walkerton (WSC Gauge No. 02FC002)

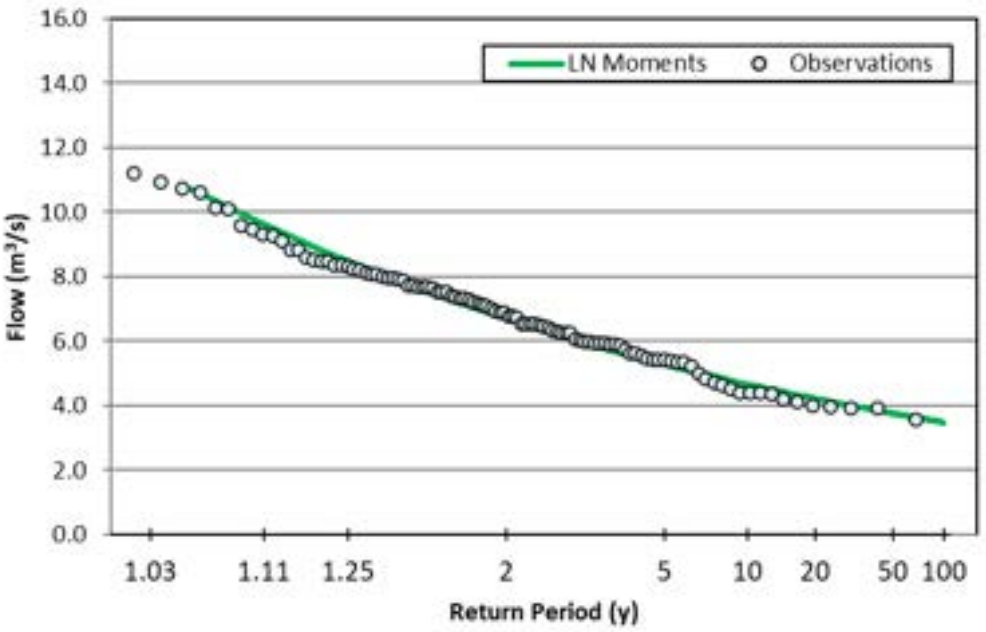


Figure A.6 – Summer Low-Flow Frequency Plot for the Saugeen River in the Vicinity of Walkerton (WSC Gauge No. 02FC002)

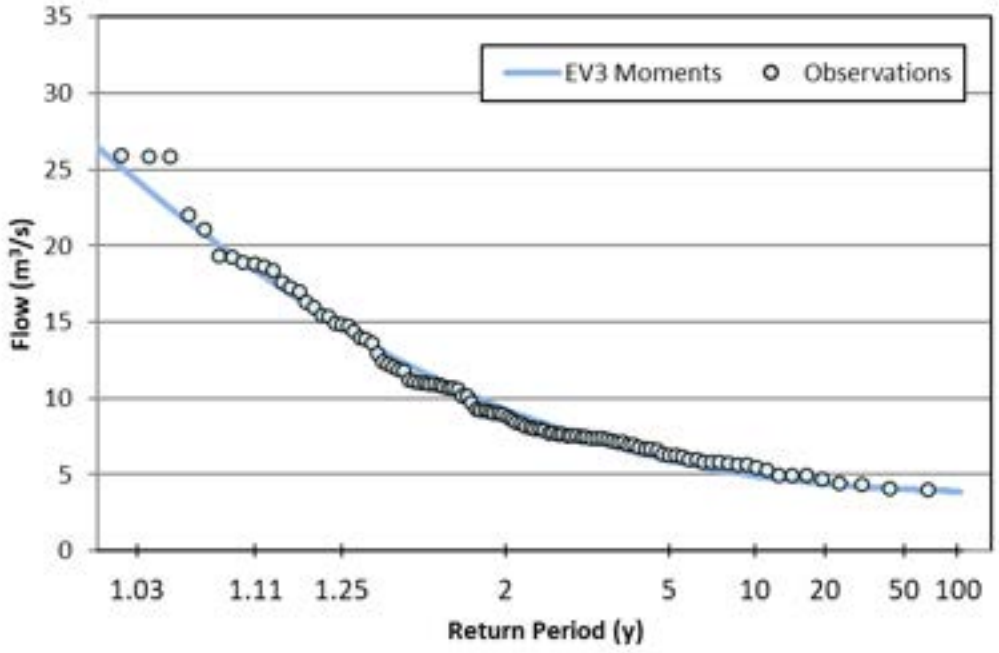


Figure A.7 – Fall Low-Flow Frequency Plot for the Saugeen River in the Vicinity of Walkerton (WSC Gauge No. 02FC002)

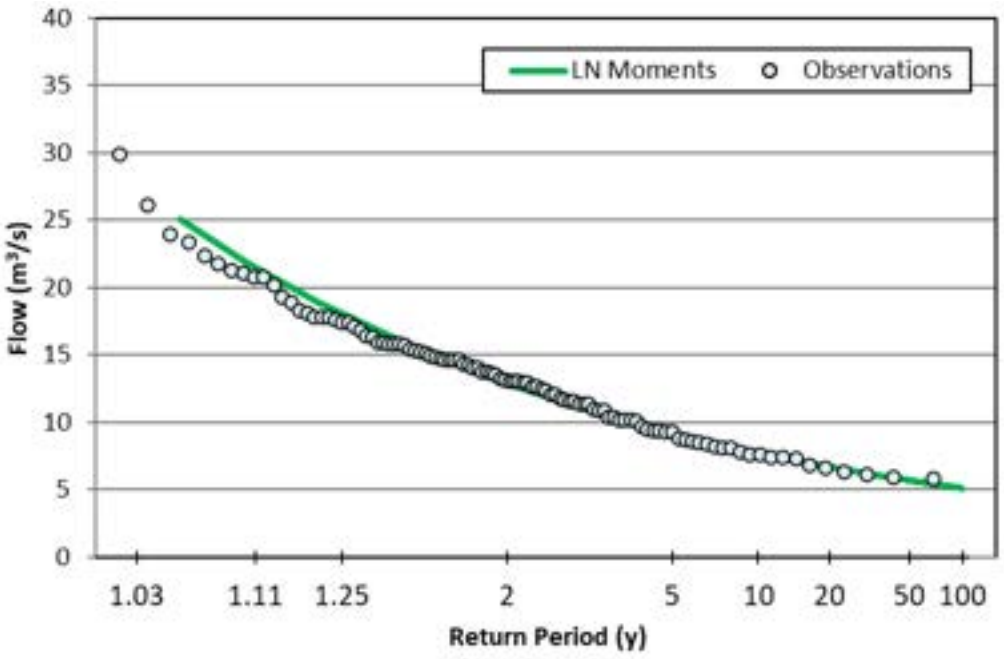


Figure A.8 – Winter Low-Flow Frequency Plot for the Saugeen River in the Vicinity of Walkerton (WSC Gauge No. 02FC002)

Appendix B

Recommended Modifications to ECA-Stipulated Effluent Monitoring Requirements

Schedule D of existing ECA No. 6173-BKNLVM stipulates a Monitoring Program for the final effluent. Given the proposed effluent criteria developed as part of this study, it is recommended that several changes be made to the effluent monitoring program, namely:

- Increasing the frequency of analysis of TAN, TKN and other nitrogen species from Monthly to Weekly. This will provide sufficient data against which to assess compliance with respect to the proposed seasonal TAN limits, as well as provide a comprehensive understanding of effluent nitrogen species in the effluent from the Hanover WWTP.
- Increasing the frequency of the calculation of Un-ionized Ammonia from Monthly to Weekly to coincide with the frequency of sample collection for TAN.
- Eliminate Total Residual Chlorine monitoring in the event that the upgraded and expanded Hanover WWTP utilizes UV disinfection.

The proposed modified effluent monitoring requirements are presented in Table B.1. Items that have been modified from the current ECA requirements have been presented in ***bold italic*** font.

Table B.1 – Proposed Effluent Monitoring Requirements

Parameters	Sample Type	Frequency
cBOD5	24-hour composite	Weekly
Total Suspended Solids	24-hour composite	Weekly
Total Phosphorus	24-hour composite	Weekly
Total Ammonia Nitrogen	24-hour composite	***Weekly***
Total Kjeldahl Nitrogen	24-hour composite	***Weekly***
Nitrate as Nitrogen	24-hour composite	***Weekly***
Nitrite as Nitrogen	24-hour composite	***Weekly***
E. coli	Grab	Weekly
Total Residual Chlorine (sampled at final effluent pumping chamber) ***(3)***	Grab/Analyzer ***(if required)***	Daily ***(if required)***
pH (1)	Grab / Probe / Analyzer	Weekly
Temperature (1)	Grab / Probe / Analyzer	Weekly
Un-ionized Ammonia (2)	As calculated	***Weekly***

Notes:

1. pH and temperature of the Final Effluent shall be determined in the field at the time of sampling for Total Ammonia Nitrogen.
2. The concentration of un-ionized ammonia shall be calculated using the total ammonia concentration, pH and temperature using methodology stipulated in "Ontario Provincial Water Quality Objectives" dated July 1994, as amended.
3. ***Applies only if the effluent disinfection system utilizes chlorine.***

Appendix C

Correspondence with MECP Regarding Effluent TAN and E. coli Targets

Melody Johnson

From: Munro, Alison (MECP) <Alison.Munro@ontario.ca>
Sent: June 30, 2025 3:57 PM
To: Jatin Singh
Cc: Kate Zheng; Michael Hulley; Bechard, Marc (MECP); Beth Wang; Macki, Monika (MECP); Melody Johnson
Subject: RE: Assimilative Capacity Study to Support the Ongoing Hanover WWTP Class EA

Good afternoon, Jatin.

I conferred with an Engineering Advisor from our Technical Assessment and Standards Development Branch who reviewed your email. The Engineer noted that the wastewater treatment plant should be property designed to accommodate the anticipated influent contaminant loadings and variability to prevent future episodes of nitrification process overloading/upsets. With these controls in mind, a properly designed and functioning conventional activated sludge process with year round nitrification should be able to achieve the following objectives/limits:

Parameter	Season	Objective	Limit
TAN	Summer (June-Sep)	2 mg/L	4 mg/L
	Winter (Oct-May)	4 mg/L	6 mg/L
E. coli		80 cfu/100mL	100 cfu/100mL

It was also noted during the review that there are examples of ECAs for industrial WWTPs at meat processing facilities with more stringent criteria than that presented above.

Please use this email as a sign-off from RTSS when you apply for the ECA. If there are any further questions or concerns, they can be discussed with the Review Engineer upon application.

Take care,

Alison

Alison Munro, Surface Water Specialist
Ministry of the Environment, Conservation and Parks
733 Exeter Road, London, ON N6E 1L3
p: 519.860.5987 f: 519.873.5020

From: Jatin Singh <jatin.singh@ainleygroup.com>
Sent: Monday, May 26, 2025 8:24 AM
To: Munro, Alison (MECP) <Alison.Munro@ontario.ca>
Cc: Kate Zheng <kate.zheng@ainleygroup.com>; Michael Hulley <Michael.Hulley@bskyeng.com>; Bechard, Marc (MECP) <Marc.Bechard@ontario.ca>; Beth Wang <beth.wang@ainleygroup.com>; Macki, Monika (MECP) <Monika.MacKi@ontario.ca>; Melody Johnson <melody@bskyeng.com>
Subject: RE: Assimilative Capacity Study to Support the Ongoing Hanover WWTP Class EA

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Hi Alison:

We are in agreement with the proposed E. coli limits outlined in the Table below. However, we would like to raise concerns regarding the proposed Total Ammonia Nitrogen (TAN) limit and objective, particularly during the winter period (October to May). A objective of 4 mg/L and limit of 6 mg/L would effectively require the plant operation to consistently aiming at an effluent concentration of 2–3 mg/L to account for normal fluctuations and ensure compliance. This imposes a significant operational burden and complexity on the facility. Meeting the proposed winter TAN limits would necessitate substantial capital investment—with much bigger aeration and secondary clarification tanks, larger blowers and aeration capacity, higher RAS pumping system capacity, and much larger building —as well as increased operational costs for maintenance and energy usage.

While we acknowledge that Table 1 of the MECP's Procedure F-5-1 indicates that conventional activated sludge (CAS) processes with nitrification can achieve TAN concentrations below 1 mg/L, it is important to note that these values are identified as expected **warm-weather effluent concentrations**. The table also assumes **optimal operating conditions and typical influent characteristics** (BOD_5 = 170 mg/L, soluble BOD_5 = 50%, SS = 200 mg/L, TP = 7 mg/L, $(NH_3+NH_4^+)$-N = 20 mg/L).

The Hanover WWTP does not operate under the optimal conditions outlined in Table 1 of F-5-1. Approximately 30–35% of the plant's influent originates from Exceldor Foods, a turkey processing facility located upstream. Operational upsets at Exceldor have a direct and often significant impact on the WWTP's performance. There are multiple instances each year where Exceldor's discharge exceeds the Town's sewer use by-law limits, resulting in influent with considerably higher strength and variability than the standard assumptions in Table 1. These upsets vary in duration—from brief events to prolonged episodes—with biological recovery at the WWTP sometimes taking weeks or even months, particularly during the winter. To address this variability, the future plant design will incorporate a safety factor in treatment capacity to help absorb these loading shocks. Imposing a more stringent nitrification limit under such conditions would substantially increase capital costs, land requirements, and long-term operational expenses.

To our knowledge, most CAS plants achieving TAN levels between 1 and 6 mg/L are doing so while operating at a capacity much lower than their rated capacity(typically upto 60-70%). Achieving the proposed low TAN limits under cold-weather conditions, especially at higher loading rates, is particularly challenging for conventional activated sludge systems.

The proposed winter TAN limit and objective of 6 mg/L and 4 mg/L, respectively, are more than 50% lower than those identified in the Assimilative Capacity Study (ACS). Given the unique operational challenges of Hanover WWTP and the significant industrial flow contribution from a single user, we respectfully request reconsideration of the proposed winter TAN effluent targets.

We respectfully propose the following revised TAN targets for the winter period (October to May):

- Objective: 8 mg/L
- Limit: 10 mg/L

We believe these adjusted values reflect a more practical and achievable standard under the site-specific conditions of the Hanover WWTP, while still protecting the receiving environment.

Regards

Jatin Singh, M.A.Sc., P.Eng.,PMP
Wastewater Treatment Group Lead

Tel: (905) 452-5172 Ext. 311

Cell: (647) 975-3885
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From: Munro, Alison (MECP) <Alison.Munro@ontario.ca>
Sent: May 7, 2025 1:53 PM
To: Jatin Singh <jatin.singh@ainleygroup.com>
Cc: Kate Zheng <kate.zheng@ainleygroup.com>; Michael Hulley <Michael.Hulley@bskyeng.com>; Bechard, Marc (MECP) <Marc.Bechard@ontario.ca>; Beth Wang <beth.wang@ainleygroup.com>; Macki, Monika (MECP) <Monika.MacKi@ontario.ca>; Melody Johnson <melody@bskyeng.com>
Subject: RE: Assimilative Capacity Study to Support the Ongoing Hanover WWTP Class EA

Good afternoon, Jatin.

Thank you for meeting with the MECP on April 30th to discuss the proposed limits and objectives for the new Hanover WWTP moving forward. It was noted that the new plant will be conventional activated sludge with nitrification. As discussed in the meeting, the Ministry must consider both the assimilative capacity of the receiver as well as the expected treatment capabilities of the Best Available Technology Economically Achievable when applying limits and objectives.

The Ministry has produced guidelines which outline the expected treatment abilities of different types of systems (F-5-1 Determination Of Treatment Requirements For Municipal And Private Sewage Treatment Works | ontario.ca). Table 1 from F-5-1 suggests that Conventional Activated Sludge with nitrification should result in an effluent with a TAN concentration of less than 1mg/L. Typical TAN values approved for Municipal Plants are between 1mg/L and 6mg/L depending on the receiver. Given that the Saugeen River has sufficient capacity to assimilate TAN without causing toxicity as detailed in the Study, the recommended numbers are on the higher end of the range.

The E. coli limits and objectives were also discussed in the meeting last week. UV treatments systems are the preferred option (over chlorine) and are expected to reach less than 100 cfu/100mL.

Below is the table with suggested values.

Parameter	Season	Objective	Limit
TAN	Summer (June-Sep)	2 mg/L	4 mg/L
	Winter (Oct-May)	4 mg/L	6 mg/L
E. coli		80 cfu/100mL	100 cfu/100mL

Please Monika know if you would like to discuss further and we can set up another meeting. Otherwise, please update the report and resend for signoff from the Region.

Thanks,
Alison

Alison Munro, Surface Water Specialist
Ministry of the Environment, Conservation and Parks
733 Exeter Road, London, ON N6E 1L3
p: 519.860.5987 f: 519.873.5020

From: Jatin Singh <jatin.singh@ainleygroup.com>
Sent: Friday, March 28, 2025 4:40 PM
To: Macki, Monika (MECP) <Monika.MacKi@ontario.ca>; Melody Johnson <melody@bskyeng.com>
Cc: Kate Zheng <kate.zheng@ainleygroup.com>; Michael Hulley <Michael.Hulley@bskyeng.com>; Bechard, Marc (MECP) <Marc.Bechard@ontario.ca>; Beth Wang <beth.wang@ainleygroup.com>; Munro, Alison (MECP) <Alison.Munro@ontario.ca>
Subject: RE: Assimilative Capacity Study to Support the Ongoing Hanover WWTP Class EA

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Hi Monika: we have completed Technology Selection and are recommending "Conventional Activate Sludge Process" for plant expansion.

Please let us know if we can finalise the proposed effluent limits.

Thank you

Jatin Singh, M.A.Sc., P.Eng.,PMP
Wastewater Treatment Group Lead

Tel: (905) 452-5172 Ext. 311
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From: Macki, Monika (MECP) <Monika.MacKi@ontario.ca>
Sent: February 18, 2025 9:27 AM
To: Melody Johnson <melody@bskyeng.com>
Cc: Kate Zheng <kate.zheng@ainleygroup.com>; Jatin Singh <jatin.singh@ainleygroup.com>; Michael Hulley <Michael.Hulley@bskyeng.com>; Bechard, Marc (MECP) <Marc.Bechard@ontario.ca>; Beth Wang <beth.wang@ainleygroup.com>; Munro, Alison (MECP) <Alison.Munro@ontario.ca>
Subject: RE: Assimilative Capacity Study to Support the Ongoing Hanover WWTP Class EA

Hi Melody,

Thank you for providing the revised ACS report and your patience.

Yes, for the most part this updated ACS is acceptable.

The TAN and E. coli numbers, although inline with the receiver's capacity, are elevated above what most treatment technologies (including activated sludge) are able to produce. MECP recommends that once the treatment technology is finalized in the EA, that the proponent discuss with the Ministry updated effluent limits.

Thank you,

Monika Macki
Environmental Resource Planner/Environmental Assessment Coordinator
Environmental Assessment Branch
Ministry of the Environment, Conservation and Parks
monika.macki@ontario.ca

From: Melody Johnson <melody@bskyeng.com>
Sent: Monday, November 25, 2024 11:55 AM
To: Macki, Monika (MECP) <Monika.MacKi@ontario.ca>; Munro, Alison (MECP) <Alison.Munro@ontario.ca>
Cc: Kate Zheng <kate.zheng@ainleygroup.com>; Jatin Singh <jatin.singh@ainleygroup.com>; Michael Hulley <Michael.Hulley@bskyeng.com>; Bechard, Marc (MECP) <Marc.Bechard@ontario.ca>; Beth Wang <beth.wang@ainleygroup.com>
Subject: RE: Assimilative Capacity Study to Support the Ongoing Hanover WWTP Class EA

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Hi Monika / Alison,

As a follow-up to our meeting on October 21st, 2024, attached please find a revised Assimilative Capacity Study report that has been updated to address MECP's comments, namely:

- Chlorine: A sub-section has been added to Section 5 – "Determination of Effluent Limits" that defines effluent TRC requirements in the event that the disinfection technology for the upgraded and expanded WWTP still utilizes chlorine.
- Total Ammonia Nitrogen: Text has been added to Section 5.4 clarifying that the proposed effluent TAN requirements were developed based on an assessment of the receiver, and that the final effluent TAN requirements may differ based on the treatment technology that is ultimately selected.
- Effluent Monitoring Requirements: Appendix B – "Recommended Modifications to ECA-Stipulated Effluent Monitoring Requirements" has been added that identifies recommended modifications to effluent monitoring requirements given the proposed effluent objectives and limits.

Please feel free to contact me if you have any questions or concerns regarding the revised ACS report.

Thanks,

Melody Johnson, PhD, P.Eng., Senior Consultant

melody@bskyeng.com | www.bskyeng.com | M. 647.721.7644

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From: Macki, Monika (MECP) <Monika.MacKi@ontario.ca>
Sent: October 22, 2024 1:20 PM
To: Beth Wang <beth.wang@ainleygroup.com>
Cc: Kate Zheng <kate.zheng@ainleygroup.com>; Jatin Singh <jatin.singh@ainleygroup.com>; Michael Hulley <Michael.Hulley@bskyeng.com>; Melody Johnson <melody@bskyeng.com>; Munro, Alison (MECP) <Alison.Munro@ontario.ca>; Bechard, Marc (MECP) <Marc.Bechard@ontario.ca>
Subject: RE: Assimilative Capacity Study to Support the Ongoing Hanover WWTP Class EA

Hi Beth,

Please find attached meeting notes for yesterday's meeting regarding the Hanover WWTP. I believe those CC-ed were present in yesterday's meeting, if I have missed anyone please forward the notes to them.

Thank you,

Monika Macki
Environmental Resource Planner/Environmental Assessment Coordinator
Environmental Assessment Branch
Ministry of the Environment, Conservation and Parks
monika.macki@ontario.ca

From: Beth Wang <beth.wang@ainleygroup.com>
Sent: Tuesday, October 15, 2024 10:39 AM
To: Macki, Monika (MECP) <Monika.MacKi@ontario.ca>
Cc: Kate Zheng <kate.zheng@ainleygroup.com>; Jatin Singh <jatin.singh@ainleygroup.com>; Michael Hulley <Michael.Hulley@bskyeng.com>; EA Notices to SWRegion (MECP) <eanotification.swregion@ontario.ca>; Melody Johnson <melody@bskyeng.com>
Subject: RE: Assimilative Capacity Study to Support the Ongoing Hanover WWTP Class EA

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Good morning Monika,

Hope all is well!

Yes, Monday, October 21th 11:00 – 12:00 works for us.
Please include the following in the meeting invite:

Melody Johnson melody@bskyeng.com
Michael Hulley Michael.Hulley@bskyeng.com
Jatin Singh jatin.singh@ainleygroup.com
Kate Zheng kate.zheng@ainleygroup.com
Beth Wang beth.wang@ainleygroup.com

Could you please advise the intent of this meeting and clarify what questions or concerns we will be addressing?

Regards,

Beth Wang, EIT
Engineering Intern

www.ainleygroup.com
Tel: (905) 452-5172 Ext. 321
Cell: (289) 541-8086

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From: Macki, Monika (MECP) <Monika.MacKi@ontario.ca>
Sent: October 15, 2024 9:38 AM
To: Beth Wang <beth.wang@ainleygroup.com>
Cc: Kate Zheng <kate.zheng@ainleygroup.com>; Jatin Singh <jatin.singh@ainleygroup.com>; Michael Hulley <Michael.Hulley@bskyeng.com>; EA Notices to SWRegion (MECP) <eanotification.swregion@ontario.ca>; Melody Johnson <melody@bskyeng.com>
Subject: RE: Assimilative Capacity Study to Support the Ongoing Hanover WWTP Class EA

Hi Beth,

Hope you had a happy thanksgiving!

MECP would like to arrange a meeting to discuss the ACS. Would **Monday, October 21 11:00-12:00** work? Let me know the invitees and I'll make a MS Teams invite.

Thanks,

Monika Macki
Environmental Resource Planner/Environmental Assessment Coordinator
Environmental Assessment Branch
Ministry of the Environment, Conservation and Parks
monika.macki@ontario.ca

From: Beth Wang <beth.wang@ainleygroup.com>
Sent: Friday, August 23, 2024 10:50 AM
To: Macki, Monika (MECP) <Monika.MacKi@ontario.ca>
Cc: Kate Zheng <kate.zheng@ainleygroup.com>; Jatin Singh <jatin.singh@ainleygroup.com>; Michael Hulley <Michael.Hulley@bskyeng.com>; EA Notices to SWRegion (MECP) <eanotification.swregion@ontario.ca>; Melody Johnson <melody@bskyeng.com>
Subject: RE: Assimilative Capacity Study to Support the Ongoing Hanover WWTP Class EA

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Good morning Monika,

Yes, that is correct. The Assimilative Capacity Study is to support the Hanover WWTP Upgrades EA, which was initiated in 2022.
Thanks and please let us know if you have any comments.

Regards,

Beth Wang, EIT
Engineering Intern
Ainley
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Tel: (905) 452-5172 Ext. 321
Cell: (289) 541-8086

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From: Macki, Monika (MECP) <Monika.MacKi@ontario.ca>
Sent: August 22, 2024 11:54 AM
To: Melody Johnson <melody@bskyeng.com>
Cc: Beth Wang <beth.wang@ainleygroup.com>; Kate Zheng <kate.zheng@ainleygroup.com>; Jatin Singh <jatin.singh@ainleygroup.com>; Michael Hulley <Michael.Hulley@bskyeng.com>; EA Notices to SWRegion (MECP) <eanotification.swregion@ontario.ca>
Subject: RE: Assimilative Capacity Study to Support the Ongoing Hanover WWTP Class EA

Some people who received this message don't often get email from monika.macki@ontario.ca. Learn why this is important

Thanks Melody.

Just to confirm, is this for the Hanover WWTP Upgrades Class EA that was initiated in 2022?

Monika Macki
Environmental Resource Planner/Environmental Assessment Coordinator
Environmental Assessment Branch
Ministry of the Environment, Conservation and Parks
monika.macki@ontario.ca

From: Melody Johnson <melody@bskyeng.com>
Sent: Friday, August 16, 2024 12:06 PM
To: Macki, Monika (MECP) <Monika.MacKi@ontario.ca>
Cc: Beth Wang <beth.wang@ainleygroup.com>; Kate Zheng <kate.zheng@ainleygroup.com>; Jatin Singh <jatin.singh@ainleygroup.com>; Michael Hulley <Michael.Hulley@bskyeng.com>; EA Notices to SWRegion (MECP) <eanotification.swregion@ontario.ca>
Subject: Assimilative Capacity Study to Support the Ongoing Hanover WWTP Class EA

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Hello Monika,

Blue Sky EEC have been retained to complete an Assimilative Capacity Study (ACS) of the Saugeen River to support the ongoing Hanover WWTP Class EA. The objectives of the ACS were to define ambient water quality and low flows in the receiver, and to develop recommended future effluent requirements for the Hanover WWTP upgraded and expanded to a 2052 design average daily flow capacity of 13,789 m^3/d.

Attached please find a copy of the ACS Report for MECP's review. We would welcome the opportunity to have a review meeting with key MECP staff, if required, to discuss any comments / questions identified during the review.

We look forward to receiving MECP's input. Should you have any questions or concerns, please don't hesitate to contact me.

Thanks, and have a great weekend.

Melody Johnson, PhD, P.Eng., Senior Consultant
melody@bskyeng.com | www.bskyeng.com | M. 647.721.7644

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Appendix C

Capacity Assessment and Optimization Study

AINLEY & ASSOCIATES LIMITED
6299 Airport Road, Suite 205, Mississauga, ON L4V 1N3
Tel: (905) 452-5172 • www.ainleygroup.com

December 15, 2023 File No. 123017

Town of Hanover
341 10th Street
Hanover, ON, N4N 1P5

Attn: **Ron Cooper,**
Director of Public Works

Re: Hanover Wastewater Treatment Plant
Capacity Assessment and Optimization Study

Dear Mr. Cooper:

We are pleased to present our Technical Memorandum concerning the "Capacity Assessment and Optimization Study" for the Hanover Wastewater Treatment Plant. This study seeks to investigate opportunities for improving treatment capacity within the HWWTP.

As a component of the re-rating process for the Hanover WWTP, this Technical Memorandum has been created to fulfill Phase 1 requirements. It aims to evaluate the current capacity and operational status of the HWWTP, along with outlining the Work Plan for Phase 2

If you have any questions or require further assistance with this matter, please feel free to contact the undersigned.

Yours truly,

AINLEY & ASSOCIATES LIMITED



Jatin Singh, P.Eng., PMP
Project Manager

cc: Aziz Ahmed - Ministry of Environment, Conservation, and Parks (By Email)
Ministry of Environment, Conservation, and Parks Southwest Region Office (By Email)
Rhonda Shannon – Ministry of Environment, Conservation, and Parks (By Email)
Mark Badali – Ministry of Environment, Conservation, and Parks (By Email)
Krupa Prajapati – Ministry of Environment, Conservation, and Parks (By Email)
John Ritchie – Ministry of Environment, Conservation, and Parks (By Email)
Jatin Singh – Ainley & Associates Limited (By Email)
Kate Zheng – Ainley & Associates Limited (By Email)

Hanover Wastewater Treatment Plant (HWWTP) Capacity Assessment and Plant Optimization Study

Technical Memorandum

Prepared For:

Town of Hanover

December 2023

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Ainley GROUP

HANOVER WASTEWATER TREATMENT PLANT CAPACITY ASSESSMENT AND OPTIMIZATION STUDY
TECHNICAL MEMORANDUM

PROJECT NO. 123017

Prepared For:

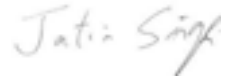
Town of Hanover

By:



Kate Zheng, P.Eng.

Checked By:



Jatin Singh, P.Eng., PMP

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Appendix C ……Phase 2 Work Plan Cost Estimate
Appendix D…… Calculation Sheet

1 Introduction

The objective of this project is to re-rate the existing Hanover WWTP to a higher rated capacity with required upgrades to meet the plant's immediate influent demand.

1.1 Background

The Hanover Wastewater Treatment Plant (HWWTP, plant), located at 718, 7th Ave, Hanover, is owned and operated by the Town of Hanover (the Town) along with gravity sewer network, The plant was originally constructed in 1934. Since then, it has undergone two major expansions in 1960's and 1980's to increase the treatment plant capacity and provide anaerobic treatment of sludge. Per Environmental Compliance Approval (ECA) number 6173-BKNLVM (Issue Date: March 2, 2020), the plant has a rated capacity of 6,360 m3 /d. The Plant is currently operated at approximately 85% of rated capacity (based on 2018-2022 flow data). The disinfected secondary effluent is discharged into the Saugeen River.

The wastewater received at the plant is primarily residential waste with pre-treated wastewater from a large meat processing facility (Exceldor Foods) through municipal sewer. In addition, hauled leachate from the Hanover/Walkerton Landfill Site (HWLS), owned by the Town of Hanover and the Municipality of Brockton, is unloaded into one of the existing underground storage tanks (old sludge drying bed). The impact of receiving leachate on the plant's liquid train operation and sludge digestion is minimal because the received leachate is only applied to the underground storage tank and is slowly discharged into the plant Headworks. Currently, several development projects approved by the Town are underway, and the expected sewage flow into the plant is projected to reach 7,000 m^3/d ADF by 2026. Moreover, several development projects in the Town are pending approval. The projected plant influent flow is projected to reach 6,333 m^3/d at year 2024, 7,000 m^3/d at year 2026, and 13,789 m^3/d at year 2052.

The Township has initiated a re-rating process for a higher rated capacity with minor upgrades in HWWTP to accommodate the increasing amount of plant influent to meet the immediate capacity demand. The plant major expansion for long term capacity demand will be planned accordingly in EA.

The Township has initiated the plant re-rating process, aiming to enhance its capacity through minor upgrades and optimization at the HWWTP. This is intended to address existing capacity issues at the facility and accommodate anticipated immediate future flows. Planning for a substantial plant expansion to meet long-term capacity needs (30-year horizon) is underway as part of the ongoing Class Environmental Assessment (EA).

1.2 Approach of Re-rating

As per "Optimization Guidance Manual for Sewage Works (2010)", the overall concept and approach associated with the Process Audit is used for the Hanover plant's capacity re-rating process. The general Process Audit approach to re-rating a WWTP include 2 phases as listed below:

1. Phase 1
   - Historical data review and analysis, including flow, loading, and operation data
   - Process capacity analysis
   - Develop Phase 2 Workplan, including budget and schedule.
2. Phase 2
   - Field investigation, including field test, stress test
   - Reporting to summarize findings, identify benefit and cost, develop recommendation and implementation plan.

As Phase 1 of the re-rating process, the Town has embarked on this Plant Capacity Assessment and Optimization Study to review the historical data, assess the capacity of the existing facilities, and recommend optimization of the existing process units to higher treatment capacity within the Plant's ECA discharge loading limits. Phase 2 workplan are also prepared in this Technical Memorandum.

1.3 Objectives

As per the requirements in Optimization Guidance Manual for Sewage Works (WEAO, MECP, Environment Canada, 2010), the objectives of this report include:

1. Review historical operation and performance data
2. Summarize site visit and findings
3. Evaluate historical operating conditions
4. Assess process and hydraulic capacity
5. Recommend Phase 2 Wok Plan with estimated budget and cost

1.4 Design Basis

The report is prepared based on the following:

1. Optimization Guidance Manual for Sewage Works (2010) (WEAO, MECP, Environment Canada)
2. Guidance Manual for Sewage Treatment Plant Process Audits (MECP, Environmental Canada, 2006)
3. Amended Environmental Compliance Approval (#6137-BKNLVM, Issued on March 2, 2020)
4. Provided as-built drawings of Plant 2 upgrades

5. Historical operation and performance data
6. Operation and Maintenance Manual (R.V.A. 1984)
7. Other report provided by the Town of Hanover
8. Information received through discussion with the plant operating staffs and Ainley Staff Site visit to HWWTP on May 17th, 2023

2 Existing WWTP Facility Description

The HWWTP is a secondary treatment plant with disinfection and chemical phosphorous removal. The Town's raw sewage is collected and transported by a series of gravity sewers discharging to the plant.

The following major systems are used at the plant:

- Sewage Pumping (constructed in early 1980s) – a pumping station with split wet well and two (2) screw pumps
- Screening (constructed in early 1980s) – in-channel conveyor system and a manual bypass bar screen
- Grit Removal (constructed in early 1980s) – an aerated grit tank with two (2) decanting channels
- Influent Flow Splitting (constructed in early 1980s) – an adjustable flow splitter to Plant 1 and Plant 2
- Plant 1 (constructed in 1960s)
  - Primary Treatment - one (1) rectangular clarifier
  - Aeration Tanks - one (1) Plug-flow tank
  - Final Clarifiers - two (2) circular clarifiers
- Plant 2 (constructed in early 1980s)
  - Primary Treatment - two (2) rectangular clarifiers
  - Aeration Tanks - two (2) complete-mixed rectangular tanks
  - Final Clarifiers - two (2) rectangular clarifiers
- Phosphorous Removal – Alum addition
- Disinfection (constructed in early 1980s) – chlorine contact tank (CCT)
- Sludge Stabilization (constructed in early 1980s) – one (1) primary anaerobic digester and one (1) secondary digester for settling and storage.
- Sludge/Biosolids Storage – two (2) underground biosolids storage tanks (constructed in early 1980s) and one above ground biosolid storage tank (constructed in 2017)
- Leachate receiving – unloaded directly into existing underground storage tank.

Digested sludge is stored on site in sludge storage tanks and subsequently trucked away from the plant for land application.

2.1 Process Description

The plant process flow schematic is presented in Figure 1.

The combination of sanitary sewage and pretreated industrial wastewater enters the plant at the plant inlet channel through one (1) 750 mm gravity influent sewer and one (1) 600 mm gravity influent sewer.

The pumping station is equipped with two (2) screw-type raw sewage lift pumps, one in operation and the other serving as a standby. These screw-type raw sewage lift pumps are responsible for pumping the influent to the conveyor screening system. The raw wastewater undergoes screening, and the screenings are removed using the in-channel conveyor with an integrated dewatering press system to a waste bin. . A manual bar screen, positioned adjacent to the mechanical screen, will be used if the plant's influent flowrate surpasses the capacity of the conveyor screen or if the conveyor screen experiences operational issues. Screened wastewater flow is directed into the aerated grit removal tank to separate and settle heavier inorganic particles at the tank's bottom. The air lift pumps are employed to remove settled grit from the grit tank bottom to two (2) grit decanting channels for wasting. Then, the wastewater is evenly divided into two (2) plants with an adjustable flow splitter: Plant 1 (East Plant) and Plant 2 (West Plant).

In both plants, the preliminary treated wastewater is treated in the primary clarifiers for solid separation and settlement, aeration tanks for biological BOD removal, and then final clarifiers for the settling and separation of activated sludge. For aeration tanks, plant 1 utilizes a coarse bubble aeration system for oxygenation, while Plant 2 employs dual-speed mechanical surface aerators. Each plant is outfitted with two (2) return activated sludge (RAS) / waste activated sludge (WAS) pumps designed for sludge returning to aeration tank and wasting WAS from the secondary clarifiers in Plant 1 is directed back to the pumping station, whereas WAS in Plant 2 is routed back to the primary clarifiers in Plant 2 for co-thickening.

The clarifiers effluent from Plant 1 and Plant 2 is subsequently combined and conveyed to the chlorine contact tank (CCT). This system comprises two (2) chlorine contact chambers. chlorine is dosed at the head of CCT for chlorination and sodium bisulphite is dosed after CCT for de-chlorination. The plant effluent flowrate is measured with a Parshall flume installed in the CCT influent channel. The effluent flow rate reading is used for the plant flow rate reporting. There is one (1) Parshall flume installed on each plant’s effluent channel to CCT. However, both Parshall flumes have not been in service for a long time.

HWWTP receives landfill leachate and is unloaded into one of existing underground storage tanks. The process parameters of each treatment unit are summarized in Table 1.

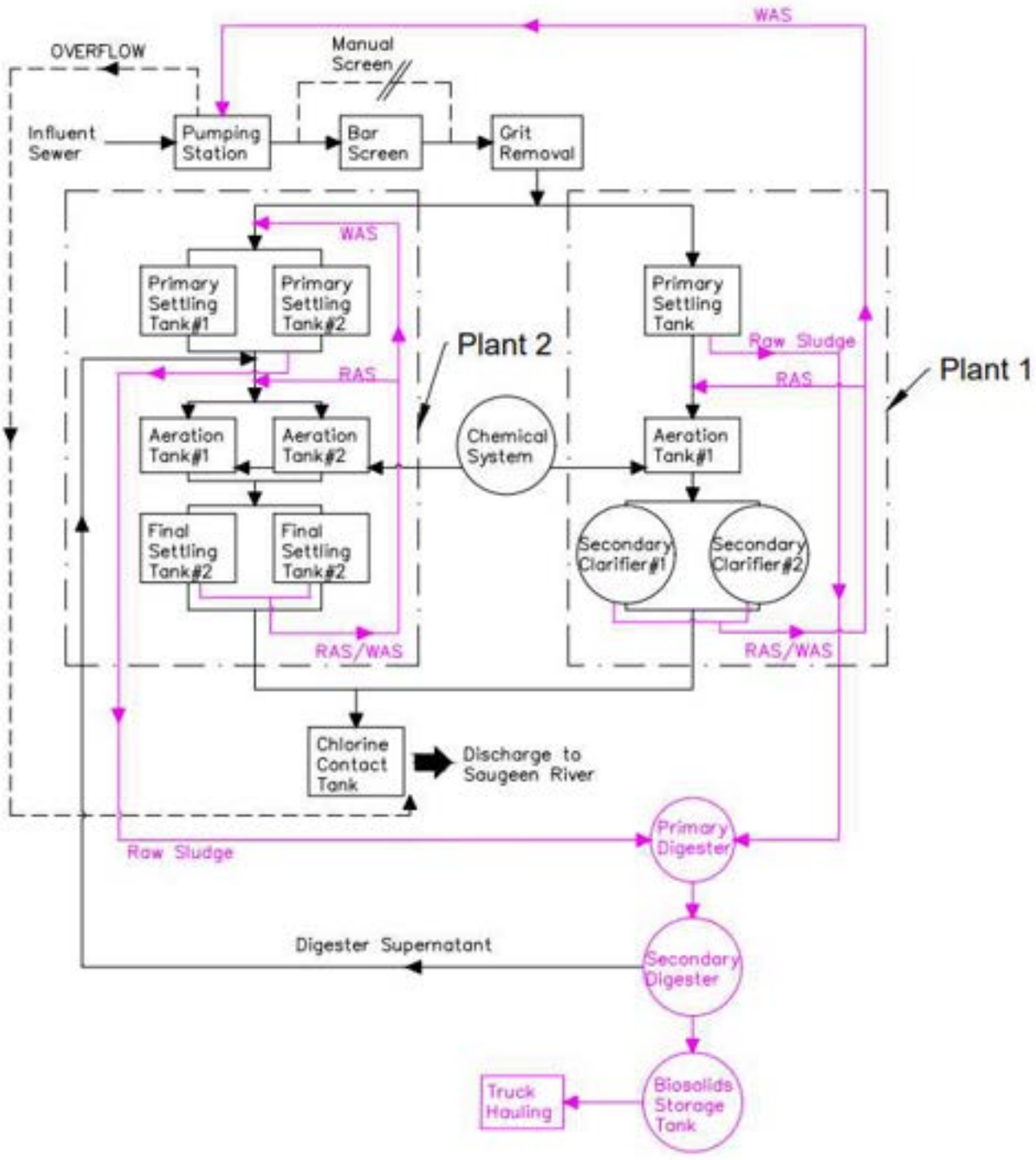


Figure 1 HWWTP Process Flow Schematic

Table 1 HWWTP Treatment Units Process Design Parameters

Process	Design
Sewage Pumping Station	
Number	1
Capacity	277 L/s (19,613 m^3/d)
Components	Two (2) screw type raw sewage lift pumps, one (1) duty and one (1) standby, One (1) split wet well
Screening	
Number	1
Capacity	105 L/s (9,072 m^3/d)
Components	One (1) in-channel conveyor with dewatering press
Manual Bar Screen	
Number	1
Capacity	Receiving excessive flows
Grit Removal	
Type	Aerated grit removal
Number	1
Tank Size	
Components	4.9 m (W) x 4.7 m (L) x 3.28 m (SWD) Two (2) air lift pumps, two (2) grit decanting channels, and two (2) air blowers
Primary Clarifier	
Number	One (1) for plant 1; Two (2) for plant 2
Size	Plant 1 – 5.5 m (W) x 17.5 m (L); Plant 2 – 4.9 m (W) x 20 m (L) x 3.05 m (SWD) each tank
Primary Sludge Pump	

Process	Design
Type	Raw sludge pump
Number	Two (2) for Plant 1; Two (2) for Plant 2; One (1) duty and one (1) standby for each plant
Capacity, each	12.7 L/s at 24.4 m TDH
Aeration Tanks (Plant 1)	
Number	8
Effective Volume	866 m^3 in total
Aeration	Coarse bubble aeration system
Aeration Blower (Plant 1)	
Type and number	Two (2) air blower
Capacity	472 L/s at 51.7 kPa each
Aeration Tanks (Plant 2)	
Number	2
Effective Volume	844 m^3 in total
Tank Size, each	9.8 m (W) x 9.8 m (L) x 4.6 m (SWD)
Aeration	One (1) mechanical aeration system each tank
Secondary Clarifiers (Plant 1)	
Type	Circular Tank
Number	2
Dimension	One with 12.19 m diameter; One with 15.2 m Diameter
Components	Circular sludge collector mechanism
Secondary Clarifiers (Plant 2)	
Type	Rectangular Tank

Process	Design
Number	2
Dimension	5.5 m (W) x 25.8 m (L) x 3.8 m (SWD)
Volume	1,079 m^3 in total
Components	Chain and flight type sludge collector mechanism, and a manual skimmer
RAS/WAS Pumps	
Type	Activated sludge return pump
Number	Two (2) for Plant 1; Two (2) for Plant 2; one (1) duty and one (1) standby for each plant
Capacity, each	37 L/s at 7.5 m TDH
Phosphorus Removal	
Storage Tank	29.7 m^3
Chemical Metering Pump	Two (2) with varied output from 70 L/h to 3.51 L/h
CCT	
Number	Two (2) chambers, each consisting two (2) pass tanks
Tank Size	4.7 m (W) x 8.95 m (L) x 2.61m (SWD) each
Total Volume	219 m^3
Feed Vacuum Pump Capacity	227 kg/day
Digesters	
Type	Anaerobic digester
Tank	Circular
Size	Primary clarifier: 15.2 m diameter x 7.3 m (SWD) Secondary clarifier: 15.2 m diameter x 6.7 n (SWD)
Effective Volume	Primary clarifier: 1,327 m^3

Process	Design
	Secondary clarifier: 1,215 m^3
Sludge Recirculation Pump	
Number	1
Capacity	12.6 L/s at 15 m TDH
Sludge Loading Pump	
Number	1
Capacity	12.6 L/s at 15 m TDH
Biosolid Storage Bins	
Number	3 underground tank, 1 above-ground tank
Capacity	6,679 m^3 in total, including secondary clarifier

2.1.1 Raw Sewage Pumping Station

Two (2) screw type raw sewage pumps, one (1) duty and one (1) standby, are installed in the Raw Sewage Pumping Station. Each pump is capable of lifting 277 L/s (19,613 m^3/d) flow.

Wastewater from both the northern and southern gravity sewer systems flow into a split underground wet well. Subsequently, screw pumps transport the wastewater to the above-ground pumping station effluent channel. The pumping station effluent flows to conveyor screen.

2.1.2 Screening

The in-channel conveyor screen, equipped with a perforated cylindrical screen and a shaftless conveyor screw, is responsible for collecting, washing, conveying, and dewatering wastewater screenings. The washed and pressed screenings are dropped to the waste bin. The peak instantaneous flow rate of the screen is up to 105 L/s (9,072 m^3/d). Any pumping station effluent exceeding this rate will flow through a manual bar screen located adjacent to the conveyor screen.

Items such as rags, paper, plastics, and metals can be extracted in the screening process to mitigate the risk of damage and blockages in downstream equipment, piping, and associated components.

2.1.3 Grit Removal

The screened wastewater proceeds into the aerated grit removal tank, where the removal of grit is accomplished by inducing a spiral flow pattern in the wastewater. To create this pattern, air is

introduced into the grit chamber through a swing-out type air diffuser, generating a perpendicular spiral velocity pattern within the tank. As a result, heavier particles are accelerated and deviate from the flow, settling at the tank's bottom, whereas lighter organic particles remain suspended and are eventually carried out of the tank. The settled grit is collected in a grit sump, and extracted to two grit decanting channels for dewatering using air lift pumps.

2.1.4 Influent Flow Splitting Point

In the current operation, one (1) adjustable flow splitter assembly in the grit tank effluent channel of the aerated grit tank evenly divides the flow between Plant 1 and Plant 2.

2.1.5 Primary Clarifiers

One (1) primary clarifier (surface area 96.25 m^2) in Plant 1 and, two (2) primary clarifiers (surface area 196 m^2 in total) in Plant 2. They are equipped with mechanisms for sludge and scum removal. Additionally, the primary clarifiers in Plant 2 receive waste activated sludge (WAS) from Plant 2 secondary treatment for co-thickening purposes.

2.1.6 Aeration

Plant 1 aeration tank is a plug-flow type comprising eight (8) passes. the tank has a combined volume of 866 m^3 and utilize a coarse bubble aeration system. Two (2) air blowers are employed, each rated at 472 L/s at 51.7 kPa, with one in operation and the other serving as a standby.

Plant 2 has with two (2) complete-mixing aeration tanks, each equipped with two (2) dual-speed mechanical surface aerators with adjustable blade tips. The total volume of the tanks in Plant 2 amounts to 884 m^3. Moreover, the aeration tanks in Plant 2 can be operated in parallel or in series through the use of adjustable weirs.

Return activated sludge (RAS) returns to aeration tanks from secondary clarifier.

2.1.7 Secondary Clarifiers

In Plant 1, there are two (2) circular secondary clarifiers, each featuring a circular sludge collector mechanism. The first clarifier has a diameter of 12.19 m while the second clarifier has a diameter of 15.2 m and can.

Two (2) rectangular secondary clarifiers were constructed in Plant 2, each equipped with a chain and flight type sludge collector mechanism. Additionally, there is a manually operated revolving skimmer that discharges collected scum into a scum hopper for scum removal. Each clarifier volume is 1,079 m^3.

In both plants, the mixed liquor from the aeration tank is directed into the clarifiers, where the settled sludge is collected in activated sludge hoppers. Each plant is equipped with two (2) RAS/WAS pumps, each rated at 37 L/s. The collected sludge is pumped back to the head of the

aeration tank as RAS. In the case of Plant 1, the WAS is pumped back to the sewage pumping station, while in Plant 2, it is returned to the head of the primary clarifier.

Additionally, there are two (2) magnetic-type flow meters for each plant: one is installed on pump common discharge pipe to measure the total secondary sludge flow, while the other on RAS pipe to track the return sludge flow.

One (1) Parshall flume was installed on the secondary clarifier effluent channel in each plant to measure flow in each plant. However, they are not in use in current operation.

2.1.8 Phosphorus Removal

The plant utilizes alum for phosphorus removal, chemicals are dosed to the headworks when the pre-treatment of the industrial wastewater does not meet requirements, or secondary clarifiers.

Alum is stored in a single 29.7 m^3 fiberglass reinforced plastic chemical storage tank, and is pumped using two (2) positive displacement chemical metering pumps. These pumps can adjust their output within a range of 70 L/h at 345 kPa down to 3.51 L/h. The chemical storage tank containment is equipped with one (1) emergency chemical dewatering pump rated at 1.2 L/s at 15 m TDH. The spilled chemical is discharged via a hose connection on the exterior wall of the main control building.

2.1.9 Disinfection

The final step in treatment of the liquid stream is disinfection using chlorination and de-chlorination. The plant's disinfection process involves two (2) chlorine contact chambers, each featuring a two-pass tank measuring approximately 8.95 m (L) x 4.7 m (W) x 2.61 m (SWD), resulting in a combined volume of 219 m^3. Chlorine is introduced into the system via a single, vacuum-operated, solution-feed-type chlorinator with a maximum capacity of 227 kg/day, situated within the main control building.

One (1) 305 mm Parshall flume is installed on the CCT influent channel to measure and record the total plant effluent flow prior.

2.1.10 Outfall

Effluent from the final effluent manhole (MH) is discharged into the Saugeen River through a 600 mm outfall sewer for a distance of approximately 107 m.

2.1.11 Digester, Biosolids Storage and Disposal

Co-thickened WAS and primary sludge in Plant 2 and primary sludge in Plant 2 are pumped to the primary digester for stabilization and secondary digester (1,215 m^3) for storage and settling. Two (2) raw sludge progressive cavity pumps (1 duty, 1 standby), each rated at 12.6 L/s at 24.4 m TDH, are equipped in each plant. Supernatant from the secondary digester is discharged to the Plant 2 aeration basins.

Stored and settled biosolid in the secondary digester is pumped to three (3) onsite storage tanks and one (1) above-ground storage tank which have a combined capacity of 6,679 m^3 together with secondary digester

3 Historical Wastewater Flows and Characteristics

3.1 Historical Plant Flows

Table 2 presents the annual average daily flows (ADF) and the peak day flows (PDF) to HWWTP from 2018 to 2022, based on the plant's reported "Influent Plant Flow" data/.

Table 2 Summary of WWTP Flows (2018-2022)

Year	Annual Average Day Flow (m^3/d)	Peak Day Flow (m^3/d)	Peak Day Peaking Factor (m^3/d)
2018	5,619	17,541	3.1
2019	5,296	11,375	2.1
2020	5,055	11,962	2.4
2021	5,185	13,963	2.7
2022	5,288	10,294	1.9
Average	**5,289**	**13,027**	**2.5**

This historical data shows that the average ADF over the five-year period was 5,289 m^3/d, which is equivalent to approximately 85% of the plant's rated capacity of 6,360 m^3/d. The peak day flowrate in 5-year data was 17,541 m^3/d, which occurred in February of 2018

The peak day peaking factor over the five-year period ranged from 1.9 to 3.1, with a 5-year average value of 2.5.

Figure 2 shows the historical trend in the WWTP's average day flow, peak day flows, the plant's rated capacity, and the 5-year historical average day flow.

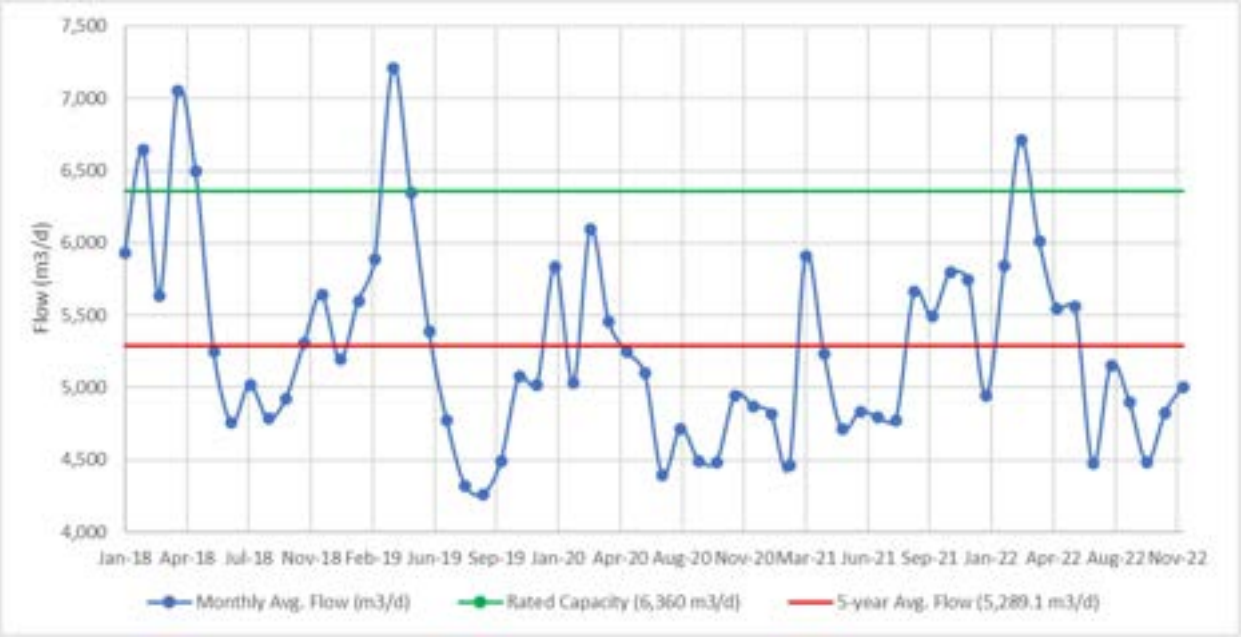


Figure 2 Historical Monthly Average Flows and Peak Day Flows

Over this five-year period, there have been five months where the average day flow for the month was greater than the plant's rated capacity. The trend in flow shows increases in flow each year during winter and spring.

The plant has reliable data for peak instantaneous and peak hourly flow rates starting from June 2021. As a result, the analysis and presentation in Table 3 exclusively concentrate on the 2-year (24 months) peak instantaneous flow (PIF) and peak hourly flow (PHF) data. The computed 2-year average instantaneous peak factor is 2.70, and the hourly flow peak factor is 2.66.

Table 3 Analysis of WWTP Peak Instantaneous and Peak Hour Flows (June 2021 – May 2023)

Period	ADF	PIF	PF	PHF	PF
June 2021 – May 2022	5,509.3	15,866.3	2.88	15,644.7	2.84
June 2022 – May 2023	5,400.4	13,617.8	2.52	13,348.6	2.47
Average	**5,454.8**	**14,742.1**	**2.70**	**14,496.6**	**2.66**

3.2 WWTP Influent Quality

The existing MECP Environmental Compliance Approval for HWWTP sets effluent limits for five-day carbonaceous biochemical oxygen demand ($CBOD_5$), total suspended solids (TSS), total phosphorous (TP), Total Chlorine Residual, E. coli, and pH. The annual average raw wastewater concentration for BOD_5, TSS, and TP are presented in Table 4.

Based on the historical data, raw wastewater entering HWWTP would be classified as medium strength since it's BOD_5, TSS, and TP concentrations have been consistently at the lower and medium range of the typical values for these parameters.

Table 4 Raw Wastewater Concentrations of MECP Regulated Parameters (2018-2022)

Year	Parameter		
	BOD_5 (mg/L)	TSS (mg/L)	TP (mg/L)
2018 Average	169.8	291.8	3.5
2019 Average	159.0	182.8	4.7
2020 Average	158.3	185.2	2.8
2021 Average	221.0	307.8	2.8
2022 Average	191.8	232.6	2.0
5-year Average	**180.0**	**240.1**	**3.2**
Typical Values*	155 - 286	155 - 330	6 - 12

* MOE Design Guidelines for Sewage Works 2008, Table 22-2.

In addition to the regulated parameters, the plant also monitors total ammonia and ammonium (TAN) as N mg/L for raw sewage. Table 5 summarizes historical levels in the raw wastewater. From Table 4, it can be seen that the TAN levels in raw wastewater is higher than typical values for domestic wastewater.

Table 5 Summary of Raw Wastewater Historical Concentrations

Year	Parameter
	TAN (mg/L)
2017 Average	18.5
2018 Average	22.2
2019 Average	18.8
2020 Average	20.7
2021 Average	20.9
5-Year Average	**20.2**
Typical Values*	4 – 13

* MOE Design Guidelines for Sewage Works 2008, Table 22-2.

Table 6 presents historic average annual loadings to the wastewater treatment plant. These average loadings were calculated using monthly average plant influent flows and monthly average concentrations for each parameter.

Table 6 Summary of Historical Monthly Loadings to WWTP in Plant Influent

Year	Parameter					
	BOD_5 (kg/d)		TSS (kg/d)		TP (kg/d)	
	Avg	Max Month	Avg	Max Month	Avg	Max Month
2018	956.3	1,473.8	1,760.8	11,362.8	19.7	29.7
2019	832.3	2,357.1	980.0	4,971.8	25.0	132.1
2020	792.3	1,002.0	916.1	1,762.6	14.0	32.5
2021	1,154.2	2,102.6	1,586.7	3,959.5	14.2	23.7
2022	1,023.8	1,819.0	1,240.1	2,167.1	10.4	16.3
Average	**951.8**	**1,750.9**	**1,296.7**	**4,844.8**	**16.7**	**46.9**

3.3 Leachate Receiving

The Town of Hanover and the Municipality of Brockton jointly own and manage the Hanover/Walkerton Landfill Site (HWLS). Following a significant expansion in 2012, leachate is collected and hauled off-site for final treatment to both the HWWTP and Walkerton WWTP. The HWLS is currently hauling 50% leachate to HWWTP and rest of the 50% to Walkerton Wastewater Treatment Plant (WWWTP). The Town is planning to pump leachate from the HWLS to HWWTP and has initiated a Class EA process to divert all leachate produced in HWLS to be transferred to HWWTP in the future.

At present, the leachate is unloaded into the existing underground storage tank at HWWTP and is slowly released into the Headworks. The total hauled landfill leachate and its average contaminant values were calculated and summarized in Table 7.The average leachate volume is approximately 0.2% of the plant's historical ADF.

Table 7 Summary of Leachate Characteristics

Year	Total Leachate Hauled Off-site (m^3/yr)	Parameter					
		$CBOD_5$ (mg/L)		TSS (mg/L)		TP (mg/L)	
		Avg	Max	Avg	Max	Avg	Max
2018	3,118.5	111.5	420.0	13.5	25.0	0.4	0.7
2019	4,351.5	210.0	595.0	25.7	36.0	0.6	0.8
2020	5,535.0	26.3	34.0	44.0	94.0	0.9	1.3
2021	8,329.5	19.3	34.0	15.3	20.0	1.2	1.9
2022	6,669.0	17.0	-	6.0	-	0.7	-
Average	**5,600.7**	**76.8**	**270.8**	**20.9**	**43.8**	**0.8**	**1.2**

4 WWTP Performance Review

The required performance level for HWWTP is governed by the effluent limits and objectives set out in the WWTP's Environmental Compliance Approval (No. 6173-BKNLVM), dated March 2, 2020.

4.1 Performance Requirements

The WWTP's ECA specifies the maximum allowable effluent concentrations and loadings for $CBOD_5$, TSS, TP, E. coli, pH, and Total Residual Chlorine, which are listed in Table 8.

Table 8 HWWTP Current ECA Effluent Limits

Parameter	Average Annual Concentration	Average Annual Loading
$CBOD_5$	25 mg/L	159 kg/d
Total Suspended Solids	25 mg/L	159 kg/d
Total Phosphorous	1 mg/L	6.4 kg/d
E. coli	200 CFU per 100mL (Monthly geometric mean density) (May 15 -September 15)	N/A
pH	between 6.0 - 9.5 inclusive	N/A
Total Residual Chlorine	0.02 mg/L	N/A

In addition to the effluent limits, wastewater treatment plants in Ontario are given effluent objectives, which are not a legal requirement of plant operation, but a level of treatment that the plant is to attempt to achieve through design, construction, or operation of the plant. The effluent objectives for the HWWTP are shown in Table 9.

Table 9 HWWTP Current ECA Effluent Objectives

Parameter	Average Annual Concentration
$CBOD_5$	15 mg/L
Total Suspended Solids	15 mg/L
Total Phosphorous	0.8 mg/L
E. Coli	150 CFU per 100mL (Monthly geometric mean density) (May 15 -September 15)
pH	between 6.5 - 8.5 inclusive
Total Residual Chlorine	Not Detectable

4.2 Historical Plant Performance

Historical plant performance data for effluent concentrations of regulated parameters is presented in Table 10 and

Table 11. All pH values in the plant effluent meet the requirements on ECA effluent limits. Even through nitrification is not required in the current ECA, the historical average TAN (ammonia + ammonium) concentration in the plant effluent is 1.81 mg/L (2018-2022), represented 91% TAN removal efficiency from the historical plant influent TAN concentration of 20.2 mg/L.

Table 10 Summary of Regulated Effluent Parameters (Average)

Year	Annual Average Effluent Concentrations			
	$CBOD_5$ (mg/L)	TSS (mg/L)	TP (mg/L)	E. Coli (CFU/100mL)
2018	4.43	6.04	0.38	44.32
2019	3.28	6.38	0.33	13.06
2020	3.15	4.94	0.20	23.82
2021	3.59	6.10	0.19	37.71
2022	3.27	3.81	0.05	18.52
ECA Limit	**25**	**25**	**1.0**	**200**

Table 11 Summary of Regulated Effluent Parameters (Max. Month)

Year	Maximum Month Effluent Concentrations			
	$CBOD_5$ (mg/L)	TSS (mg/L)	TP (mg/L)	E. Coli (CFU/100mL)
2018	8.50	8.50	0.56	139.00
2019	4.25	12.25	0.62	26.37
2020	7.00	13.00	0.37	36.31
2021	5.75	11.50	0.34	73.69
2022	5.67	5.67	0.07	27.47
ECA Limit	**25**	**25**	**1.0**	**200**

The historical data shows that the plant has been performing well and achieving average effluent concentrations that are at least 75% lower than the allowable effluent concentration limit for all parameters. The maximum monthly average values are at least 48% lower than the allowable effluent concentration limits except that E. Coli monthly average reached 70% of discharge limit once in 2018.

5 Current Operation Investigation and Evaluation

5.1 Site Visit and Findings

There is no SCADA in Hanover WWTP. So, the site visit, conducted on May 17, 2023, was focused on observing the treatment units operation and discussion with the operation staff.

Through discussion with the plant operation staff and observation on the facility operation, the site visit findings are summarized as:

- Cracks were observed on the tank structure concrete above water level in Plant 1.
- The concrete in the secondary clarifier tank of Plant 1 was identified as leaking during the recent upgrade construction
- The plant is operated manually without SCADA system.
- Pumping Station: There haven't been significant or frequent issues in terms of operation and maintenance. On a few occasions over the past few years, the second screw pump was activated based on water levels during the snow melting season.
- Screening system is under sized, and often overflow through 1'' bypass screen, then the fibers clogged the grit removal air lifting pump.
- The plant flow splitting only relies on the flow splitting device in the middle of grit tank effluent channel. No flow monitoring of the flow in Plant 1 and Plant 2.
- Aeration:
  - One (1) DO probe is located at the last cell/end of each aeration tank to monitor DO values continuously. A portable DO probe is used to calibrate the continuous DO reading and monitor DO values in other part of aeration tanks.
  - DO reading is generally 6-7 mg/L. But when high BOD hit the plant, DO will drop to 1.5 mg/L at the beginning of aeration tanks.
  - Plant 1 aeration blower running at 100%, no VFD control.
- Secondary clarifier: Sludge rising was observed by Ainley Engineers on the inflow side (rectangular tank) in Plant 2. RAS pumps were operated at the full capacity at the time of site visit.
- Biosolids produced at the plant are applied for land application.

5.2 Operation Data Analysis

The plant process data in the plant operation from January 2022 to May 2023 are analyzed and summarized in Table 12.

Table 12 HWWTP Monthly Average Operation Data Summary

Parameter		Plant 1 (East Plant)	Plant 2 (West Plant)
DO (mg/L) (end of Aeration Tanks)	Range	3.8 - 8.2	4.2 - 7.6
	Average	5.9	6.2
MLSS (mg/L)	Range	3393 - 4610	3142 - 4325

Parameter		Plant 1 (East Plant)	Plant 2 (West Plant)
	Average	4050	3712
SVI (mL/g)	Range	48 - 235	51 - 237
	Average	147	174

As discussed in Section 4.2, the historical data analysis showed 91% of TAN (ammonia + ammonium) removal efficiency in the plant. Therefore, even through nitrification is not required in Hanover WWTP operation as per the current ECA, the plant secondary treatment is identified as conventional activated sludge with nitrification according to its current operation.

As shown in Table 12, the DO values in at the end of the aeration tanks in both Plant 1 and Plant 2 were above the target value of 2 mg/L. Based on the discussion with the plant operating staff, the DO values dropped as low as 1.5 mg/L at the beginning of the aeration tank when the pre-treatment of the industrial wastewater did not meet the requirements. Based on Engineer's experience, occasionally DO value of 1.5 mg/L at the beginning of the aeration tank will not affect aeration tank performance. In addition, the Township has reinforced the requirements of the industrial wastewater pre-treatment. Therefore, both Plant 1 and Plant 2 have sufficient aeration capacity for the current flow rate and organic loading with possible spare capacity.

The plant monthly average MLSS is in the recommended MLSS range is 3000 – 5000 mg/L by MECP Design Guideline.

The secondary sludge SVI values indicate sludge settleability and possible operation concerns. The preferred SVI for conventional activated sludge process is less than 100 mL/g, and mixed liquor with SVI greater than 150 mL/g indicates the possible presenting of filamentous bacteria. The plant monthly average SVI values ranged from 48 to 237 mL/g, and the average value is 147 mL/g for Plant 1 and 174 mL/g for Plant 2. These data shows that the plant is often operated beyond the preferred sludge settleability range. The low sludge settleability requires higher sludge pumping capacity and RAS return rate. Based on the current operation parameters in Hanover WWCP and nutrition concentration in the plant influent, the main cause for poor sludge settleability is likely the unknown substances in plant influent, likely from the industrial wastewater.

6 Hydraulic Capacity Assessment

6.1 Existing Plant Hydraulic Capacity

Plant 1 was constructed in 1963-64 and Plant 2 was constructed in early 1980. During Phase 2 upgrades, minor modifications in Plant 1 were constructed to reach the current total rated capacity of 6,360 m^3/d. The total design capacity and plant operation was recorded in the plant's Operation & Maintenance Manual (R.V.A., 1984). As per this O&M, the plant influent flow should be split evenly between Plant 1 and Plant 2 after grit removal in operation, and each plant has 50% of total hydraulic and treatment capacity. The plant's total hydraulic peak capacity is 19,640 m^3/d.

6.2 Rated Capacity Assessment

As discussed in Section 3.1 (Table 3), the historical instantaneous peak factor is 2.70. Based on this historical instantaneous peak factor, instantaneous peak flow rate at rated capacity of 7,000 m^3/d is 18,900 m^3/d, which can pass the plant without exceeding the current plant hydraulic capacity.

The calculated recycled supernatant from the secondary digester is approximately 0.5% of the plant influent flow, which is insignificant and not included in hydraulic capacity calculation.

7 Process Capacity Assessment

The treatment capacity of each unit process at the HWWTP was assessed using plant historical data, Environmental Compliance Approval requirements, discussions with Operations, handbooks, and MECP design guidelines for Sewage Works.

Table 13 lists the parameters, parameter values, and source reference for each parameter that was used in this capacity assessment. Table 14 summarizes the process unit design basis, which is used as the guideline for current operation evaluation and capacity assessment of each process unit in the following sections.

Table 13 Parameters and Values Used in Capacity Assessment

Parameter	Parameter Value	Source of Parameter Value
Plant Rated Capacity	6,360 m^3/d	Per ECA 6173-BKNLVM (2020.03.02)
Average Day Flow	5,289 m^3/d	Historical 2018-2022 Average
Max. Day Flow PF	2.50	Historical 2018-2022 PF average
Peak Hour Flow PF	2.66	Historical 2021.6-2023.5 PF average
Peak Instantaneous Flow PF	2.70	Historical 2021.6-2023.5 PF average
Average Plant Influent BOD concentration	240 mg/L	Historical 2018-2022 Average
Average Plant Influent BOD concentration	180 mg/L	Historical 2018-2022 Average
Aeration Tank MLSS	3,881 mg/L	2022 Average Data for Plant 1 and Plant 2
MLVSS: MLSS	0.6	Handbook for undigested mixed primary and secondary sludge
WAS TS%	1.095%	2022 Average Data for Plant 1 and Plant 2

Table 14 Process Design Basis (MECP Sewage Work Design Guideline, except where noted)

Process	Design Basis
Sewage Pumping Stations	Design Peak Instantaneous Flow
Screening	Design Peak Instantaneous Flow
Grit Removal	Design Peak Hourly Flow

Primary Sedimentation	Design Peak Daily Flow (Wastewater Engineering, Metcalf& Eddy, Edition 4th)
Aeration (without nitrification)	Average Daily BOD_5 loading (based on Design Average Daily Flow),
Secondary Sedimentation	Design Peak Hourly Flow, Peak Daily Solids Loading
Sludge Return	For activated sludge processes, 50 to 200% of Design Average Daily Flow
Disinfection	Design Peak Hourly Flow
Sludge Treatment (digestion and dewatering)	Maximum Monthly Mass Loading and Flow Rates

7.1 Pumping Station and Headworks

The main unit processes in the headworks area are the raw sewage pumping station, in-channel conveyor screen, manual bar screen, and the aerated grit tank.

7.1.1 Raw Sewage Pumping Station

The firm capacity of the pumping station is 277 L/s (19,613 m^3/d) with one duty pump and one standby pump according to the current ECA. The equivalent ADF of the firm capacity is 7,264 m^3/d, which is greater than the historical 5-year average ADF of 5,289 m^3/d and the rated ADF of 6,360 m^3/d. While experiencing excessive flow, the standby pump can be operated during the instantaneous peak to avoid bypass during operation.

7.1.2 Screening

The mechanical in-channel conveyor screen is designed to handle peak flows of up to 105 L/s (9,072 m^3/d). The equivalent ADF of the peak flow rate is 3,360 m^3/d, which is less than the rated ADF of 6,360 m^3/d. Nevertheless, there is a manual bar screen in place for flows exceeding 105 L/s to manage excessive flow.

7.1.3 Grit Removal

According to the current ECA, the aerated grit removal tank has a hourly peak capacity of 22,149 m^3/d), and equivalent to ADF of 8,327 m^3/d, which is higher than the rated capacity of 6,360 m^3/d.

7.2 Primary Treatment

Plant 1 is equipped with one (1) rectangular primary clarifier, offering a surface area of 96 m^2. Plant 2 features two (2) rectangular primary clarifiers, providing a combined surface area of 196 m^2.

Table 15 presents the current performance of the primary clarifiers in terms of the key design parameters and typical/recommended values for each parameter.

Table 15 Primary Clarifier Current Operation Condition

Design Parameter	Historical Average (2018 – 2022)		Typical Design Values*
	Plant 1	Plant 2	
Allowed Peak Hourly Flow based on Surface Overflow Rate (SOR) without receiving WAS ($m^3/(m^2$-d)	73	-	120
Allowed Peak Hourly Flow based on Surface Overflow Rate (SOR) with receiving WAS ($m^3/(m^2$-d)	-	36	70

*Table 5-20 in Wastewater Engineering: Treatment and Resource Recovery, 4th Edition, Metcalf & Eddy (2002)

The individual capacities of the primary clarifiers in Plant 1 and Plant 2, calculated based on the limiting values for key design parameters, are presented in Table 16.

Table 16 Primary Clarifier Capacity Assessment

Design Parameter	Equivalent ADF Capacity (m^3/d)		Spare Capacity above Rated ADF (m^3/d)
	Plant 1	Plant 2	
Allowed Peak Hourly Flow based on Surface Overflow Rate (SOR) without receiving WAS (120 $m^3/(m^2$-d))	4,243	-	1,162
Allowed Peak Hourly Flow based on Surface Overflow Rate (SOR) with receiving WAS (70 $m^3/(m^2$-d))	-	5,158	1,978

The weir loading of primary clarifiers has been verified to be greater than equivalent ADF 3,500 m^3/d for each plant.

7.3 Secondary Treatment

7.3.1 Aeration Tank

Plant 1 utilizes one (1) plug-flow type aeration tank with eight (8) passes with a coarse bubble aeration system, offering a treatment volume of 866 m^3through. Plant 2 is equipped with two (2) complete-mixing aeration tanks with one (1) mechanical surface aerator at the center of each tank, providing a total volume of 884 m^3. The current ECA does not requires nitrification in the plant treatment. However, the historical data analysis shows that averagely over 90% of the NH_3-N in the plant influent has been nitrified in the process. So, the design criteria of conventional activated sludge (CAS) with nitrification in MECP Design Guideline is used for evaluating the current operation and assessing the tank capacity.

Table 17 shows the design parameters of conventional aeration system with nitrification presented in MECP Design Guideline (2008) and the historical (2018-2022) operation parameter values for both Plant 1 and Plant 2.

Table 17 Aeration Tank Current Operating Conditions

Design Parameter	Historical Average (2018-2022)		Typical Design Values*
	Plant 1	Plant 2	
Organic Loading Rate (kg BOD_5/m^3-d)) – OLR	0.38	0.38	0.31 - 0.72
Food to Micro-Organism Ratio (F:M) (d-1)	0.10	0.10	0.05 - 0.25
Hydraulic Retention Time (hrs) – HRT	8	8	Minimum 6
MLSS (mg/L)	3,881		3000 - 5000

*Per MOE Design Guidelines for Sewage Works 2008

The values of organic loading rate (OLR) and F:M is at the middle of typical design values for a conventional aeration system. The hydraulic retention time is higher than the recommended minimum value.

The separated and combined capacity of the aeration tanks in both Plant 1 and Plant 2 are calculated based on the limiting values for key design parameter and shown in Table 18.

Table 18 Aeration Tank Separated and Combined Capacity Assessment

Limiting Parameter	Equivalent ADF Capacity (m^3/d)			Spare Capacity above Rated ADF (m^3/d)		
	Total	Plant 1	Plant 2	Total	Plant 1	Plant 2
OLR (0.72 kg/(m^3-d) maximum)	10,002	4950	5053	3,642	1770	1873
F:M (0.25 d^{-1} maximum)	8,087	4002	4085	1,727	822	905
HRT (6 hrs minimum)	**7,000**	3464	3536	**640**	284	356

The capacity analysis shows that HRT is the limiting design parameter to increase the capacity of the aeration tanks. The aeration tanks could accommodate an average day flow up to 7,000 m^3/d with the historical average influent BOD concentration.

It is to be noted that the hydraulic design limit for CAS without nitrification is the same as that for CAS with nitrification. Thus, assessing the aeration tanks capacity based on the design criteria of CAS with nitrification process will conclude with the same result as assessing based on the design criteria of CAS without nitrification process.

7.3.2 Secondary Clarifiers

Plant 1 features two (2) circular secondary clarifiers, with a combined surface area of 298 m^2. Meanwhile, Plant 2 is equipped with two (2) rectangular secondary clarifiers, offering a combined surface area of 284 m^2.Table 19 presents the current performance of the secondary clarifiers in terms of the key design parameters and typical/recommended values for each parameter.

Table 19 Secondary Clarifiers Current Operating Conditions

Design Parameter	Historical Average (2018-2022)		Typical Design Values*
	Plant 1	Plant 2	
Surface Overflow Rate (SOR) (m^3/m^2-d)	24	25	37, maximum
Peak Day Solids Loading Rate (SLR) (kg/m^2-d) (Max. 100% RAS return as current operation)	170	178	240, maximum

*Per MOE Design Guidelines for Sewage Works 2008

The secondary clarifiers are currently operating within the MECP's recommended range for SOR and SLR (calculated based on 100% RAS return rate).

Table 20 below presents the capacity analysis for the secondary clarifiers using the limiting values for the design parameters. As discussed in Section 5, SVI values of the aeration mixed liquor are around 200 mL/g except in summer season. In order to evaluate the impact of the sludge settleability in the secondary clarifier capacity, RAS recycle rate of 100%, 150%, and 200% are used in the following capacity assessment.

Table 20 Secondary Clarifiers Capacity Assessment

Limiting Parameter		Equivalent ADF Capacity (m^3/d)			Spare Capacity above Rated ADF (m^3/d)		
		Total	Plant 1	Plant 2	Total	Plant 1	Plant 2
Surface Overflow Rate (SOR) (37 $m^3/(m^2$-d) minimum)		8,093	4,145	3,948	1,733	965	768
Peak Daily Solids Loading Rate (SLR) (240 kg/(m^2-d) maximum)	with 100% RAS ratio	7,196	3,686	3,510	836	506	330
	with 150% RAS ratio	5,757	2,949	2,808	-503	-231	-372
	with 200% RAS ratio	4,797	2,457	2,340	-1,563	-723	-840

The capacity analysis indicates that the SLR is the parameter that limits capacity of the secondary clarifiers. In addition, the plant sludge settleability need to be improved to ensure that the maximum sludge recycled rate required is 100% to allow the existing secondary clarifiers to provide additional capacity to meet the immediate demand on capacity increase.

The weir loading of secondary clarifiers has been verified to be greater than equivalent ADF 3,500 m^3/d for each plant.

7.4 Disinfection

Disinfection at the HWWTP is performed by chlorination and de-chlorination in a CCT. The disinfection system has been meeting the effluent limits, with no exceedances in the past five years except for one occasion assumed to be a test error or temporary equipment malfunction. Based on the current Length to width ratio of CCT, a buffering factor of 0.7 is used to calculate the chlorination effective volume to 154 m^3. The total effective volume for chlorination can be increased to 208 m^3 by increasing the buffering factor to 0.95.

Table 21 presents the typical/recommended values for each parameter.

Table 21 CCT Typical Design Values

Design Parameter	Typical Design Values*
Allowed Average Daily Flow based on Chlorine Contact Time (min)	30, minimum
Allowed Peak Hourly Flow based on Chlorine Contact Time (min)	15, minimum

*Per MOE Design Guidelines for Sewage Works 2008

Table 22 below presents the capacity analysis for the CCT using the limiting values for the design parameters under different buffering factor.

Table 22 CCT Current Operating Conditions

Limiting Parameter	Equivalent ADF Capacity (m^3/d)	Spare Capacity above Rated ADF (m^3/d)
Allowed Average Daily Flow based on Chlorine Contact Time (BF=0.7) (min)	7,372	1,012
Allowed Peak Hourly Flow based on Chlorine Contact Time (BF=0.7) (min)	5,543	-817
Allowed Average Daily Flow based on Chlorine Contact Time (BF=0.95) (min)	10,005	3,645
Allowed Peak Hourly Flow based on Chlorine Contact Time (BF=0.95) (min)	7,147	787

The capacity analysis indicates that the chlorine contact time at peak hourly flow is the parameter that limits capacity of the CCT. The ADF in 2022 reached 5,289 m^3/d, which is only 5% lower than CCT capacity evaluated based on peak hourly flow with buffering factor of 0.7. The existing tank effective value with buffering factor of 0.7 will not be able to provide required capacity for the increased plant influent flow. However, by installing baffle walls in the existing CCT, the baffling factor can be increased to 0.95 and the CCT capacity can reach 7,147 m^3/d.

The existing vacuum operated, solution feed type chlorinator has a capacity of 227 kg/d. Evaluated based on the suggested maximum chlorine dosage of 9 mg/L for secondary effluent,

the existing chlorinator can provide chlorination to 25,222 m^3/d hourly peak flow, which is equivalent to ADF 9,842 m^3/d.

7.5 Sludge Digestion

The plant utilizes one (1) anaerobic primary digester for sludge stabilization. Subsequently, the digested sludge is transferred into one (1) secondary digester with a volume of 1,215 m^3 for storage and settling. The digester capacity is assessed based on WAS generation rate in 2022 operation data and assumed TSS removal efficiency (50%) in primary clarifiers. The key parameters considered in primary digester design are the volatile solids loading rate and the hydraulic retention time. Table 23 shows current digester performance as it relates to these two parameters.

Table 23 Aerobic Digester Current Operating Conditions

Design Parameter	Historical Average (2018-2022)	Typical Design Values*
Solids Loading Rate (SLR) (kg VSS/m^3-d))	0.9	1.6, maximum
Hydraulic Retention Time (HRT) (days)	23	15, minimum

*MOE Design Guidelines for Sewage Works, 2008

The data indicates that both current solids loading rate and the solids retention time meet the recommended guidelines.

The current SLR is approximately 40% lower than the recommended maximum 1.6 kg VSS/(m^3-d). The system's current HRT is 8 days more than the MECP's guideline of 15 days. The digesters are capable to treat more flows.

Table 24 below presents the capacity analysis for the digesters using the limiting values for the design parameters.

Table 24 Aerobic Digester Capacity Assessment

Limiting Parameter	Potential ADF Capacity (m^3/d)	Spare Capacity above Rated ADF (m^3/d)
Solids Loading Rate (1.6 kg VSS/m^3-d)	9,204	2,844
Hydraulic Retention Time (15 days)	8,053	1,693

7.6 Biosolids Storage

The HWWTP is equipped with one (1) secondary digester, offering a storage volume of 1,097 m^3. In addition, there are three (3) on-site underground storage tanks (582 m^3) and one (1) above-ground glass-fused-to-steel biosolids tanks providing 5,000 m^3. The combined biosolids storage volume available at the plant is 6,679 m^3.

The Ministry of Environment, Conservation, and Parks (MECP) standards require sufficient on-site biosolids storage equivalent to 240 days of biosolids generation. Based on the current sludge generation rates, the plant possesses sufficient capacity to store solids for 240 days with an effective storage volume of 6,106 m^3 if the final biosolid concentration (haul away concentration) is 5%. If the plant further decants solids to 6% Total Solids (TS), the storage capacity of the plant is increased to 7,328 m^3.

7.7 Capacity Summary

Table 25 presents the capacity assessments for the major processes at the HWWTP.

Table 25 Summary of Capacity Assessment

Treatment Process	Equivalent Average Day Flow (m^3/d)	Spare Capacity above Rated ADF (m^3/d)
Hydraulic Capacity	7,274	-
Pumping Station	7,264	904
Bar Screen	3,360	-
Grit Removal	8,327	1,967
Primary Clarifier	9,500	3,140
Aeration Tank	7,000	640
Secondary Clarifiers (100% RAS rate)	7,196	836
Chlorine Contact Tank (BF=0.7)	5,543	-817
Chlorine Contact Tank (BF=0.95)	7,147	787
Digester	8,053	1,693
Biosolids Storage	7,327	967

The results of the capacity assessment indicate that the existing plant can treat influent flow up to the capacity of ADF 7,000 m^3/d, which is limited by the capacity of the aeration tanks. Minor upgrades are required to bring all treatment units to the target ADF of 7,000 m^3/d. Thus, ADF 7,000 m3/d is set up as target capacity for the following re-rating discussion.

The existing CCT has a lower baffling factor, which results in an inadequate capacity. Therefore, tank modification to a higher baffling factor should be considered. The existing screen has an equivalent ADF capacity of 3,360 m^3/d based on calculated peak instantaneous flow, which is significantly lower than the plant's rated capacity. So, replacing with a screen system with a higher capacity should be considered.

In order for the existing secondary clarifiers to provide the capacity of 7,000 m^3/d, the issue of poor sludge settleability in the current operation should be addressed to reduce RAS return ratio to no greater than 100%.

Figure 3 shows the potential average day flow capacity of each treatment unit evaluated.

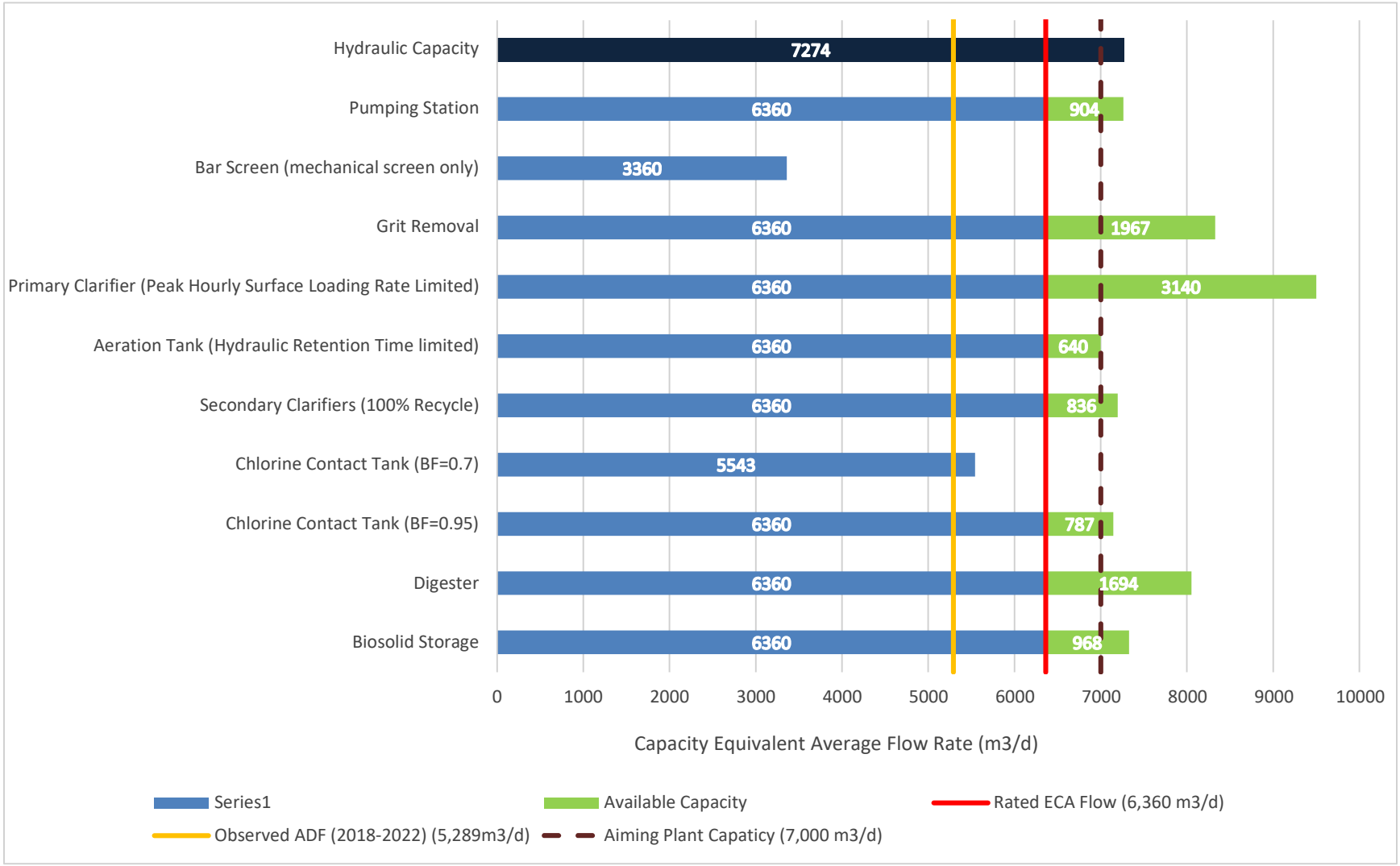


Figure 3 Equivalent ADF Capacity of Major Treatment Processes

8 Phase 1 Finding Summary and Discussion

Based on the capacity assessment presented in Section 7, the target capacity for HWWP re-rating is set at ADF 7,000 m^3/d. The following discussion will base on this target capacity. The limiting factors that were found in capacity assessment, operation data analysis, and site visit are summarized as follows:

1. **Plant 1 and Plant 2 Parshall flume flow meters**

   Each of Plant 1 and Plant 2 is equipped with one (1) 230 mm Parshall flume flow meter to measure flow rate of each plant. Measuring flow rate in each plant is important to verify the even flow splitting between Plant 1 and 2 at normal operation, and to better manage the flow distribution between Plant 1 and 2 during stress test, equipment/tank maintenance. However, these two flow meters have not been service for many years.

   Phase 2 Work Plan will schedule bringing the flow meters back to service by installing new ultrasonic level sensor to each flow meter. This task should be completed prior to stress test on Plant 1 or Plant 2.

2. **Low capacity of the existing in-channel conveyor screen**

   The existing conveyor screen has the capacity of 9,072 m^3/d, which is only equivalent to ADF 3,360 m^3/d. In current operation (ADF 5,289 m^3/d), rag, paper, and plastic passed through the 1inch bypass screen and clogged downstream grit air lifting pumps, which interrupted the normal operation sometimes. The situation is expected to get worse when the plant flow reaches ADF 7,000 m^3/d.

   Although the current screen arrangement does cause operational difficulty, it does not directly affect the plant's capacity to meet the required discharge limits. In Phase 2, the conveyor screen capacity should be increased to avoid more plant raw wastewater flow through bypass screen as a minimum requirement. Another possible approach is to reduce the pore opening size of the bypass manual screen to avoid the downstream pump clogging. Both approaches will be explored in later work and the more feasible one will be carried out in system upgrade.

3. **High SVI and poor secondary sludge settleability**

   Sludge with high SVI leads to larger settled sludge volume in secondary clarifiers. So, RAS pump with larger capacity is needed to remove the settled sludge in time to avoid sludge rising due to denitrification, which will deteriorate the effluent quality.

   As discussed in Section 5.2, the average SVI was 147 mL/g in Plant 1 and 174 mL/g in Plant 2. The monthly average SVI values were around 200 mL/g except in summer. Sludge rising was observed during site visit. The operating staff suggested that the existing RAS pumps capacity is insufficient due to the poor settleability of secondary sludge.

As shown in Section 7.3, the capacity of the secondary clarifiers decreases with higher RAS return ratio. Capacity assessment results also suggest that successfully re-rating the existing secondary clarifiers at ADF 7,000 m^3/d requires significant improvement of secondary sludge settleability to reduce RAS return ratio.

Addressing poor sludge settleability could potentially be resolved through coagulant dosing. Therefore, a jar test will be recommended in the Phase 2 Work Plan. If the jar test results do not yield an economically and effectively optimal dosage, an investigation into the implementation of anoxic zone at the head of each aeration tank will be conducted. This study will be carried out in Plant 1 by opening/closing the existing gate/valve to increase biological loading in the first cell and reduce the aeration air supply, creating a low dissolved oxygen (DO) environment.

4. Alum Pumping System Upgrades

One (1) Alum dosing pump should be installed to provide standby to the existing two (2) Alum dosing pumps.

5. Aeration capacity

The existing aeration systems were installed 40 years ago, so their actual capacities cannot be determined through equipment's original design data. The current operation reported average DO at approximately 6.0 mg/L, and as low as 1.5 mg/L at the head of aeration tanks only when the industrial wastewater was not pre-treated as required. Therefore, it is likely that existing aeration system has adequate capacity for re-rated ADF. Stress test will be scheduled to verify the capacity of the existing aeration system.

6. RAS/WAS pumping system capacity

The existing RAS/WAS pumping system has capacity of 6,393 m^3/d, 100% of current rated ADF, 120% of current operation ADF, and 91% of target rated ADF. 91% of target rated ADF is slightly less than the suggested 100% of rated ADF by MECP Guideline.

If the stress test proves that 90% RAS return rate is sufficient with improved sludge settleability, the following stress test will be carried out with the existing RAS/WAS pumps system. However, if the stress test proves otherwise, RAS/WAS pumping system will be upgraded to serve the re-rating target capacity.

7. Chlorine Contact Tank Effective Capacity

The existing CCT has a total volume of 219 m3 and a length to width (L:W) ratio of 4.5. The L/W ratio of 4.5 suggests a significant amount of short current occurred in the tank, and less than 70% of tank volume is effective for chlorine contact hydraulic retention. By installing RFP baffle walls in the existing CCT, the L:W ratio can be increased to 40:1 and the baffling factor can be increased to 0.95. The total effective volume of the existing CCT will reach 208 m^3, which is sufficient for the re-rating target capacity. This upgrade can be scheduled between September 16 to May 14 when disinfection is not required for the plant effluent and CCT is not in use.

9 Phase 2 Work Plan

9.1 Objectives:

The Phase 2 Work Plan is for jar test and possible anoxic zone operation study, stress test, and s upgrades design and construction of several systems, along with a schedule and cost to undertake these activities, aimed at:

1. Developing cost-effective solution to improve secondary sludge settleability, and upgrade the existing system accordingly if required.
2. Confirming the treatment and hydraulic capacity of Plant 1 and Plant 2 with stress test. Identify required upgrades based on stress test results.
3. Design and/or construction to upgrade the following process unit with limiting capacities:
    - Grit removal system,
    - Chemical system,
    - CCT tank,
    - Flowmeters in Plant 1 and Plant 2.
    - If the capacities of aeration system and RAS/WAS system in Plant 1 and Plant 2 are found to be insufficient in stress test, upgrades their capacities.
4. Additional work requirement identified during Phase 2.
5. Meet requirements of re-rating process in Optimization Guidance Manual for Sewage Works (2010) and Guidance Manual for Sewage Treatment Plant Process Audits (MECP, Environmental Canada, 2006)

9.2 Phase 2 Work Plan

Target rated capacity: 7,000 m^3/d.

The Plan schedule is explained in Section 9.2.1. The details of Work Plan are discussed in Section 9.2.2, such as: each task's scope, objective, Engineer and Operator's responsibilities, lab QA, monitoring plan, contingency plan, and health and safety. Cost of studies and system upgrades are summarized in 9.2.3.

9.2.1 Plan Schedule

The Work Plan schedule is detailed in Appendix B.

The action of consulting and notifying MECP are scheduled in Work Plan.

Phase 2 is scheduled to fulfill the pre-requirements of each task in schedule, and provide additional time for potentially required anoxic zone study and upgrades identified in stress test. For example, the flow meters and chemical system upgrades, and sludge settleability study (including jar test and possible anoxic operation study) are scheduled prior to stress test, so the auxiliary systems are ready for stress test.

If the jar test is successful, anoxic zone operation study and Plant 2 upgrades will not be required.

If anoxic zone operation is decided to be implemented for sludge settleability improvement, the aeration system of plant 2 will be upgraded, and stress test on Plant 2 will not be required.

According to the requirements of re-rating process in Optimization Guidance Manual for Sewage Works (2010) and Guidance Manual for Sewage Treatment Plant Process Audits (MECP, Environmental Canada, 2006), the stress test should last 3-4 SRT, and better for both summer and winter season. The SRT of the current operation is 7 days. So, two stress tests are scheduled for each plant, and each test should last 1.5 month (45 days). One stress test is scheduled at winter-spring season to catch the high flow and low temperature, and the other is scheduled at summer to catch the dry and high temperature.

All required upgrades identified in capacity assessment are scheduled to start design and construction from the first month.

Therefore, all tasks in Phase 2 Work Plan will be completed in 14-19 months depending on the study results and the schedule adjustment.

9.2.2 Work Plan Details

Pre-Stage 1:

The Phase 2 Work Plan will be consulted with MECP and other parties for approval.

Stage 1:

1. **Install ultrasonic level sensor for Parshall flume flow meters**

    - Scope: Install ultrasonic level sensor for Plant 1 and 2 Parshall flume flow meters, verify the reading.
    - Objective: Provide reliable flow reading to Plant 1 and Plant 2 separately
    - Engineer's responsibilities
        - Design, inspection, and contract administration.
    - Operator's responsibilities:
        - Cooperate with Supplier, Contractor, and Engineer in plant operation and accessibility,

- ❖ Review contactor's H&S plan and related H&S documents,
- ❖ Assist O&M update
- ❖ Training on new flow meters.

- ➢ Health and safety: the Contractor should provide their H&S plan for construction work.

2. Chemical system upgrades

- ➢ Scope: Upgrade the existing chemical system with the capacity to dose prior to primary clarifier and after aeration tank at the same time.
- ➢ Objective: Enhance the plant's capability for additional treatment in cases where industrial wastewater pre-treatment (Exceldor Foods) falls short of meeting requirements. Also, increase the capacity for chemical phosphorus (P) removal after aeration and improve sludge settleability.
- ➢ Engineer's responsibilities:
  - ❖ Design, inspection, and contract administration.
- ➢ Operator's responsibilities:
  - ❖ Cooperate with Supplier, Contractor, and Engineer in plant operation and accessibility,
  - ❖ Review contactor's H&S plan and related H&S documents,
  - ❖ Training on new chemical system.
- ➢ Health and safety: The Contractor should provide their H&S plan for construction work.

Stage 2:

1. Sludge settleability study and Plant 2 aeration tank upgrades if needed

- ➢ Scope:
  - ❖ Jar test with coagulants (Alum, Ferric Chloride, Ferric Sulphate) to find the effective and economic dosage to reduce SVI to less than 100 mL/g.
  - ❖ If the result is not satisfactory, a full-scale test of anoxic zone operation in Plant 1 should be carried out to verify the impact of anoxic zone on the plant's sludge settleability.
  - ❖ Modify Plant 1 and 2 aeration tanks to improve the sludge settleability.

- Objective: To identify and implement cost effective approaches to improve the mixed liquor settleability
- Engineer's responsibilities
  - Jar Test
    - Prepare test plan with operator, analyze the results, provide conclusion and recommendation.
  - For full-scale test
    - Prepare test plan with operator, design temporary system for test and oversee its installation, oversee the test,
    - Prepare TM, analyze the results, provide conclusion and recommendation,
    - Workshop with clients
  - (Possible) Plant 2 aeration tank upgrades
    - Design, inspection, and contract administration.
- Operator's responsibilities:
  - Perform Jar test and recording the results.
  - For full-scale test
    - Training on ORP system
    - Work with Engineer in preparing test plan.
    - During full-scale test, collecting sample, submit sample to outside lab, and performing in-house test, recording test results, to monitor and adjust operation. Operation parameter (MLSS, DO, SVI) and plant effluent should be tested everyday.
    - Report results and operation observations to Engineer.
  - (Possible) Plant 2 Aeration Tank upgrades
    - Cooperate with Supplier, Contractor, and Engineer in plant operation and accessibility,
    - Review contactor's H&S plan and related H&S documents,
    - Training on new chemical system.

- Health and safety:
  - All chemical handling should be according to lab H&S.
  - The Contractor should provide their H&S plan for construction work.
- Contingency plan
  - The plant effluent quality and operation parameters are tested daily (except once a week for BOD_5).
  - If the test results show the plant quality deteriorated, the flow to the tested plant will be reduced to improve the effluent quality.
  - The plant operating staff is responsible for making decision regarding effluent quality control, and notifying the Engineer.

Stage 3:

1. **Stress Test on Plant 1 and Plant 2**

- Notification: Notification will be sent to MECP and other parties concerned.
- Scope:
  - Operate Plant 1/Plant 2 at the 67% of plant flow (equal to target flow ADF 3,500 m^3/d for each plant) by adjusting the flow splitting device after grit removal tank. Test short period of projected instantaneous peak flow rate for hydraulic capacity verification.
  - Monitoring the plant operation according to the monitoring program, including:
    - Collect, store, and analyse samples according to “Guidance Manual for Sewage Treatment Plant Process Audits” (Chapter 6)
    - All samples are collected with 24-hour composite frig sampler.
    - Plant flow rate (daily average and instantaneous screen shot)
    - Plant influent sample test parameters: BOD_5, TBOD, and TKN once a week, TSS, TP, TAN every day.
    - Plant effluent sample test parameters: BOD_5, TBOD, and TKN once a week, TSS, TP, TAN every day.
    - Primary and secondary clarifier effluent for the plant under stress test sample test parameters: BOD_5, TBOD, and TKN once a week, TSS, TP, TAN every day.

- Operation parameters every day, including: MLSS, DO, RAS concentration, RAS/WAS flow, RAS recycle ratio, SVI, BOD loading, F:M, HRT, sludge blanket depth in primary and secondary clarifiers.
- Once a week, the samples of the plant influent, effluent, and stress tested plant secondary effluent to be submitted to an analytical lab accredited by SCC for analysis.
- From the very beginning of test, send split samples to a lab accredited by SCC to analysis all in-house analysed parameters once a week for QA/QC.

- Objective: Verify the treatment capacity of Plant 1 and Plant 2. identify the systems that requires upgrades.
- Engineer's responsibilities:
  - Prepare test plan with operator, design temporary system for test and oversee its installation, oversee the test,
  - Prepare TM to analyze the results, provide conclusion and recommendation.
  - Workshop with the Client after Plant 1 stress test and Plant 2 stress test.
- Operator's responsibilities:
  - Operate the plant. Recording the plant observation daily
  - Perform sampling, delivery to outside lab, and perform in-house testing. Record test results
  - Report and discuss the progress with the Engineer
- Health and safety: follow the plant's H&S plan.
- Contingency plan
  - The plant effluent quality and operation parameters are tested daily (except once a week for BOD_5).
  - If the test results show the plant quality deteriorated, the flow to the tested plant will be reduced to improve the effluent quality.
  - The plant operating staff is responsible for making decision regarding effluent quality control, and notifying the Engineer.

Stage 4:

1. **Conveyor Screen and CCT Upgrade**

- Scope: replace the existing screen system with increased capacity and install baffle wall in CCT
- Objective: Provide required capacity for screening system and effective CCT volume
- Engineer's responsibilities
  - Design, inspection, and contract administration.
- Operator's responsibilities:
  - Cooperate with Supplier, Contractor, and Engineer in plant operation and accessibility,
  - Review contactor's H&S plan and related H&S documents,
  - Assist O&M update
  - Training on new screen system.
- Health and safety: the Contractor should provide their H&S plan for construction work.

2. **(If stress test identifies insufficient capacity) upgrade aeration and/or RAS systems for Plant 1 and Plant 2**
   - Scope: Upgrade the system identified in stress test,
   - Objective: Provide capacity required for re-rating target ADF of 7,000 m3/d
   - Engineer's responsibilities
     - Design, inspection, and contract administration.
   - Operator's responsibilities:
     - Cooperate with Supplier, Contractor, and Engineer in plant operation and accessibility,
     - Review contactor's H&S plan and related H&S documents,
     - Assist O&M update
     - Training on new system.
   - Health and safety: the Contractor should provide their H&S plan for construction work.

Stage 5

1. Phase 2 Reporting
    - Scope: Prepare Technical Memoranda and final report
    - Engineer's responsibilities
        - Prepare report
    - Operator's responsibilities:
        - Assist with system and plant information

9.2.3 Plan Cost Estimate

The cost estimate details are summarized in Appendix C. The cost of Hanover WWTP lab, outside lab, rental equipment (such as a composite sampler) for stress test will be determined in the later stage. The approximate cost of basic cost for Phase 2 work is CAD 493,000.

10 Conclusion

The capacity assessment and current operation evaluation in Phase 1 suggested that Hanover WWTP has the capacity of ADF 7,000 m^3/d with new screen system, new CCT baffling wall, and sludge settleability improvement. The Phase 2 Work Plan indicated the studies and system upgrades will take approximately 1 - 1.5 years to complete the re-rating process.

With the current development plan, the current plant rated capacity will be surpassed in 2024 and is anticipated to reach 7,000 m^3/d in 2026. Therefore, completing the re-rating process is critical and urgent to ensure that Hanover WWPT will be operated within Environmental Compliance Certificate.

To handle the situation in a timely manner, it is recommended for the plant to prepare for jar test the upgrades identified in capacity assessment while the consulting and approval of Phase 2 Work Plan is in process.

To best utilize the capacity of the existing facility, the stress test of Plant 1 and Plant 2 should test flow rate ADF 7,500 m^3/d after the stress tests on ADF 7,000 m^3/d have succeeded.

Appendix A

Environmental Compliance Approval (ECA) number 6173-BKNLVM

Ontario

Ministry of the Environment, Conservation and Parks
Ministère de l'Environnement, de la Protection de la nature et des Parcs

AMENDED ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER 6173-BKNLVM
Issue Date: March 2, 2020

The Corporation of the Town of Hanover
341 10th St.
Hanover, Ontario
N4N 1P5

Site Location: Hanover Water Pollution Control Plant - Works # 120001461
718 7th Avenue
Town of Hanover, County of Grey

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

alteration, usage and operation of existing municipal sewage works, for the treatment of sanitary sewage and disposal of effluent to Saugeen River via a Sewage Treatment Plant (Hanover Wastewater Treatment Plant) and Final Effluent disposal facilities as follows:

Classification of Collection System: Separate Sanitary Sewer System

Classification of Sewage Treatment Plant: Secondary

Design Capacity of Sewage Treatment Plant

Design Capacity with All Treatment Trains in Operation	Prior to Completion of Construction of All Proposed Works	Upon Completion of Construction of All Proposed Works
Rated Capacity	6,360 m^3/d	6,360 m^3/d

Influent, Imported Sewage and Processed Organic Waste

Receiving Location	Types

In Collection System	Sanitary Sewage
At Sewage Treatment Plant	None

Proposed Works:

Hanover Wastewater Treatment Plant (WWTP)

Secondary Treatment Systems

- Secondary Sedimentation
    - New scum weir inside the existing two (2) circular final clarifiers in Plant 1 to remove and discharge scum to the new outdoor scum wet well/chamber;
    - One (1) new outdoor scum wet well (2.2 m ID- precast chamber) to collect scum from the existing two (2) circular final clarifiers in Plant 1;
    - One (1) new submersible scum discharge pump (7.0 L/s @ 5.0 m TDH, 1.6 kW) to discharge scum from new scum wet well to existing sanitary MH #7 or the existing one (1) primary clarifier for Plant 1;

Dechlorination System

- One (1) new outdoor 3,000 L sodium bisulphite FRP storage tank complete with ultrasonic level sensor, heat tracing and concrete secondary containment with dimension of 2.5m L X 2.5m W X 1.5m H;
- Three (3) new sodium bisulphite metering and feed pumps (2 duty, 1 stand-by), installed inside the existing main control building and each duty pump shall be dedicated to discharge sodium bisulphite into each chlorine contact tank (each with a capacity of 1.5 L/h at 140 kPa back pressure);
- One (1) outside bisulphite analyzer beside existing chlorine contact tank;

Sludge Management System

- Two (2) new magnetic flow meters in the Return activated sludge pump discharge piping located inside main control building;
- Two (2) new magnetic flow meters in the Waste activated sludge pump discharge piping located inside blower and pump building; all to work together with the following existing works;

Existing Works:

Sanitary Sewage Pumping Stations

Sewage Pumping Station

- two (2) screw type raw sewage lift pumps each capable of lifting 340 L/s a distance of 7.8 m, the pumps to be initially fitted with motors to permit each to operate at a firm capacity of 227 L/s;

- split wet well, discharge trough and control building;

Hanover WWTP

Influent Sewers

- 600 mm and 750 mm diameter inlet sewers to the Preliminary Treatment System;

- 500 mm diameter emergency overflow pipe, discharging to the effluent outfall manhole;

Preliminary Treatment System

- Screening

  - one (1) in-channel conveyor with dewatering press, with a Peak Instantaneous Flow Rate of 105 L/s, to collect, convey and dewater wastewater screenings up to the maximum daily flow and a manual bar screen for flows in excess of 105 L/s;

- Grit Removal

  - one (1) aerated grit tank measuring 4.9 m (W) x 4.7 m (L) x 3.28 m (SWD) with a Peak Hourly Flow Rate of 817 m^3/h;

  - one (1) swing-out type air diffusion header assembly;

  - two (2) air lift pump assemblies for removal of grit to the grit decanting channels;

  - two (2) grit decanting channels;

  - two (2) air blowers, each rated at 679 m^3/hr at 20.7 kPa to provide air for grit removal air diffusers, air lift pumps and channel aeration;

Influent Flow Splitting Point

- an adjustable flow splitter assembly located in the discharge channel of the air grit tank, to divide the flow equally between the Plants 1 and 2;

Primary Treatment System

- one (1) primary clarifier for Plant 1, with a Peak Daily Flow Rate of 9,800 m^3/d;
- two (2) primary clarifiers for Plant 2, each measuring 20.0 m x 4.9 m x 3.05 m SWD, with a combined Peak Daily Flow Rate of 9,800 m^3/d and equipped with sludge and scum removal mechanisms. The Plant 2 primary clarifiers also receive waste activated sludge from both Plants 1 and 2 for co-thickening;
- two (2) raw sludge pumps for Plant 1, each rated at 12.6 L/s at 24.4 m TDH;
- two (2) raw sludge pumps for Plant 2, each rated at 12.6 L/s at 24.4 m TDH;

Secondary Treatment Systems

- Biological Treatment
  - eight (8) aeration tanks for Plant 1, with a total volume is 866 m^3, with aeration system and two (2) air blowers each rated at 472 L/s at 51.7 kPa;
  - two (2) aeration tanks for Plant 2, capable of either plug flow or complete mix configuration by means of adjustable weirs, each tank measuring 9.8 m x 9.8 m x 4.6 m SWD with a total volume of 884 m^3 and equipped with two (2) dual speed mechanical aerators with adjustable blade tips;
- Secondary Sedimentation
  - two (2) circular final clarifiers for Plant 1, one 12.19 m in diameter with a Peak Hourly Flow Rate of 159 m^3/h and one 15.2 m in diameter with a Peak Hourly Flow Rate of 250 m^3/h, each clarifier equipped with circular sludge collector mechanism;
  - two (2) rectangular final clarifiers for Plant 2, each measuring 25.8 m x 5.5 m x 3.8 m SWD with a total volume of 1,079 m^3 and a combined Peak Hourly Flow Rate of 409 m^3/h, each clarifier is equipped with a chain and flight type sludge collector mechanism and a manually operated revolving skimmer discharging to a scum hopper for scum removal;
  - one (1) activated sludge hopper for Plant 1, with two (2) activated sludge return pumps, each rated at 37 L/s at 7.5 m TDH, complete with valving and piping to permit sludge wasting and two (2) 100 mm magnetic type flow meters, one measuring total pumpage the other measuring return

sludge;

- one (1) activated sludge hopper for Plant 2, with two (2) activated sludge return pumps, each rated at 37 L/s at 7.5 m TDH, complete with valving and piping to permit sludge wasting and two (2) - 100 mm magnetic flow meters, one measuring total pumpage, the other measuring return sludge;

- two (2) - 230 mm Parshall flumes, measuring final clarifier effluent from Plants 1 and 2 for process control;

Supplementary Treatment Systems

- Phosphorus Removal

  - one (1) 29.7 m^3 fibreglass reinforced plastic chemical storage tank;

  - two (2) chemical metering pumps each capable of having its output varied over a range of 70 L/h at 345 kPa down to 3.51 L/h;

  - one (1) emergency chemical dewatering pump rated at 1.2 L/s at 15 m TDH to take its suction from the chemical spill catchment areas at the chemical storage tank;

Disinfection System

- two (2) chlorine contact chambers, each consisting of a two pass tank measuring 9.2 m x 4.9 m x 2.44 m SWD for a total volume of 210 m^3 with a Peak Hourly Flow Rate of 817 m^3/h;

- one (1) vacuum operated, solution feed type chlorinator with a maximum feed capacity of 227 kg/day;

Final Effluent Flow Measurement and Sampling Point

- one (1) - 305 mm Parshall flume, measuring and recording total effluent flow prior to chlorination;

Sludge Management System

- Sludge Digestion

  - Primary Digesters

    - one (1) fixed roof primary digester measuring 15.2 m diameter x 7.3 m SWD representing a total volume of 1327 m^3 complete with gas mixing diffusers, sludge discharge and suction

piping and gas dome;

- one (1) floating cover secondary digester measuring 15.2 m diameter with a 6.7 m SWD representing a total volume of 1,215 m^3;

- one (1) digested sludge recirculation pump with a rated capacity of 12.6 L/s at 15 m;

- one (1) digested sludge loading pump with a rated capacity of 12.6 L/s at 15 m;

- Biosolids Storage and Disposal

  - three (3) biosolids storage tanks having a combined capacity of 1,679 m^3;

  - one (1) sludge transfer pump located in the digester control building, rated at 18.9 L/s at 17.6 m TDH, complete with valving and piping to transport digested sludge to the biosolids storage tank *;*

  - one (1) above ground glass fused to steel biosolids storage tank measuring 25.62 m diameter x 9.70 SWD m and representing a storage capacity of 5,000 m^3 complete with a sludge mixing system and sludge discharge and suction piping;

  - one (1) mixing system inside the biosolids storage tank consisting of an arrangement of floor mounted nozzles fed by a mixing/chopper pump located in the digester control building, rated at 284 L/s at 15.24 m TDH, and associated valving and piping. The mixing/chopper pump is also used to discharge biosolids to the truck loading bay located outside the digester control building;

  - Loading Bay: one (1) truck loading bay located north of the secondary digester, consisting of one (1) tanker loading arm, one (1) concrete loading pad measuring 8.8 m x 4.0 m, one (1) 1,200 mm diameter precast concrete spill containment catchbasin manhole and associated pipes connecting to an existing sanitary manhole, and an access road that tapers to the loading pad*;*

Final Effluent Disposal Facilities

- **Final Effluent Pumping Chamber -** 10.50 m X 2.05 m X 3.05 m SWD, representing a total volume of 65.65 cubic meters

- final Effluent Pumping - two (2) final effluent pumps, each with a capacity of 227 L/s at 5.2 m TDH and set to automatically start when backwater elevations in the final effluent pumping chamber reach 262.1 m;

- one (1) motorized sluice gate (normally open) located between the effluent pumping chamber and the effluent manhole, and set to automatically close when backwater elevations in the final effluent pumping chamber reach 262.1 m;

- one (1), 107 m long 600 mm diameter outfall sewer from the final effluent manhole to the Saugeen River;

including all other mechanical system, electrical system, instrumentation and control system, standby power system, piping, pumps, valves and appurtenances essential for the proper, safe and reliable operation of the Works in accordance with this Approval, in the context of process performance and general principles of wastewater engineering only;

all in accordance with the submitted supporting documents listed in Schedule A.

For the purpose of this environmental compliance approval, the following definitions apply:

1. "Annual Average Effluent Concentration" is the mean of all Single Sample Results of the concentration of a contaminant in the Final Effluent sampled or measured during a calendar year, calculated and reported as per the methodology specified in Schedule F;

2. "Annual Total Effluent Loading" means the value obtained by multiplying the Annual Average Effluent Concentration of a contaminant by the cumulative total Final Effluent discharged during the same calendar year;

3. "Annual Average Daily Influent Flow" means the cumulative total sewage flow of Influent to the Sewage Treatment Plant during a calendar year divided by the number of days during which sewage was flowing to the Sewage Treatment Plant that year;

4. "Approval" means this environmental compliance approval and any schedules attached to it, and the application;

5. "BOD5" (also known as TBOD5) means five day biochemical oxygen demand measured in an unfiltered sample and includes carbonaceous and nitrogenous oxygen demands;

6. "Bypass" means diversion of sewage around one or more treatment processes, excluding Preliminary Treatment System, within the Sewage Treatment Plant with the diverted sewage flows being returned to the Sewage Treatment Plant treatment train upstream of the Final Effluent sampling point(s) and discharged via the approved effluent disposal facilities;

7. "CBOD5" means five day carbonaceous (nitrification inhibited) biochemical oxygen demand measured in an unfiltered sample;

8. "Director" means a person appointed by the Minister pursuant to section 5 of the EPA for the purposes of Part II.1 of the EPA;

9. "District Manager" means the District Manager of the appropriate local district office of the Ministry where the Works is geographically located;

10. "*E. coli* " refers to coliform bacteria that possess the enzyme beta-glucuronidase and are capable of cleaving a fluorogenic or chromogenic substrate with the corresponding release of a fluorogen or chromogen, that produces fluorescence under long wavelength (366 nm) UV light, or color development, respectively. Enumeration methods include tube, membrane filter, or multi-well procedures. Depending on the method selected, incubation temperatures include 35.5 $\pm$ 0.5 °C or 44.5 $\pm$ 0.2 °C (to enumerate thermotolerant species). Depending on the procedure used, data are reported as either colony forming units (CFU) per 100 mL (for membrane filtration methods) or as most probable number (MPN) per 100 mL (for tube or multi-well methods);

11. "EPA" means the *Environmental Protection Act* , R.S.O. 1990, c.E.19, as amended;

12. "Equivalent Equipment" means alternate piece(s) of equipment that meets the design requirements and performance specifications of the piece(s) of equipment to be substituted;

13. "Event" means an action or occurrence, at a given location within the Works that causes a Bypass or Overflow. An Event ends when there is no recurrence of Bypass or Overflow in the 12-hour period following the last Bypass or Overflow. Overflows and Bypasses are separate Events even when they occur concurrently;

14. "Existing Works" means those portions of the Works included in the Approval that have been constructed previously;

15. "Final Effluent" means effluent that is discharged to the environment through the approved effluent disposal facilities, including all Bypasses, that are required to meet the compliance limits stipulated in the Approval for the Sewage Treatment Plant at the Final Effluent sampling point(s);

16. "Influent" means flows to the Sewage Treatment Plant from the collection system but excluding process return flows.

17. "Limited Operational Flexibility" (LOF) means the conditions that the Owner shall follow in order to undertake any modification that is pre-authorized as part of this Approval;

18. "Ministry" means the ministry of the government of Ontario responsible for the EPA and OWRA and includes all officials, employees or other persons acting on its behalf;

19. "Monthly Average Effluent Concentration" is the mean of all Single Sample Results of the concentration of a contaminant in the Final Effluent sampled or measured during a calendar month, calculated and reported as per the methodology specified in Schedule F;

20. "Monthly Geometric Mean Density" is the mean of all Single Sample Results of *E. coli* measurement in the samples taken during a calendar month, calculated and reported as per the methodology specified in Schedule F;

21. "Normal Operating Condition" means the condition when all unit process(es), excluding Preliminary Treatment System, in a treatment train is operating within its design capacity;

22. "Operating Agency" means the Owner or the entity that is authorized by the Owner for the management, operation, maintenance, or alteration of the Works in accordance with this Approval;

23. "Overflow" means a discharge to the environment from the Works at designed location(s) other than the approved effluent disposal facilities or via the effluent disposal facilities downstream of the Final Effluent sampling point;

24. "Owner" means The Corporation of the Town of Hanover and its successors and assignees;

25. "OWRA" means the *Ontario Water Resources Act* , R.S.O. 1990, c. O.40, as amended;

26. "Peak Daily Flow Rate" (also referred to as maximum daily flow or maximum day flow) means the largest volume of flow to be received during a one-day period for which the sewage treatment process unit or equipment is designed to handle;

27. "Peak Hourly Flow Rate" (also referred to as maximum hourly flow or maximum hour flow) means the largest volume of flow to be received during a one-hour period for which the sewage treatment process unit or equipment is designed to handle;

28. "Preliminary Treatment System" means all facilities in the Sewage Treatment Plant associated with screening and grit removal;

29. "Primary Treatment System" means all facilities in the Sewage Treatment Plant associated with the primary sedimentation unit process and includes chemically enhanced primary treatment;

30. "Professional Engineer" means a person entitled to practice as a Professional Engineer in the Province of Ontario under a license issued under the Professional Engineers Act;

31. "Proposed Works" means those portions of the Works included in the Approval that are under construction or to be constructed;

32. "Rated Capacity" means the Annual Average Daily Influent Flow for which the Sewage Treatment Plant is designed to handle;

33. "Sanitary Sewers" means pipes that collect and convey sanitary sewage only but include allowance for infiltration and inflow from extraneous sources such as ground-water and surface run-off through means other than stormwater catch basins, and include Nominally Separate Sanitary Sewers;

34. "Secondary Treatment System" means all facilities in the Sewage Treatment Plant associated with biological treatment, secondary sedimentation and phosphorus removal unit processes;

35. "Sewage Treatment Plant" means all the facilities related to sewage treatment within the sewage treatment plant site excluding the Final Effluent disposal facilities;

36. "Single Sample Result" means the test result of a parameter in the effluent discharged on any day, as measured by a probe, analyzer or in a composite or grab sample, as required;

37. "Works" means the approved sewage works, and includes Proposed Works, Existing Works and modifications made under Limited Operational Flexibility.

You are hereby notified that this environmental compliance approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

TERMS AND CONDITIONS

1. GENERAL PROVISIONS

1. The Owner shall ensure that any person authorized to carry out work on or operate any aspect of the Works is notified of this Approval and the terms and conditions herein and shall take all reasonable measures to ensure any such person complies with the same.

2. The Owner shall design, construct, operate and maintain the Works in accordance with the conditions of this Approval.

3. Where there is a conflict between a provision of any document referred to in this Approval and the conditions of this Approval, the conditions in this Approval shall take precedence.

2. CHANGE OF OWNER AND OPERATING AGENCY

1. The Owner shall, within thirty (30) calendar days of issuance of this Approval, prepare/update and submit to the District Manager the Municipal and Local Services Board Wastewater System Profile Information Form, as amended (Schedule G) under any of the following situations:

    a. the form has not been previously submitted for the Works;

    b. this Approval is issued for extension, re-rating or process treatment upgrade of the Works;

    c. when a notification is provided to the District Manager in compliance with requirements of change of Owner or Operating Agency under this condition.

2. The Owner shall notify the District Manager and the Director, in writing, of any of the following changes within thirty (30) days of the change occurring:

a. change of address of Owner;

b. change of Owner, including address of new owner;

c. change of partners where the Owner is or at any time becomes a partnership, and a copy of the most recent declaration filed under the *Business Names Act, R.S.O. 1990, c. B.17* , as amended, shall be included in the notification;

d. change of name of the corporation where the Owner is or at any time becomes a corporation, and a copy of the most current information filed under the *Corporations Information Act, R.S.O. 1990, c. C.39* , as amended, shall be included in the notification.

3. The Owner shall notify the District Manager, in writing, of any of the following changes within thirty (30) days of the change occurring:

a. change of address of Operating Agency;

b. change of Operating Agency, including address of new Operating Agency.

4. In the event of any change in ownership of the Works, the Owner shall notify the succeeding owner in writing, of the existence of this Approval, and forward a copy of the notice to the District Manager.

5. The Owner shall ensure that all communications made pursuant to this condition refer to the environmental compliance approval number.

3. CONSTRUCTION OF PROPOSED WORKS / RECORD DRAWINGS

1. All Proposed Works in this Approval shall be constructed and installed and must commence operation within five (5) years of issuance of this Approval, after which time the Approval ceases to apply in respect of any portions of the Works not in operation. In the event that the construction, installation and/or operation of any portion of the Proposed Works is anticipated to be delayed beyond the time period stipulated, the Owner shall submit to the Director an application to amend the Approval to extend this time period, at least six (6) months prior to the end of the period. The amendment application shall include the reason(s) for the delay and whether there is any design change(s).

2. Within thirty (30) days of commencement of construction, the Owner shall prepare and submit to the District Manager a schedule for the completion of construction and commissioning operation of the Proposed Works. The Owner shall notify the District Manager within thirty (30) days of the commissioning operation of any Proposed Works. Upon completion of construction of the Proposed Works, the Owner shall prepare and submit a statement to the District Manager, certified by a Professional Engineer, that the Proposed Works is constructed in accordance with this Approval.

3. Within one (1) year of completion of construction of the Proposed Works, a set of record drawings of the Works shall be prepared or updated. These drawings shall be kept up to date through revisions

undertaken from time to time and a copy shall be readily accessible for reference at the Works.

4. BYPASSES

1. Any Bypass is prohibited, except:

   a. an emergency Bypass when a structural, mechanical or electrical failure causes a temporary reduction in the capacity of a treatment process or when an unforeseen flow condition exceeds the design capacity of a treatment process that is likely to result in personal injury, loss of life, health hazard, basement flooding, severe property damage, equipment damage or treatment process upset, if a portion of the flow is not bypassed;

   b. a planned Bypass that is a direct and unavoidable result of a planned repair and maintenance procedure or other circumstance(s), the Owner having notified the District Manager in writing at least fifteen (15) days prior to the occurrence of Bypass, including an estimated quantity and duration of the Bypass, an assessment of the impact on the quality of the Final Effluent and the mitigation measures if necessary, and the District Manager has given written consent of the Bypass;

2. Notwithstanding the exceptions given in Paragraph 1, the Operating Agency shall undertake everything practicable to maximize the flow through the downstream treatment process(es) prior to bypassing.

3. At the beginning of a Bypass Event, the Owner shall immediately notify the Spills Action Centre (SAC) and the local Medical Officer of Health. This notice shall include, at a minimum, the following information:

   a. the type of the Bypass as indicated in Paragraph 1 and the reason(s) for the Bypass;

   b. the date and time of the beginning of the Bypass;

   c. the treatment process(es) gone through prior to the Bypass and the treatment process(es) bypassed;

   d. the effort(s) done to maximize the flow through the downstream treatment process(es) and the reason(s) why the Bypass was not avoided.

4. Upon confirmation of the end of a Bypass Event, the Owner shall immediately notify the Spills Action Centre (SAC) and the local Medical Officer of Health. This notice shall include, at a minimum, the following information:

   a. the date and time of the end of the Bypass;

   b. the estimated or measured volume of Bypass.

5. For any Bypass Event, the Owner shall collect daily sample(s) of the Final Effluent, inclusive of the Event and analyze for all effluent parameters outlined in Compliance Limits condition that require composite samples, following the same protocol specified in the Monitoring and Recording condition for

the regular samples. The sample(s) shall be in addition to the regular Final Effluent samples required under the monitoring and recording condition. If the Event occurs on a scheduled monitoring day, the regular sampling requirements prevail. If representative sample for the effluent parameter(s) that require grab sample cannot be obtained, they shall be collected after the Event at the earliest time when situation returns to normal.

6. The Owner shall submit a summary report of the Bypass Event(s) to the District Manager on a quarterly basis, no later than each of the following dates for each calendar year: February 15, May 15, August 15, and November 15. The summary reports shall contain, at a minimum, the types of information set out in Paragraphs (3), (4) and (5) and either a statement of compliance or a summary of the non-compliance notifications submitted as required under Paragraph 1 of Condition 11. If there is no Bypass Event during a quarter, a statement of no occurrence of Bypass is deemed sufficient.

7. The Owner shall develop a notification procedure in consultation with the District Manager and SAC and notify the public and downstream water users that may be adversely impacted by any Bypass Event

5. OVERFLOWS

1. Any Overflow is prohibited, except:

   a. an emergency Overflow in an emergency situation when a structural, mechanical or electrical failure causes a temporary reduction in the capacity of the Works or when an unforeseen flow condition exceeds the design capacity of the Works that is likely to result in personal injury, loss of life, health hazard, basement flooding, severe property damage, equipment damage or treatment process upset, if a portion of the flow is not overflowed;

   b. a planned Overflow that is a direct and unavoidable result of a planned repair and maintenance procedure or other circumstance(s), the Owner having notified the District Manager in writing at least fifteen (15) days prior to the occurrence of Overflow, including an estimated quantity and duration of the Overflow, an assessment of the impact on the environment and the mitigation measures if necessary, and the District Manager has given written consent of the Overflow;

2. Notwithstanding the exceptions given in Paragraph 1, the Operating Agency shall undertake everything practicable to maximize the flow through the downstream treatment process(es) and Bypass(es) prior to overflowing.

3. At the beginning of an Overflow Event, the Owner shall immediately notify the Spills Action Centre (SAC) and the local Medical Officer of Health. This notice shall include, at a minimum, the following information:

   a. the type of the Overflow as indicated in Paragraph 1 and the reason(s) for the Overflow;

   b. the date and time of the beginning of the Overflow;

   c. the point of the Overflow from the Works, the treatment process(es) gone through prior to the

Overflow, the disinfection status of the Overflow and whether the Overflow is discharged through the effluent disposal facilities or an alternate location;

d. the effort(s) done to maximize the flow through the downstream treatment process(es) and Bypass(es) and the reason(s) why the Overflow was not avoided.

4. Upon confirmation of the end of an Overflow Event, the Owner shall immediately notify the Spills Action Centre (SAC) and the local Medical Officer of Health. This notice shall include, at a minimum, the following information:

   a. the date and time of the end of the Overflow;

   b. the estimated or measured volume of the Overflow.

5. For any Overflow Event

   a. in the Sewage Treatment Plant, the Owner shall collect grab sample(s) of the Overflow, one near the beginning of the Event and one every eight (8) hours for the duration of the Event, and have them analyzed at least for CBOD5, total suspended solids, total phosphorus, except that raw sewage and primary treated effluent Overflow shall be analyzed for BOD5, total suspended solids, total phosphorus and total Kjeldahl nitrogen only.

6. The Owner shall submit a summary report of the Overflow Event(s) to the District Manager on a quarterly basis, no later than each of the following dates for each calendar year: February 15, May 15, August 15, and November 15. The summary report shall contain, at a minimum, the types of information set out in Paragraphs (3), (4) and (5). If there is no Overflow Event during a quarter, a statement of no occurrence of Overflow is deemed sufficient.

7. The Owner shall develop a notification procedure in consultation with the District Manager and SAC and notify the public and downstream water users that may be adversely impacted by any Overflow Event.

6. DESIGN OBJECTIVES

1. The Owner shall design and undertake everything practicable to operate the Sewage Treatment Plant in accordance with the following objectives:

   a. Final Effluent parameters design objectives listed in the table(s) included in Schedule B.

   b. Final Effluent is essentially free of floating and settleable solids and does not contain oil or any other substance in amounts sufficient to create a visible film or sheen or foam or discolouration on the receiving waters.

   c. Total Residual Chlorine (TRC) in the Final Effluent shall be non-detectable as measured by a method with a sensitivity of at least 0.02 mg/L. Normal operation of de-chlorination equipment

should provide for an excess of reagents to ensure that total chlorine residuals are not detected.

d. Annual Average Daily Influent Flow is within the Rated Capacity of the Sewage Treatment Plant.

7. COMPLIANCE LIMITS

1. The Owner shall operate and maintain the Sewage Treatment Plant such that compliance limits for the Final Effluent parameters listed in the table(s) included in Schedule C are met.

2. The Owner shall operate and maintain the Sewage Treatment Plant such that the Final Effluent is disinfected during the disinfection period between May 15 and September 15 inclusive.

8. OPERATION AND MAINTENANCE

1. The Owner shall ensure that, at all times, the Works and the related equipment and appurtenances used to achieve compliance with this Approval are properly operated and maintained. Proper operation and maintenance shall include effective performance, adequate funding, adequate staffing and training, including training in all procedures and other requirements of this Approval and the OWRA and regulations, adequate laboratory facilities, process controls and alarms and the use of process chemicals and other substances used in the Works.

2. The Owner shall prepare/update/maintain the operations manual for the Works within six (6) months of completion of construction of the Proposed Works, that includes, but not necessarily limited to, the following information:

   a. operating procedures for the Works under Normal Operating Conditions;

   b. inspection programs, including frequency of inspection, for the Works and the methods or tests employed to detect when maintenance is necessary;

   c. repair and maintenance programs, including the frequency of repair and maintenance for the Works;

   d. procedures for the inspection and calibration of monitoring equipment;

   e. operating procedures for the Works to handle situations outside Normal Operating Conditions and emergency situations such as a structural, mechanical or electrical failure, or an unforeseen flow condition, including procedures to minimize Bypasses and Overflows;

   f. a spill prevention and contingency plan, consisting of procedures and contingency plans, including notification to the District Manager, to reduce the risk of spills of pollutants and prevent, eliminate or ameliorate any adverse effects that result or may result from spills of pollutants;

   g. procedures for receiving, responding and recording public complaints, including recording any followup actions taken.

3. The Owner shall maintain the operations manual up-to-date and make the manual readily accessible for reference at the Works.

4. The Owner shall ensure that the Operating Agency fulfills the requirements under O. Reg. 129/04, as amended for the Works, including the classification of facilities, licensing of operators and operating standards.

9. MONITORING AND RECORDING

1. The Owner shall, upon commencement of operation of the Works, carry out a scheduled monitoring program of collecting samples at the required sampling points, at the frequency specified or higher, by means of the specified sample type and analyzed for each parameter listed in the tables under the monitoring program included in Schedule D and record all results, as follows:

    a. all samples and measurements are to be taken at a time and in a location characteristic of the quality and quantity of the sewage stream over the time period being monitored.

    b. definitions and preparation requirements for each sample type are included in document referenced in Paragraph 3.b.

    c. definitions for frequency:

        i. Daily means once every day;

        ii. Weekly means once every week;

        iii. Monthly means once every month;

        iv. Quarterly means once every three months;

2. In addition to the scheduled monitoring program required in Paragraph 1, the Owner shall collect daily sample(s) of the Final Effluent, on any day when there is any situation outside Normal Operating Conditions, and analyze for all effluent parameters outlined in Compliance Limits condition that require composite samples, following the same protocol specified in this condition for the regular samples. If the Event occurs on a scheduled monitoring day, the regular sampling requirements prevail. If representative sample for the effluent parameter(s) that require grab sample cannot be obtained, they shall be collected after the Event at the earliest time when situation returns to normal.

3. The methods and protocols for sampling, analysis and recording shall conform, in order of precedence, to the methods and protocols specified in the following documents and all analysis shall be conducted by a laboratory accredited to the ISO/IEC:17025 standard or as directed by the District Manager:

    a. the Ministry's Procedure F-10-1, “Procedures for Sampling and Analysis Requirements for Municipal and Private Sewage Treatment Works (Liquid Waste Streams Only), as amended;

    b. the Ministry's publication "Protocol for the Sampling and Analysis of Industrial/Municipal

Wastewater Version 2.0" (January 2016), PIBS 2724e02, as amended;

c. the publication "Standard Methods for the Examination of Water and Wastewater", as amended.

4. The Owner shall monitor and record the flow rate and daily quantity using flow measuring devices or other methods of measurement as approved below calibrated to an accuracy within plus or minus 15 per cent (+/- 15%) of the actual flowrate of the following:

   a. Final Effluent discharged from the Sewage Treatment Plant by continuous flow measuring devices and instrumentations/pumping rates/details of other methods (e.g. level of lagoons), or in lieu of an actual installation of equipment, adopt the flow measurements of the Influent for the purpose of estimating Final Effluent flows if the Influent and Final Effluent streams are considered not significantly different in flow rates and quantities;

5. If the Owner monitors Bisulphite Residual as a surrogate to Total Residual Chlorine, then detected levels of Bisulphite Residual in the sample shall be deemed to confirm absence of Total Residual Chlorine.

6. The Owner shall retain for a minimum of five (5) years from the date of their creation, all records and information related to or resulting from the monitoring activities required by this Approval.

10. LIMITED OPERATIONAL FLEXIBILITY

1. The Owner may make pre-authorized modifications to the sewage pumping stations and Sewage Treatment Plant in Works in accordance with the document "Limited Operational Flexibility - Protocol for Pre-Authorized Modifications to Municipal Sewage Works" (Schedule E), as amended, subject to the following:

   a. the modifications will not involve the addition of any new treatment process or the removal of an existing treatment process, including chemical systems, from the liquid or solids treatment trains as originally designed and approved.

   b. the scope and technical aspects of the modifications are in line with those delineated in Schedule E and conform with the Ministry's publication "Design Guidelines for Sewage Works 2008", as amended, Ministry's regulations, policies, guidelines, and industry engineering standards;

   c. the modifications shall not negatively impact on the performance of any process or equipment in the Works or result in deterioration in the Final Effluent quality;

   d. where the pre-authorized modification requires notification, a "Notice of Modifications to Sewage Works" (Schedule E), as amended shall be completed with declarations from a Professional Engineer and the Owner and retained on-site prior to the scheduled implementation date. All supporting information including technical memorandum, engineering plans and specifications, as applicable and appropriate to support the declarations that the modifications conform with LOF shall remain on-site for future inspection.

2. The following modifications are not pre-authorized under Limited Operational Flexibility:

   a. Modifications that involve addition or extension of process structures, tankages or channels;

   b. Modifications that involve relocation of the Final Effluent outfall or any other discharge location or that may require reassessment of the impact to the receiver or environment;

   c. Modifications that involve addition of or change in technology of a treatment process or that may involve reassessment of the treatment train process design;

   d. Modifications that require changes to be made to the emergency response, spill prevention and contingency plan; or

   e. Modifications that are required pursuant to an order issued by the Ministry.

11. REPORTING

1. The Owner shall report to the District Manager orally as soon as possible any non-compliance with the compliance limits, and in writing within seven (7) days of non-compliance.

2. The Owner shall, within fifteen (15) days of occurrence of a spill within the meaning of Part X of the EPA, submit a full written report of the occurrence to the District Manager describing the cause and discovery of the spill, clean-up and recovery measures taken, preventative measures to be taken and schedule of implementation, in addition to fulfilling the requirements under the EPA and O. Reg. 675/98 "Classification and Exemption of Spills and Reporting of Discharges".

3. The Owner shall, upon request, make all manuals, plans, records, data, procedures and supporting documentation available to Ministry staff.

4. The Owner shall prepare performance reports on a calendar year basis and submit to the District Manager by March 31 of the calendar year following the period being reported upon. The reports shall contain, but shall not be limited to, the following information pertaining to the reporting period:

   a. a summary and interpretation of all Influent monitoring data, and a review of the historical trend of the sewage characteristics and flow rates;

   b. a summary and interpretation of all Final Effluent monitoring data, including concentration, flow rates, loading and a comparison to the design objectives and compliance limits in this Approval, including an overview of the success and adequacy of the Works;

   c. a summary of all operating issues encountered and corrective actions taken;

   d. a summary of all normal and emergency repairs and maintenance activities carried out on any major structure, equipment, apparatus or mechanism forming part of the Works;

e. a summary of any effluent quality assurance or control measures undertaken;

f. a summary of the calibration and maintenance carried out on all Influent and Final Effluent monitoring equipment to ensure that the accuracy is within the tolerance of that equipment as required in this Approval or recommended by the manufacturer;

g. a summary of efforts made to achieve the design objectives in this Approval, including an assessment of the issues and recommendations for pro-active actions if any are required under the following situations:

   i. when any of the design objectives is not achieved more than 50% of the time in a year, or there is an increasing trend in deterioration of Final Effluent quality;

   ii. when the Annual Average Daily Influent Flow reaches 80% of the Rated Capacity;

h. a tabulation of the volume of sludge generated, an outline of anticipated volumes to be generated in the next reporting period and a summary of the locations to where the sludge was disposed.

i. a summary of any complaints received and any steps taken to address the complaints;

j. a summary of all Bypasses, Overflows, other situations outside Normal Operating Conditions and spills within the meaning of Part X of EPA and abnormal discharge events;

k. a summary of all Notice of Modifications to Sewage Works completed under Paragraph 1.d. of Condition 10, including a report on status of implementation of all modification.

l. a summary of efforts made to achieve conformance with Procedure F-5-1 including but not limited to projects undertaken and completed in the sanitary sewer system that result in overall Bypass/Overflow elimination including expenditures and proposed projects to eliminate Bypass/Overflows with estimated budget forecast for the year following that for which the report is submitted.

m. any changes or updates to the schedule for the completion of construction and commissioning operation of major process(es) / equipment groups in the Proposed Works.

The reasons for the imposition of these terms and conditions are as follows:

1. Condition 1 regarding general provisions is imposed to ensure that the Works are constructed and operated in the manner in which they were described and upon which approval was granted.

2. Condition 2 regarding change of owner and operator is included to ensure that the Ministry records are kept accurate and current with respect to ownership and operator of the Works and to ensure that subsequent owners of the Works are made aware of the Approval and continue to operate the Works in compliance with

it.

3. Condition 3 regarding timing for construction of proposed works is included to ensure that the Works are constructed in a timely manner so that standards applicable at the time of Approval of the Works are still applicable at the time of construction to ensure the ongoing protection of the environment, and that prior to the commencement of construction of the portion of the Works that are approved in principle only, the Director will have the opportunity to review detailed design drawings, specifications and an engineer's report containing detailed design calculations for that portion of the Works, to determine capability to comply with the Ministry's requirements stipulated in the terms and conditions of the Approval, and also ensure that the Works are constructed in accordance with the Approval and that record drawings of the Works "as constructed" are updated and maintained for future references.

4. Condition 4 regarding Bypasses is included to indicate that Bypass is prohibited, except in circumstances where the failure to Bypass could result in greater damage to the environment than the Bypass itself. The notification and documentation requirements allow the Ministry to take action in an informed manner and will ensure the Owner is aware of the extent and frequency of Bypass Events.

5. Condition 5 regarding Overflows is included to indicate that Overflow of untreated or partially treated sewage to the receiver is prohibited, except in circumstances where the failure to Overflow could result in greater damage to the environment than the Overflow itself. The notification and documentation requirements allow the Ministry to take action in an informed manner and will ensure the Owner is aware of the extent and frequency of Overflow Events.

6. Condition 6 regarding design objectives is imposed to establish non-enforceable design objectives to be used as a mechanism to trigger corrective action proactively and voluntarily before environmental impairment occurs.

7. Condition 7 regarding compliance limits is imposed to ensure that the Final Effluent discharged from the Works to the environment meets the Ministry's effluent quality requirements.

8. Condition 8 regarding operation and maintenance is included to require that the Works be properly operated, maintained, funded, staffed and equipped such that the environment is protected and deterioration, loss, injury or damage to any person or property is prevented. As well, the inclusion of a comprehensive operations manual governing all significant areas of operation, maintenance and repair is prepared, implemented and kept up-to-date by the Owner. Such a manual is an integral part of the operation of the Works. Its compilation and use should assist the Owner in staff training, in proper plant operation and in identifying and planning for contingencies during possible abnormal conditions. The manual will also act as a benchmark for Ministry staff when reviewing the Owner's operation of the Works.

9. Condition 9 regarding monitoring and recording is included to enable the Owner to evaluate and demonstrate the performance of the Works, on a continual basis, so that the Works are properly operated and maintained at a level which is consistent with the design objectives and compliance limits.

10. Condition 10 regarding Limited Operational Flexibility is included to ensure that the Works are constructed, maintained and operated in accordance with the Approval, and that any pre-approved modification will not

negatively impact on the performance of the Works.

11. Condition 11 regarding reporting is included to provide a performance record for future references, to ensure that the Ministry is made aware of problems as they arise, and to provide a compliance record for this Approval.

Schedule A

1. Application for Environmental Compliance Approval submitted by Ron Cooper, Director of Public Works of the Corporation of the Town of Hanover, dated July 2, 2019 for amendment of ECA No. 9576-APWJ9E for upgrading works including dechlorination system and design brief and drawings prepared by Ainley Consulting Engineers and Planners.

2. Application for Environmental Compliance Approval submitted by Ron Cooper, Director of Public Works of the Corporation of the Town of Hanover, dated June 8, 2017 and received on July 24, 2017 for the proposed biosolids storage tank and associated works, and supporting documents including the Preliminary Design Report, Technical Memorandum - Biosolids Storage Capacity Assessment, design drawings and specifications.

Schedule B

Final Effluent Design Objectives

Concentration Objectives prior to completion of construction of all Proposed Works

Final Effluent Parameter	Averaging Calculator	Objective (milligrams per litre unless otherwise indicated)
CBOD5	Monthly Average Effluent Concentration	15.0 mg/L
Total Suspended Solids	Monthly Average Effluent Concentration	15.0 mg/L
Total Phosphorus	Monthly Average Effluent Concentration	0.8 mg/L
E. coli	Monthly Geometric Mean Density	*150 CFU/100 mL (May 15 - Sep 15)
pH	Single Sample Result	6.5 - 8.5 inclusive

* If the MPN method is utilized for E.Coli analysis the objective shall be 150 MPN/100mL.

Concentration Objectives upon completion of construction of all Proposed Works

Final Effluent Parameter	Averaging Calculator	Objective (milligrams per litre unless otherwise indicated)
CBOD5	Monthly Average Effluent Concentration	15.0 mg/L
Total Suspended Solids	Monthly Average Effluent Concentration	15.0 mg/L
Total Phosphorus	Monthly Average Effluent Concentration	0.8 mg/L
Total Residual Chlorine **	Single Sample Result	Not detectable
E. coli	Monthly Geometric Mean Density	*150 CFU/100 mL (May 15 - Sep 15)
pH	Single Sample Result	6.5 - 8.5 inclusive

* If the MPN method is utilized for E.Coli analysis the objective shall be 150 MPN/100mL.
**Total Residual Chlorine shall be non-detectable as measured by a method with a sensitivity of at least 0.02 mg/L.

Schedule C

Final Effluent Compliance Limits

Concentration Limits prior to completion of construction of all Proposed Works

Final Effluent Parameter	Averaging Calculator	Limit (milligrams per litre unless otherwise indicated)
CBOD5	Monthly Average Effluent Concentration	25.0 mg/L
Total Suspended Solids	Monthly Average Effluent Concentration	25.0 mg/L
Total Phosphorus	Monthly Average Effluent Concentration	1.0 mg/L
E. coli	Monthly Geometric Mean Density	*200 CFU/100 mL (May 15 - Sep 15)
pH	Single Sample Result	6.0 - 9.5 inclusive

* If the MPN method is utilized for E.Coli analysis the objective shall be 200 MPN/100mL.

Concentration Limits upon completion of construction of all Proposed Works

Final Effluent Parameter	Averaging Calculator	Limit (milligrams per litre unless otherwise indicated)
CBOD5	Monthly Average Effluent Concentration	25.0 mg/L
Total Suspended Solids	Monthly Average Effluent Concentration	25.0 mg/L
Total Phosphorus	Monthly Average Effluent Concentration	1.0 mg/L
Total Residual Chlorine **	Single Sample Result	0.02 mg/L
E. coli	Monthly Geometric Mean Density	*200 CFU/100 mL (May 15 - Sep 15)
pH	Single Sample Result	6.0 - 9.5 inclusive

* If the MPN method is utilized for E.Coli analysis the objective shall be 200 MPN/100mL.
**If continuous analyzer is used for monitoring of Total Residual Chlorine, reading shall be recorded at a minimum frequency of every 5 minutes and any record is not to exceed 0.1 mg/L and any two-hour moving average is not to exceed 0.02 mg/L.

Loading Limits prior to completion of construction of all Proposed Works

Final Effluent Parameter	Averaging Calculator	Limit (maximum unless otherwise indicated)
CBOD5	Annual Average Daily Effluent Loading	159.0 kg/d
Total Suspended Solids	Annual Average Daily Effluent Loading	159.0 kg/d
Total Phosphorus	Annual Average Daily Effluent Loading	6.4 kg/d

Loading Limits upon completion of construction of all Proposed Works

Final Effluent Parameter	Averaging Calculator	Limit (maximum unless otherwise indicated)
CBOD5	Annual Average Daily Effluent Loading	159.0 kg/d
Total Suspended Solids	Annual Average Daily Effluent Loading	159.0 kg/d
Total Phosphorus	Annual Average Daily Effluent Loading	6.4 kg/d

Schedule D

Monitoring Program

Influent - Influent sampling point

Parameters	Sample Type	Frequency
BOD5	24 hour composite	Monthly
Total Suspended Solids	24 hour composite	Monthly
Total Phosphorus	24 hour composite	Monthly

Final Effluent - Final Effluent sampling point

Parameters	Sample Type	Frequency
CBOD5	24 hour composite	Weekly
Total Suspended Solids	24 hour composite	Weekly
Total Phosphorus	24 hour composite	Weekly
Total Ammonia Nitrogen	24 hour composite	Monthly
Total Kjeldahl Nitrogen	24 hour composite	Monthly
Nitrate as Nitrogen	24 hour composite	Monthly
Nitrite as Nitrogen	24 hour composite	Monthly
E. coli	Grab	Weekly
Total Residual Chlorine (sampled at final effluent pumping chamber)	Grab/Analyzer	Daily
pH*	Grab/Probe/Analyzer	Weekly
Temperature*	Grab/Probe/Analyzer	Weekly
Un-ionized Ammonia**	As calculated	Monthly

* pH and temperature of the Final Effluent shall be determined in the field at the time of sampling for Total Ammonia Nitrogen.

** The concentration of un-ionized ammonia shall be calculated using the total ammonia concentration, pH and temperature using methodology stipulated in " Ontario Provincial Water Quality Objectives" dated July 1994, as amended.

Sludge/Biosolids sampling point – Holding tank/truck loading bay

Parameters	Sample Type	Frequency
Total Solids	Grab	Quarterly
Total Phosphorus	Grab	Quarterly
Total Ammonia Nitrogen	Grab	Quarterly
Nitrate as Nitrogen	Grab	Quarterly
Metal Scan: - Arsenic - Cadmium - Cobalt - Chromium - Copper - Lead - Mercury - Molybdenum - Nickel - Potassium - Selenium - Zinc	Grab	Quarterly

Schedule E

Limited Operational Flexibility

Protocol for Pre-Authorized Modifications to Municipal Sewage Works

1. General

1. Pre-authorized modifications are permitted only where Limited Operational Flexibility has already been granted in the Approval and only permitted to be made at the pumping stations and sewage treatment plant in the Works, subject to the conditions of the Approval.

2. Where there is a conflict between the types and scope of pre-authorized modifications listed in this document, and the Approval where Limited Operational Flexibility has been granted, the Approval shall take precedence.

3. The Owner shall consult the District Manager on any proposed modifications that may fall within the scope and intention of the Limited Operational Flexibility but is not listed explicitly or included as an example in this document.

4. The Owner shall ensure that any pre-authorized modifications will not:

    a. adversely affect the hydraulic profile of the Sewage Treatment Plant or the performance of any upstream or downstream processes, both in terms of hydraulics and treatment performance;

    b. result in new Overflow or Bypass locations, or any potential increase in frequency or quantity of Overflow(s) or Bypass(es).

    c. result in a reduction in the required Peak Flow Rate of the treatment process or equipment as originally designed.

2. Modifications that do not require pre-authorization:

1. Sewage works that are exempt from Ministry approval requirements;

2. Modifications to the electrical system, instrumentation and control system.

3. Pre-authorized modifications that do not require preparation of "Notice of Modification to Sewage Works"

1. Normal or emergency maintenance activities, such as repairs, renovations, refurbishments and replacements with Equivalent Equipment, or other improvements to an existing approved piece of equipment of a treatment process do not require pre-authorization. Examples of these activities are:

a. Repairing a piece of equipment and putting it back into operation, including replacement of minor components such as belts, gear boxes, seals, bearings;

b. Repairing a piece of equipment by replacing a major component of the equipment such as motor, with the same make and model or another with the same or very close power rating but the capacity of the pump or blower will still be essentially the same as originally designed and approved;

c. Replacing the entire piece of equipment with Equivalent Equipment.

2. Improvements to equipment efficiency or treatment process control do not require pre-authorization. Examples of these activities are:

a. Adding variable frequency drive to pumps;

b. Adding on-line analyzer, dissolved oxygen probe, ORP probe, flow measurement or other process control device.

4. Pre-Authorized Modifications that require preparation of "Notice of Modification to Sewage Works"

1. Pumping Stations

a. Replacement, realignment of existing sewers including manholes, valves, gates, weirs and associated appurtenances provided that the modifications will not add new influent source(s) or result in an increase in flow from existing sources as originally approved.

b. Extension or partition of wetwell to increase retention time for emergency response and improve station maintenance and pump operation;

c. Replacement or installation of inlet screens to the wetwell;

d. Replacement or installation of flowmeters, construction of station bypass;

e. Replacement, reconfiguration or addition of pumps and modifications to pump suctions and discharge pipings including valve, gates, motors, variable frequency drives and associated appurtenances to maintain firm pumping capacity or modulate the pump rate provided that the modifications will not result in a reduction in the firm pumping capacity or discharge head or an increase in the peak pumping rate of the pumping station as originally designed;

f. Replacement, realignment of existing forcemain(s) including valves, gates, and associated appurtenances provided that the modifications will not reduce the flow capacity or increase the total dynamic head and transient in the forcemain.

2. Sewage Treatment Plant

1. Sewers and appurtenances

    a. Replacement, realignment of existing sewers (including pipes and channels) or construction of new sewers, including manholes, valves, gates, weirs and associated appurtenances within the a sewage treatment plant, provided that the modifications will not add new influent source(s) or result in an increase in flow from existing sources as originally approved and that the modifications will remove hydraulic bottlenecks or improve the conveyance of sewage into and through the Works.

2. Flow Distribution Chambers/Splitters

    a. Replacement or modification of existing flow distribution chamber/splitters or construction of new flow distribution chamber/splitters, including replacements or installation of sluice gates, weirs, valves for distribution of flows to the downstream process trains, provided that the modifications will not result in a change in flow distribution ratio to the downstream process trains as originally designed.

3. Imported Sewage Receiving Facility

    a. Replacement, relocation or installation of loading bays, connect/disconnect hook-up systems and unloading/transferring systems;

    b. Replacement, relocation or installation of screens, grit removal units and compactors;

    c. Replacement, relocation or installation of pumps, such as dosing pumps and transfer pumps, valves, piping and appurtenances;

    d. Replacement, relocation or installation of storage tanks/chambers and spill containment systems;

    e. Replacement, relocation or installation of flow measurement and sampling equipment;

    f. Changes to the source(s) or quantity from each source, provided that changes will not result in an increase in the total quantity and waste loading of each type of Imported Sewage already approved for co-treatment.

4. Preliminary Treatment System

    a. Replacement of existing screens and grit removal units with equipment of the same or higher process performance technology, including where necessary replacement or upgrading of existing screenings dewatering washing compactors, hydrocyclones, grit classifiers, grit pumps, air blowers conveyor system, disposal bins and other ancillary equipment to the screening and grit removal processes.

    b. Replacement or installation of channel aeration systems, including air blowers, air supply main,

air headers, air laterals, air distribution grids and diffusers.

5. Primary Treatment System

    a. Replacement of existing sludge removal mechanism, including sludge chamber;

    b. Replacement or installation of scum removal mechanism, including scum chamber;

    c. Replacement or installation of primary sludge pumps, scum pumps, provided that:the modifications will not result in a reduction in the firm pumping capacity or discharge head that the primary sludge pump(s) and scum pump(s) are originally designed to handle.

6. Secondary Treatment System

    1. Biological Treatment

        a. Conversion of complete mix aeration tank to plug-flow multi-pass aeration tank, including modifications to internal structural configuration;

        b. Addition of inlet gates in multi-pass aeration tank for step-feed operation mode;

        c. Partitioning of an anoxic/flip zone in the inlet of the aeration tank, including installation of submersible mixer(s);

        d. Replacement of aeration system including air blowers, air supply main, air headers, air laterals, air distribution grids and diffusers, provided that the modifications will not result in a reduction in the firm capacity or discharge pressure that the blowers are originally designed to supply or in the net oxygen transferred to the wastewater required for biological treatment as originally required.

    2. Secondary Sedimentation

        a. Replacement of sludge removal mechanism, including sludge chamber;

        b. Replacement or installation of scum removal mechanism, including scum chamber;

        c. Replacement or installation of return activated sludge pump(s), waste activated sludge pump(s), scum pump(s), provided that the modifications will not result in a reduction in the firm pumping capacity or discharge head that the activated sludge pump(s) and scum pump(s) are originally designed to handle.

7. Post-Secondary Treatment System

    a. Replacement of filtration system with equipment of the same filtration technology, including feed pumps, backwash pumps, filter reject pumps, filtrate extract pumps, holding tanks associated

with the pumping system, provided that the modifications will not result in a reduction in the capacity of the filtration system as originally designed.

8. Disinfection System

    1. UV Irradiation

        a. Replacement of UV irradiation system, provided that the modifications will not result in a reduction in the design capacity of the disinfection system or the radiation level as originally designed.

    2. Chlorination/Dechlorination and Ozonation Systems

        a. Extension and reconfiguration of contact tank to increase retention time for effective disinfection and reduce dead zones and minimize short-circuiting;

        b. Replacement or installation of chemical storage tanks, provided that the tanks are provided with effective spill containment.

9. Supplementary Treatment Systems

    1. Chemical systems

        a. Replacement, relocation or installation of chemical storage tanks for existing chemical systems only, provided that the tanks are sited with effective spill containment;

        b. Replacement or installation of chemical dosing pumps provided that the modifications will not result in a reduction in the firm capacity that the dosing pumps are originally designed to handle.

        c. Relocation and addition of chemical dosing point(s) including chemical feed pipes and valves and controls, to improve phosphorus removal efficiency;

        d. Use of an alternate chemical provided that it is a non-proprietary product and is a commonly used alternative to the chemical approved in the Works, provided that the chemical storage tanks, chemical dosing pumps, feed pipes and controls are also upgraded, as necessary..

10. Sludge Management System

    1. Sludge Holding and Thickening

        a. Replacement or installation of sludge holding tanks, sludge handling pumps, such as transfer pumps, feed pumps, recirculation pumps, provided that modifications will not result in reduction in the solids storage or handling capacities;

2. Sludge Digestion

    a. Replacement or installation of digesters, sludge handling pumps, such as transfer pumps, feed pumps, recirculation pumps, provided that modifications will not result in reduction in the solids storage or handling capacities;

    b. replacement of sludge digester covers.

3. Sludge Dewatering and Disposal

    a. Replacement of sludge dewatering equipment, sludge handling pumps, such as transfer pumps, feed pumps, cake pumps, loading pumps, provided that modifications will not result in reduction in solids storage or handling capacities.

4. Processed Organic Waste

    a. Changes to the source(s) or quantity from each source, provided that changes will not result in an increase in the total quantity already approved for co-processing.

11. Standby Power System

    1. Replacement or installation of standby power system, including feed from alternate power grid, emergency power generator, fuel supply and storage systems, provided that the existing standby power generation capacity is not reduced.

12. Pilot Study

    1. Small side-stream pilot study for existing or new technologies, alternative treatment process or chemical, provided:

        a. all effluent from the pilot system is hauled off-site for proper disposal or returned back to the sewage treatment plant for at a point no further than immediately downstream of the location from where the side-stream is drawn;

        b. no proprietary treatment process or propriety chemical is involved in the pilot study;

        c. the effluent from the pilot system returned to the sewage treatment plant does not significantly alter the composition/concentration of or add any new contaminant/inhibiting substances to the sewage to be treated in the downstream process;

        d. the pilot study will not have any negative impacts on the operation of the sewage treatment plant or cause a deterioration of effluent quality;

        e. the pilot study does not exceed a maximum of two years and a notification of completion shall be submitted to the District Manager within one month of completion of the pilot

project.

13. Lagoons

    a. installing baffles in lagoon provided that the operating capacity of the lagoon system is not reduced;

    b. raise top elevation of lagoon berms to increase free-board;

    c. replace or install interconnecting pipes and chambers between cells, provided that the process design operating sequence is not changed;

    d. replace or install mechanical aerators, or replace mechanical aerators with diffused aeration system provided that the mixing and aeration capacity are not reduced;

    e. removal of accumulated sludge and disposal to an approved location offsite.

3. Final Effluent Disposal Facilities

    a. Replacement or realignment of the Final Effluent channel, sewer or forcemain, including manholes, valves and appurtenances from the end of the treatment train to the discharge outfall section, provided that the sewer conveys only effluent discharged from the Sewage Treatment Plant and that the replacement or re-aligned sewer has similar dimensions and performance criteria and is in the same or approximately the same location and that the hydraulic capacity will not be reduced.

This page contains an image of the form entitled "Notice of Modification to Sewage Works". A digital copy can be obtained from the District Manager.

Ontario

Ministry of the Environment, Conservation and Parks

Notice of Modification to Sewage Works

RETAIN COPY OF COMPLETED FORM AS PART OF THE ECA ON-SITE PRIOR TO THE SCHEDULED IMPLEMENTATION DATE.

Part 1 – Environmental Compliance Approval (ECA) with Limited Operational Flexibility

(Insert the ECA's owner, number and issuance date and notice number, which should start with "01" and consecutive numbers thereafter)

ECA Number	Issuance Date (mm/dd/yy)	Notice number (if applicable)

ECA Owner	Municipality

Part 2: Description of the modifications as part of the Limited Operational Flexibility

(Attach a detailed description of the sewage works)

Description shall include:
1. A detail description of the modifications and/or operations to the sewage works (e.g. sewage work component, location, size, equipment type/model, material, process name, etc.)
2. Confirmation that the anticipated environmental effects are negligible.
3. List of updated versions of, or amendments to, all relevant technical documents that are affected by the modifications as applicable, i.e. submission of documentation is not required, but the listing of updated documents is (design brief, drawings, emergency plan, etc.)

Part 3 – Declaration by Professional Engineer

I hereby declare that I have verified the scope and technical aspects of this modification and confirm that the design:
1. Has been prepared or reviewed by a Professional Engineer who is licensed to practice in the Province of Ontario;
2. Has been designed in accordance with the Limited Operational Flexibility as described in the ECA;
3. Has been designed consistent with Ministry's Design Guidelines, adhering to engineering standards, industry's best management practices, and demonstrating ongoing compliance with s.53 of the Ontario Water Resources Act; and other appropriate regulations.

I hereby declare that to the best of my knowledge, information and belief the information contained in this form is complete and accurate

Name (Print)	PEO License Number

Signature	Date (mm/dd/yy)

Name of Employer

Part 4 – Declaration by Owner

I hereby declare that:
1. I am authorized by the Owner to complete this Declaration;
2. The Owner consents to the modification; and
3. This modifications to the sewage works are proposed in accordance with the Limited Operational Flexibility as described in the ECA.
4. The Owner has fulfilled all applicable requirements of the *Environmental Assessment Act*.

I hereby declare that to the best of my knowledge, information and belief the information contained in this form is complete and accurate

Name of Owner Representative (Print)	Owner representative's title (Print)

Owner Representative's Signature	Date (mm/dd/yy)

Schedule F

Methodology for Calculating and Reporting Monthly Average Effluent Concentration, Annual Average Effluent Concentration and Monthly Geometric Mean Density

1. Monthly Average Effluent Concentration

Step 1: Calculate the arithmetic mean of all Single Sample Results of the concentration of a contaminant in the Final Effluent sampled or measured during a calendar month and proceed as follows depending on the result of the calculation:

a. If the arithmetic mean does not exceed the compliance limit for the contaminant, then report and use this arithmetic mean as the Monthly Average Effluent Concentration for this parameter where applicable in this Approval;

b. If the arithmetic mean exceeds the compliance limit for the contaminant and there was no Bypass Event during the calendar month, then report and use this arithmetic mean as the Monthly Average Effluent Concentration for this parameter where applicable in this Approval;

c. If the arithmetic mean exceeds the compliance limit for the contaminant and there was Bypass Event(s) during the calendar month, then proceed to Step 2;

d. If the arithmetic mean does not exceed the compliance limit for the contaminant and there was Bypass Event(s) during the calendar month, the Owner may still elect to proceed to Step 2 calculation of the flow-weighted arithmetic mean.

Step 2: Calculate the flow-weighted arithmetic mean of all Single Sample Results of the concentration of a contaminant in the Final Effluent sampled or measured during a calendar month and proceed depending on the result of the calculation:

a. Group No Bypass Days (**NBPD**) data and Bypass Days (**BPD**) data during a calendar month separately;

b. Calculate the arithmetic mean of all Single Sample Results of the concentration of a contaminant in the Final Effluent sampled or measured on all NBPD during a calendar month and record it as **Monthly Average NBPD Effluent Concentration**;

c. Obtain the "**Total Monthly NBPD Flow**" which is the total amount of Final Effluent discharged on all NBPD during the calendar month;

d. Calculate the arithmetic mean of all Single Sample Results of the concentration of a contaminant in the Final Effluent sampled or measured on all BPD during a calendar month

and record it as **Monthly Average BPD Effluent Concentration**;

e. Obtain the "**Total Monthly BPD Flow**" which is the total amount of Final Effluent discharged on all BPD during the calendar month;

f. Calculate the flow-weighted arithmetic mean using the following formula:

[(Monthly Average NBPD Effluent Concentration × Total Monthly NBPD Flow) + (Monthly Average BPD Effluent Concentration × Total Monthly BPD Flow)] ÷ (Total Monthly NBPD Flow + Total Monthly BPD Flow)

It should be noted that in this method, if there are no Bypass Event for the month, the calculated result would be the same as the non-flow-weighted arithmetic mean method;

g. Report and use the lesser of the flow-weighted arithmetic mean obtained in Step 2 and the arithmetic mean obtained in Step 1 as the Monthly Average Effluent Concentration for this parameter where applicable in this Approval.

2. Annual Average Effluent Concentration

Step 1: Calculate the arithmetic mean of all Single Sample Results of the concentration of a contaminant in the Final Effluent sampled or measured during a calendar year and proceed as follows depending on the result of the calculation:

a. If the arithmetic mean does not exceed the compliance limit for the contaminant, then report and use this arithmetic mean as the Annual Average Effluent Concentration for this parameter where applicable in this Approval;

b. If the arithmetic mean exceeds the compliance limit for the contaminant and there was no Bypass Event during the calendar year, then report and use this arithmetic mean as the Annual Average Effluent Concentration for this parameter where applicable in this Approval;

c. If the arithmetic mean exceeds the compliance limit for the contaminant and there was Bypass Event(s) during the calendar year, then proceed to Step 2;

d. If the arithmetic mean does not exceed the compliance limit for the contaminant and there was Bypass Event(s) during the calendar year, the Owner may still elect to proceed to Step 2 calculation of the flow-weighted arithmetic mean.

Step 2: Calculate the flow-weighted arithmetic mean of all Single Sample Results of the concentration of a contaminant in the Final Effluent sampled or measured during a calendar year and proceed depending on the result of the calculation:

a. Group No Bypass Days (**NBPD**) data and Bypass Days (**BPD**) data during a calendar year

separately;

b. Calculate the arithmetic mean of all Single Sample Results of the concentration of a contaminant in the Final Effluent sampled or measured on all NBPD during a calendar year and record it as **Annual Average NBPD Effluent Concentration**;

c. Obtain the "**Total Annual NBPD Flow**" which is the total amount of Final Effluent discharged on all NBPD during the calendar year;

d. Calculate the arithmetic mean of all Single Sample Results of the concentration of a contaminant in the Final Effluent sampled or measured on all BPD during a calendar year and record it as **Annual Average BPD Effluent Concentration**;

e. Obtain the "**Total Annual BPD Flow**" which is the total amount of Final Effluent discharged on all BPD during the calendar year;

f. Calculate the flow-weighted arithmetic mean using the following formula:

[(Annual Average NBPD Effluent Concentration × Total Annual NBPD Flow) + (Annual Average BPD Effluent Concentration × Total Annual BPD Flow)] ÷ (Total Annual NBPD Flow + Total Annual BPD Flow)

It should be noted that in this method, if there are no Bypass Event for the calendar year, the calculated result would be the same as the non-flow-weighted arithmetic mean method;

g. Report and use the lesser of the flow-weighted arithmetic mean obtained in Step 2 and the arithmetic mean obtained in Step 1 as the Annual Average Effluent Concentration for this parameter where applicable in this Approval.

3. Monthly Geometric Mean Density

Geometric mean is defined as the n^{th} root of the product of n numbers. In the context of calculating Monthly Geometric Mean Density for *E. coli*, the following formula shall be used:

$$\sqrt[n]{x_1 x_2 x_3 \cdots x_n}$$

in which,

"n" is the number of samples collected during the calendar month; and

"x" is the value of each Single Sample Result.

For example, four weekly grab samples were collected and tested for *E. coli* during the calendar month. The *E. coli* densities in the Final Effluent were found below:

Sample Number	*E. coli* Densities* (CFU/100 mL)
1	10
2	100
3	300
4	50

The Geometric Mean Density for these data:

$$\sqrt[4]{10 \times 100 \times 300 \times 50} = 62$$

*If a particular result is zero (0), then a value of one (1) will be substituted into the calculation of the Monthly Geometric Mean Density. If the MPN method is utilized for E. coli analysis, values in the table shall be MPN/100 mL.

Schedule G

Municipal and Local Services Board Wastewater System
Profile Information Form

(For reference only, images of the form are attached on the next four pages. A digital copy can be obtained from the District Manger.)

Ontario

Ministry of the Environment, Conservation and Parks

Municipal and Local Services Board Wastewater System Profile Information Form

The information in this form is necessary to administer the Ministry's approvals, compliance and enforcement programs with respect to wastewater treatment and collection systems owned by municipalities and local services boards. These programs are authorized under the *Ontario Water Resources Act*, the *Environmental Protection Act*, the *Nutrient Management Act* and their respective regulations.

Email the completed form to: waterforms@ontario.ca
For any questions call 1-866-793-2588.

[A] SYSTEM PROFILE INFORMATION

Wastewater System Number *(if assigned)*

☐ New Profile
☐ Update Existing Profile

Name of System

Name of Municipality or Local Services Board

Level of Treatment (select one*)
☐ Primary
☐ Secondary
☐ Tertiary
☐ Secondary Equivalent
☐ Other (specify):

*See Terms and Concepts on page 4

Population Served	Population (Design)	Type of System
		☐ Treatment & Collection System ☐ Collection System Only

Design Rated Capacity (m^3/day)	Peak Flow Rate (m^3/day)	Current Environmental Compliance Approval (ECA) Number	Current ECA Issue Date (yyyy/mm/dd):

The treatment plant receives sewage from: (Check all that applies.* If you have checked more than one option below, indicate the approximate %)

☐ Sanitary Sewer ☐ Combined Sewer
☐ Nominally Separated Sewer ☐ Partially Separated Sewer

*See Terms and Concepts on page 4

[B] OWNER INFORMATION

Legal Name of Municipality or Local Services Board

Unit No	Street No.	Street Name.	Street Type (St, Rd, etc)	Street Direction (N,S,E,W)

PO Box	City/Town	Postal Code

☐ Dr ☐ Miss ☐ Mr ☐ Mrs ☐ Ms	Owner Contact First Name	Owner Contact Last Name	Owner Contact Job Title

Tel. No.	Fax Number	Email address
( ) - ext.	( ) -	

[C] OPERATING AUTHORITY ☐ Check if same as owner

Legal Name of Operator

Unit No	Street No.	Street Name.	Street Type (St, Rd, etc)	Street Direction (N,S,E,W)

PO Box	City/Town	Postal Code

☐ Dr ☐ Miss ☐ Mr ☐ Mrs ☐ Ms	Operator Contact First Name	Operator Contact Last Name	Operator Contact Job Title

Tel. No.	Fax Number	Email address
( ) - ext.	( ) -	

[D] 24/7 CONTACT

☐ Dr ☐ Miss ☒ Mr ☐ Mrs ☐ Ms	First Name	Last Name	Job Title

Tel. No. ( ) - ext.	Fax Number ( ) -	Email address

[E] SYSTEM CIVIC LOCATION ADDRESS (I.E. ADDRESS OF TREATMENT PLANT)

Unit No	Street No.	Street Name.	Street Type (St, Rd, etc)	Street Direction (N,S,E,W)

PO Box	City/Town	Postal Code

If the Wastewater System has no street address

Geographical Township	Lot	Concession

Geographical Referencing (if known, enter the Geographical Reference Information for this Wastewater System)

Map Datum	Geo-Referencing Method	Accuracy Estimate	Location Reference	
Latitude	**Longitude**	**Zone**	**Easting**	**Northing**

[F] TREATMENT PROCESS

Preliminary	Primary	Secondary	Secondary Equivalent	Post-Secondary	Additional Treatment
☐ Screening ☐ Shredding/ grinding ☐ Grit Removal ☐ Other(specify):	☐ Settling/sedimentation/ clarification ☐ Scum Removal ☐ Polymer Addition ☐ Other(specify):	☐ Conventional Activated Sludge (CAS) ☐ Extended Aeration ☐ Membrane Bioreactor (MBR) ☐ Sequencing Batch Reactor (SBR) ☐ Rotating Biological Contactor (RBC) ☐ Trickling Filter (TF) ☐ Biological Aerated Filter (BAF) ☐ Other(specify):	☐ Aerated Lagoon ☐ Facultative Lagoon ☐ Anaerobic Lagoon ☐ Aerobic Lagoon ☐ Other(specify):	☐ Filtration ☐ Clarification ☐ Intermittent Sand Filter (after lagoons) ☐ Polishing Wetlands ☐ Polishing Lagoons ☐ Other(specify):	☐ Phosphorous Removal ☐ Biological ☐ Chemical If chemical is used, specify: ☐ Nitrification ☐ Denitrification ☐ Other(specify):

[G] DISINFECTION

Method of Disinfection	Disinfection Period
☐ Chlorination If you chlorinate, do you practice de-chlorination? ☐ Yes ☐ No	☐ Continuous ☐ Seasonal
☐ Ultraviolet Irradiation	☐ Continuous ☐ Seasonal
☐ Other (specify):	☐ Continuous ☐ Seasonal

[H] SLUDGE	
Sludge Stabilization Process	Method of Sludge Disposal/Utilization
☐ Aerobic Digestion	☐ Agricultural
☐ Anaerobic Digestion	☐ Landfill
☐ Drying & Pelletization	☐ Incineration
☐ Lime Treatment	☐ Other (specify):
☐ Composting	
☐ Other (specify):	
Available Sludge Storage Capacity (m^3):	

[I] EFFLUENT	
Effluent Disposal Method	Effluent Discharge Frequency
☐ Surface Water Receiving Water Body Name:	☐ Continuous ☐ Seasonal
☐ Subsurface	☐ Continuous ☐ Seasonal
☐ Other (specify):	☐ Continuous ☐ Seasonal

Is the effluent discharged in a vulnerable area identified in the local source protection assessment report approved under the Clean Water Act, 2006?
☐ Yes ☐ No

[J] INFLUENT

Does the plant receive sewage from another municipality or local services board either through an interconnected collection system or hauled sewage?
☐ Yes ☐ No
(if yes, name(s) of other municipality or local services board):

Plant receives:
☐ Leachate (approximate annual volume in m^3):
☐ Septage (approximate annual volume in m^3):
☐ Industrial input (approximate annual volume in m^3):
or (approximate volume in %):

Terms and Concepts

The following Terms and Concepts are provided to assist you when completing Wastewater System Profile Information Form.

In order to determine the level of treatment that applies to the wastewater system, the effluent quality objectives that the wastewater treatment plant was designed to meet must be considered. The process based approach often used in the past has led to confusion and is open to interpretation due to recent developments and practices in the wastewater treatment industry. For example, a plant with a high rate filter (often referred to as a tertiary filter) after its secondary treatment was considered a tertiary treatment in the past since the filter was designed and operated to produce a tertiary quality effluent. However, secondary plants are now being constructed with these filters as a safeguard against any potential secondary clarifier performance degradation and not for the purpose of ensuring tertiary treatment performance. Also, new technologies have evolved that can produce tertiary quality effluent without having these high rate filters (e.g., membrane bioreactors). Lagoons were considered in the past as being capable of providing only secondary equivalent treatment. However, with add-on treatment after the lagoons (e.g. intermittent sand filters), many lagoon treatment systems are capable of producing secondary or tertiary quality effluent.

During the establishment of sewage works, site-specific effluent limits (including averaging periods) are provided by the Ministry's Regional Technical Support Section, considering the assimilative capacity of the receivers and the minimum treatment requirements provided in Procedure F-5-1. The designer of the sewage works then selects objective values that are acceptable to the Ministry and are less (i.e. more stringent) than the effluent limits , in order to provide an adequate safety factor based on the designer's confidence/experience with the technology chosen and other site-specific conditions. The sewage works are then designed (and operated) to meet these design objectives in a reliable and consistent manner. Therefore, the values that are to be used in the determination of the level of treatment that applies to the sewage works must be based on the design objectives, and not the effluent limits.

Two common parameters used in almost all sewage works designs and performance evaluations are $CBOD_5$ (carbonaceous biochemical oxygen demand) (BOD_5 – biochemical oxygen demand - for primary sewage works) and total suspended solids (TSS). Therefore, it is logical that the **objective values** of these two parameters are used to determine the level of treatment at the sewage works.

Level of Treatment:

Primary:
Wastewater treatment plants that have only settling/sedimentation (with or without chemical addition) and providing 30% and 50% or better reduction of BOD_5 and TSS respectively are considered primary plants (MOE Procedures F-5-1 and F-5-5).

Secondary:
Wastewater treatment plants that have biological processes (e.g. activated sludge process and its variations, fixed film processes) or physical-chemical processes producing an effluent quality of $CBOD_5$ and TSS of 15 mg/L or better are considered secondary plants (MOE Design Guidelines for Sewage Works, 2008).

Secondary Equivalent:
Wastewater treatment plants producing an effluent quality of $CBOD_5$ of 25 mg/L and TSS of 30 mg/L or better are considered as secondary equivalent plants.

Note: Wastewater treatment plants that provide only primary settling of solids and the addition of chemicals to improve the removal of TSS (and phosphorus) are not considered as secondary treatment plants or secondary equivalent plants (MOE Design Guidelines for Sewage Works, 2008).

Tertiary:
Wastewater treatment plants that have biological processes (e.g. activated sludge process and its variations, fixed film processes) and/or physical-chemical processes producing an effluent quality of $CBOD_5$ and TSS of 5 mg/L or better are considered tertiary plants.

Note: Biological processes such as nitrification, denitrification and enhanced biological phosphorus removal can be part of either a secondary or tertiary treatment plant. They may be described as secondary treatment plant with nitrification, secondary treatment plant with enhanced biological phosphorus removal, tertiary treatment plant with nitrification etc.

Sewer System Type:

Sanitary Sewers:
Pipes that convey sanitary sewage flows made up of wastewater discharges from residential, commercial, institutional and industrial establishments plus extraneous flow components from such sources as groundwater and surface run off.

Combined Sewers:
Pipes that convey both sanitary sewage and stormwater runoff through a single-pipe system.

Partially Separated Sewers:
Exist when either a portion of the combined sewer area was retrofitted to separate (sanitary and storm) sewers and/or a service area with combined sewers has had a new development area with separate sewers added to the service area; whatever the case may be, the final flows will be combined sewage.

Nominally Separated Sewers:
These sewers are constructed as separate sewers, but the sanitary sewers accept stormwater from roof and foundation drains (i.e., these are separated sewers in name only).

Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s). 4011-BEZN4G issued on November 26, 2019

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

a. The portions of the environmental compliance approval or each term or condition in the environmental compliance approval in respect of which the hearing is required, and;
b. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

1. The name of the appellant;
2. The address of the appellant;
3. The environmental compliance approval number;
4. The date of the environmental compliance approval;
5. The name of the Director, and;
6. The municipality or municipalities within which the project is to be engaged in.

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes of Part II.1 of the Environmental Protection Act
Ministry of the Environment, Conservation and Parks
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca**

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 2nd day of March, 2020

A. Ahmed

Aziz Ahmed, P.Eng.
Director

appointed for the purposes of Part II.1 of the *Environmental Protection Act*

NZ/

c: District Manager, MECP Owen Sound
Jatin Singh, Ainley Group

Appendix B

Phase 2 Work Plan Schedule

Phase 2 Work Plan
Schedule

Report and Design | Test | Upgrades Design and construction

		Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12	Month 13	Month 14	Month 15	Month 16	Month 17	Month 18	Month 19	Month 20	Month 21
Consult MECP																						
Stage 1	Task 1: Install Flow Meter Ultrasonic Flume Meter	Flow meter upgrades																				
	Task 2: Update Chemical System	Update Chemical System (2 month pump skid delivery																				
Stage 2	Task 1: Sludge Settleability Study	Jar Test and result analysis																				
			If Jar Test fails, Anoxica zone test in Plant 1 (including ORP installation																			
					TM#2 &Workshop Sludge settleability study and system upgrades																		
	Task 2: (if anoxic zone is required) upgrade Plant 2 aerationt ank					(If anoxic zone is approved) Design and Construct Anoxic Zone in Plant 2 (7 months, including 4 month equipment delivery)																
Stage 3	Stress Test				**Notify MECP**																	
						Stress test on Plant 1 (1.5 month, with ADF 3500 m3/d)					Stress test on Plant 1 (1.5 month, with ADF 3500 m3/d)											
							Stress test on Plant 2 (1.5 month, ADF 3500 m3/d					Stress test on Plant 2 (1.5 month, ADF 3500 m3/d										
															TM #3&Workshop Stress Test Evaluation							
Stage 4	Task #1: Conveyor Screeen Upgrade Design and Construction		Conveyor Screeen Upgrade Design and Construction																			
	Task #2: CCT Upgrades Design and Construction			CCT Upgrades Design and Construction																		
	(If Stress Test on Plant 1 shoues insufficient capacity) Plant 1 aeration and/or RAS system upgrades													(If Stress test identified)Plant 1 aeration and/or RAS system upgrades Design and Construction (7 months, including 4 months equipment delivery)								
	(If Stress Test on Plant 2 shoues insufficient capacity) Plant 2 aeration and/or RAS system upgrades															(If Stress test identified)Plant 2 aeration and/or RAS system upgrades (9 months, including 4 months equipment delivery)						
Starge 5	Phase 2 report and Final Report															Complete Phase 2 TM (#4) and Final Report						
	OM update																	Update OM				(If upgrade required) Update OM after upgrades

Contingency plan for stress test, and anoxic full-scale test

1. The plant effluent quality and operation parameters are tested daily.
2. If the test results show the plant quality deteriorated, the flow to the tested plant will be reduced to improve the effluent quality.
3. The plant operating staff is reponsible formaking decision regarding effluent quality control, and notifying the Engineer.

Appendix C

Phase 2 Work Plan Cost Estimate

Phase 2 Work Plan
Cost Estimate

		The Plant Lab	Outside Lab	Renting Equipment	Construction	Sub-Total
Stage 1	Task 1: Install Flow Meter Ultrasonic Flume Meter				$20,000	$20,000
	Task 2: Update Chemical System (only One additional pump)				$50,000	$50,000
	Task 3: Sludge Settleability Study	TBD				TBD
	(Provincial) Task 4: (if anoxic zone is required) upgrade Plant 2 aeration ank			TBD	$600,000	$600,000
	Report and Workshop					TBD
Stage 2	Stress Test	TBD	TBD	TBD		TBD
	Report and Workshop					
Stage 3	Task #1: Conveyor Screeen Upgrade Design and Construction				$43,000	$43,000
	Task #2: CCT Upgrades Design and Construction				$380,000	$380,000
	(Provincial) (If Stress Test on Plant 1 showes insufficient capacity) Plant 1 aeration and RAS system upgrades				$1,840,000	$1,840,000
	(Provincial) (If Stress Test on Plant 2 showes insufficient capacity) Plant 2 aeration and RAS system upgrades				$3,302,000	$3,302,000
Starge 4	Phase 2 TM					TBD
	Final Report					TBD
	OM update					TBD
					Basic Task Total	**$493,000**
					Provisional Task Total	**$5,742,000**

Appendix D
Calculation Sheet

Hanover WWTP Optimization Study
WWTP CAPACITY ASSESSMENT
PLANT OPERATIONAL DATA USED IN CAPACITY ASSESSMENT CALCULATIONS

Plant Rated Capacity	6,360	m3/d	Per ECA 6173-BKNLVM (2020.03.02)
Average Day Flow	5,289	m3/d	Historical 2018-2022
Maximum Monthly Flow PF	1.28		Based on historical flow data 2018-2022
Maximum Day Flow PF	2.50		Based on historical flow data 2018-2022
Peak Hourly Flow PF	2.66		Based on historical flow data 2021.6-2023.5
Peak Instantaneous Flow PF	2.70		Based on historical flow data 2021.6-2023.5
Average Raw Sweage TSS Concentration	240	mg/L	Based on historical flow data 2018-2022
Average Raw Sweage BOD Concentration	179.96	mg/L	Based on historical flow data 2018-2022
Average Raw Sewage BOD loading	952	kg/d	Based on historical flow data 2018-2022
Digester Supernatant BOD	170	mg/L	Mid-Halton operation data BOD=170mg/L
Digester Supernatant TSS	190	mg/L	Mid-Halton operation data TSS = 190 mg/L
Aeration Tank MLSS	3881	mg/L	2022 Average data for 2 plants
Aeration Tank MLVSS	2329	mg/L	Typical VS/TS=0.6 for CAS with P removal
Average WAS Flow	44	m3/d	Calculated
WAS VSS:TSS:	0.60		Engineer experience
WAS TSS:	10000	mg/L	Calculated
WAS VSS:	6000	mg/L	MECP Table 16-1, undigested primary with CAS
Centrifuge Feeding TS%	0.017		Historical 2017-2021
Biocake TS%	20%		Historical 2017-2021

Hanover WWTP Optimization Study
WWTP CAPACITY ASSESSMENT
Sewage Pumping Station

Plant Rated Capacity:	6360	m3/d	Per ECA
Histoical Instantaneous Flow PF	2.70		Historical 2021.06-2023.05

Pumping Station

Number of Duty Pump	1		Per ECA
Standby pump	1		Per ECA
Capacity of Each Pump	227	L/s	Per ECA
	19612.8	m3/d	
Total Capacity	19612.8	m3/d	

Design Parameter	Current Capacity (m3/d)	Equivalent ADF (m3/d)	Potential Capacity* (m3/d)	ADF Capacity (m3/d)
Peak Instantaneous Flow Based on ECA (m3/d)	19613	7264	904	6360

Hanover WWTP Optimization Study
WWTP CAPACITY ASSESSMENT
Screen

Plant Rated Capacity:	6,360	m3/d	Per ECA
Plant Instantaneous Peak PF	2.70		Historical 2021.06-2023.05
Plant Rated Capacity:	6360	m3/d	Per ECA
Screen Peak Instantaneous Flow Rate:	0.105	m3/s	Per ECA
	378	m3/h	
	9,072	m3/d	
Equivalent to ADF	3,360		

Excessive wastewater flow will be taken care of by a manual bar screen sitting besides the mechanical screer

Hanover WWTP Optimization Study
WWTP CAPACITY ASSESSMENT
Aerated Grit Removal

Plant Rated Capacity:	6360	m3/d	Per ECA
Aerated Grit Tank Peak hourly Flow Rate:	817	m3/h	Per ECA
	19608	m3/d	
	0.23	m3/s	
Equivalent to ADF	7,371		
Historical Plant hourly PF	2.66		Historical 2021.06-2023.05

Design Requirements:

Metcalf & Eddy - 4th edition		
Typical Design Information for Aerated Grit Tank		
Design Parameter	max	Units
Detention time at peak flowrate	2	min, minimum MECP requirement

Capcity Assessment

Grit Tank Depth (Effective)	2.09	m	based on 1:1.5 D/W ratio, ECA depth 3.28m
Grit Tank Length	4.70	m	ECA
Grit Tank Width (Effective)	3.13	m	based on 1:1.5 D/W ratio, ECA width 4.9m
Grit Tank Effective Volume	30.76	m3	
Detention time at historical hourly peak	2.26	min	
Detention time at hourly peak at rated ADF	2.62	min	
Capacity based on Detention time@Hourly peak flow	22149	m3/d	
Equivalent to ADF	**8327**	**m3/d**	

Unit capacity verified

From the MECP Design Guidelines for Sewage Works 2008:

10.3.3.3 Aerated Grit Tanks

Aerated grit tanks for the removal of 0.2 mm (1/16 in), or larger, particles with specific gravity of 2.65 should be designed in accordance with the following parameters:

- Detention time - 2 to 5 minutes at design peak hourly flow rate (the longer retention times provide additional benefit in the form of preaeration);
- Air supply - 4.7 to 12.4 L/(m·s) (3 to 8 cfm/ft), via wide band diffusion header positioned lengthwise along one wall of tank; (air supply should be variable);
- Inlet conditions - inlet flow should be parallel to induced roll pattern developed in tank;
- Baffling - minimum of one transverse baffle near outlet weir, with additional transverse baffles in long tanks and longitudinal baffles in wide tanks;
- Outlet conditions - outlet weir oriented parallel to direction of induced roll;
- Tank dimensions - lower limit of above aeration rates generally suitable for tanks up to 3.7 m (12 ft) deep and 4.3 m (14 ft) wide; wider, or deeper tanks require aeration rates in the upper end of the above range; long, narrow aerated grit tanks are generally more efficient than short tanks and produce cleaner grit; length-to-width (L/W) ratio normally is 1.5:1 to 2:1, but up to 5:1 is acceptable; depth-to-width (D/W) ratio 1:1.5 to 1:2;

Hanover WWTP Optimization Study
WWTP CAPACITY ASSESSMENT
Primary Clarifier

Plant Rated Capacity:	6360	m3/d	Per ECA	

Clarifier Dimensions:

Plant 1	Number of Clarifier	1		Per ECA	treat 50% of plant flow
	Length	17.5	m	As-builts drawing	
	Width	5.5	m		
	Surface Area Each Tank:	96	m2	Per ECA	
	Total Clarifier Surface Area:	**96**	m2		
	Weir L:	22	m		
Plant 2	Number of Clarifier	2		Per ECA	treat 50% of plant flow
	Length	20	m	Per ECA	
	Width	4.9	m	Per ECA	
	SWD:	3.05	m		
	Surface Area Each Tank:	98	m2		
	Total Clarifier Surface Area:	**196**	m2		
	Weir L:				

Operational Data:

Average BOD concentration	179.96	mg/L	Historical 2018-2022
Average TSS concentration	240.00	mg/L	Historical 2018-2022
BOD removal	30%		Assumed
TSS removal	50%		Assumed
BOD concentration after primary treatment	125.97	mg/L	calculated
TSS concentration after primary treatment	120.00	mg/L	calculated

Design Parameter

BECAUSE Max. day Q PF = 2.5 >2, peak SOR is the limiting factor, average SOR will not be calculated.

SOR- not receiving WAS (hourly peak)	120	m3/(m2*d)	Metcalf-Eddy Table 5-20, Edition 4
SOR- receiving WAS (hourly peak)	70	m3/(m2*d)	Metcalf-Eddy Table 5-20, Edition 4

Assessment

Design Parameter		Current Operation	Existing Capacity (m3/d)	Equivalent ADF (m3/d)	Potential Capacity* (m3/d)	Rated ADF Capacity (m3/d)
Allowed peak **HOURLY** Flow based on Surface Overflow Rate (SOR) **without** receiving WAS (m3/(m2-d) **(Metcalf&Eddy)**	Plant 1	73	11550	4342	1162	3180
Allowed Peak **HOURLY** Flow based on Surface Overflow Rate (SOR) **with** receiving WAS (m3/(m2-d) **(Metcalf&Eddy)**	Plant 2	36	13720	5158	1978	3180

Hanover WWTP Optimization Study
WWTP CAPACITY ASSESSMENT
Aeration Tanks

Plant Rated Capacity, ADF: 6360 m3/d Per ECA

Tank Dimensions:

Plant 1 Tank Effective Volume 866 m3 Per ECA treat 50% of grit tank effluent
Number of Ditches: 8

Plant 2 Tank Effective Volume 884 m3 Per ECA treat 50% of grit tank effluent
Number of Ditches: 2

Operational Data:

Average Day Flow:	6360	m3/d	2018-2022 average
Average BOD concentration to Aeration Tank:	126	mg/L	2018-2022 average with 30% BOD removal
Tank MLSS:	3881	mg/L	2022 average
Tank MLVSS:	2329	mg/L	Calculated
Effluent BOD5:	6.23	mg/L	2018-2022 average

Design Parameter (MECP Design Guidelines 2008 (Conventional A.S. with Nitrification)) ECA does not require,

Organic Loading Rate	0.72	kg BOD/(m3-d)	but the operation data shows >80% TAN rreduction
F/M	0.25	d-1	
	0.05		
Hydraulic Retention Time	6	hr	
MLSS	3881	mg/L	

Design Parameter		Max. Design Value	Existing Capacity (m3/d)	Equivalent ADF (m3/d)	Potential Capacity* (m3/d)	Rated ADF Capacity (m3/d)	Current Operation
Plant 1	Organic Loading Rate (kg BOD/(m3-d))	0.72	4950	4950	1770	3180	0.38
	F/M (d-1)	0.25	4002	4002	822	3180	0.10
	Hydraulic Retention Time (hr)	6	3464	**3464**	284	3180	8
Plant 2	Organic Loading Rate (kg BOD/(m3-d))	0.72	5053	5053	1873	3180	0.38
	F/M (d-1)	0.25	4085	4085	905	3180	0.10
	Hydraulic Retention Time (hr)	6	3536	**3536**	356	3180	8
Total	Organic Loading Rate (kg BOD/(m3-d))			10002	3642	6360	
	F/M (d-1)			8087	1727	6360	
	Hydraulic Retention Time (hr)			**7000**	**640**	**6360**	

From the MECP Design Guidelines for Sewage Works 2008:

Table 12-1 - Aeration System Design Parameters[11, 13]

Treatment Process	Organic Loading Rate[12] (kg BOD_5 / (m^3·d))	F / M_v[1] (d^{-1})	Minimum Retention Time (Based on Q Avg.)	Return Sludge Rate[2] (% Q Avg.)	Oxygen Demand in Typical Municipal Sewage at Standard Conditions[9]	Solids Retention Time (SRT) (Days)	MLSS Concentra (mg/L)
Conventional A.S.[3] -Without Nitrification	0.31 - 0.72	0.2 - 0.5	6 h	25 - 100	1.0 kg O_2/kg BOD_5	4 - 6	1000 - 30
-With Nitrification	0.31 - 0.72	0.05 - 0.25	6 h	50 - 200	1.0 kg O_2/kg BOD_5 + 4.6 kg O_2/kg TKN	>4 at 20°C; >10 at 5°C	3000 - 50
Extended Aeration (Provides Nitrification)	0.17 - 0.24	0.05 - 0.15	15[10] h	50 - 200	1.5 kg O_2/kg BOD_5 + 4.6 kg O_2/kg TKN	>15	3000 - 50
High-Rate -Without Nitrification[4]	0.72 - 0.96	0.4 - 1.0	4 h	50 - 200	1.0 kg O_2/kg BOD_5	4 - 6	1000 - 30
Contact Stabilization -Without Nitrification[4]	0.31 - 0.72[5]	0.2 - 0.5[13]	0.33[6] h; 4[7] h	50 - 150	1.0 kg O_2/kg BOD_5	4 -10	1000 - 30
Aerated Facultative Lagoons[8,11]	0.031 - 0.048	-	4 -5 d	-	1.0 kg O_2/kg BOD_5	-	N/A

1. "F" is the mass loading to the aeration tank of BOD_5 per day and "M_v" is the mixed liquor volatile suspended solids mass under aeration.
2. Return sludge pumping should be variable over the full range given.
3. Including step aeration.
4. High-rate and contact stabilization not considered suitable for nitrification.
5. Based on contact and re-aeration tankage.
6. Based on Q Peak + 100% Q Avg. return sludge rate, (Contact).
7. Based on 100% Q Avg. return sludge rate, (Re-aeration).
8. Aerated facultative lagoons providing pretreatment prior to conventional lagoons (minimum total retention time of 30 days).
9. The designer should adjust these values to the necessary O_2 transfer rate of the chosen aeration equipment by applying factors for alpha, beta, DO and t standard conditions such as altitude and temperature. U.S. customary units are lb O_2/ lb BOD_5 or TKN applied. The BOD_5 and TKN loadings refer to v entering the aeration tank.
10. If nitrification is required year-round, a longer detention time may be required.
11. Deviations from the recommended design parameters may be considered if the designer can demonstrate through operating data or tests that the require treatment efficiency can still be consistently achieved.
12. Organic loading rates in US customary units are:
    a. 0.31-0.72 kg BOD_5/(m^3 d) is 0.019-0.045 lb BOD_5/(ft^3 d)
    b. 0.17-0.24 kg BOD_5/(m^3 d) is 0.011-0.015 lb BOD_5/(ft^3 d)
    c. 0.72-0.96 kg BOD_5/(m^3 d) is 0.045-0.060 lb BOD_5/(ft^3 d)
    d. 0.031-0.048 kg BOD_5/(m^3 d) is 0.002-0.003 lb BOD_5/(ft^3 d)
13. The above aeration system design parameters apply under a normal range of peak hourly flow to average daily flow ratio of 2 - 4:1.

Hanover WWTP Optimization Study
WWTP CAPACITY ASSESSMENT
Conventional Aeration Tank without Nitrification

SRT Potential ADF:
Set SRT to be 15 days (minimum per MOE)

(assumes difference in influent and effluent flow is negligible)

$$SRT = \frac{\text{(Ditch Volume) x (Ditch MLVSS)}}{\text{(WAS Flow) x (WAS VSS Concentration)}}$$

Only MLVSS is a function of inlet flow in SRT equation, so solving for MLVSS:

$$MLVSS = \frac{\text{(SRT) x (WAS Flow) x(WAS VSS Concentration)}}{\text{Ditch Volume}}$$

Another Expression for MLVSS is:

$$MLVSS = \frac{\text{(SRT)x(Y)x(Influent BOD concenration - Eff BOD Concentration)}}{\text{(HRT)x[1 + (kd) x (SRT)]}}$$ (Metcalf and Eddy 3rd Edition)

Y: Sludge yield coefficient (kg VSS produced/kg BOD destroyed)
Y: 0.6 (kgVSS/kgBOD)(typical for activated sludge process)
(kd): endogenous decay coefficient (d^{-1}) (assume 0.6, which is typical for ww)
0.06 (d-1)(assume 0.6, which is typical for ww)

$$HRT = \frac{\text{(Ditch Volume)}}{\text{Influent Flow}}$$

$$\text{so } MLVSS = \frac{\text{(Influent Flow) (SRT) x (Y) x ((Influent BOD concenration - Eff BOD Concentration)}}{\text{(Ditch Volume) x [1 + (kd) x (SRT)]}}$$

$$\text{Influent Flow} = \frac{\text{(MLVSS) x (Ditch Volume) x [1 + (kd) x (SRT)]}}{\text{(SRT) x (Y) x (Influent BOD concenration - Eff BOD Concentration)}}$$

Hanover WWTP Optimization Study
WWTP CAPACITY ASSESSMENT
Secondary Clarifier

	Plant Rated Capacity:	6360	m3/d	Per ECA	
Clarifier Dimensions:					
Plant 1	Number of Clarifier	2		Per ECA	treat 50% of plant flow
	Diameter:	12.19	m	Per ECA	
	Surface Area Each Tank:	117	m2		
	Diameter:	15.2	m	Per ECA	
	Surface Area Each Tank:	181	m2		
	Total Clarifier Surface Area:	298	m2		
Plant 2	Number of Clarifier	2		Per ECA	treat 50% of plant flow
	Length	25.8	m	Per ECA	
	Width	5.5	m	Per ECA	
	SWD:	3.8	m		
	Surface Area Each Tank:	142	m2		
	Total Clarifier Surface Area:	284	m2		
Operational Data:					
	TSS into Secondary Clarifier (MLSS):	3881	mg/L	Assumed	
	RAS ratio	200%		MECP Design Guideline 12-1 "Conventionl A.S."	
	RAS pump capacity	6393.6	m3/d		
		100%		trial calculation	
		150%		trial calculation	
		200%		trial calculation	
Design Parameter (MECP Design Guidelines 2008 (Extended Aeration)					
	SOR	37	m3/(m2.d)	influent flow only, peak houry flow	
	SLR	240	kg/(m2.d)	max. RAS return, peak day flow	

Assessment

Design Parameter		Current Operation	Existing Capacity (m3/d)	Equivalent ADF (m3/d)	Potential Capacity* (m3/d)	ADF Capacity (m3/d)
Plant 1	Allowed Peak Hourly Flow based on Surface Overflow Rate (SOR) (m3/(m2-d)	23.6	11027	4145	965	3180
	Peak (Day) Solids Loading Rate with 100% RAS ratio (kg/(m2-d)	170	9215	3686	506	3180
	Peak (Day) Solids Loading Rate with 150% RAS ratio (kg/(m2-d)	212	7372	2949	-231	3180
	Peak (Day) Solids Loading Rate with 200% RAS ratio (kg/(m2-d)	254	6143	2457	-723	3180
Plant 2	Allowed Peak Hourly Flow based on Surface Overflow Rate (SOR) (m3/(m2-d)	25	10501	3948	768	3180
	Peak (Day) Solids Loading Rate with 100% RAS ratio (kg/(m2-d)	178	8775	3510	330	3180
	Peak (Day) Solids Loading Rate with 150% RAS ratio (kg/(m2-d)	223	7020	2808	-372	3180
	Peak (Day) Solids Loading Rate with 200% RAS ratio (kg/(m2-d)	267	5850	2340	-840	3180

	Plant 1	Plant 2	
Weir Length (m)	95	66	
Overflow Weir Loading Equivalent ADF (MECP: 375m3/m.d)	14318	9900	Equivalent ADF>3500 m3/d

From the MECP Design Guidelines for Sewage Works 2008:

Table 13-1 – Final Clarifier Recommended Loading Rates

Treatment Process	Surface Overflow Rate at Design Peak Hourly Flow[1] $m^3/(m^2 \cdot d)$ (USgpd/ft^2)	Peak Solids Loading Rate[3] $kg/(m^2 \cdot d)$ (lb/(day·ft^2))
Conventional ASP (CAS), Step Aeration, Complete Mix, Contact Stabilization, Carbonaceous Stage of Separate-Stage Nitrification	50 (1200)[2]	240 (50)
Extended Aeration, Single-Stage Nitrification	40 (1000)	170 (35)
Two-Stage Nitrification	33 (800)	170 (35)
Activated Sludge with Chemical Addition to Mixed Liquor for Phosphorus Removal	37 (900)	As above, depending on the treatment process

Notes:
1 Based on influent flow only.
2 Plants designed to meet less than 15 mg/L suspended solids after secondary clarification should reduce the design surface overflow rate.
3 Clarifier peak solids loading rate should be computed based on the design peak daily flow plus the design maximum return sludge flow rate and the design MLSS under aeration.

Hanover WWTP Optimization Study
WWTP CAPACITY ASSESSMENT
CCT

Plant Rated Capacity:	6360	m3/d	Per ECA
Peaking Daily Flow PF	2.5		Historical 2018-2022
Peak Hourly Flow PF	2.7		Historical 2018-2022

Clarifier Dimensions:

Number of CCT	2	
Length	8.95	m
Width	4.7	m
SWD	2.608	m
Total Volume	219.41	m3
Assume Baffering factor	0.70	
Chlorination Effective Volume	153.59	m3
Assume Baffering factor	0.95	
Chlorination Effective Volume	208.44	m3

Design Guideline (MECP Guideine 2008)

	Min. contact time	
Design Average Daily Flow	30	min
Design Peak Hourly Flow	15	min

Assessment

Design Parameter	Existing Capacity (m3/d)	Equivalent ADF (m3/d)	Potential Capacity (m3/d)	ADF Capacity (m3/d)
Allowed Average Daily Flow based on Chlorine Contact Time (BF=0.7) (min)	7372	7372	1012	6360
Allowed Peak Hourly Flow based on Chlorine Contact Time (BF=0.7) (min)	14744	5543	-817	6360
Allowed Average Daily Flow based on Chlorine Contact Time (BF=0.95) (min)	10005	10005	3645	6360
Allowed Peak Hourly Flow based on Chlorine Contact Time (BF=0.95) (min)	19010	7147	787	6360

Chlorine System Capacity
MECP Table 14-1, Chlorine dosage based on design ADF

Activated sludge process effluent	2-9	mg/L	
Nitrified effluent	1-6	mg/L	
m operated, solution feed type chlorinator capacity	227	kg/d	
Instantaneous Peak flow	25222	m3/d	assume dosage of 9 mg/L
Equivalent ADF	9342	m3/d	

Hanover WWTP Optimization Study
WWTP CAPACITY ASSESSMENT
DIGESTERS

Plant Rated Capacity:	6360	m3/d	Per ECA

Digester Effective Volumes:

Primary Digester			
Diameter	15.2	m	
SWD	7.3	m	
Volume	1325	m3	
Secondary Digester			
Diameter	15.2	m	
SWD	6.7	m	
Volume	1216	m3	
Total Volume	2540	m3	

Operational Data:

MM flow PF	1.28		2018-2022 average
Total Effective Volume of Aeration Tank:	1750	m3	
MLSS Concentration:	3881	mg/L	2022 data
Total WAS Flow to Digesters:	34099	m3/yr	2022 data
WAS Solids Concentration:	10950	mg/L	2022 Average of west and east plants
WAS Amount:	373384	kg/yr	calculated
Total BOD Loading:	373682	kg/yr	2022 data
BOD Loading after primary treatment:	261577	kg/yr	calculated, 2022
Primary sludge concentration:	3.5%		assumed

WAS Generation:

WSS/VSS(TSS):	0.60		Assumed
Equivalent WAS per 1kg BOD:	1.43	kg/kg	calculated
Average primary effluent BOD Concentration	125.97	mg/L	2018-2022 historicla data
Equivalent WAS per 1 m3 wastewater:	0.180	kg/m3	Calculated

Primary Sludge Generation

TSS removal in primary clarifier	50%	Equal to TSS removal in primary clarifier
TSS in raw wastewater	240.00	mg/L
TSS (primary sludge) generation	0.12	kg/m3 WW

Total Sludge Generation

Total sludge	0.30	kg/m3 WW
Sludge concentraton	3.5%	Assumed based literature and handbook
Total sludge volume	0.0086	m3 sludge/m3 wastewater

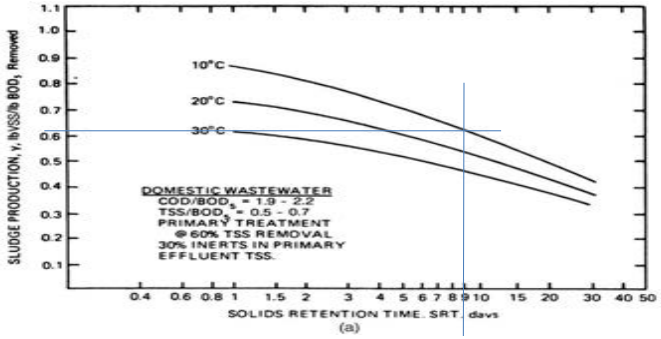
Design Requirements

Maximum VS Loading:	1.6	kgVSS/(m3-d)	anaerobic primary digester	MOE Design Guidelines (2008)
Hydraulic Retention Time:	15	day		MOE Design Guidelines (2008)

Digester Capacity Assessment

Design Parameter	Current Operation	Equivalent to ADF	Potential ADF Capacity (m3/d)	ADF Capacity (m3/d)
Solids Loading Rate(kgVSS/(m3-d)	0.919	9205	2845	6360
Solids Retention Time (days)	-	-	-	6360
Hydraulic Retention Time (days)	22.841	8054	1694	6360

From the MECP Design Guidelines for Sewage Works 2008:



Process : *Digestion (Mesophilic)*				
Parameter	**Units**	**Anaerobic**	**Aerobic**	**Reference**
Retention Time HRT (min.) SRT (min.)	 days days	 ≥ 15 ≥ 15	 -- ≥ 45 (total)	 Section 16.2.2.3 Section 16.3.2
VS Loading	$kg/m^3 d$	0.65 (to low rate primary digester) 1.6 (to high rate primary digester)	1.6 (to first stage digester)	Section 16.2.4 Section 16.3.1
Sidewater Depth	m	≥ 6.1	3.6 – 4.6	Section 16.2.2.1 Section 16.3.1

Note:
1. HRT means hydraulic retention time.
2. SRT means solids retention time.
3. VS means volatile solids.
4. Aerobic SRT includes the activated sludge process and the aerobic digestion process SRT.

The nominal minimum hydraulic retention time (HRT) in the primary digester should be at least 15 days [the theoretical solids retention time (SRT) requirement of slowest methane producers is approximately 10 days]. Secondary digesters of two-stage series digestion systems, which are used for digested sludge storage and concentration, should not be credited in the calculations for volumes required for sludge digestion.

Supernatant Calculation

WAS Approach #1Total Sludge feed into primary digester

V=	0.0086	m3 sludge/m3 wastewater
TS%	4%	
VSS:TSS=	0.6	assumed
VS removal	40%	assumed

Secondary digester

Feed TS=	2.66%	
Haul Away TS%=	6%	Biocake storage design report
Supernatant V=	0.0048	m3 supernatant/m3 wastewater
Biosolid V=	**0.0038**	**m3 Biosolid/m3 wastewater**
estimated BOD at primary clarifier effluent at 7000m3/d	882	kg/d
estimated BOD in supernatant at 7000m3/d	6	kg/d
	0.6%	**Thus BOD loading from supernatant is ignored in Aeration Tank and digester assessment**

Hanover WWTP Optimization Study
WWTP CAPACITY ASSESSMENT
Biosolid Storage

Secondary Digester	1097	m3
3 onsite underground storage tanks	582	m
Above ground glass fused-to-steel biosolid tanks	5000	m
Volume	6679	m3

Biosolid V=	0.0038	m3 Biosolid/m3 wastewater
Storage Capacity=	**7328**	m3 /d ADF with decanting to 6% TS

Appendix D

Stage 1 Archaeological Assessment

Stage 1 Archaeological Assessment of the Hanover Wastewater Treatment Plant (Part of Lots 73 and 74, Concession 1, North of Durham Road, Geographic Township of Brant Bruce County) Town of Hanover, Grey County

Original Report

Prepared for:

Ainley Group
195 County Court Boulevard 300
Brampton, Ontario L6W 4P7

Archaeological Licence: Merritt (P094)
PIF P094-0366-2023
Archaeological Services Inc. File: 22EA-168

October 24, 2023



Executive Summary

Archaeological Services Inc. was contracted by Ainley Group to conduct a Stage 1 Archaeological Assessment (Background Research and Property Inspection) for the Hanover Wastewater Treatment Plant. This project is being undertaken in advance of the proposed upgrading and expansion of the plant, including the construction of a leachate pumping station and forcemain.

The Stage 1 Study Area scope involves an area of approximately 6.71 hectares, located within a mixed commercial and residential area on Seventh Avenue, opposite the intersection with Sixteenth Street, on the perimeter of the Town of Hanover, in the Township of Brant.

The Stage 1 background study determined that one previously registered archaeological site is located within one kilometre of the Study Area. The property inspection determined that parts of the Study Area exhibit archaeological potential and will require archaeological assessment.

The following recommendations are made:

1) Parts of the Study Area exhibit archaeological potential. These lands require Stage 2 archaeological assessment by test pit survey at five metre intervals, where appropriate. Stage 2 is required prior to any proposed construction activities on these lands;

2) The remainder of the Study Area does not retain archaeological potential on account of deep and extensive land disturbance or low and wet conditions. These lands do not require further archaeological assessment; and,

3) Should the proposed work extend beyond the current Study Area, further archaeological assessment should be conducted to determine the archaeological potential of the surrounding lands.

Project Personnel

- **Senior Project Manager**: Lisa Merritt, MSc. (P094) Partner, Director, Environmental Assessment Division
- **Project Manager**: Eliza Brandy, MA (R1109). Associate Archaeologist, Project Manager, Environmental Assessment Division
- **Project Director**: Lisa Merritt
- **Division Coordinator**: Katrina Thach, BA Hons. (R1225), Associate Archaeologist, Assistant Manager, Environmental Assessment Division
- **Project Administrator**: Catherine Kitchen, BA (R1364), Archaeologist, Project Administrator, Environmental Assessment Division
- **Field Director**: Eliza Brandy, MA (R1109). Associate Archaeologist, Project Manager, Environmental Assessment Division
- **Report Preparation**: Sarah-Jane Leipert, Doctor of Philosophy, Archaeologist, Technical Writer, Planning Assessment Division
- **Graphics**: Andrew Clish, BES (P046), Senior Archaeologist, Senior Field Director, Laboratory and Fieldwork Services, Operations Division
- **Report Review**: Eliza Brandy; Lisa Merritt

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1.0 Project Context

Archaeological Services Inc. (ASI) was contracted by Ainley Group, on behalf of the Town of Hanover, to conduct a Stage 1 Archaeological Assessment (Background Research and Property Inspection) for the Hanover Wastewater Treatment Plant Municipal Class Environmental Assessment. This project is being undertaken in advance of the proposed upgrading and expansion of the plant, including the construction of a leachate pumping station and forcemain.

The Stage 1 Study Area scope involves an area of approximately 6.71 hectares in including the existing Hanover Wastewater Treatment Plant and surrounding lands owned by the Town of Hanover (Figure 1).

All activities carried out during this assessment were completed in accordance with the *Ontario Heritage Act* (1990, as amended in 2023) and the 2011 *Standards and Guidelines for Consultant Archaeologists* (S & G), administered by the Ministry of Citizenship and Multiculturalism (MCM 2011).

1.1 Development Context

All work has been undertaken as required by the *Environmental Assessment Act, RSO* (Environmental Assessment Act, R.S.O. c. E.18, 1990 as amended 2022) and regulations made under the Act, and are therefore subject to all associated legislation. This project is being conducted in accordance with the *Municipal Class Environmental Assessment* process (Municipal Engineers Association, 2023).

Authorization to carry out the activities necessary for the completion of the Stage 1 archaeological assessment and property inspection was granted by Ainley Group on September 9, 2023.

1.1.1 Treaties and Traditional Territories

The Study Area is located in the traditional territory of the Saugeen Ojibway Nation (SON) the collective name for the Saugeen Ojibway First Nation and the Chippewas of Nawash Unceded First Nation, known as *Saukiing*

Anishnaabekiing. *Saukiing Anishnaabekiing* includes the Saugeen Peninsula (or Bruce Peninsula), the waters and islands of Lake Huron and Georgian Bay surrounding the Saugeen Peninsula, and extends south to include the Maitland River watershed and east to include the Nottawasaga River watershed in part of Grey, Bruce, Huron, Perth, Wellington, Dufferin, and Simcoe Counties (Saugeen Ojibway Nation, 2011).

The Study Area is within the Saugeen Tract Purchase treaty, which was agreed upon on August 9, 1836 along with Treaty 45 (Treaty of Manitowaning/Manitoulin Island Treaty). The treaty covers land of the Saugeen Ojibway Nation's traditional territory. The treaty was signed by representatives of the Crown and Anishinaabek leaders in Manitowaning during an annual distribution of gifts for Indigenous peoples (Ministry of Indigenous Affairs, 2022). In exchange for the 1.5 million acres the Crown was to provide economic assistance in the form of housing and the means to cultivate land as well as protection from white settlers' encroachment onto their lands. The land covered by Treaty 45 ½ extends from the town of Arthur in the southeast to approximately the town of Kingsbridge on Lake Huron to the southwest, then north to Southampton in the northwest and across to the northwestern corner of the former Sydenham Township on Georgian Bay in the northeast (Ministry of Indigenous Affairs, 2020; *Treaty History | Saugeen Ojibway Nation Environment Office*, no date).

With the signing of the 1818 Lake Simcoe-Nottawasaga Treaty 18 and the 1836 "Saugeen Tract Agreement" Treaty 45 ½, Ojibway chiefs granted the Crown approximately 1.5 million acres of land south of the Peninsula in an effort to secure a land base on Manitoulin Island along the shores of Lake Huron and southern Georgian Bay (Crown-Indigenous Relations and Northern Affairs, 2016). In exchange for the land surrendered under Treaty 45 ½, the Crown promised to protect the Saugeen Peninsula forever (Saugeen Ojibway Nation, 2021b).

The Saugeen continued using their traditional territory for hunting, medicine gathering, sugaring camps and fish spawning. Euro-Canadian settlement continued to encroach upon the Peninsula and in 1847 Queen Victoria issued a

Royal Declaration to support the rights of the Saugeen Ojibway Nation. The Declaration also established strict rules for the purchase and surrender of Indigenous lands in Canada and confirmed that the Bruce Peninsula belonged to the Saugeen Ojibway Nation. Additional acts were passed in 1850 and 1851 to protect lands from squatters and loggers, such as the 1851 Half Mile Strip Treaty 67 which surrendered over 4,000 acres for the Crown to build a road joining Owen Sound and Southampton (Saugeen Ojibway Nation, 2021a). These documents did little to stem the tide of Euro-Canadian settlement.

In 1994 a claim was submitted to the Crown arguing that Treaty 72 was not valid as the Crown had not fulfilled its duty to the Saugeen Ojibway Nation and Chippewas of Nawash Unceded First Nation to protect them from the effects of colonization and that they were misled by the Crown during negotiations for Treaty 72 (Olthuis Kleer Townshend L.L.P., 2021). In 2003 the Saugeen Ojibway Nation and the Chippewas of Nawash Unceded First nation subsequently filed a joint claim for Aboriginal Title to portions of Lake Huron and Georgian Bay (Olthuis Kleer Townshend L.L.P., 2021). The trial addressing these claims began in 2019 and a decision was reached in 2021 (Olthuis Kleer Townshend L.L.P., 2021). The court rejected SON's Aboriginal Title claim but agreed that the Crown breached its honour by failing to uphold its promise to protect the Saugeen Peninsula forever.

1.2 Historical Context

1.2.1 Indigenous Land Use and Settlement

Southern Ontario has been occupied by human populations since the retreat of the Laurentide glacier approximately 13,000 years before present (B.P.) (Ferris, 2013). Populations at this time would have been highly mobile, inhabiting a boreal-parkland similar to the modern sub-arctic. By approximately 10,000 B.P., the environment had progressively warmed (Edwards & Fritz, 1988) and populations now occupied less extensive territories (Ellis & Deller, 1990).

Between approximately 10,000-5500 B.P., the Great Lakes basins experienced low-water levels, and many sites which would have been located on those former shorelines are now submerged. This period produces the earliest

evidence of heavy wood working tools, an indication of greater investment of labour in felling trees for fuel, to build shelter, and watercraft production. These activities suggest prolonged seasonal residency at occupation sites. Polished stone and native copper implements were being produced by approximately 8,000 B.P.; the latter was acquired from the north shore of Lake Superior, evidence of extensive exchange networks throughout the Great Lakes region. The earliest evidence for cemeteries dates to approximately 4500-3,00 B.P. and is indicative of increased social organization, investment of labour into social infrastructure, and the establishment of socially prescribed territories (Brown, 199:13; Ellis et al., 1990, 2009).

Between 3000-2500 B.P., populations continued to practice residential mobility and to harvest seasonally available resources, including spawning fish. The Woodland period begins around 2,500 B.P. and exchange and interaction networks broaden at this time (Spence et al., 1990:136, 138) and by approximately 2000 B.P., evidence exists for small community camps, focusing on the seasonal harvesting of resources (Spence et al., 1990, pp. 155, 164). By 1500 B.P. there is macro botanical evidence for maize in southern Ontario, and it is thought that maize only supplemented people's diet. There is earlier phytolithic evidence for maize in central New York State by 2300 B.P. - it is likely that once similar analyses are conducted on Ontario ceramic vessels of the same period, the same evidence will be found (Birch & Williamson, 2013:3–15). As is evident in detailed Anishinaabek ethnographies, winter was a period during which some families would depart from the larger group as it was easier to sustain smaller populations (Rogers, 1962). It is generally understood that these populations were Algonquian-speakers during these millennia of settlement and land use.

From the beginning of the Late Woodland period at approximately 1000 B.P., lifeways became more similar to that described in early historical documents. Between approximately 1000-1300 Common Era (C.E.), the communal site is replaced by the village focused on horticulture. Seasonal disintegration of the community for the exploitation of a wider territory and more varied resource base was still practised (Williamson, 1990:317). By 1300-1450 C.E., this episodic community disintegration was no longer practised and populations now

communally occupied sites throughout the year (Dodd et al., 1990:343). By the mid-sixteenth century these small villages had coalesced into larger communities (Birch et al., 2021). Through this process, the socio-political organization of the First Nations, as described historically by the French and English explorers who first visited southern Ontario, was developed.

By 1600 C.E., the communities within Simcoe County had formed the Confederation of Nations encountered by the first European explorers and missionaries. In the 1640s, devastating epidemics and the traditional enmity between the Haudenosaunee and the Attawandaron and the Huron-Wendat (and their Algonquian allies such as the Nippissing and Odawa) led to their dispersal from Southern Ontario. Shortly afterwards, the Haudenosaunee established a series of settlements at strategic locations along the trade routes inland from the north shore of Lake Ontario. By the 1690s however, the Anishinaabeg were the only communities with a permanent presence in southern Ontario. From the beginning of the eighteenth century to the assertion of British sovereignty in 1763, there was no interruption to Anishinaabeg control and use of southern Ontario.

The Odawa are first described in the historical record 1615 when Samuel de Champlain encountered a group of Odawas at the mouth of the French River (Langton & Ganong, 1971:44). The Odawa were an Algonquian Nation who occupied Bruce County, Grey County and Manitoulin Island. The Odawa subsisted primarily from fishing but also practiced horticulture and were extensively involved in trade. They were known to co-reside with Iroquoian populations (Thwaites, 1896:125). The oral tradition from Nawash and Saugeen suggests that the ancestors of the SON occupied the area as early as 7,500 years ago.

In Bruce County, archaeological evidence is indicative of some residential stability related to the practice of agriculture (for example: Nodwell Site, Rankin 2000). The archaeological evidence of Huron-Wendat/Tionontate material culture on Odawa sites, the proximity of contemporary Huron-Wendat and Tionontate and Odawa sites to each other, and the historically documented alliance between the Odawa and the Neutral Nations are all indicative of

cooperation between Algonquian and Iroquoian populations in Bruce and Grey Counties (Fox, 1990).

The region of Bruce and Grey Counties is not specifically addressed in the contemporary documentary sources; however, the later dispersal of the Haudenosaunee from the region in the late seventeenth century is confirmed by Ojibway oral tradition (Copway 1850:80 and 88).

1.2.2 Post-Contact Settlement

Historically, the Study Area is located in the Geographical Township of Brant, Bruce County, in Lots 73 and 74, Concession 1, North of Durham Road.

The S & G stipulates that areas of early Euro-Canadian settlement (pioneer homesteads, isolated cabins, farmstead complexes), early wharf or dock complexes, pioneer churches, and early cemeteries are considered to have archaeological potential. Early historical transportation routes (trails, passes, roads, railways, portage routes), properties listed on a municipal register or designated under the Ontario Heritage Act or a federal, provincial, or municipal historic landmark or site are also considered to have archaeological potential.

For the Euro-Canadian period, the majority of early nineteenth century farmsteads (i.e., those that are arguably the most potentially significant resources and whose locations are rarely recorded on nineteenth century maps) are likely to be located in proximity to water. The development of the network of concession roads and railroads through the course of the nineteenth century frequently influenced the siting of farmsteads and businesses. Accordingly, undisturbed lands within 100 metres of an early settlement road are also considered to have potential for the presence of Euro-Canadian archaeological sites.

The first Europeans to arrive in the area were transient merchants and traders from France and England, who followed Indigenous pathways and set up trading posts at strategic locations along the well-traveled river routes. All of these occupations occurred at sites that afforded both natural landfalls and convenient access, by means of the various waterways and overland trails, into

the hinterlands. Early transportation routes followed existing Indigenous trails, both along the lakeshore and adjacent to various creeks and rivers (ASI 2006).

Township of Brant

Brant Township, named for Mohawk Chief Joseph Brant, was first Surveyed in 1848 by surveyor A.P. Brough. The first lots in Concessions 1 and 2 north and south of Durham Road were offered as free land grants the following spring and summer. The first settlers in the region settled in 1849 on land that would become the Town of Walkerton. The first mill in the Township was constructed by Joseph Walker, founder of the Town of Walkerton. The Saugeen River and its many tributaries flow through the Township providing excellent irrigation for farmlands and power for many mills and industries (Bruce County Genealogical Society, 2021; Mika & Mika, 1977).

Until 1854, Brant was part of a municipal union of the Townships in Bruce County until it joined with Carrick Township to form a separate municipality. Two years later, the Township became its own municipality with Joseph Walker as Reeve. The first church in the Township was constructed in 1852. Develop was swift in the area and by 1857 the Township boasted 12 taverns. Walkerton developed particularly quickly, incorporating as a town in 1871 without first incorporating as a village. A notable resident of Brant Township is Robert Sutherland, Ontario's first lawyer of African ancestry who practices as a barrister and attorney in Walkerton (Bruce County Genealogical Society, 2021; Mika & Mika, 1977).

In 1999, Brant and Greenock Townships joined with the Town of Walkerton to form a new municipality called Brockton, a portmanteau of three names. Today, agriculture and tourism are two of the most important industries in the area (Bruce County Genealogical Society, 2021; Bruce County Museum & Cultural Centre, 2023; Mika & Mika, 1977).

Town of Hanover

Historically, the Town of Hanover was located upon the county line of Bruce and Grey Counties However, at some point in the twentieth century, the entire Town of Hanover, was annexed into Grey County.

There are two origin stories for the naming of Hanover, the first, is that it was named after the hometown of one of the first settlers, from Hannover, Germany, and the second is that it was named after a Mr. Hahn (who had originally wanted the settlement to be called 'Hahnover'). However, before this name was chosen, the settlement was known as 'Buck's Crossing' or 'Buck's Bridge', after one of two German immigrants who first settled in the area, an Abraham Buck, who opened the first inn. Abraham Buck and a Mr. Jasper, settled by the Saugeen River, close to the later location of the Canada Pacific Railway station. More German settlers arrived shortly after, the majority from Waterloo County. By 1854, the settlement had a grist and sawmill, and proposals had been made to form a village. In 1856, upon the opening of the first post office, the settlement was named Hanover. By 1858, the first log church was built (Church of England), replaced by a brick church in 1876. Hanover grew into a thriving industrial community, and by 1860, additional businesses included a tannery, a furniture factory and a foundry. By 1866, the population of Hanover was nearly 400, and a second furniture factory was opened. Additional furniture businesses opened, including 'Peppler Bros. and Ball Furniture'. The mills contributed all the raw materials, and the successful furniture business led to Hanover being locally known as "Slab Town". In 1868, the first school was constructed, with a second larger school opening in 1875.

By 1880, the population of Hanover was c.1200, with the majority of inhabitants employed in local industry. By 1882, Hanover had a railway station on the Grand Trunk Railway, and by 1899, with a population of over 1600, Hanover was incorporated as a village, and subsequently became a town in 1904 (Brown, 2011; Mika & Mika, 1981:231–232).

Hanover Water Works

In 1901, a pump station and waterworks was established at 722 Seventh Avenue, at this stage primarily for fire protection. In 1901, the pumps comprised water driven turbines utilising the Saugeen River for both a water supply and for power for the pumps. Due to the unpredictability of the Saugeen River, an alternative source of water was sought by Town Officials, and in 1912, a local lake later known as 'Ruhl Lake' was chosen as an alternative source, a pump station was established here, and a '12 inch watermain' was constructed to feed water to the pumping station at 722 Seventh Avenue. The Saugeen River continued to supply the pumps only.

Port Dover & Lake Huron Railway

Historically, the Study Area was bound on the east side by the Port Dover & Lake Huron Railway (PD&LH), which connected the Lake Erie community of Port Dover with the Southern Ontario community of Stratford. This railway line was chartered in 1872, with a portion having running rights to utilize the existing Grand Trunk Railway track. By early 1875, the line opened for use between Port Dover and Woodstock, and the following year it was opened to Stratford. However, an agreement could not be reached with the Grand Trunk Railway for running rights between Tavistock and Stratford, resulting in the PD&LH having to construct their own track. In 1877, the PD&LH amalgamated with the Stratford & Huron Railway and is recorded as the "Port Dover Stratford and Lake Huron Railway" on 1880 mapping (Figure 3). In 1881, alongside two other railway companies: the Stratford & Huron Railway and the Georgian Bay & Wellington Railway, the PD&LH was amalgamated into the Grand Trunk, Georgian Bay & Lake Erie Railway. The Grand Trunk, Georgian Bay & Lake Erie Railway itself was then amalgamated into the Grand Trunk Railway in 1893. In 1923 the Grand Trunk Railway was assumed by the Canadian National Railway, and this portion of the line closed in the early 1980s (Cooper, 2014; Hughes, 2010). The railway track was removed in the mid-1990s when the Town of Hanover commenced a trail project (Bacon, 2022). This former rail track is now the Hanover Community Trail.

Saugeen River

The Saugeen River system is the third longest river system in southern Ontario, measuring approximately 198 kilometres in length. The river flows from the headwaters in Dundalk and empties into Lake Huron at the Town of Southampton, flowing through Bruce, Dufferin, Grey, Huron, and Wellington Counties. Altogether, the Saugeen River watershed covers 4,675 kilometres squared and is overseen by the Saugeen Conservation Authority (Saugeen Conservation, 2022).

Historically, the Saugeen River has served as an important transport route and food source for the Indigenous communities who inhabited the Bruce Peninsula centuries before the arrival of Europeans, including the SON who share a name with the river. Early European settlers used the river as a trade route and as a means of traveling to the northern townships where access by road or inland trails was often difficult or impossible. As settlers claimed the land on the banks of the river, it became an important power source to numerous mills and industries. Today, the Saugeen River continues to be important to local communities and visitors and is a popular destination for outdoor recreational activities including canoeing/kayaking, fishing, hiking, and camping (Barkwell, 2007; Bruce County Genealogical Society, 2021a; Saugeen Conservation, 2023).

1.2.3 Map Review

The 1855 *Map of the Counties of Grey and Bruce* (C. Rankin D.S., 1855), the 1880 *Illustrated Historical Atlas of the Counties of Grey and Bruce* (Belden, 1880) and the 1946 Walkerton Topographic Sheet (Department of National Defence, 1946) were examined determine the presence of historic features within the Study Area during the nineteenth and twentieth centuries (Figures 2-4).

On the 1855 map (Figure 2), the Study Area overlays part of the northern portion of Lots 73 and 74, Concession 1, North of Durham Road. This map typically does not indicate landowners, however lots and concessions are depicted, as well as watercourses. The Study Area fronts the Seventh Avenue road allowance county line. No structures or settlement features are depicted

within the Study Area. A watercourse, the Saugeen River, is depicted adjacent to the west side of the Study Area.

On the 1880 map (Figure 3), a schematic plan of Hanover is now depicted on the crossroads of Seventh Avenue (present-day County Road 10) and Durham Road (present-day Tenth Street/Highway 4). As with earlier mapping, no structures or settlement features are depicted within the Study Area, and the Saugeen River remains depicted adjacent to the west side of the property. The course of the Port Dover Stratford and Lake Huron Railway now forms the east boundary of the Study Area.

By 1946, (Figure 4), the Town of Hanover had expanded northwards, predominantly remaining on the east side of present-day County Road 10. A proposed road for the further expansion of Hanover is depicted as extending into the Study Area, terminating in the centre (this was never opened). At least five buildings are now depicted within the Study Area, with all but one fronting Seventh Avenue (County Road 10). Three buildings are within the Study Area. Two of the three buildings front Seventh Avenue, one on either side of the access road, both remaining to the present-day (Images 12 and 13). The third is the Hanover Waterworks (constructed in circa 1901) depicted within the main area of the current Hanover Wastewater Treatment Plant, accessed via the road from Seventh Avenue (County Road 10). The northwest portion of the Study Area is depicted as wetland, and the north and south sides as within woodlots. Seventh Avenue (County Road 10) is now depicted as a metalled road[1] with a telegraph line on the east side. The railway line (now Canadian Pacific Railway) remains depicted on the east side of the Study Area, as well as the Saugeen River to the west. Contour lines indicate an elevation of approximately 875 feet (267 metres) in the east portion of the property, descending towards the wetland of the Saugeen River.

[1] Metalled roads were constructed from crushed stone bound by tar which was then compressed with a steam roller, also known as “tarmac” (Neill, 2016).

1.2.4 Aerial and Orthoimagery Review

Historical aerial imagery from 1954 shows the Study Area as with the Hanover Wastewater Treatment Plant and adjacent to dense woodlots in the wetland on the banks of the Saugeen River and the Town of Hanover to the east and south (Figure 5). The image shows the earlier configuration of the Hanover Waterworks, albeit obscured by trees, as depicted in 1946 topographic mapping (Figure 4) with various access laneways across the Study Area. The image also shows the railway line as traversing the southeast corner of the Study Area.

Google Satellite Imagery from 2006 shows the modernised and expanded Hanover Wastewater Treatment Works (Google Earth Pro, 2023), with various associated buildings and infrastructure, including tanks, a pumping station and control building, as well as a paved access road from Seventh Avenue (Figure 6). A hydro corridor with an access route is also shown on the north side.

1.3 Archaeological Context

This section provides background research pertaining to previous archaeological fieldwork conducted within and in the vicinity of the Study Area, its environmental characteristics (including drainage, soils or surficial geology and topography, etc.), and current land use and field conditions. Three sources of information were consulted to provide information about previous archaeological research: the site record forms for registered sites available online from the MCM through “Ontario’s Past Portal”; published and unpublished documentary sources; and the files of ASI.

1.3.1 Geography

In addition to the known archaeological sites, the state of the natural environment is a helpful indicator of archaeological potential. Accordingly, a description of the physiography and soils are briefly discussed for the Study Area.

The S & G stipulates that primary water sources (lakes, rivers, streams, creeks, etc.), secondary water sources (intermittent streams and creeks, springs, marshes, swamps, etc.), ancient water sources (glacial lake shorelines indicated

by the presence of raised sand or gravel beach ridges, relic river or stream channels indicated by clear dip or swale in the topography, shorelines of drained lakes or marshes, cobble beaches, etc.), as well as accessible or inaccessible shorelines (high bluffs, swamp or marsh fields by the edge of a lake, sandbars stretching into marsh, etc.) are characteristics that indicate archaeological potential.

Water has been identified as the major determinant of site selection and the presence of potable water is the single most important resource necessary for any extended human occupation or settlement. Since water sources have remained relatively stable in Ontario since 5,000 B.P. (Karrow & Warner, 1990, fig. 2.16), proximity to water can be regarded as a useful index for the evaluation of archaeological site potential. Indeed, distance from water has been one of the most commonly used variables for predictive modeling of site location.

Other geographic characteristics that can indicate archaeological potential include elevated topography (eskers, drumlins, large knolls, and plateaux), pockets of well-drained sandy soil, especially near areas of heavy soil or rocky ground, distinctive land formations that might have been special or spiritual places, such as waterfalls, rock outcrops, caverns, mounds, and promontories and their bases. There may be physical indicators of their use, such as burials, structures, offerings, rock paintings or carvings. Resource areas, including; food or medicinal plants (migratory routes, spawning areas) are also considered characteristics that indicate archaeological potential (S & G, Section 1.3.1).

The entire Study Area is located within the Horseshoe Moraine physiographic region of southern Ontario. This region forms the core of a horseshoe shaped area flanking the upland that lies to the west of the highest part of the Niagara cuesta (Chapman & Putnam, 1984). The southwestern limb of the region, located in the southern part of Huron County, has a fairly simple landscape consisting of morainic ridges composed of pale brown, hard calcareous, fine-textured till, with a moderate degree of stoniness. Huron clay loam is the most representative soil type, and it occurs widely throughout the region.

Surficial geology mapping (Figure 7) demonstrates that the Study Area contains sections of:

- Coarse-textured glaciolacustrine deposits (foreshore-basinal deposits, comprising sand, gravel, minor silt and clay)
- Modern alluvial deposits (clay, silt, sand, gravel, potentially containing organic remains)

Soil types within the Study Area include Sullivan, a sandy loam with good drainage. Soil drainage within the Study Area is shown on Figure 8.

The nearest watercourse is the Saugeen River, within the main body located approximately 17 metres to the west, and a small branch adjacent to the north side.

The entire Study Area is within the Upper Main Saugeen River subwatershed (Saugeen Conservation, 2008), within the larger watershed of the Saugeen River. The Upper Main Saugeen River Watershed drains 782 square kilometres, and incorporates 116 kilometres of the Saugeen River.

1.3.2 Previously Registered Archaeological Sites

In Ontario, information concerning archaeological sites is stored in the Ontario Archaeological Sites Database maintained by the MCM. This database contains archaeological sites registered within the Borden system. Under the Borden system, Canada has been divided into grid blocks based on latitude and longitude. A Borden block is approximately 13 kilometres east to west, and approximately 18.5 kilometres north to south. Each Borden block is referenced by a four-letter designator, and sites within a block are numbered sequentially as they are found. The Study Area under review is located in the Borden block *BaHg.*

According to the Ontario Archaeological Sites Database, one previously registered archaeological site is located within one kilometre of the Study Area (MCM 2023). Site BaHg-1, is located approximately 700 metres to the

southwest. No further details are available on the Ontario Archaeological Sites Database as to the nature of this site.

1.3.3 Previous Archaeological Assessments

No previous archaeological assessments were identified with 50 metres of the Study Area.

2.0 Property Inspection

2.1 Field Methods

A Stage 1 property inspection must adhere to the S & G, Section 1.2, Standards 1-6, which are discussed below. The entire property and its periphery must be inspected. The inspection may be either systematic or random. Coverage must be sufficient to identify the presence or absence of any features of archaeological potential. The inspection must be conducted when weather conditions permit good visibility of land features. Natural landforms and watercourses are to be confirmed if previously identified. Additional features such as elevated topography, relic water channels, glacial shorelines, well-drained soils within heavy soils and slightly elevated areas within low and wet areas should be identified and documented, if present. Features affecting assessment strategies should be identified and documented such as woodlots, bogs or other permanently wet areas, areas of steeper grade than indicated on topographic mapping, areas of overgrown vegetation, areas of heavy soil, and recent land disturbance such as grading, fill deposits and vegetation clearing. The inspection should also identify and document structures and built features that will affect assessment strategies, such as heritage structures or landscapes, cairns, monuments or plaques, and cemeteries.

The Stage 1 archaeological assessment property inspection was conducted under the field direction of Eliza Brandy (R1109) of ASI, on August 21, 2023, in order to gain first-hand knowledge of the geography, topography, and current conditions and to evaluate and map archaeological potential of the Study Area. It was a systematic visual inspection from private lands with permitted access from the Hanover Wastewater Treatment Plant, and did not include excavation

or collection of archaeological resources. Fieldwork was conducted when weather conditions were deemed clear with good visibility (sunny with seasonal temperatures), per S & G Section 1.2., Standard 2. Field photography is presented in Section 7.1 (Images 1-17), and field observations are overlaid onto the existing conditions of the Study Area in Section 8.0 (Figure 10).

2.2 Current Land Use and Field Conditions

The Study Area measures approximately 6.71 hectares and is located west of Seventh Avenue (County Road 10). It is bound by the densely wooded banks of the Saugeen River, and the Hanover Community Trail to the south and west (Images 19-20), a woodlot to the east, and Seventh Avenue (County Road 10) to the east. The Study Area comprises the Hanover Wastewater Treatment Plant, including various above and below ground infrastructure surrounded by maintained greenspace, as well as a paved access road and parking lot. The Study Area also incorporates a Hydro right-of-way and overhead power lines on the north side.

3.0 Analysis of Archaeological Potential

The S & G, Section 1.3.1, lists criteria that are indicative of archaeological potential. The Study Area meets the following criteria indicative of archaeological potential:

- Water sources: primary, secondary, or past water source (Saugeen River)
- Elevated topography
- Well-drained soils (Sullivan) and;
- Early historic transportation routes (Seventh Avenue, PD&LH).

According to the S & G, Section 1.4 Standard 1e, no areas within a property containing locations listed or designated by a municipality can be recommended for exemption from further assessment unless the area can be documented as disturbed. No Municipal Heritage Register was available.

The property inspection determined that parts of the Study Area exhibit archaeological potential. These areas will require Stage 2 archaeological assessment prior to any construction activities or other proposed impacts.

According to the S & G Section 2.1.2, test pit survey is required on terrain where ploughing is not viable, such as wooded areas, properties where existing landscaping or infrastructure would be damaged, overgrown farmland with heavy brush or rocky pasture, and narrow linear corridors up to 10 metres wide (Figure 10: areas highlighted in green).

Part of the Study Area is located within a low-lying wet area, and according to the S & G Section 2.1 does not retain potential (Image 1; Figure 10: area highlighted in blue). This area does not require further survey.

Part of the Study Area has been subjected to deep soil disturbance events, due to the construction of the PD&LH railway in the 1870s, early twentieth century construction of the Hanover Wastewater Treatment Plant and subsequent modernisation and expansion over the course of the twentieth and twenty-first centuries, and a Twentieth Century Hydro right-of-way. Other disturbance events include the construction of houses in the late nineteenth or early twentieth centuries, the twentieth century construction of a small residential apartment block with an attached commercial restaurant, and a storage building. According to the S & G Section 1.3.2 these areas do not retain archaeological potential (Images 2-18; Figure 10: areas highlighted in yellow) and do not require further survey.

3.1 Conclusions

The Stage 1 background study determined that one previously registered archaeological site is located within one kilometre of the Study Area. The property inspection determined that parts of the Study Area exhibit archaeological potential and will require archaeological assessment (Figure 10: areas highlighted in green).

4.0 Recommendations

The following recommendations are made:

1) Parts of the Study Area exhibit archaeological potential. These lands require Stage 2 archaeological assessment by test pit at five metre intervals (Figure

10). Stage 2 is required prior to any proposed construction activities on these lands;

2) The remainder of the Study Area does not retain archaeological potential on account of deep and extensive land disturbance or low and wet conditions. These lands do not require further archaeological assessment; and,

3) Should the proposed work extend beyond the current Study Area, further archaeological assessment should be conducted to determine the archaeological potential of the surrounding lands.

NOTWITHSTANDING the results and recommendations presented in this study, ASI notes that no archaeological assessment, no matter how thorough or carefully completed, can necessarily predict, account for, or identify every form of isolated or deeply buried archaeological deposit. In the event that archaeological remains are found during subsequent construction activities, the consultant archaeologist, approval authority, and the Archaeology Programs Unit of the Ministry of Citizenship and Multiculturalism should be immediately notified.

The above recommendations are subject to Ministry approval and it is an offence to alter any archaeological site without Ministry of Citizenship and Multiculturalism concurrence. No grading or other activities that may result in the destruction or disturbance of any archaeological sites are permitted until notice of MCM approval has been received.

5.0 Legislation Compliance Advice

ASI advises compliance with the following legislation:

- This report is submitted to the Ministry of Citizenship and Multiculturalism as a condition of licensing in accordance with Part VI of the *Ontario Heritage Act*, RSO 2005, c 0.18. The report is reviewed to ensure that it complies with the standards and guidelines that are issued by the Minister, and that the archaeological field work and report

recommendations ensure the conservation, preservation, and protection of the cultural heritage of Ontario. When all matters relating to archaeological sites within the project area of a development proposal have been addressed to the satisfaction of the Ministry of Citizenship and Multiculturalism, a letter will be issued by the Ministry stating that there are no further concerns with regards to alterations to archaeological sites by the proposed development.

- It is an offence under Sections 48 and 69 of the *Ontario Heritage Act* for any party other than a licensed archaeologist to make any alteration to a known archaeological site or to remove any artifact or other physical evidence of past human use or activity from the site, until such time as a licensed archaeologist has completed archaeological field work on the site, submitted a report to the Minister stating that the site has no further cultural heritage value or interest, and the report has been filed in the Ontario Public Register of Archaeology Reports referred to in Section 65.1 of the *Ontario Heritage Act*.

- Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48 (1) of the *Ontario Heritage Act*. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with sec. 48 (1) *of the Ontario Heritage Act*.

- The *Funeral, Burial and Cremation Services Act*, 2002, S.O. 2002, c.33, requires that any person discovering or having knowledge of a burial site shall immediately notify the police or coroner. It is recommended that the Registrar of Cemeteries at the Ministry of Consumer Services is also immediately notified.

- Archaeological sites recommended for further archaeological field work or protection remain subject to Section 48(1) of the *Ontario Heritage Act* and may not be altered, nor may artifacts be removed from them, except by a person holding an archaeological license.

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7.0 Images

7.1 Field Photography



Image 1: Lawn in foreground requires Stage 2; swamp in background is low and wet, no archaeological potential.



Image 2: Paved and gravel roads are disturbed; no archaeological potential.



Image 3: Above and below-ground infrastructure of the Hanover Wastewater Treatment Plant is disturbed; no archaeological potential.



Image 4: Above and below-ground infrastructure of the Hanover Wastewater Treatment Plant is disturbed; no archaeological potential.



Image 5: Above and below-ground infrastructure of the Hanover Wastewater Treatment Plant is disturbed; no archaeological potential.



Image 6: Above and below-ground infrastructure of the Hanover Wastewater Treatment Plant is disturbed; no archaeological potential.



Image 7: Above and below-ground infrastructure with landscaping of the Hanover Wastewater Treatment Plant is disturbed; no archaeological potential.



Image 8: Paved access road and compacted overgrown gravel driveway and parking area with gate adjacent to Hanover Wastewater Treatment Plant is disturbed; no archaeological potential.



Image 9: Paved access road and storage tank area at Hanover Wastewater Treatment Plant is disturbed; no archaeological potential.



Image 10: Original 1906 "Hanover Waterworks" building with adjacent overhead power lines; no archaeological potential. Front lawn beyond building requires test pit survey.



Image 11: Early "Hanover Waterworks" building; no archaeological potential; Front lawn beyond building requires test pit survey.



Image 12: Residence with paved driveway; no archaeological potential. Lawn surrounding building requires test pit survey.



Image 13: Residence with paved driveway; no archaeological potential. Lawn surrounding building requires test pit survey.



Image 14: Residences with paved front parking area; no archaeological potential.



Image 15: A commercial building with compacted gravel parking lot; no archaeological potential.



Image 16: Storage building with gravel parking area and access driveway; no archaeological potential.



Image 17: Hydro right-of-way disturbed gravel access driveway; no archaeological potential.



Image 18: Stage 2 required in lawn and treed area beyond disturbed Hydro gravel right-of-way terminus/parking area.



Image 19: Stage 2 required in lands beyond Hanover Community Trail/former rail line.



Image 20: Stage 2 required in treed area beyond Hanover Community Trail/former rail line.

8.0 Maps

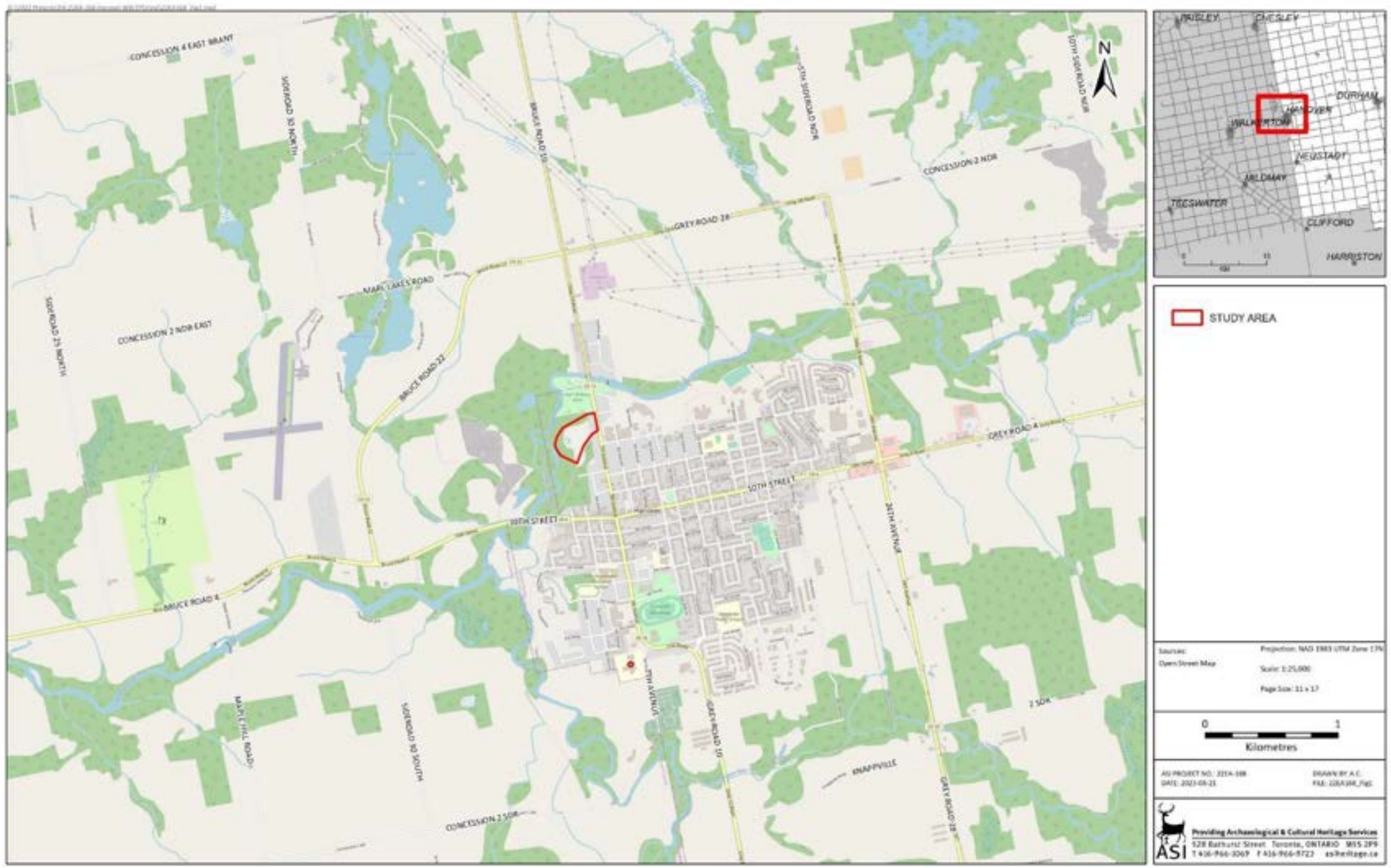


Figure 1: Location of the Hanover Wastewater Treatment Study Area.



Figure 2: Study Area (Approximate Location) Overlaid on the 1855 Map of the Counties of Grey and Bruce.



Figure 3: Study Area (Approximate Location) Overlaid on the 1880 Illustrated Historical Atlas of the Counties of Grey and Bruce, Ontario.

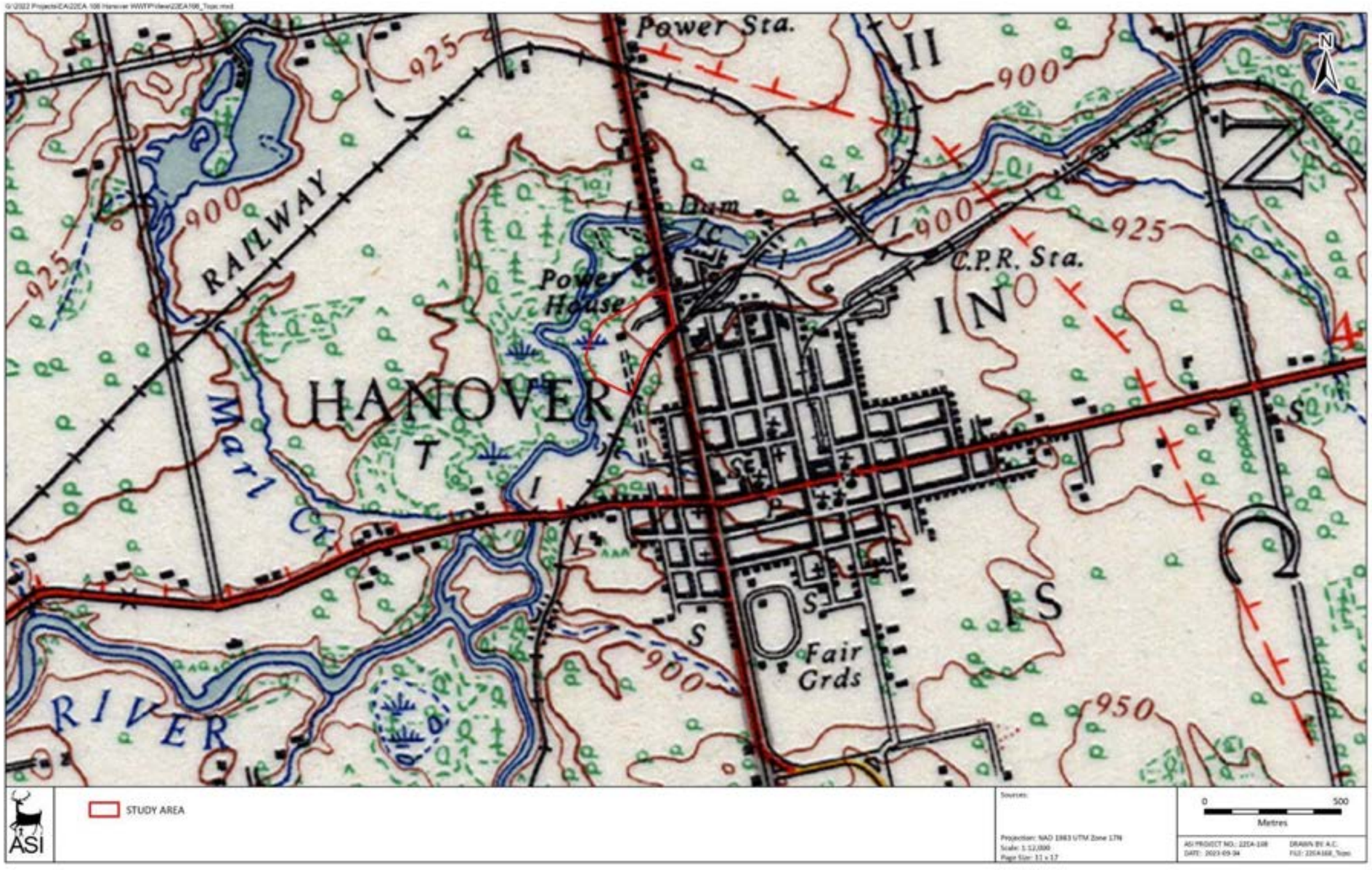


Figure 4: Study Area (Approximate Location) Overlaid on the 1946 Walkerton Topographic Sheet.



Figure 5: Study Area (Approximate Location) Overlaid on 1954 Aerial Imagery.



Figure 6: Study Area (Approximate Location) Overlaid on 2006 Aerial Imagery.

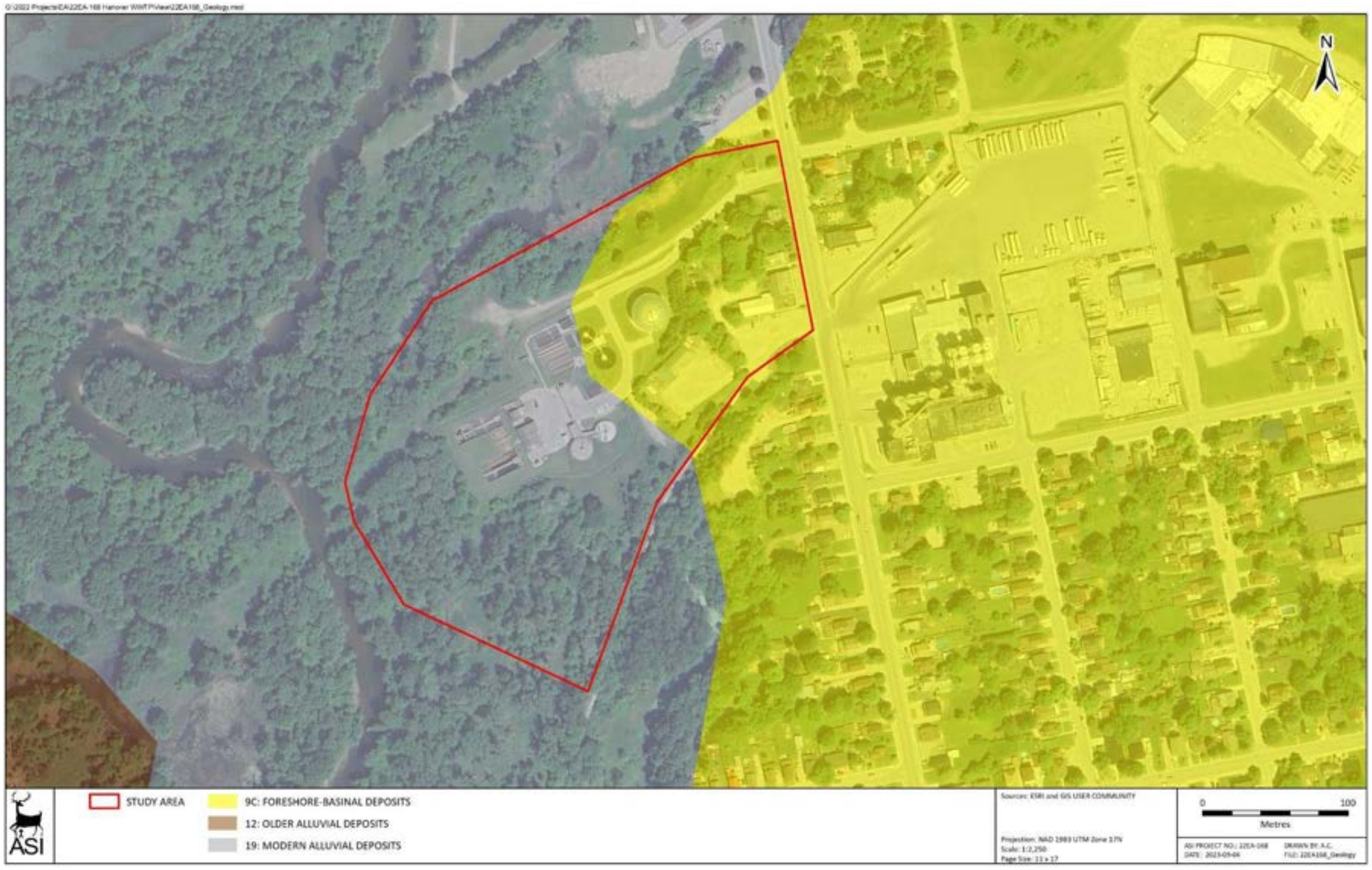


Figure 7: Surficial Geology of the Study Area.

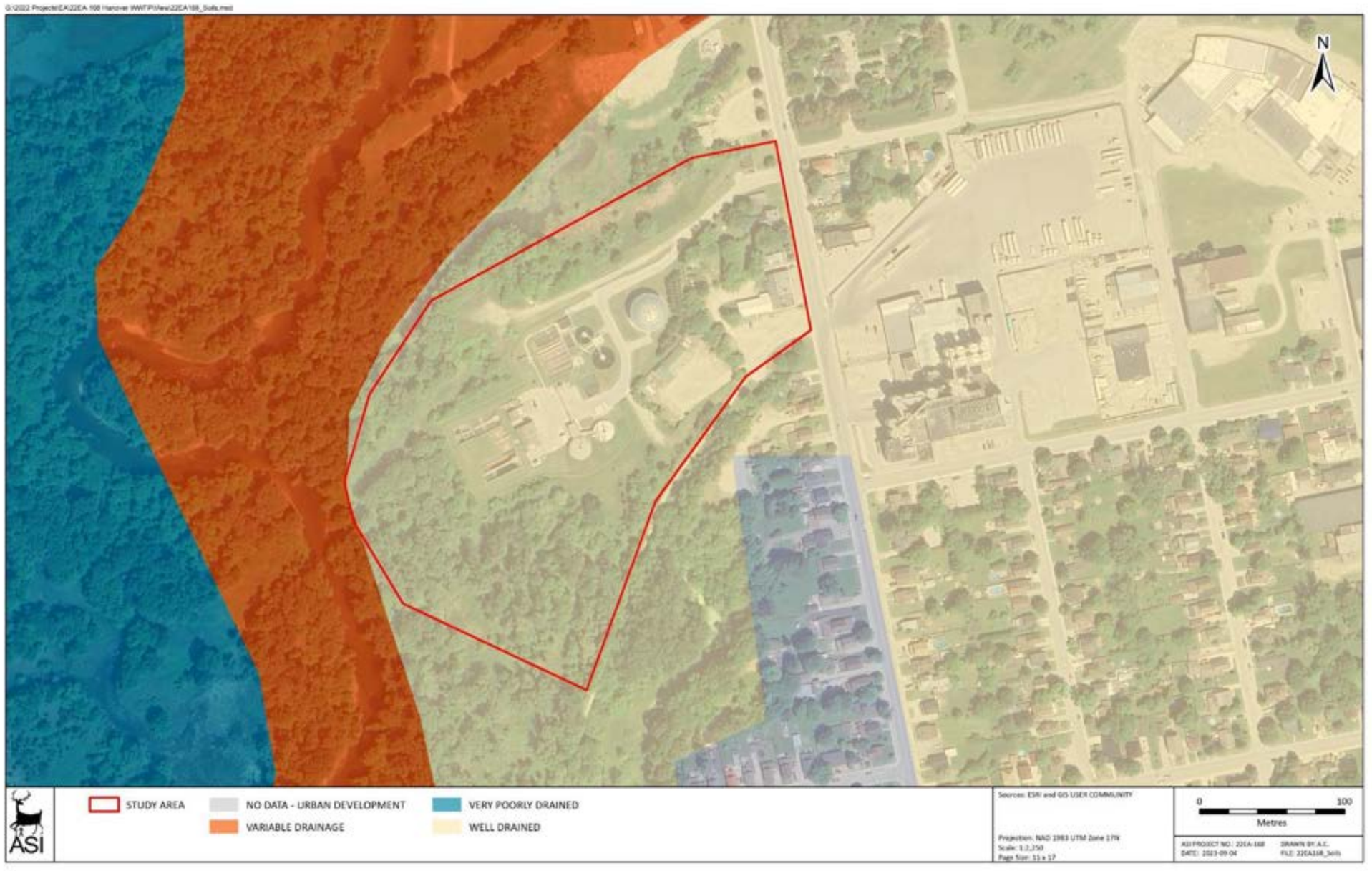


Figure 8: Soil Drainage of the Study Area.



Figure 9: Existing conditions within the Study Area.



Figure 10: Hanover Wastewater Treatment Plant – Results of Stage 1.

Appendix E

Stage 2 Archaeological Assessment

Stage 2 Archaeological Assessment
Hanover Wastewater Treatment Plant
Part of Lots 73 and 74, Concession 1, North of Durham Road (Geographic Township of Brant, Bruce County)
Town of Hanover, Grey County

Revised Report

Prepared for:

Ainley Group
195 County Court Boulevard 300
Brampton, Ontario L6W 4P7

Archaeological Licence: P383 (Williams)

PIF: P383-0422-2023

Archaeological Services Inc. File: 23EA-276

30 September 2024



Executive Summary

Archaeological Services Inc. (ASI) was contracted by Ainley Group, on behalf of the Town of Hanover, to conduct a Stage 2 Archaeological Assessment as part of the Hanover Wastewater Treatment Plant Project. This project involves upgrades and expansion of the plant, including a new pumping station and force main.

A Stage 1 assessment for the Hanover Wastewater Treatment Plant project was previously completed by ASI in 2023. Background research and property inspection determined that portions of the Study Area retained archaeological potential and Stage 2 test pit survey was recommended.

The Stage 2 property survey was conducted from December 13-15, 2023, in accordance with the *Ontario Heritage Act* and the *Standards and Guidelines for Consultant Archaeologists* (S & G) by test pit survey. Approximately 10.4 percent of the Study Area (1,709 square metres) did not have archaeological potential due to previous deep and extensive ground disturbance. These lands include engineered berms relating the infrastructure of the Wastewater Treatment Plant.

The remaining 89.6 percent of the Study Area (1.47 hectares), comprising the woodlot, was subject to test pit survey at five metre intervals, and judgmental test pit survey at 10 metre intervals to confirm previous disturbance such as engineered berms and gleysolic conditions (Figure 3; Image 5-Image 15). Portions with intact and non-gleysolic stratigraphy were identified in the central portions of the Study Area, but no archaeological resources were encountered during the Stage 2 survey, and no further archaeological assessment is recommended.

A portion of the Study Area, 3,145 square metres, 19.1 percent, situated at the western end, has been requested by the Saugeen Ojibway Nation (SON) to be subject to additional work in the form of construction monitoring.

Project Personnel

- **Senior Project Manager**: Lisa Merritt, MSc (P094) Partner, Director, Environmental Assessment Division
- **Project Manager**: Blake Williams, MLitt (P383), Lead Archaeologist, Project Manager, Environmental Assessment Division
- **Project Director**: Blake Williams, MLitt (P383), Lead Archaeologist, Project Manager, Environmental Assessment Division
- **Division Coordinator**: Katrina Thach, BA Hons (R1225), Associate Archaeologist, Assistant Manager, Environmental Assessment Division
- **Project Administrator**: Catherine Kitchen, BA (R1364), Archaeologist, Project Administrator, Environmental Assessment Division
- **Field Director**: Jose Gutierrez, MA (R1213), Archaeologist, Field Director, Environmental Assessment Division
- **Field Archaeologists**: Allison Suba, Kristina Brilli
- **Report Preparation**: Ciprian Ardelean, PhD, Senior Associate, Technical Writer and Researcher, Environmental Assessment Division; Blake Williams
- **Graphics**: Peter Bikoulis, PhD, Archaeologist, GIS Technician, Operation Division; Robin Latour, MPhil, PDip, Associate Archaeologist, Geomatics Specialist, Operations Division; Carolyn Nettleton, BA, Archaeologist, GIS Technician, Operation Division
- **Report Review**: Jessica Lytle, MSc (P1066), Lead Archaeologist, Technical Writer and Fieldwork Coordinator, Environmental Assessment Division; Lisa Merritt

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1.0 Project Context

Archaeological Services Inc. (ASI) was contracted by Ainley Group, on behalf of the Town of Hanover, to conduct a Stage 2 Archaeological Assessment as part of the Hanover Wastewater Treatment Plant Municipal Class Environmental Assessment. This project is being undertaken in advance of the proposed upgrading and expansion of the plant, including the construction of a new pumping station and force main.

The Stage 2 Study Area involves an area of approximately 1.64 hectares, including lands located to the south and southwest of the Hanover Wastewater Treatment Plant, owned by the Town of Hanover (Figure 1). This report is seeking to fulfill the recommendations of the previous Stage 1 report (ASI 2024; P094-0366-2023).

All activities carried out during this assessment were completed in accordance with the *Ontario Heritage Act* (1990, as amended in 2023) and the 2011 *Standards and Guidelines for Consultant Archaeologists* (S & G), currently administered by the Ministry of Citizenship and Multiculturalism (MCM 2011).

1.1 Development Context

All work has been undertaken as required by the *Environmental Assessment Act, RSO* (Environmental Assessment Act, R.S.O. c. E.18, 1990 as amended 2022) and regulations made under the Act, and are therefore subject to all associated legislation. This project is being conducted in accordance with the *Municipal Class Environmental Assessment* process (Municipal Engineers Association, 2023).

In addition, this Stage 2 assessment has been commissioned to satisfy the recommendations of the previous Stage 1 assessment (ASI, 2024; P094-0366-2023) that was undertaken as part of the Hanover Wastewater Treatment Plant project in the Town of Hanover (2022).

ASI has been actively engaging with Indigenous communities who have expressed an interest in the archaeological work within the Study Area for this project on behalf of the Town of Hanover. Representatives from the Saugeen Ojibway

Nation were present on site and participated during the Stage 2 property survey. No concerns were expressed during the execution of the fieldwork. A detailed account of all First Nations engagement can be found in the *Supplementary Documentation: Indigenous Engagement* document associated with this report.

Authorization to access and carry out all activities necessary for the completion of this Stage 2 assessment was granted by Ainley Group on November 16, 2023.

1.1.1 Treaties and Traditional Territories

The Study Area is located in the traditional territory of the Saugeen Ojibway Nation (SON) the collective name for the Saugeen Ojibway First Nation and the Chippewas of Nawash Unceded First Nation, known as *Saukiing Anishnaabekiing*. *Saukiing Anishnaabekiing* includes the Saugeen Peninsula (or Bruce Peninsula), the waters and islands of Lake Huron and Georgian Bay surrounding the Saugeen Peninsula, and extends south to include the Maitland River watershed and east to include the Nottawasaga River watershed in part of Grey, Bruce, Huron, Perth, Wellington, Dufferin, and Simcoe Counties (SON, 2011).

The Study Area is within the Saugeen Tract Purchase treaty, which was agreed upon on August 9, 1836, along with Treaty 45 (Treaty of Manitowaning/ Manitoulin Island Treaty). The treaty covers land of the SON's traditional territory. The treaty was signed by representatives of the Crown and Anishinaabek leaders in Manitowaning during an annual distribution of gifts for Indigenous peoples (Ministry of Indigenous Affairs, 2022). In exchange for the 1.5 million acres the Crown was to provide economic assistance in the form of housing and the means to cultivate land as well as protection from white settlers' encroachment onto their lands. The land covered by Treaty 45 ½ extends from the town of Arthur in the southeast to approximately the town of Kingsbridge on Lake Huron to the southwest, then north to Southampton in the northwest and across to the northwestern corner of the former Sydenham Township on Georgian Bay in the northeast (Ministry of Indigenous Affairs, 2020; *Treaty History | Saugeen Ojibway Nation Environment Office*, no date).

With the signing of the 1818 Lake Simcoe-Nottawasaga Treaty 18 and the 1836 "Saugeen Tract Agreement" Treaty 45 ½, Ojibway chiefs granted the Crown

approximately 1.5 million acres of land south of the Peninsula in an effort to secure a land base on Manitoulin Island along the shores of Lake Huron and southern Georgian Bay (Crown-Indigenous Relations and Northern Affairs, 2016). In exchange for the land surrendered under Treaty 45 ½, the Crown promised to protect the Saugeen Peninsula forever (Saugeen Ojibway Nation, 2021b).

The Saugeen continued using their traditional territory for hunting, medicine gathering, sugaring camps and fish spawning. Euro-Canadian settlement continued to encroach upon the Peninsula and in 1847 Queen Victoria issued a Royal Declaration to support the rights of the Saugeen Ojibway Nation. The Declaration also established strict rules for the purchase and surrender of Indigenous lands in Canada and confirmed that the Bruce Peninsula belonged to the SON. Additional acts were passed in 1850 and 1851 to protect lands from squatters and loggers, such as the 1851 Half Mile Strip Treaty 67 which surrendered over 4,000 acres for the Crown to build a road joining Owen Sound and Southampton (SON, 2021a). These documents did little to stem the tide of Euro-Canadian settlement.

In 1994 a claim was submitted to the Crown arguing that Treaty 72 was not valid as the Crown had not fulfilled its duty to the SON and Chippewas of Nawash Unceded First Nation to protect them from the effects of colonization and that they were misled by the Crown during negotiations for Treaty 72 (Olthuis Kleer Townshend L.L.P., 2021). In 2003 the SON and the Chippewas of Nawash Unceded First nation subsequently filed a joint claim for Aboriginal Title to portions of Lake Huron and Georgian Bay (Olthuis Kleer Townshend L.L.P., 2021). The trial addressing these claims began in 2019 and a decision was reached in 2021 (Olthuis Kleer Townshend L.L.P., 2021). The court rejected SON's Aboriginal Title claim but agreed that the Crown breached its honour by failing to uphold its promise to protect the Saugeen Peninsula forever.

1.2 Historical Context

A comprehensive review of the precontact Indigenous and Euro-Canadian occupations of the Bruce/Grey County is presented in the Stage 1 report (Archaeological Services Incorporated, 2024). To summarize, background research indicates that the general vicinity of the Study Area has been

attractive to human settlement for thousands of years, primarily by Indigenous people and more recently by Euro-Canadian settlers. Historically, the Study Area corridor is within part of Lots 73 and 74, Concession 1, in the Geographical Township of Brant, County of Bruce, Ontario.

Township of Brant

Brant Township, named for Mohawk Chief Joseph Brant, was first Surveyed in 1848 by surveyor A.P. Brough. The first lots in Concessions 1 and 2 north and south of Durham Road were offered as free land grants the following spring and summer. The first settlers in the region settled in 1849 on land that would become the Town of Walkerton. The first mill in the Township was constructed by Joseph Walker, founder of the Town of Walkerton. The Saugeen River and its many tributaries flow through the Township providing excellent irrigation for farmlands and power for many mills and industries (Bruce County Genealogical Society, 2021b; Mika & Mika, 1977).

Until 1854, Brant was part of a municipal union of the Townships in Bruce County until it joined with Carrick Township to form a separate municipality. Two years later, the Township became its own municipality with Joseph Walker as Reeve. Walkerton developed particularly quickly, incorporating as a town in 1871 without first incorporating as a village. A notable resident of Brant Township is Robert Sutherland, Ontario's first lawyer of African ancestry who practices as a barrister and attorney in Walkerton (Bruce County Genealogical Society, 2021b; Mika & Mika, 1977).

In 1999, Brant and Greenock Townships joined with the Town of Walkerton to form a new municipality called Brockton, a portmanteau of three names. Today, agriculture and tourism are two of the most important industries in the area (Bruce County Genealogical Society, 2021b; Bruce County Museum & Cultural Centre, 2023; Mika & Mika, 1977).

Town of Hanover

Historically, the Town of Hanover was located upon the county line of Bruce and Grey Counties However, at some point in the twentieth century, the entire Town of Hanover, was annexed into Grey County.

There are two origin stories for the naming of Hanover, the first, is that it was named after the hometown of one of the first settlers, from Hannover, Germany, and the second is that it was named after a Mr. Hahn (who had originally wanted the settlement to be called 'Hahnover'). However, before this name was chosen, the settlement was known as 'Buck's Crossing' or 'Buck's Bridge', after one of two German immigrants who first settled in the area, an Abraham Buck, who opened the first inn. By 1854, the settlement had a grist and sawmill, and proposals had been made to form a village. By 1866, the population of Hanover was nearly 400, and a second furniture factory was opened. Additional furniture businesses opened, including 'Peppler Bros. and Ball Furniture'. The mills contributed all the raw materials, and the successful furniture business led to Hanover being locally known as "Slab Town". In 1868, the first school was constructed, with a second larger school opening in 1875.

By 1880, the population of Hanover was 1200, with the majority of inhabitants employed in local industry. By 1882, Hanover had a railway station on the Grand Trunk Railway, and by 1899, with a population of over 1600, Hanover was incorporated as a village, and subsequently became a town in 1904 (Brown, 2011; Mika & Mika, 1981:231–232).

Hanover Water Works

In 1901, a pump station and waterworks was established at 722 Seventh Avenue, at this stage primarily for fire protection. In 1901, the pumps comprised water driven turbines utilising the Saugeen River for both a water supply and for power for the pumps. Due to the unpredictability of the Saugeen River, an alternative source of water was sought by Town Officials, and in 1912, a local lake later known as 'Ruhl Lake' was chosen as an alternative source, a pump station was established here, and a '12 inch watermain' was constructed to feed water to

the pumping station at 722 Seventh Avenue. The Saugeen River continued to supply the pumps only.

1.3 Archaeological Context

This section provides background research pertaining to previous archaeological fieldwork conducted within and in the vicinity of the Study Area, its environmental characteristics (including drainage, soils or surficial geology and topography, etc.), and current land use and field conditions. Three sources of information were consulted to provide information about previous archaeological research: the site record forms for registered sites available online from the MCM through *Ontario's Past Portal*; published and unpublished documentary sources; and the files of ASI.

1.3.1 Current Land Use and Field Conditions

The Study Area is located west of Seventh Avenue (County Road 10) and south of the existing Water Treatment Plant (Figure 1). It is bound by the densely wooded banks of the Saugeen River to the west, the existing Wastewater Treatment Plant to the north, and the Hanover Community Trails and woodlot to the east and south. In its north sector, the Study Area comprises a small portion of the maintained greenspace belonging to the Hanover Wastewater Treatment Plant. The western edge of the Study Area sits on the eastern bank of the Saugeen River (Figure 2).

The Stage 2 survey for the Hanover Water Treatment Plant project was conducted from December 13-15, 2023, under the field direction of Jose Gutierrez (R1213).

1.3.2 Geography

A comprehensive summary of the geology and physiography of the region is presented in the Stage 1 report (Archaeological Services Incorporated, 2024). To summarize, the Study Area is situated within the spillways of the Horseshoe Moraine physiographic region of southern Ontario (Chapman & Putnam, 1984). The region is characterized by morainic ridges composed of pale brown, hard calcareous, fine-textured till, with a moderate degree of stoniness. The Study Area contains sections of coarse-textured glaciolacustrine deposits (foreshore-

basinal deposits, comprising sand, gravel, minor silt and clay) and modern alluvial deposits (clay, silt, sand, gravel, potentially containing organic remains). The soil types of the Study Area include Sullivan, a sandy loam with good drainage.

The nearest watercourse is the Saugeen River, with its main body located approximately 17 meters to the west of the Study Area, and a small branch located 90 meters to the north. The entire Study Area is within the Upper Main Saugeen River subwatershed (Saugeen Conservation, 2008), within the larger watershed of the Saugeen River. The Upper Main Saugeen River Watershed drains 782 square kilometres and incorporates 116 kilometres of the Saugeen River.

The Saugeen River system is the third longest river system in southern Ontario, measuring approximately 198 kilometres in length. The river flows from the headwaters in Dundalk and empties into Lake Huron at the Town of Southampton, flowing through Bruce, Dufferin, Grey, Huron, and Wellington Counties. Altogether, the Saugeen River watershed covers 4,675 kilometres squared and is overseen by the Saugeen Conservation Authority (Saugeen Conservation, 2022).

Historically, the Saugeen River has served as an important transport route and food source for the Indigenous communities who inhabited the Bruce Peninsula centuries before the arrival of Europeans, including the SON who share a name with the river. Early European settlers used the river as a trade route and as a means of traveling to the northern townships where access by road or inland trails was often difficult or impossible. As settlers claimed the land on the banks of the river, it became an important power source to numerous mills and industries. Today, the Saugeen River continues to be important to local communities and visitors and is a popular destination for outdoor recreational activities including canoeing/kayaking, fishing, hiking, and camping (Barkwell, 2007; Bruce County Genealogical Society, 2021a; Saugeen Conservation, 2023).

1.3.3 Previously Registered Archaeological Sites

In Ontario, information concerning archaeological sites is stored in the Ontario Archaeological Sites Database maintained by the MCM. This database contains archaeological sites registered within the Borden system. Under the Borden

system, Canada has been divided into grid blocks based on latitude and longitude. A Borden block is approximately 13 kilometres east to west, and approximately 18.5 kilometres north to south. Each Borden block is referenced by a four-letter designator, and sites within a block are numbered sequentially as they are found. The Study Area under review is located in the Borden block *BaHg.*

According to the Ontario Archaeological Sites Database, one previously registered archaeological site is located within one kilometre of the Study Area (MCM 2023). Site BaHg-1 is located approximately 700 metres southwest of the Study Area. No further details are available on the Ontario Archaeological Sites Database likely due to the fieldwork being conducted from 1954 to 1956 (Archaeological Services Incorporated, 2024).

1.3.4 Previous Archaeological Assessments

(ASI 2024) Stage 1 Archaeological Assessment of the Hanover Wastewater Treatment Plant (Part of Lots 73 and 74, Concession 1, North of Durham Road, Geographic Township of Brant Bruce County) Town of Hanover, Grey County. PIF: P094-0366-2023, ASI file 22EA-168.

The Stage 1 background study determined that one previously registered archaeological site is located within one kilometre of the Study Area. The property inspection determined that parts of the Study Area exhibit archaeological potential and will require archaeological assessment. This Stage 2 report seeks to fulfill the recommendations of this Stage 1.

2.0 Field Methods

The Stage 2 Study Area comprises a portion of land located south and southwest of the Hanover Water Treatment Plant in the Town of Hanover, Ontario (Figure 1). It measures approximately 222 metres by 110 metres in size and covers an area of approximately 1.6 hectares (Figure 1-Figure 3).

The Stage 2 property survey was conducted under the field direction of Jose Gutierrez (R1213) from December 13-15, 2023, in accordance with the *Ontario Heritage Act* and the S & G, Section 2. During the field assessment, weather and

lighting conditions permitted good visibility and were in accordance with the S & G, Section 2.1, Standard 3. During the time of survey, conditions were seasonal with overcast skies, light snow on the first day, and temperatures of -5 to -1 degrees Celsius. There was freezing temperatures during the course of the project, but despite the cold temperature, the soils were not wet or frozen during the assessment and did not affect the ability to identify artifacts. Photographs of all field conditions were taken (Image 1-Image 15), and the location and direction of each photograph is mapped in Figure 3.

As per Section 2.1 of the S & G, all lands were within areas where ploughing was not possible or viable and therefore subject to test pit survey. According to Section 2.1.2, Standard 2 of the S & G, any undisturbed areas requiring test pit survey within 300 metres of any feature of archaeological potential must be subject to systematic assessment at five metre intervals. Test pits were placed at five metre intervals until disturbance was encountered, and then judgmentally increased to 10 metre intervals as per S & G Section 2.1.8. Judgmental 10 metre intervals were employed to confirm previous disturbance and gleysolic soil conditions as per S & G Section 2.1.8b. All test pits were excavated following the S & G Section 2.1.2 Standards 5-9. All test pits were excavated by hand to a minimum of 30 centimetres in diameter and into the first five centimetres of subsoil. Each test pit was examined for stratigraphy, cultural features, and evidence of fill. Test pit fill was screened through six-millimetre mesh to facilitate artifact recovery. Afterwards, all test pits were backfilled, and their locations were recorded on field maps. Any factors that precluded the excavation of test pits (e.g., excessive slope, drainage, exposed bedrock, previous disturbance) were noted, and the areas were mapped and photographed.

Fieldwork was conducted using a Samsung Galaxy S4 tablet running Esri Collector software equipped with a sub-metre Trimble Catalyst Global Navigation Satellite System in conjunction with project mapping provided by the Town of Hanover to ensure the assessment remained within the Study Area limits.

2.1 Areas of No Archaeological Potential

Visual assessment and fieldwork determined that a reduced portion of the Study Area did not retain archaeological potential. Approximately 10.4 percent

of the Study Area (1,709 square metres) had been previously subject to deep and extensive ground disturbance per S & G Section 2.1, Standard 2.b. The lands documented as being previously disturbed have no archaeological potential and include two engineered berms situated at the eastern and northern margins of the Study Area, bordering the Hanover Community Trail and the manicured south lawns of the Wastewater Treatment Plant, respectively (Figure 3; Image 1-



Image 3).

2.2 Test Pit Survey

Approximately 2.4 percent of the Study Area (395 square metres) was found to contain natural topsoil and buried topsoil (A-horizon) and was subject to test pit survey at five metre intervals following S & G Section 2.1.2, Standards 1-9. The areas subject to test pit survey at five metre intervals include most of the woodlot south of the Hanover Wastewater Treatment Plant (Figure 3; Image 14- Image 15).

Undisturbed stratigraphy in the Study Area is characterized by approximately 25-30 centimetres of very dark grayish brown (10YR 3/2) sandy loam topsoil (A-

horizon) with till, overlying a dark yellowish (10YR 4/4) brown clay subsoil (B-horizon) (Image 15).

Approximately 24.2 percent of the Study Area (3,982 square metres) did not contain natural topsoil (A-horizon) and was subject to judgmental test pit survey at 10 metre intervals to confirm previous disturbance following S & G Section 2.1.8, Standards 1-2. Approximately 63 percent of the Study Area (10,349 square meters) had vegetation indicating a wetland environment, standing water was present and contained gley soils. These areas were subject to judgmental test pit survey include the central-northern sector of the Study Area, between the two mentioned berms (Figure 3; Image 5-Image 12,).

Disturbed stratigraphy in the Study Area is characterized by 10-20 centimetres of laid topsoil (A-horizon) composed of dark brown to reddish brown silt and/or clay loam (10YR 3/3, 4/3, 2.5Y 5/4) containing occasional stones, atop several fill layers measuring 35-80 centimetres in depth characterized by brown silt (10YR 4/3), reddish brown to pale red silty clay (2.5Y 5/4, 6/4, 7/2), dark brown clay loam (10YR 3/3) mixed with reddish brown to pale brown sand (2.5Y 5/3 and 10YR 6/3), occasionally containing metal, glass, ceramic, charcoal, and plastic (Image 10-Image 11).

The wetland area had a gleyed stratigraphy in the Study Area is characterized by approximately 25-30 centimetres of very dark greyish brown (10YR3/2) clay loam topsoil with stone inclusions (A-horizon) overlying a light brownish gray (10YR 6/2) clay gleyed subsoil (B-horizon) (Figure 3; Image 12, 16-17).

Natural and permanently wet stratigraphy in the Study Area is consistent with the Gleysolic soil order. Gleysolic soils result from prolonged water saturation of the soil profile. Landscapes with clay-dominated soil textures have very slow rates of water movement through the soil which causes water saturation. Water saturation leads to depletion of oxygen in the soil and soil features associated with oxygen-depleted conditions. These conditions cause the transformation of metals, such as iron, and lead to changes in the dominant colour of soil horizons. When oxygen becomes depleted (due to water saturation) the iron is reduced and takes on a blue-gray hue and this dominates the colour of the horizon. Reduced iron is also mobile, and it can concentrate in the profile and re-oxidize,

producing reddish or brown mottles. These features are collectively referred to as gley features, and the diagnostic criteria for gleysolic soils in the presence of well-developed gley features within 50 centimetres of the soil surface (University of Saskatchewan, 2021).

2.3 Stage 2 Assessment Results Summary

A summary of the Stage 2 assessment results for the Hanover Water Treatment Plant Project can be found in Table 1 below.

Table 1: Stage 2 Survey Results Summary

Survey Method	Area	Description	Images
Assessed as being previously disturbed; no archaeological potential	1,709 square metres (10.4 percent)	Engineered berms	1-4
Judgmental test pit survey; 10 metre intervals - disturbed	3,982 square metres (24.2 percent)	Disturbed soil profiles	5-6, 10-11
Judgmental test pit survey; 10 metre intervals –to confirm low and wet conditions	10,349 square metres (63.0 percent)	Wetland vegetation, standing water and gleysolic soil profiles	7-9, 12, 16-17
Test pit survey; five metre intervals	395 square metres (2.4 percent)	Woodlot	13-15

3.0 Record of Finds

No archaeological resources were encountered over the course of the Stage 2 Archaeological Assessment for the Hanover Wastewater Treatment Plant project.

3.1 Inventory of Documentary and Material Record

The documentation related to this archaeological assessment will be curated by ASI until such a time that arrangements for their ultimate transfer to His Majesty the King in right of Ontario, or other public institution, can be made to the satisfaction of the project owner(s), the MCM, and any other legitimate interest groups.

Table 2 provides an inventory and location of the documentary and material record for the project in accordance with the S & G, Sections 6.7 and 7.8.2.3.

Table 2: Inventory of Documentary and Material Record

Material	Location	Comments
Digital field notes, field maps, GPS logs, etc.	Archaeological Services Inc., 528 Bathurst Street, Toronto, Ontario, M5S 2P9	Stored in ASI project folder 23EA-276; GPS and digital information stored on ASI network servers
Digital field photography	Same as above	Files stored on ASI network servers
Digital research, analysis, and reporting materials	Same as above	Files stored on ASI network servers

4.0 Analysis and Conclusions

ASI was contracted by Ainley Group, on behalf of the Town of Hanover, to conduct a Stage 2 Archaeological Assessment as part of the Hanover Wastewater Treatment Plant Municipal Class Environmental Assessment (Figure 1-Figure 3). This project is being undertaken in advance of the proposed upgrading and expansion of the plant, including the construction of a new pumping station and force main.

A Stage 1 assessment for the Hanover Wastewater Treatment Plant project was previously completed by (ASI 2024). Background research and a property inspection determined that portions of the Study Area retained archaeological potential and Stage 2 test pit survey was recommended.

The Stage 2 property survey was conducted from December 13-15, 2023, in accordance with the *Ontario Heritage Act* and the S & G by test pit survey. Approximately 10.4 percent (1,709 square metres) of the Study Area was determined to have been previously disturbed during the construction of the treatment plant, engineered berms and the community trail (Figure 3; Image 1-



Image 3).

The remaining 89.6 percent of the Study Area (1.47 hectares), comprising the woodlot, was subject to test pit survey at five metre intervals, and judgmental test pit survey at 10 metre intervals to confirm previous disturbance such as engineered berms and wetland areas with standing water, wetland plants and gleysolic conditions (Figure 3; Image 5-Image 15, 16-17). Portions with intact and non-gleysolic stratigraphy were identified in the central portions of the Study Area, but no archaeological resources were encountered during the Stage 2 survey.

A portion of the Study Area, 3,145 square metres, 19.1 percent, situated at the western end, has been requested by the Saugeen Ojibway Nation (SON) to be subject to additional work in the form of construction monitoring.

To minimize the risk of impacting of deeply buried finds within the Stage 2 Study Area limits, a licensed archaeologist and a SON Representative should be present to monitor the removal of topsoil for the area of interest that is adjacent to the Saugeen River (Figure 3: Cross-hatched area).

5.0 Recommendations

In light of these results, the following recommendations are made:

1. No archaeological resources were recovered during the Stage 2 assessment; however, the Saugeen Ojibway Nation (SON) have flagged this as an archaeologically sensitive area and have requested archaeological construction monitoring (Figure 3). A detailed monitoring strategy should be formulated at the time construction is proposed.

    a) To minimize the risk of impacting of impacting sites within the area of high potential, archaeological monitoring of any proposed construction activities by a licensed archaeologist is required. This should include a monitoring program specifically tailored to project impacts and may include systematic testing of fill soils and mechanical trenching to determine if there are any extant topsoil deposits;

    b) Given the demonstrated interest by the SON, they should be notified before the start of the construction works, so that the SON can assign a representative to be present to observe ground disturbing within the construction monitoring buffer;

    c) The construction monitoring area should be subject to the mechanical removal of topsoil where possible, under the supervision of a licensed archaeologist. The exposed subsoil will then be shovel-shined and thoroughly examined for the presence of archaeological features or artifacts; and,

2. Should the proposed work extend beyond the current Study Area or should changes to the project design or temporary workspace requirements result in the inclusion of previously un-surveyed lands, these lands should be subject to a Stage 2 archaeological assessment.

NOTWITHSTANDING the results and recommendations presented in this study, ASI notes that no archaeological assessment, no matter how thorough or carefully completed, can necessarily predict, account for, or identify every form of isolated or deeply buried archaeological deposit. In the event that archaeological remains are found during subsequent construction activities, the consultant archaeologist, approval authority, and the Archaeology Programs Unit of the MCM should be immediately notified.

The above recommendations are subject to Ministry approval, and it is an offence to alter any archaeological site without MCM concurrence. No grading or other activities that may result in the destruction or disturbance of any archaeological sites are permitted until notice of MCM approval has been received.

6.0 Legislation Compliance Advice

ASI advises compliance with the following legislation:

- This report is submitted to the Ministry of Citizenship and Multiculturalism as a condition of licensing in accordance with Part VI of the *Ontario Heritage Act*, RSO 2005, c 0.18. The report is reviewed to ensure that it complies with the standards and guidelines that are issued by the Minister, and that the archaeological field work and report recommendations ensure the conservation, preservation, and protection of the cultural heritage of Ontario. When all matters relating to archaeological sites within the project area of a development proposal have been addressed to the satisfaction of the Ministry of Citizenship and Multiculturalism, a letter will be issued by the Ministry stating that there are no further concerns with regards to alterations to archaeological sites by the proposed development.

- It is an offence under Sections 48 and 69 of the *Ontario Heritage Act* for any party other than a licensed archaeologist to make any alteration to a

known archaeological site or to remove any artifact or other physical evidence of past human use or activity from the site, until such time as a licensed archaeologist has completed archaeological field work on the site, submitted a report to the Minister stating that the site has no further cultural heritage value or interest, and the report has been filed in the Ontario Public Register of Archaeology Reports referred to in Section 65.1 of the *Ontario Heritage Act*.

- Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48 (1) of the *Ontario Heritage Act*. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with sec. 48 (1) of the *Ontario Heritage Act*.

- The *Funeral, Burial and Cremation Services Act*, 2002, S.O. 2002, c.33, requires that any person discovering or having knowledge of a burial site shall immediately notify the police or coroner. It is recommended that the Registrar of Cemeteries at the Ministry of Consumer Services is also immediately notified.

- Archaeological sites recommended for further archaeological field work or protection remain subject to Section 48(1) of the *Ontario Heritage Act* and may not be altered, nor may artifacts be removed from them, except by a person holding an archaeological license.

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8.0 Images



Image 1: Disturbance created by landscaped berm; no potential



Image 2 Disturbance created by engineered berm; no potential



Image 3: Disturbance created by engineered berm; no potential



Image 4: Engineered berm; no potential



Image 5: Judgemental test pit survey at 10 metre intervals



Image 6: Judgemental test pit survey at 10 metre intervals



Image 7: Judgemental test pit survey at 10 metre intervals



Image 8: Judgemental test pit survey at 10 metre intervals, dried wetlands vegetation present



Image 9: Judgemental test pit survey at 10 metre intervals, due to wet conditions and wetland vegetation



Image 10: Disturbed test pit profile showing no natural stratigraphy



Image 11: Disturbed test pit profile showing no natural stratigraphy



Image 12: Intact gleysolic test pit soil profile



Image 13: Test pit survey at 5 metre intervals



Image 14: Test pit survey at fives metre intervals



Image 15: Test pit demonstrating buried topsoil (A-horizon)



Image 16: Standing water with surrounding wetland vegetation



Image 17: Standing water with surrounding wetland vegetation

9.0 Maps

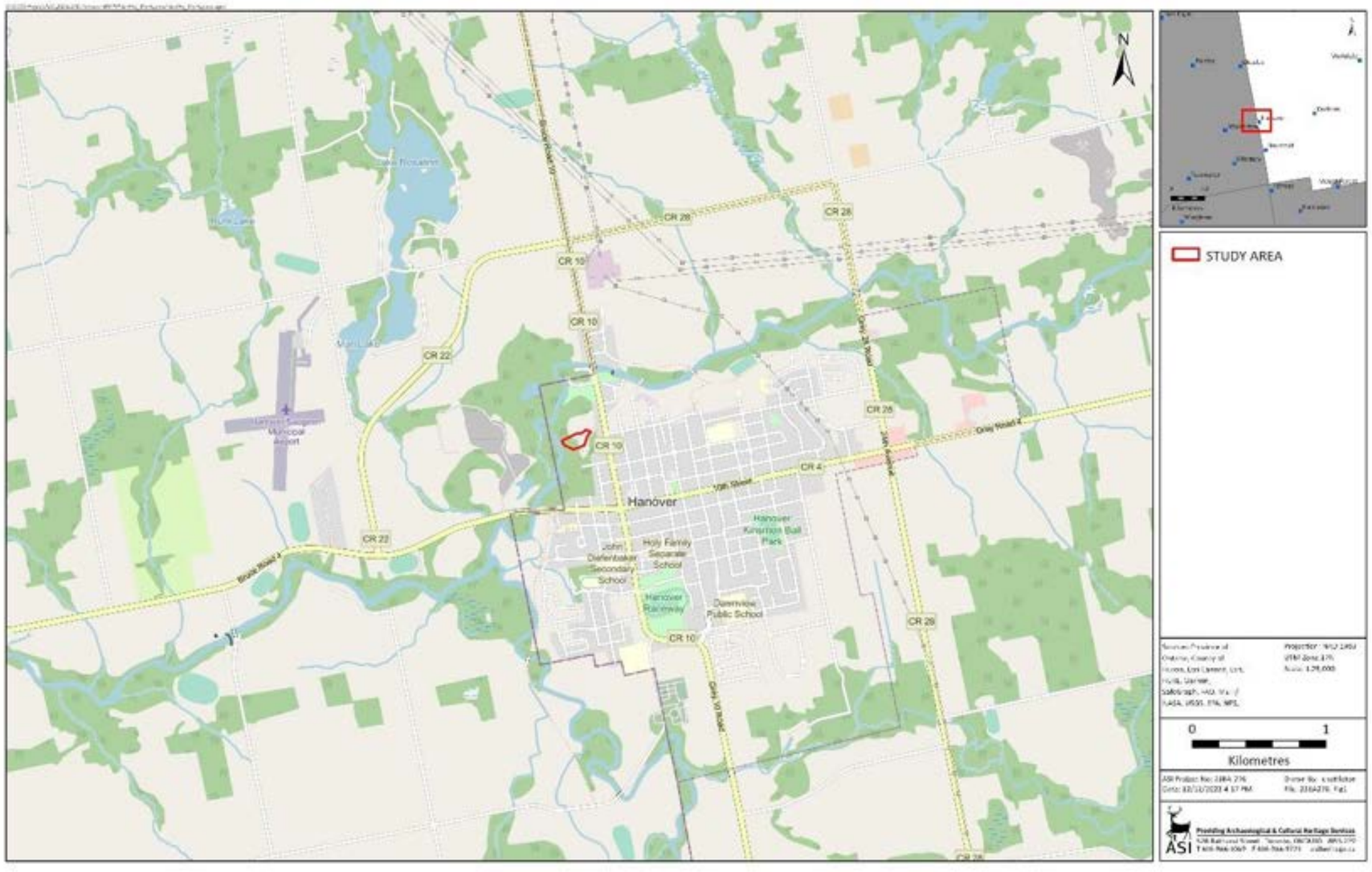


Figure 1: Location of the Study Area



Figure 2: Existing Conditions of the Study Area

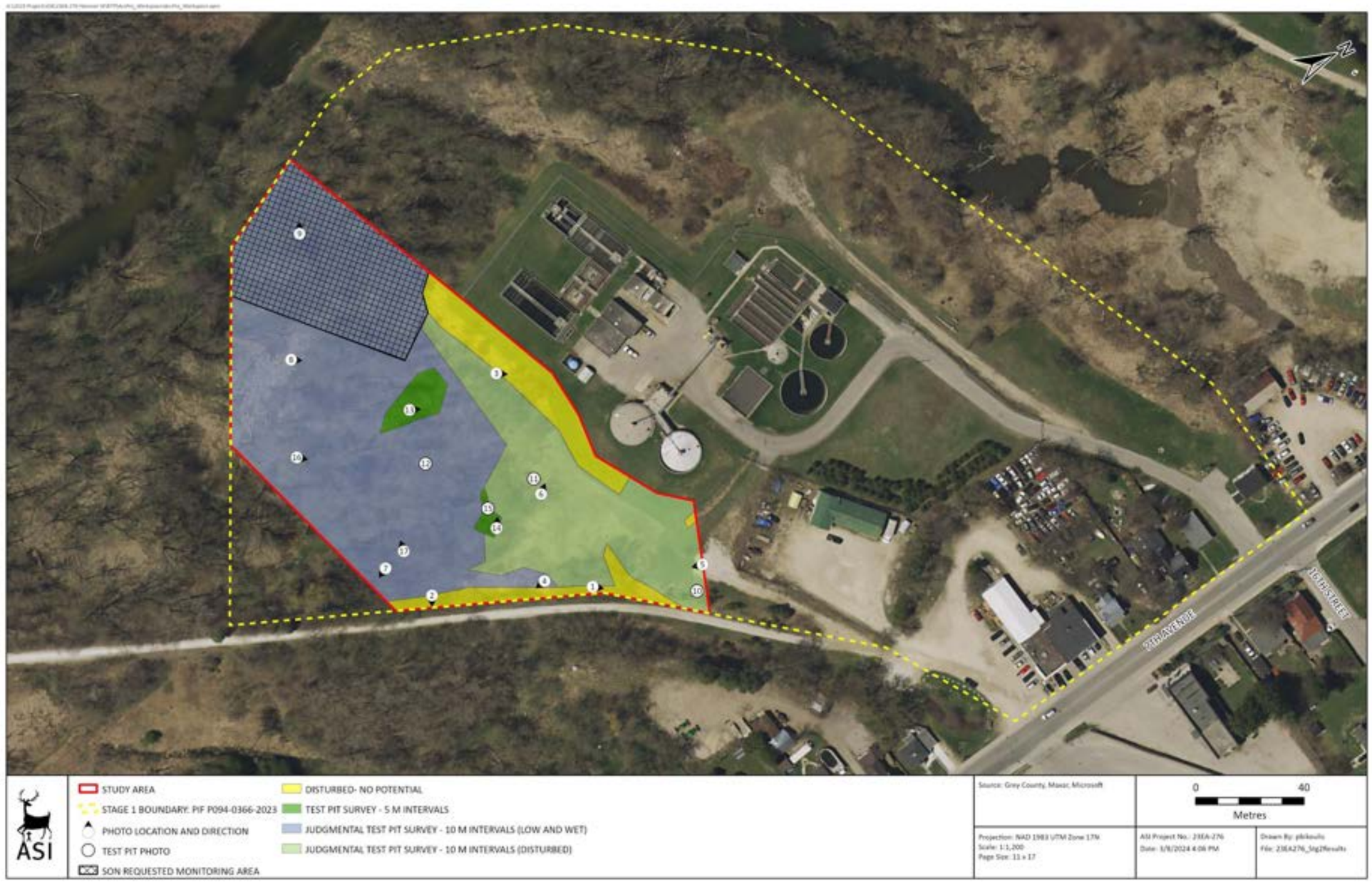


Figure 3: Stage 2 Archaeological Assessment Results for the Hanover Wastewater Treatment Plant project

Appendix F
Cultural Heritage Report

Cultural Heritage Report:
Existing Conditions and Preliminary Impact Assessment

Hanover Wastewater Treatment Plant
Municipal Class Environmental Assessment

Town of Hanover
Grey County, Ontario

Final Report

Prepared for:

Ainley Group
6299 Airport Road #205
Mississauga, ON L4V 1N3

Archaeological Services Inc. File: 22CH-107

September 2023 (revised June 2024)



Executive Summary

Archaeological Services Inc. was contracted by Ainley Group, on behalf of the Town of Hanover, to conduct a Cultural Heritage Report as part of the Hanover Wastewater Treatment Plant (W.W.T.P.) Municipal Class Environmental Assessment. The Environmental Assessment involves expansion to include additional wastewater treatment infrastructure and components (including construction of a leachate pumping station and forcemain) on the existing W.W.T.P. property as required to increase capacity. The project study area consists of the grounds of the Hanover W.W.T.P. plus a 50-metre buffer.

The purpose of this report is to present an inventory of known and potential built heritage resources and cultural heritage landscapes, identify existing conditions of the project study area, provide a preliminary impact assessment, and propose appropriate mitigation measures.

The results of background historical research and a review of secondary source material, including historical mapping, indicate a study area with an Indigenous land use history spanning millennia and a Euro-Canadian rural/suburban land use history dating back to the mid nineteenth century. A review of federal, provincial, and municipal registers, inventories, and databases revealed that there are no known built heritage resources (B.H.R.s) or known cultural heritage landscapes (C.H.L.s) in the Hanover W.W.T.P. study area. Seven potential B.H.R.s and three potential C.H.L.s were identified during the background information review and fieldwork.

Based on the results of the assessment, the following recommendations have been developed:

1. Construction activities and staging should be suitably planned and undertaken to avoid impacts to identified B.H.R.s and C.H.L.s.

2. Suitable mitigation including establishing no-go zones with fencing and issuing instructions to construction crews to avoid identified B.H.R.s and

C.H.L.s should be considered to mitigate any unintended impacts during construction.

3. As B.H.R. 2-7 and C.H.L. 3 are located within 50 metres of the proposed Hanover W.W.T.P. Expansion study area, construction related vibration impacts may occur as a result of their location within or adjacent to the proposed W.W.T.P. expansion area. To ensure the structures on the properties at 719 7th Avenue (B.H.R. 2), 713 7th Avenue (B.H.R. 3), 703 7th Avenue (B.H.R. 4), 722 7th Avenue (B.H.R. 5), 710 7th Avenue (B.H.R. 6), 702 7th Avenue (B.H.R. 7), and the 7th Avenue Streetscape between 664 and 590 7th Avenue (C.H.L. 3) are not adversely impacted during construction, a baseline vibration assessment should be undertaken during detailed design if construction is anticipated within 50 metres of any structures on these properties.

4. Should future work require an expansion of the study area then a qualified heritage consultant should be contacted in order to confirm the impacts of the proposed work on B.H.R.s and C.H.L.s.

5. This report should be submitted by the proponent to heritage staff at the Town of Hanover, the Ministry of Citizenship and Multiculturalism, and any other relevant stakeholder with an interest in this project.

Report Accessibility Features

This report has been formatted to meet the Information and Communications Standards under the *Accessibility for Ontarians with Disabilities Act*, 2005 (A.O.D.A.). Features of this report which enhance accessibility include: headings, font size and colour, alternative text provided for images, and the use of periods within acronyms. Given this is a technical report, there may be instances where additional accommodation is required in order for readers to access the report's information. If additional accommodation is required, please contact Annie Veilleux, Manager of the Cultural Heritage Division at Archaeological Services Inc., by email at aveilleux@asiheritage.ca or by phone 416-966-1069 ext. 255.

Project Personnel

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- **Field Review**: Leora Bebko, M.M.St., Cultural Heritage Technician, Technical Writer and Researcher – Cultural Heritage Division
- **Report Production**: Leora Bebko and John Sleath
- **Graphics Production**: Andrew Clish, B.E.S., Senior Archaeologist - Planning Assessment Division
- **Report Reviewer(s)**: John Sleath and Annie Veilleux

Qualified Persons Involved in the Project

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Senior Cultural Heritage Specialist, Manager - Cultural Heritage Division

The Senior Project Manager for this Cultural Heritage Report is **Annie Veilleux** (M.A., C.A.H.P.), who is a Senior Cultural Heritage Specialist and Manager of the Cultural Heritage Division. She was responsible for: overall project scoping and approach; development and confirmation of technical findings and study recommendations; application of relevant standards, guidelines and regulations; and implementation of quality control procedures. Annie is academically trained in the fields of cultural landscape theory, history, archaeology, and collections management and has over 15 years of experience in the field of cultural heritage resource management. This work has focused on the identification and evaluation of cultural heritage resources, both above and below ground. Annie has managed and conducted numerous built heritage and cultural heritage landscape assessments, heritage recordings and evaluations, and heritage impact assessments as required for Environmental Assessments and Planning projects throughout the Province of Ontario. Annie has extensive experience leading and conducting research for large-scale heritage planning studies, heritage interpretation programs, and projects requiring comprehensive public and Indigenous engagement programs. She is fully bilingual in English and French and has served as a French language liaison on behalf of Archaeological Services Inc. Annie is a member of the Ontario Archaeological Society, the National Trust for Canada, I.C.O.M.O.S. Canada, and I.A.P.2 Canada. She is also a professional member in good standing of the Canadian Association of Heritage Professionals.

John Sleath, M.A.
Cultural Heritage Specialist, Project Manager - Cultural Heritage Division

The Project Manager for this Cultural Heritage Report is **John Sleath** (M.A.), who is a Cultural Heritage Specialist and Project Manager within the Cultural Heritage Division with A.S.I. He was responsible for the day-to-day management activities, including scoping of research activities and site surveys and drafting of study

findings and recommendations. John has worked in a variety of contexts within the field of cultural heritage resource management for the past 14 years, as an archaeologist and as a cultural heritage professional. An exposure to both land-based and underwater archaeology and above ground cultural heritage assessments has provided John with a holistic understanding of heritage in a variety of contexts. In 2015 John began working in the Cultural Heritage Division researching and preparing a multitude of cultural heritage assessment reports and for which he was responsible for a variety of tasks including: completing archival research, investigating built heritage and cultural heritage landscapes, report preparation, historical map regression, and municipal consultation. Since 2018 John has been a project manager responsible for a variety of tasks required for successful project completion. This work has allowed John to engage with stakeholders from the public and private sector, as well as representatives from local municipal planning departments and museums. John has conducted hundreds of cultural heritage assessments across Ontario, with a focus on transit and rail corridor infrastructure including bridges and culverts.

Leora Bebko, M.M.St.
Cultural Heritage Technician, Technical Writer and Researcher - Cultural Heritage Division

One of the Cultural Heritage Technicians for this project is **Leora Bebko** (M.M.St.), who is a Cultural Heritage Technician and Technical Writer and Researcher within the Cultural Heritage Division. She was responsible for preparing and contributing research and technical reporting. In Leora's career as a cultural heritage and museum professional she has worked extensively in public programming and education within built heritage spaces. Leora is particularly interested in the ways in which our heritage landscapes can be used to facilitate public engagement and interest in our region's diverse histories. While completing her Master of Museum Studies she was able to combine her interest in heritage architecture and museums by focusing on the historic house museum and the accessibility challenges they face. As a thesis project, Leora co-curated the award-winning exhibit *Lost & Found: Rediscovering Fragments of Old Toronto* on the grounds of Campbell House Museum. Since completing her degree she has worked as a

historical interpreter in a variety of heritage spaces, learning a range of traditional trades and has spent considerable time researching heritage foodways and baking in historic kitchens. In 2022, she joined ASI's Cultural Heritage team as a Cultural Heritage Technician.

Glossary

Built Heritage Resource (B.H.R.)
Definition: "…a building, structure, monument, installation or any manufactured remnant that contributes to a property's cultural heritage value or interest as identified by a community, including an Indigenous community. Built heritage resources are located on property that may be designated under Parts IV or V of the *Ontario Heritage Act*, or that may be included on local, provincial, federal and/or international registers" (Ministry of Municipal Affairs and Housing, 2020, p. 41).

Cultural Heritage Landscape (C.H.L.)
Definition: "…a defined geographical area that may have been modified by human activity and is identified as having cultural heritage value or interest by a community, including an Indigenous community. The area may include features such as buildings, structures, spaces, views, archaeological sites or natural elements that are valued together for their interrelationship, meaning or association. Cultural heritage landscapes may be properties that have been determined to have cultural heritage value or interest under the *Ontario Heritage Act*, or have been included on federal and/or international registers, and/or protected through official plan, zoning by-law, or other land use planning mechanisms" (Ministry of Municipal Affairs and Housing, 2020, p. 42).

Known Built Heritage Resource or Cultural Heritage Landscape
Definition: A known built heritage resource or cultural heritage landscape is a property that has recognized cultural heritage value or interest. This can include a property listed on a Municipal Heritage Register, designated under Part IV or V of the *Ontario Heritage Act*, or protected by a heritage agreement, covenant or easement, protected by the *Heritage Railway Stations Protection Act or the Heritage Lighthouse Protection Act*, identified as a Federal Heritage Building, or located within a U.N.E.S.C.O. World Heritage Site (Ministry of Citizenship and Multiculturalism, 2016).

Impact
Definition: Includes negative and positive, direct and indirect effects to an identified built heritage resource and cultural heritage landscape. Direct impacts include destruction of any, or part of any, significant heritage attributes or features and/or unsympathetic or incompatible alterations to an identified resource. Indirect impacts include, but are not limited to, creation of shadows, isolation of heritage attributes, direct or indirect obstruction of significant views, change in land use, land disturbances (Ministry of Tourism Culture and Sport, 2006). Indirect impacts also include potential vibration impacts (See Section 2.5 for complete definition and discussion of potential impacts).

Mitigation
Definition: Mitigation is the process of lessening or negating anticipated adverse impacts to built heritage resources or cultural heritage landscapes and may include, but are not limited to, such actions as avoidance, monitoring, protection, relocation, remedial landscaping, and documentation of the cultural heritage landscape and/or built heritage resource if to be demolished or relocated (Ministry of Citizenship and Multiculturalism, 2006b).

Potential Built Heritage Resource or Cultural Heritage Landscape
Definition: A potential built heritage resource or cultural heritage landscape is a property that has the potential for cultural heritage value or interest. This can include properties/project area that contain a parcel of land that is the subject of a commemorative or interpretive plaque, is adjacent to a known burial site and/or cemetery, is in a Canadian Heritage River Watershed, or contains buildings or structures that are 40 or more years old (Ministry of Citizenship and Multiculturalism, 2016).

Significant
Definition: With regard to cultural heritage and archaeology resources, significant means “resources that have been determined to have cultural heritage value or interest. Processes and criteria for determining cultural heritage value or interest are established by the Province under the authority of the *Ontario Heritage Act.*

While some significant resources may already be identified and inventoried by official sources, the significance of others can only be determined after evaluation" (Ministry of Municipal Affairs and Housing, 2020, p. 51).

Vibration Zone of Influence

Definition: Area within a 50-metre buffer of construction-related activities in which there is potential to affect an identified built heritage resource or cultural heritage landscape. A 50-metre buffer is applied in the absence of a project-specific defined vibration zone of influence based on existing secondary source literature (Carman et al., 2012; Crispino & D'Apuzzo, 2001; P. Ellis, 1987; Rainer, 1982; Wiss, 1981). This buffer accommodates the additional threat from collisions with heavy machinery or subsidence (Randl, 2001).

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1.0 Introduction

Archaeological Services Inc. was contracted by Ainley Group, on behalf of the Town of Hanover, to conduct a Cultural Heritage Report as part of the Hanover Wastewater Treatment Plant (W.W.T.P.) Municipal Class Environmental Assessment. The purpose of this report is to present an inventory of known and potential built heritage resources and cultural heritage landscapes, identify existing conditions of the project study area, provide a preliminary impact assessment, and propose appropriate mitigation measures.

1.1 Project Overview

The Environmental Assessment involves expansion to include additional wastewater treatment infrastructure and components (including construction of a leachate pumping station and forcemain) on the existing W.W.T.P. property as required to increase capacity. The project study area consists of the grounds of the existing Hanover W.W.T.P. plus a 50-metre buffer.

1.2 Description of Study Area

This Cultural Heritage Report will focus on the project study area on the grounds of the existing Hanover W.W.T.P. with an additional 50 metre buffer (Figure 1). This project study area has been defined as inclusive of those lands that may contain built heritage resources or cultural heritage landscapes that may be subject to direct or indirect impacts as a result of the proposed undertaking. Properties within the study area are located in the Town of Hanover.



Figure 1: Location of the study area (Base Map: ©OpenStreetMap and contributors, Creative Commons-Share Alike License (C.C.-By-S.A.))

2.0 Methodology

The following sections provide a summary of regulatory requirements and municipal and regional heritage policies that guide this cultural heritage assessment. In addition, an overview of the process undertaken to identify known and potential built heritage resources (B.H.R.s) and cultural heritage landscapes (C.H.L.s) is provided, along with a description of how the preliminary impact assessment will be undertaken.

2.1 Regulatory Requirements

The *Ontario Heritage Act* (O.H.A.) (Ontario Heritage Act, R.S.O. c. O.18, 1990 [as Amended in 2021], 1990) is the primary piece of legislation that determines policies, priorities and programs for the conservation of Ontario's heritage. There are many other provincial acts, regulations and policies governing land use

planning and resource development that support heritage conservation, including:

- The *Planning Act* (Planning Act, R.S.O. 1990, c. P.13, 1990), which states that "conservation of features of significant architectural, cultural, historical, archaeological or scientific interest" is a "matter of provincial interest". The *Provincial Policy Statement* (Ministry of Municipal Affairs and Housing, 2020), issued under the *Planning Act*, links heritage conservation to long-term economic prosperity and requires municipalities and the Crown to conserve significant built heritage resources and cultural heritage landscapes.

- The *Environmental Assessment Act* (Environmental Assessment Act, R.S.O. c. E.18, 1990), which defines "environment" to include cultural conditions that influence the life of humans or a community. Cultural heritage resources, which includes archaeological resources, built heritage resources and cultural heritage landscapes, are important components of those cultural conditions.

The Ministry of Citizenship and Multiculturalism (hereafter "The Ministry") is charged under Section 2.0 of the O.H.A. with the responsibility to determine policies, priorities, and programs for the conservation, protection, and preservation of the heritage of Ontario. The *Standards and Guidelines for Conservation of Provincial Heritage Properties* (Ministry of Citizenship and Multiculturalism, 2010) (hereinafter "*Standards and Guidelines")* apply to properties the Government of Ontario owns or controls that have "cultural heritage value or interest" (C.H.V.I.). The *Standards and Guidelines* provide a series of guidelines that apply to provincial heritage properties in the areas of identification and evaluation; protection; maintenance; use; and disposal. For the purpose of this report, the *Standards and Guidelines* provide points of reference to aid in determining potential heritage significance in the identification of built heritage resources and cultural heritage landscapes. While not directly applicable for use in properties not under provincial ownership, the *Standards and*

Guidelines are regarded as best practice for guiding heritage assessments and ensure that additional identification and mitigation measures are considered.

Similarly, the *Ontario Heritage Tool Kit* (Ministry of Citizenship and Multiculturalism, 2006a) provides a guide to evaluate heritage properties. To conserve a B.H.R. or C.H.L., the *Ontario Heritage Tool Kit* states that a municipality or approval authority may require a heritage impact assessment and/or a conservation plan to guide the approval, modification, or denial of a proposed development.

2.2 Municipal/Regional Heritage Policies

The study area is located within the Town of Hanover, in the County of Grey. Policies relating to B.H.R.s and C.H.L.s were reviewed from the following sources:

- *Town of Hanover Official Plan* (Town of Hanover, 2016)
- *Recolour Grey – County of Grey Official Plan* (County of Grey, 2019)

2.3 Identification of Built Heritage Resources and Cultural Heritage Landscapes

This Cultural Heritage Report follows guidelines presented in the *Ontario Heritage Tool Kit* (Ministry of Citizenship and Multiculturalism, 2006a) and *Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes* (Ministry of Citizenship and Multiculturalism, 2016). The objective of this report is to present an inventory of and a preliminary understanding of known and potential B.H.R.s and C.H.L.s located within areas anticipated to be directly or indirectly impacted by the proposed project.

In the course of the cultural heritage assessment process, all potentially affected B.H.R.s and C.H.L.s are subject to identification and inventory. Generally, when conducting an identification of B.H.R.s and C.H.L.s within a study area, three stages of research and data collection are undertaken to appropriately establish

the potential for and existence of B.H.R.s and C.H.L.s in a geographic area: background research and desktop data collection; field review; and identification.

Background historical research, which includes consultation of primary and secondary source research and historical mapping, is undertaken to identify early settlement patterns and broad agents or themes of change in a study area. This stage in the data collection process enables the researcher to determine the presence of sensitive heritage areas that correspond to nineteenth- and twentieth-century settlement and development patterns. To augment data collected during this stage of the research process, federal, provincial, and municipal databases and/or agencies are consulted to obtain information about specific properties that have been previously identified and/or designated as having cultural heritage value. Typically, resources identified during these stages of the research process are reflective of particular architectural styles or construction methods, associated with an important person, place, or event, and contribute to the contextual facets of a particular place, neighbourhood, or intersection.

A field review is then undertaken to confirm the location and condition of previously identified B.H.R.s and C.H.L.s. The field review is also used to identify potential B.H.R.s and C.H.L.s that have not been previously identified on federal, provincial, or municipal databases or through other appropriate agency data sources.

During the cultural heritage assessment process, a property is identified as a potential B.H.R.s and C.H.L.s based on research, the Ministry screening tool, and professional expertise and best practice. In addition, use of a 40-year-old benchmark is a guiding principle when conducting a preliminary identification of B.H.R.s and C.H.L.s. While identification of a resource that is 40 years old or older does not confer outright heritage significance, this benchmark provides a means to collect information about resources that may retain heritage value. Similarly, if a resource is slightly younger than 40 years old, this does not preclude the resource from having cultural heritage value or interest.

2.4 Background Information Review

To make an identification of previously identified known or potential B.H.R.s and C.H.L.s within the study area, the following sections present the resources that were consulted as part of this Cultural Heritage Report.

2.4.1 Review of Existing Heritage Inventories

A number of resources were consulted in order to identify previously identified B.H.R.s and C.H.L.s within the study area. These resources, reviewed on 11 September 2023, include:

- Historical maps (including historical atlases, topographic maps, and aerial photography);
- The *Ontario Heritage Act Register* (Ontario Heritage Trust, n.d.b);
- The *Places of Worship Inventory* (Ontario Heritage Trust, n.d.c);
- The inventory of Ontario Heritage Trust easements (Ontario Heritage Trust, n.d.a);
- The Ontario Heritage Trust's *An Inventory of Provincial Plaques Across Ontario*: a PDF of Ontario Heritage Trust Plaques and their locations (Ontario Heritage Trust, 2023);
- The Ontario Heritage Trust's *An Inventory of Ontario Heritage Trust-owned properties across Ontario*: a PDF of properties owned by the Ontario Heritage Trust (Ontario Heritage Trust, 2019);
- Inventory of known cemeteries/burial sites in the Ontario Genealogical Society's online databases (Ontario Genealogical Society, n.d.);
- Canada's Historic Places website: available online, the searchable register provides information on historic places recognized for their heritage value at the local, provincial, territorial, and national levels (Parks Canada, n.d.a);
- Directory of Federal Heritage Designations: a searchable on-line database that identifies National Historic Sites, National Historic Events,

National Historic People, Heritage Railway Stations, Federal Heritage Buildings, and Heritage Lighthouses (Parks Canada, n.d.b);

- Canadian Heritage River System: a national river conservation program that promotes, protects and enhances the best examples of Canada's river heritage (Canadian Heritage Rivers Board and Technical Planning Committee, n.d.); and,
- United Nations Educational, Scientific and Cultural Organization (U.N.E.S.C.O.) World Heritage Sites (U.N.E.S.C.O. World Heritage Centre, n.d.).

2.4.2 Review of Previous Heritage Reporting

No previous heritage reporting was available for review at the time of report submission.

2.4.3 Community Information Gathering

The following individuals, groups, and/or organizations were contacted to gather information on known and potential B.H.R.s and C.H.L.s, active and inactive cemeteries, and areas of identified Indigenous interest within the study area:

- Sandeep Kaur, Planning/Administrative Coordinator, Town of Hanover (email communication 25 September and 6 and 16 October 2023). Email correspondence requested information on any listed or Part IV designated properties within the study area. A response confirmed that no properties within the study area are listed, designated, or have been justified as potential cultural heritage properties.
- The Ministry of Citizenship and Multiculturalism (email communication 25 and 29 September 2023). A response confirmed that there are no properties designated by the Minister and they were not aware of any Provincial Heritage Properties within or adjacent to the study area.

- The Ontario Heritage Trust (email communication 25 September and 6 October 2023). A response confirmed that the study area does not contain any properties subject to a Trust easement or Trust ownership.

2.4.4 Community Engagement

Indigenous Nations Engagement for this project is being completed by Cambium Indigenous Professional Services on behalf of the Town of Hanover to Indigenous Nations that have an interest in this study area. The Notice of Commencement for the Environmental Assessment was sent to Chippewas of Nawash Unceded First Nation, Saugeen First Nation, Saugeen Ojibway Nation Environment Office, Historic Saugeen Métis, and Great Lakes Métis Council (Ainley Group email communication 26 September 2023). These groups will be provided the opportunity to review the draft Cultural Heritage Report, and any feedback or additional information received will be incorporated into the final report.

2.5 Preliminary Impact Assessment Methodology

To assess the potential impacts of the undertaking, identified B.H.R.s and C.H.L.s are considered against a range of possible negative impacts, based on the *Ontario Heritage Tool Kit InfoSheet #5: Heritage Impact Assessments and Conservation Plans* (Ministry of Tourism Culture and Sport, 2006). These include:

Direct impacts:

- Destruction of any, or part of any, significant heritage attributes or features; and
- Alteration that is not sympathetic, or is incompatible, with the historic fabric and appearance.

Indirect impacts:

- Shadows created that alter the appearance of a heritage attribute or change the viability of a natural feature or plantings, such as a garden;

- Isolation of a heritage attribute from its surrounding environment, context or a significant relationship;
- Direct or indirect obstruction of significant views or vistas within, from, or of built and natural features;
- A change in land use such as rezoning a battlefield from open space to residential use, allowing new development or site alteration to fill in the formerly open spaces; and
- Land disturbances such as a change in grade that alters soils, and drainage patterns that adversely affect an archaeological resource.

Indirect impacts from construction-related vibration have the potential to negatively affect B.H.R.s and C.H.L.s depending on the type of construction methods and machinery selected for the project and proximity and composition of the identified resources. Potential vibration impacts are defined as having potential to affect an identified B.H.R.s and C.H.L.s where work is taking place within 50 metre of features on the property. A 50 metre buffer is applied in the absence of a project-specific defined vibration zone of influence based on existing secondary source literature (Carman et al., 2012; Crispino & D'Apuzzo, 2001; P. Ellis, 1987; Rainer, 1982; Wiss, 1981). This buffer accommodates any additional or potential threat from collisions with heavy machinery or subsidence (Randl, 2001).

Several additional factors are also considered when evaluating potential impacts on identified B.H.R.s and C.H.L.s. These are outlined in a document set out by the Ministry of Culture and Communications (now Ministry of Citizenship and Multiculturalism) and the Ministry of the Environment entitled *Guideline for Preparing the Cultural Heritage Resource Component of Environmental Assessments* (1992). While this document has largely been superseded in some respects by more current policies and legislation, the guidance provided that continues to be of relevance to this specific project includes the following definitions:

- Magnitude: the amount of physical alteration or destruction which can be expected;
- Severity: the irreversibility or reversibility of an impact;
- Duration: the length of time an adverse impact persists;
- Frequency: the number of times an impact can be expected;
- Range: the spatial distribution, widespread or site specific, of an adverse impact; and
- Diversity: the number of different kinds of activities to affect a heritage resource.

The proposed undertaking should endeavor to avoid adversely affecting known and potential B.H.R.s and C.H.L.s and interventions should be managed in such a way that identified features are conserved. When the nature of the undertaking is such that adverse impacts are unavoidable, it may be necessary to implement alternative approaches or mitigation strategies that alleviate the negative effects on identified built heritage resources and cultural heritage landscapes. Mitigation is the process of lessening or negating anticipated adverse impacts and may include, but are not limited to, such actions as avoidance, monitoring, protection, relocation, remedial landscaping, and documentation of the B.H.R.s and C.H.L.s if to be demolished or relocated.

Various works associated with infrastructure improvements have the potential to affect B.H.R.s and C.H.L.s in a variety of ways, and as such, appropriate mitigation measures for the undertaking need to be considered.

3.0 Summary of Historical Development Within the Study Area

This section provides a brief summary of historical research. A review of available primary and secondary source material was undertaken to produce a contextual overview of the study area, including a general description Indigenous land use and Euro-Canadian settlement.

3.1 Indigenous Land Use and Settlement

Current archaeological evidence demonstrates that humans were present in Southern Ontario approximately 13,000 years before present (B.P.) (Ferris, 2013). Archaeological evidence of the Paleo period, beginning approximately 13,000 years B.P., demonstrates that populations at this time would have been highly mobile, inhabiting a boreal-parkland similar to the modern sub-arctic. By approximately 10,000 B.P. the environment had progressively warmed (Edwards & Fritz, 1988) and populations now occupied less extensive territories (C. J. Ellis & Deller, 1990).

Between approximately 10,000-5,500 B.P., the Great Lakes basins experienced low-water levels, and many sites which would have been located on those former shorelines are now submerged. This period produces the earliest evidence of heavy wood working tools, an indication of greater investment of labour in felling trees for fuel, to build shelter, and watercraft production. These activities suggest prolonged seasonal residency at occupation sites. Polished stone and native copper implements were being produced by approximately 8,000 B.P.; the latter was acquired from the north shore of Lake Superior, evidence of extensive exchange networks throughout the Great Lakes region. The earliest evidence for cemeteries dates to approximately 4,500-3,000 B.P. and is indicative of increased social organization and investment of labour into social infrastructure (Brown, 1995, p. 13; C. J. Ellis et al., 1990, 2009).

Between 3,000-2,500 B.P., populations continued to practice residential mobility and to harvest seasonally available resources, including spawning fish. The Woodland period begins around 2,500 B.P. and exchange and interaction networks broaden at this time (Spence et al., 1990, pp. 136, 138) and by approximately 2,000 B.P., evidence exists for small community camps, focusing on the seasonal harvesting of resources (Spence et al., 1990, pp. 155, 164). By 1,500 B.P. there is macro botanical evidence for maize in southern Ontario, and it is thought that maize only supplemented people's diet. There is earlier phytolithic evidence for maize in central New York State by 2,300 B.P. – it is likely that once

similar analyses are conducted on Ontario ceramic vessels of the same period, the same evidence will be found (Birch & Williamson, 2013, pp. 13–15). As is evident in detailed Anishinaabeg ethnographies, winter was a period during which some families would depart from the larger group as it was easier to sustain smaller populations (Rogers, 1962). It is generally understood that these populations were Algonquian-speakers during these millennia of settlement and land use.

From the beginning of the Late Woodland period at approximately 1,000 B.P., lifeways became more similar to that described in early historical documents. Between approximately 1000-1300 Common Era (C.E.), village sites focused on horticulture increased in the archaeological record while the seasonal disintegration of the community for the exploitation of a wider territory and more varied resource base was still practised by some (Williamson, 1990, p. 317). By 1300-1450 C.E., archaeological research focusing on these horticultural societies note that this episodic community disintegration was no longer practised and these populations now communally occupied sites throughout the year (Dodd et al., 1990, p. 343). By the mid-sixteenth century these small villages had coalesced into larger communities (Birch et al., 2021). Through this process, the socio-political organization of these First Nations, as described historically by the French and English explorers who first visited southern Ontario, was developed. Other First Nation communities continued to practice residential mobility and to harvest available resources across landscapes they returned to seasonally/annually.

By 1600 C.E., the Huron-Wendat were encountered by the first European explorers and missionaries in Simcoe County. Samuel de Champlain in 1615 reported that a group of Iroquoian-speaking people situated between the warring Haudenosaunee and Huron-Wendat were at peace with both groups and remained “la nation neutre” in the conflict. Like the Huron-Wendat, Petun, and Haudenosaunee, the Neutral or Attawandaron people were settled village agriculturalists. In the 1640s, the Attawandaron and the Huron-Wendat (and their Algonquian allies such as the Nippissing and Odawa) were decimated by epidemics and ultimately dispersed by the Haudenosaunee. Shortly afterwards, the Haudenosaunee established a series of settlements at strategic locations

along the trade routes inland from the north shore of Lake Ontario. By the 1690s however, the Anishinaabeg were the only communities with a permanent presence in southern Ontario. From the beginning of the eighteenth century to the assertion of British sovereignty in 1763, there was no interruption to Anishinaabeg control and use of southern Ontario.

The arrival of European trade goods in the sixteenth century, Europeans themselves in the seventeenth century, and increasing settlement efforts in the eighteenth century all significantly impacted traditional ways of life in Southern Ontario. Over time, war and disease contributed to death, dispersion, and displacement of many Indigenous peoples across the region. The Euro-Canadian population grew in both numbers and power through the eighteenth and nineteenth centuries and treaties between colonial administrators and First Nations representatives began to be negotiated.

The study area is located in the traditional territory of the Saugeen Ojibway Nation (S.O.N.), the collective name for the Saugeen Ojibway First Nation and the Chippewas of Nawash Unceded First Nation, known as *Saukiing Anishnaabekiing*. *Saukiing Anishnaabekiing* includes the Saugeen Peninsula (or Bruce Peninsula), the waters and islands of Lake Huron and Georgian Bay surrounding the Saugeen Peninsula, and extends south to include the Maitland River watershed and east to include the Nottawasaga River watershed in part of Grey, Bruce, Huron, Perth, Wellington, Dufferin, and Simcoe Counties (Saugeen Ojibway Nation, 2011).

The study area is within the Saugeen Tract Purchase treaty, which was agreed upon on August 9, 1836 along with Treaty 45 (Treaty of Manitowaning/Manitoulin Island Treaty). The treaty covers land of the Saugeen Ojibway Nation's traditional territory. The treaty was signed by representatives of the Crown and Anishinaabek leaders in Manitowaning during an annual distribution of gifts for Indigenous peoples (Ministry of Indigenous Affairs, 2022). In exchange for the 1.5 million acres the Crown was to provide economic assistance in the form of housing and the means to cultivate land as well as protection from white settlers' encroachment onto their lands. The land covered by Treaty 45 ½ extends from

the town of Arthur in the southeast to approximately the town of Kingsbridge on Lake Huron to the southwest, then north to Southampton in the northwest and across to the northwestern corner of the former Sydenham Township on Georgian Bay in the northeast (Ministry of Indigenous Affairs, 2020; *Treaty History | Saugeen Ojibway Nation Environment Office*, no date).

With the signing of the 1818 Lake Simcoe-Nottawasaga Treaty 18 and the 1836 "Saugeen Tract Agreement" Treaty 45 ½, Ojibway chiefs granted the Crown approximately 1.5 million acres of land south of the Peninsula in an effort to secure a land base on Manitoulin Island along the shores of Lake Huron and southern Georgian Bay (Crown-Indigenous Relations and Northern Affairs, 2016). In exchange for the land surrendered under Treaty 45 ½, the Crown promised to protect the Saugeen Peninsula forever (Saugeen Ojibway Nation, 2021b).

The Saugeen continued using their traditional territory for hunting, medicine gathering, sugaring camps and fish spawning. Euro-Canadian settlement continued to encroach upon the Peninsula and in 1847 Queen Victoria issued a Royal Declaration to support the rights of the Saugeen Ojibway Nation. The Declaration also established strict rules for the purchase and surrender of Indigenous lands in Canada and confirmed that the Bruce Peninsula belonged to the Saugeen Ojibway Nation. Additional acts were passed in 1850 and 1851 to protect lands from squatters and loggers, such as the 1851 Half Mile Strip Treaty 67 which surrendered over 4,000 acres for the Crown to build a road joining Owen Sound and Southampton (Saugeen Ojibway Nation, 2021a). These documents did little to stem the tide of Euro-Canadian settlement.

In 1994 a claim was submitted to the Crown arguing that Treaty 72 was not valid as the Crown had not fulfilled its duty to the Saugeen Ojibway Nation and Chippewas of Nawash Unceded First Nation to protect them from the effects of colonization and that they were misled by the Crown during negotiations for Treaty 72 (Olthuis Kleer Townshend L.L.P., 2021). In 2003 the Saugeen Ojibway Nation and the Chippewas of Nawash Unceded First nation subsequently filed a joint claim for Aboriginal Title to portions of Lake Huron and Georgian Bay

(Olthuis Kleer Townshend L.L.P., 2021). The trial addressing these claims began in 2019 and a decision was reached in 2021 (Olthuis Kleer Townshend L.L.P., 2021). The court rejected S.O.N.'s Aboriginal Title claim but agreed that the Crown breached its honour by failing to uphold its promise to protect the Saugeen Peninsula forever.

3.2 Historical Euro-Canadian Township Survey and Settlement

The first Europeans to arrive in the area were transient merchants and traders from France and England, who followed Indigenous pathways and set up trading posts at strategic locations along the well-traveled river routes. All of these occupations occurred at sites that afforded both natural landfalls and convenient access, by means of the various waterways and overland trails, into the hinterlands. Early transportation routes continued the use of existing Indigenous trails that typically followed the highlands adjacent to various creeks and rivers (Archaeological Services Inc., 2006). Early European settlements occupied similar locations as Indigenous settlements as they were generally accessible by trail or water routes and would have been in locations with good soil and suitable topography to ensure adequate drainage.

Throughout the period of initial European settlement, Indigenous groups continued to inhabit Southern Ontario, and continued to fish, gather, and hunt within their traditional and treaty territories, albeit often with legal and informal restrictions imposed by colonial authorities and settlers. In many cases, Indigenous peoples acted as guides and teachers, passing on their traditional knowledge to Euro-Canadian settlers, allowing them to sustain themselves in their new homes. Indigenous peoples entered into economic arrangements and partnerships, and often inter-married with settlers. However, pervasive and systemic oppression and marginalization of Indigenous peoples also characterized Euro-Canadian colonization, with thousands being displaced from their lands, denied access to traditional and treaty hunting, fishing, and collecting grounds,

and forced to assimilate with Euro-Canadian culture through mandatory attendance at Day and Residential Schools (Ray, 2005; Rogers & Smith, 1994).

Historically, the study area is located in the Township of Brant, County of Bruce in Lots 73 and 74, Concession 1 North of Durham Road.

3.2.1 Township of Brant

Brant Township, named for Mohawk Chief Joseph Brant, was first Surveyed in 1848 by surveyor A.P. Brough. The first lots in Concessions 1 and 2 north and south of Durham Road were offered as free land grants the following spring and summer. The first settlers in the region settled in 1849 on land that would become the Town of Walkerton. The first mill in the Township was constructed by Joseph Walker, founder of the Town of Walkerton. The Saugeen River and its many tributaries flow through the Township providing excellent irrigation for farmlands and power for many mills and industries (Bruce County Genealogical Society, 2021b; Mika & Mika, 1977).

Until 1854, Brant was part of a municipal union of the Townships in Bruce County until it joined with Carrick Township to form a separate municipality. Two years later, the Township became its own municipality with Joseph Walker as Reeve. The first church in the Township was constructed in 1852. Develop was swift in the area and by 1857 the Township boasted 12 taverns. Walkerton developed particularly quickly, incorporating as a town in 1871 without first incorporating as a village. A notable resident of Brant Township is Robert Sutherland, Ontario's first lawyer of African ancestry who practices as a barrister and attorney in Walkerton (Bruce County Genealogical Society, 2021b; Mika & Mika, 1977).

In 1999, Brant and Greenock Townships joined with the Town of Walkerton to form a new municipality called Brockton, a portmanteau of three names. Today, agriculture and tourism are two of the most important industries in the area (Bruce County Genealogical Society, 2021b; Bruce County Museum & Cultural Centre, 2023; Mika & Mika, 1977).

3.2.2 Town of Hanover

The first settler of the land that would become Hanover was Abraham Buck who arrived in 1859. He and another early settler, Mr. Jasper, settled on the Saugeen River at the site of the future Canadian Pacific Railway station. The settlement was first called Buck's Crossing or Buck's Bridge for Mr. Buck who also became the settlement's first innkeeper. In 1854, a grist and sawmill had been constructed and proposal were made for a new village plan. Two years later, in 1856, the first post office was opened under the name Hanover. The first Postmaster was storekeeper A.Z. Gottwals (Mika & Mika, 1981; Town of Hanover, n.d.; Welch & Payne, 2015).

The town's reputation as a local centre for manufacturing began in the 1860s with the opening of a tannery, a furniture company, and a foundry. In 1866, the Knechtel furniture factory opened, and the industry soon became essential to the town's prosperity. So many people were employed by the furniture industry, as the factories and mills, that the community earned the nickname "Slabtown" (Mika & Mika, 1981; Town of Hanover, n.d.; Welch & Payne, 2015).

By 1880, Hanover's population reached 1,200 and in 1904 it incorporated as a town. In 1920, Hanover was known as "The Furniture Capital of Canada", however by the late twentieth century the manufacturing industry had begun to decline. Today, the town's major industries include light manufacturing and food processing (Mika & Mika, 1981; Town of Hanover, n.d.; Welch & Payne, 2015).

3.2.3 Saugeen River

The Saugeen River system is the third longest river system in southern Ontario, measuring approximately 198 kilometres in length. The river flows from the headwaters in Dundalk and empties into Lake Huron at the Town of Southampton, flowing through Bruce, Dufferin, Grey, Huron, and Wellington Counties. Altogether, the Saugeen River watershed covers 4,675 kilometres squared and is overseen by the Saugeen Conservation Authority (Saugeen Conservation, 2022).

Historically, the Saugeen River has served as an important transportation route and food source for the Indigenous communities who inhabited the Bruce Peninsula centuries before the arrival of Europeans, including the Saugeen Ojibway Nation (S.O.N.) who share a name with the river. Early European settlers used the river as a trade route and as a means of traveling to the northern townships where access by road or inland trails was often difficult or impossible. As settlers claimed the land on the banks of the river, it became an important power source to numerous mills and industries. Today, the Saugeen River continues to be important to local communities and visitors and is a popular destination for outdoor recreational activities including canoeing/kayaking, fishing, hiking, and camping (Barkwell, 2007; Bruce County Genealogical Society, 2021a; Saugeen Conservation, 2023).

3.3 Review of Historical Mapping

The 1855 Rankin *Map of the Counties of Grey and Bruce* (Rankin, 1855) and the 1880 *Illustrated Historical Atlas of the Counties of Grey and Bruce* (Belden, 1880), were examined to determine the presence of historical features within the study area during the nineteenth century (Figure 2 and Figure 3). Historically, the study area is located on Lots 73-74, Concession 1 North of Durham Road in the Township of Brant, County of Bruce.

It should be noted, however, that not all features of interest were mapped systematically in the Ontario series of historical atlases. For instance, they were often financed by subscription limiting the level of detail provided on the maps. Moreover, not every feature of interest would have been within the scope of the atlases. The use of historical map sources to reconstruct or predict the location of former features within the modern landscape generally begins by using common reference points between the various sources. The historical maps are geo-referenced to provide the most accurate determination of the location of any property on a modern map. The results of this exercise can often be imprecise or even contradictory, as there are numerous potential sources of error inherent in

such a process, including differences of scale and resolution, and distortions introduced by reproduction of the sources.

The 1855 Rankin *Map of the Counties of Grey and Bruce* shows very little detail. Bruce Road 10 is depicted as a historically surveyed road that forms the boundary between the Counties Grey and Bruce. The Saugeen River is also depicted following its present-day alignment. The 1880 *Illustrated Historical Atlas of the Counties of Grey and Bruce* considerably more detail. The settlement of Hanover is shown in town lots, which extend northward to the study area on the east side of Bruce Road 10. Bruce Road 10 continues to be depicted as the County line between Grey and Bruce Counties. The Dover, Stratford and Lake Huron Railway is shown running following the southeastern boundary of the future wastewater treatment plant site, following the alignment of the present-day Hanover Community Trail.

In addition to nineteenth-century mapping, historical topographic mapping and aerial photographs from the twentieth century were examined. This report presents maps and aerial photographs from 1946 (Department of National Defence, 1946), 1954 (Hunting Survey Corporation Limited, 1954), and 2006 (Grey County, 2023)(Figure 4 to Figure 6).

The 1946 topographic map of Walkerton (Figure 4) shows some development in the study area. A structure is depicted in the centre of the study area (representing part of the subject W.W.T.P., which had been constructed in 1934) and several more along the west side of Bruce Road 10 within the study area. A road is depicted from Bruce Road 10 to the structure at the centre of the study area, following a similar alignment to the wastewater treatment plant driveway. An unused road is also depicted following a north-south alignment extending north from present-day alignment of 5th Avenue into the southern end of the study area. Several more structures are shown on the east side of Bruce Road 10. A large structure occupies the location of the present-day milling facility. A “Power House” is indicated north of the study area. This is likely referring to the large structure just west of Bruce Road 10, to the north of the study area. The rail

line at the south end of the study area is labeled in this mapping as belonging to Canadian National Railways. The 1954 aerial photograph (Figure 5) shows very little detail. The area in the centre of the study area appears to be cleared of trees and several small roads or pathways are discernable crossing the study area.

The 2006 aerial photograph (Figure 6) depicts the Hanover W.W.T.P. in clear detail. The subject property appears to feature all infrastructure and components required to process wastewater that were visible at the time of field review (15 August 2023), with settling ponds, clarifiers, digesters, pumps and piping, and related infrastructures and buildings. The Saugeen River to the east is depicted in a similar alignment to earlier mapping, the milling facility is depicted to the north, and the former rail line in the southeast of the study area appears to have been abandoned an in use as a recreational trail. To the southeast of the recreational trail are residences fronting on Bruce Road 10. Other structures on Bruce Road 10 appear to be consistent with those encountered during field review. Overall, the 2006 aerial photograph depicts the study area at the northwest boundary of the Town of Hanover, with the Saugeen River and associated woodlands immediately to the west and rural agricultural areas further west.

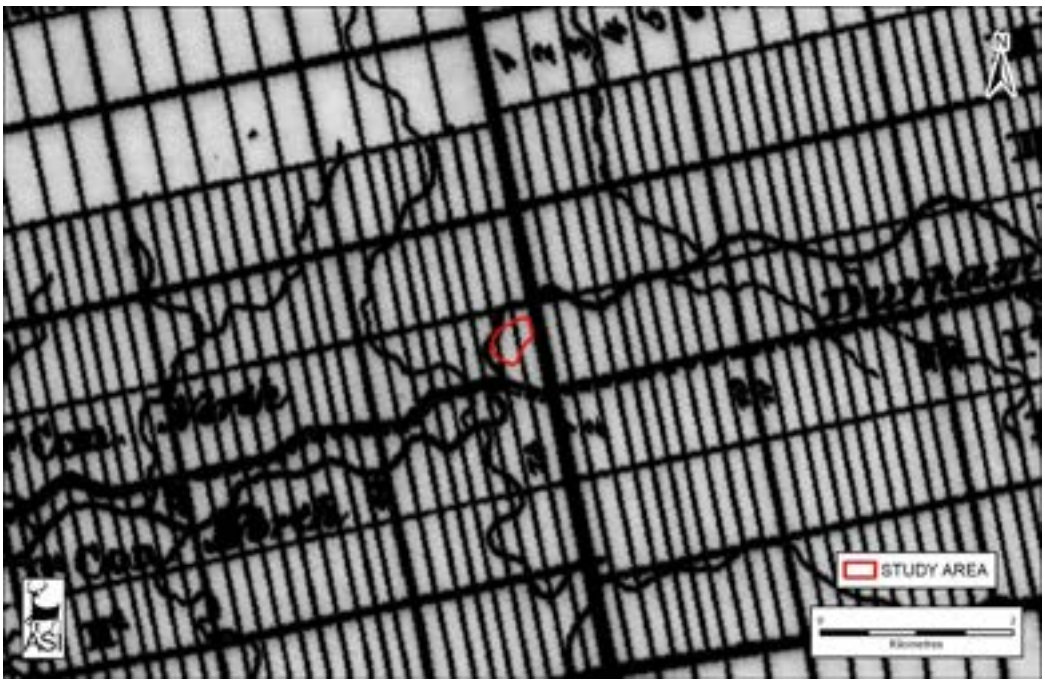


Figure 2: The study area overlaid on the 1855 Rankin *Map of the Counties of Grey and Bruce* (Base Map: Rankin, 1855).



Figure 3: The study area overlaid on the 1880 *Illustrated Historical Atlas of the Counties of Grey and Bruce* (Base Map: Belden, 1880).



Figure 4: The study area overlaid on the 1946 topographic map of Walkerton (Base Map: Department of National Defence, 1946).



Figure 5: The study area overlaid on the 1954 aerial photograph (Base Map: Hunting Survey Corporation Limited, 1954).



Figure 6: The study area overlaid on the 2006 aerial photograph (Base Map: Grey County Open Data, Grey County, 2023).

4.0 Existing Conditions

A field review of the study area was undertaken by Leora Bebko of Archaeological Services Incorporated (A.S.I.), on 15 August 2023 to document the existing conditions of the study area from existing rights-of-way. The existing conditions of the study area are described below and captured in Plate 1 to Plate 15. A site plan depicting the various components of the W.W.T.P. is included in Appendix A.

4.1 Description of Field Review

The study area consists of a wastewater treatment plant and its surrounding area, the study area is bounded by 7th Avenue (Bruce Road 10) to the east, the Hanover Community Trail to the south and roughly by the Saugeen River and Hover Park to the west and north.

The Hanover Wastewater Treatment Plant (W.W.T.P.) at 718 7th Avenue is accessed by a long driveway on the west side of 7th Avenue/Bruce Road 10. There are small structures on either side of the driveway, just west of 7th Avenue/Bruce Road 10 (Plate 1 and Plate 2). The W.W.T.P. contains a large domed biosolids storage tank, main control buildings, four open-air cisterns, several open-air aeration and settling tanks, and a number of outbuildings and other infrastructure supporting the wastewater treatment operations. The driveway extends into the centre of the facility, allowing vehicular access to the site (Plate 3 to Plate 6). The facility is contained within a high chain-link fence. One small structure is located outside the fence, at the southeast end of the site (Plate 7).

A gravel access road branches off from the driveway near the gate and runs along the north side of the property right outside the fence line (Plate 8). The access road extends approximately 500 metres from the driveway terminating in a small clearing (Plate 9). The clearing contains some detritus including a large snowplough attachment (Plate 10). On the north and west sides of the access road and clearing is a marshy wooded area and the Saugeen River (Plate 11).

7th Avenue/Bruce Road 10 runs along the east side of the study area, and is a two-lane paved road that follows a north-south alignment with sidewalks on both sides. There are residential properties on the southeast corner of 7th Avenue/Bruce Road 10 and 16th Street and at the southwest corner of Bruce Road 10 and the W.W.T.P. driveway. These residential properties have many mature trees. South of the residences on the west side of 7th Avenue/Bruce Road 10 is a commercial property that has been converted for residential use and a gravel parking lot for the Hanover Community Trail. South of the residential properties on the east side of 7th Avenue/Bruce Road 10 is a commercial property and a large milling facility (Plate 12 and Plate 13).

The south side of the water treatment plant is bounded by the Hanover Community Trail. The trail is accessed by a parking lot on the west side of 7th Avenue/Bruce Road 10 (Plate 14). The Hanover Community Trail is a public walking trail that roughly follows the southern boundary of the wastewater treatment plant along the alignment of the former Dover, Stratford and Lake Huron Railway. The trail is a gravel path that passes through wooded areas and marshland (Plate 15).



Plate 1: The plant driveway, looking east toward Bruce Road 10, one of the two small structures near the roadway is visible on the left (A.S.I., 2023).



Plate 2: The plant driveway, looking west toward the plant entrance. The blue biosolids storage building is visible (A.S.I., 2023).



Plate 3: Looking west, into the plant from the front gate (A.S.I., 2023).



Plate 4: Looking west toward the main control building from near the centre of the plant (A.S.I., 2023).



Plate 5: Open-air sludge drying tank and aeration tank at north side of the water treatment plant (A.S.I., 2023).



Plate 6: Open-air aeration tanks at the rear of the main control building, looking north (A.S.I., 2023).



Plate 7: The outbuilding outside the plant fencing, looking north (A.S.I., 2023).



Plate 8: The access road on the north side of the property, looking east toward the driveway and Bruce Road 10. (A.S.I., 2023).



Plate 9: The clearing at the end of the access road, looking east (A.S.I., 2023).



Plate 10: Looking south toward the plant from the clearing. The snow plough attachment is visible on the left (A.S.I., 2023).



Plate 11: The marshy wooded area north of the clearing (A.S.I., 2023).



Plate 12: 7th Avenue/Bruce Road 10, looking south. The driveway to the water treatment plant is visible on the right and the milling facility is visible on the left (A.S.I., 2023).



Plate 13: 7th Avenue/Bruce Road 10, looking north toward the entrance to the wastewater treatment plant (A.S.I., 2023).



Plate 14: The gravel parking lot for the Hanover Community Trail, looking southwest (A.S.I., 2023).



Plate 15: The Hanover Community Trail, looking west (A.S.I., 2023).

4.2 Identification of Known and Potential Built Heritage Resources and Cultural Heritage Landscapes

Based on the results of the background research and field review, seven built heritage resources (B.H.R.) and three potential cultural heritage landscapes (C.H.L.s) were identified within the study area. A detailed inventory of known and potential B.H.R.s and C.H.L.s within the study area is presented below in Table 1. See Figure 7 for mapping showing the location of identified B.H.R.s and C.H.L.s.

While the Hanover W.W.T.P. was first constructed in 1934, it has been extensively refurbished and rehabilitated with updated structures and equipment, with major expansions completed in 1964 and 1981 (Town of Hanover Class E.A. Notice of Commencement). As such, the subject W.W.T.P. is not believed to retain sufficient original equipment or infrastructure to be considered a potential C.H.L.

Table 1: Inventory of Known and Potential Built Heritage Resources and Cultural Heritage Landscapes within the Study Area

Feature I.D.	Type of Property	Address or Location	Heritage Status and Recognition	Description of Property and Known or Potential C.H.V.I.	Photographs/ Digital Image
B.H.R. 1	Residence	741 7th Avenue	Potential B.H.R.– Identified during field review/desktop research	This potential B.H.R. is located on the east side of 7th Avenue, north of 16th Street. The B.H.R. is a two-and-a-half-storey residence with an irregular footprint and front verandah. Potential heritage attributes may include the structure's height, massing, fenestration, irregular roofline, decorative stonework, and large front verandah.	 Plate 16: Obscured view of the residence at 741 7th Avenue (A.S.I., 2023).
B.H.R. 2	Residence	719 7th Avenue	Potential B.H.R.– Identified during field review/desktop research	The B.H.R. is located on the southeast corner of the intersection of 7th Avenue and 16th Street. The B.H.R. is a two-storey residence with a gable roof. Potential heritage attributes include the structure's height, massing, fenestration, and gable roof.	 Plate 17: View of the residence at 719 7th Avenue (A.S.I., 2023).

B.H.R. 3	Residence	713 7th Avenue	Potential B.H.R.– Identified during field review/desktop research	The B.H.R. is located on the east side of 7th Avenue, south of 16th Street. The B.H.R. is a one-and-a-half-storey residence with a gable roof, dormer, and front addition. Potential heritage attributes include the structure's height, massing, fenestration, dormer, and gable roof.	 Plate 18: View of the residence at 713 7th Avenue (A.S.I., 2023).
B.H.R. 4	Residence	703 7th Avenue	Potential B.H.R.– Identified during field review/desktop research	The B.H.R. is located on the east side of 7th Avenue, south of 16th Street. The B.H.R. is a two-storey commercial structure with a mansard roof and addition on the east side. Potential heritage attributes include the structure's height, massing, fenestration, decorative cornices, and window hoods.	 Plate 19: View of the residence at 703 7th Avenue (A.S.I., 2023).

B.H.R. 5	Public Works	722 7th Avenue	Potential B.H.R.– Identified during field review/desktop research	The B.H.R. is located on the west side of 7th Avenue, north of the driveway to the Hanover Wastewater Treatment Plant. The B.H.R. is a single-storey structure with a flat roof and projecting cornice, constructed in 1901. Potential heritage attributes include the structure's height, massing, flat roof with projecting cornice, elements of classical architectural style, and associations with an early water treatment plant on the site.	 Plate 20: View of the waterworks structure at 722 7th Avenue (A.S.I., 2023).

B.H.R. 6	Residence and associated structure	710 7th Avenue	Potential B.H.R.– Identified during field review/desktop research	The B.H.R. is located on the west side of 7th Avenue, on the south side of the Hanover Wastewater Treatment Plant Driveway. The property features two associated structures, a two-and-a-half-storey yellow brick residence on the south of the property and a single-storey concrete block former commercial structure or garage to the north. The residence is a one-and-a-half-storey residence with a cross-gable roof. Potential heritage attributes include the structure's height, massing, fenestration, cross-gable roof, yellow brick construction, and front verandah. The concrete block garage/former commercial structure is a single-storey structure with rectangular footprint and flat roof. Potential heritage attributes include the structure's height, massing, fenestration, and brick construction.	 Plate 21: The residence at 710 7th Avenue (A.S.I., 2023).  Plate 22: View of the concrete block garage/former commercial structure (A.S.I., 2023).

B.H.R. 7	Residence	702 7th Avenue	Potential B.H.R.– Identified during field review/desktop research	The B.H.R. is located on the west side of 7th Avenue, south of the Hanover Wastewater Treatment Plant driveway. The B.H.R. is a one-and-a-half-storey residence with a gable roof and front addition. Potential heritage attributes include the structure's height, massing, and fenestration.	 Plate 23: The residence at 702 7th Avenue (A.S.I., 2023).
C.H.L. 1	Former railway	Hanover Community Trail	Potential C.H.L.– Identified during field review/desktop research	The C.H.L. is located along the southern boundary of the study area. The C.H.L. is a public walking trail that follows the alignment of the former Dover, Stratford and Lake Huron Railway. Potential heritage attributes include the walking trail, surrounding wooded areas and marshland, Saugeen River Crossing, and historical associations with the Dover, Stratford and Lake Huron Railway.	 Plate 24: The Hanover Community Trail on the former rail line, looking west (A.S.I., 2023).

C.H.L. 2	Waterway	Saugeen River	Potential C.H.L.– Identified during field review/desktop research	The Saugeen River follows a meandering path to the west of the study area. The Saugeen River served an important role as a transportation route and a hunting, fishing, and gathering area for Indigenous communities for millennia. For early Euro-Canadian settlers it was a driving force of early settlement and commerce in Bruce and Grey Counties, powering countless mills and industries. Potential heritage attributes include the river's natural features (watercourse, banks, etc.) and its historical associations with Indigenous land uses and trade routes and early settlement in Grey and Bruce Counties.	 Plate 25: The Saugeen River, looking south toward the study area from Hanover Park (A.S.I., 2023).

C.H.L. 3	Streetscape	7th Avenue	Potential C.H.L.– Identified during field review/desktop research	The potential C.H.L. is located along the eastern boundary of the study area. The potential streetscape C.H.L. features residences on the west side of 7th Avenue that generally have a similar one-and-a-half storey scale, massing, gable roof, and feature yellow brick. These residences all feature deep properties that extend west from 7th Avenue to the Hanover Community Trail (C.H.L. 1), from south of the Hanover Community Trail entrance to approximately 13th Street. Residences that contribute to the aesthetic of this potential CHL include: • 664 7th Avenue • 658 7th Avenue • 652 7th Avenue • 648 7th Avenue • 644 7th Avenue • 640 7th Avenue • 634 7th Avenue • 628 7th Avenue • 620 7th Avenue • 614 7th Avenue • 610 7th Avenue • 606 7th Avenue • 602 7th Avenue • 596 7th Avenue • 590 7th Avenue	 Plate 26: Representative residences in 7th Avenue Steetscape, looking southwest (Google Streetview)  Plate 27: Representative residences in 7th Avenue Steetscape, looking southwest (Google Streetview)

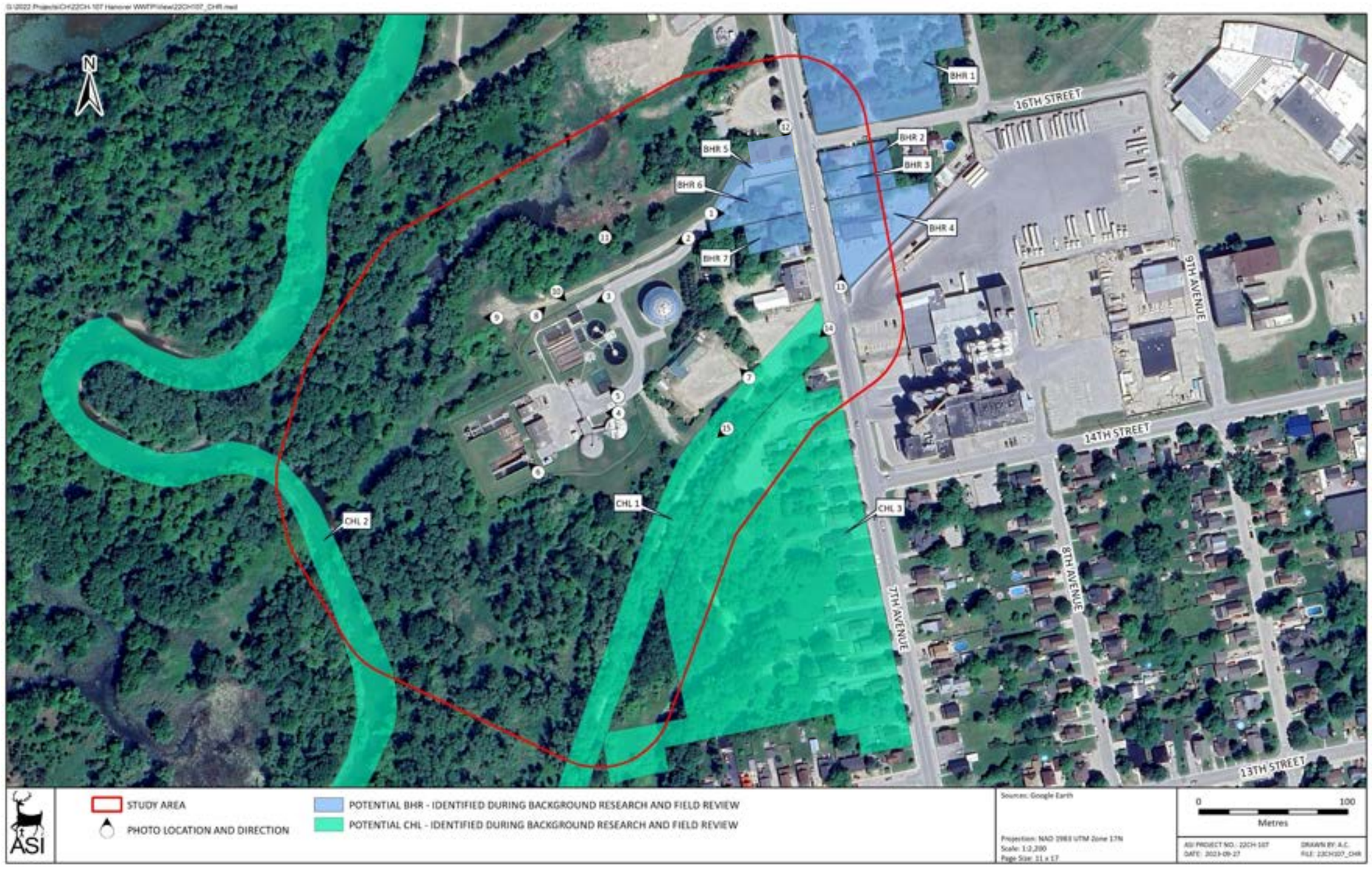


Figure 7: Location of Identified Built Heritage Resources (B.H.R.) and Cultural Heritage Landscapes (C.H.L.) in the Study Area

5.0 Preliminary Impact Assessment

The following sections provide more detailed information regarding the proposed project undertaking and analysis of the potential impacts on identified built heritage resources and cultural heritage landscapes.

5.1 Description of Proposed Undertaking

The Hanover Wastewater Treatment Plant Municipal Class Environmental Assessment (M.C.E.A.) study area consists of the grounds of the Hanover Wastewater Treatment Plant (W.W.T.P.) at 718 7th Avenue plus a 50-metre buffer. The existing W.W.T.P. has reach approximately 80% capacity, and with significant grown and development anticipated in the Town of Hanover, additional wastewater treatment capacity is required. To achieve this additional capacity, the existing W.W.T.P. will be expanded to include additional wastewater treatment infrastructure and components (including construction of a leachate pumping station and forcemain) on the existing W.W.T.P. property as required to increase capacity.

5.2 Analysis of Potential Impacts

Table 2 outlines the potential impacts on all identified built heritage resources (B.H.R.s) and cultural heritage landscapes (C.H.L.s) within the study area.

Table 2: Preliminary Impact Assessment and Recommended Mitigation Measures

Feature I.D.	**Location/Name**	**Heritage Status and Recognition**	**Type and Description of Potential/Anticipated Impact**	**Mitigation Strategies**
B.H.R. 1	741 7th Avenue	Potential B.H.R.– Identified during field review/desktop research	It is understood that the limits of the proposed W.W.T.P. improvements be confined to the west side of 7th Avenue. As the subject property is on the east side of 7th Avenue, no direct or indirect adverse impacts to any potential heritage attributes on the property are anticipated. As the residence on the property is greater than 50 metres from the W.W.T.P. property, no construction-related vibration impacts are anticipated. The low stone wall joined with mortar and featuring metal bars adjacent to the 7th Avenue right-of-way is believed to be sufficiently strong to withstand any minor construction vibrations west of the roadway.	No further work required.
B.H.R. 2	719 7th Avenue	Potential B.H.R.– Identified during field review/desktop research	It is understood that the limits of the proposed W.W.T.P. improvements be confined to the west side of 7th Avenue. As the subject property is on the east side of 7th Avenue, no direct or indirect adverse impacts to any potential heritage attributes on the property are anticipated. As the residence on the property is within 50 metres of the W.W.T.P. property, construction-related vibration impacts are possible if construction is planned immediately west of the 7th Avenue right-of-way.	If construction is anticipated within 50 metres of the residence on B.H.R. 2, undertake engineering assessment during detail design to determine potential vibration impacts.
B.H.R. 3	713 7th Avenue	Potential B.H.R.– Identified during field review/desktop research	It is understood that the limits of the proposed W.W.T.P. improvements be confined to the west side of 7th Avenue. As the subject property is on the east side of 7th Avenue, no direct or indirect	If construction is anticipated within 50 metres of the residence on B.H.R. 3, undertake engineering assessment during

Feature I.D.	Location/Name	Heritage Status and Recognition	Type and Description of Potential/Anticipated Impact	Mitigation Strategies
			adverse impacts to any potential heritage attributes on the property are anticipated. As the residence on the property is within 50 metres of the W.W.T.P. property, construction-related vibration impacts are possible if construction is planned immediately west of the 7th Avenue right-of-way.	detail design to determine potential vibration impacts.
B.H.R. 4	703 7th Avenue	Potential B.H.R.– Identified during field review/desktop research	It is understood that the limits of the proposed W.W.T.P. improvements be confined to the west side of 7th Avenue. As the subject property is on the east side of 7th Avenue, no direct or indirect adverse impacts to any potential heritage attributes on the property are anticipated. As the structure on the property is within 50 metres of the W.W.T.P. property, construction-related vibration impacts are possible if construction is planned immediately west of the 7th Avenue right-of-way.	If construction is anticipated within 50 metres of the structure on B.H.R. 4, undertake engineering assessment during detail design to determine potential vibration impacts.
B.H.R. 5	722 7th Avenue	Potential B.H.R.– Identified during field review/desktop research	The limits of the proposed W.W.T.P. improvements study area include this property parcel, however, no direct or indirect impacts to B.H.R. 5 are anticipated as the proposed infrastructure improvements are anticipated to be confined to the west and south of the existing W.W.T.P., greater than 100 metres from the structure. The small concrete block structure is located adjacent to the entrance drive of the W.W.T.P., immediately west of 7th Avenue. As such, heavy machinery is anticipated to pass in close proximity to the structure. However, as the entrance drive is used by heavy trucks and machinery as part of the normal operation of the W.W.T.P., this does not	If construction is anticipated within 50 metres of the structure on B.H.R. 5, undertake engineering assessment during detail design to determine potential vibration impacts.

Feature I.D.	Location/Name	Heritage Status and Recognition	Type and Description of Potential/Anticipated Impact	Mitigation Strategies
			constitute a chance in land use or represent any direct or indirect adverse impacts to the structure. As the structure on the property is within the M.C.E.A. study area for the W.W.T.P. property, construction-related vibration impacts are possible if construction is planned within 50 metres of B.H.R. 5.	
B.H.R. 6	710 7th Avenue	Potential B.H.R.– Identified during field review/desktop research	The limits of the proposed W.W.T.P. improvements study area include this property parcel, however, no direct or indirect impacts to B.H.R. 6 are anticipated as the proposed infrastructure improvements are anticipated to be confined to the west and south of the existing W.W.T.P., greater than 100 metres from the structure. The small concrete block structure is located adjacent to the entrance drive of the W.W.T.P., immediately west of 7th Avenue. As such, heavy machinery is anticipated to pass in close proximity to the structure. However, as the entrance drive is used by heavy trucks and machinery as part of the normal operation of the W.W.T.P., this does not constitute a chance in land use or represent any direct or indirect adverse impacts to the structure. As the structure on the property is within the M.C.E.A. study area for the W.W.T.P. property, construction-related vibration impacts are possible if construction is planned within 50 metres of B.H.R. 6.	If construction is anticipated within 50 metres of the structure on B.H.R. 6, undertake engineering assessment during detail design to determine potential vibration impacts.
B.H.R. 7	702 7th Avenue	Potential B.H.R.– Identified during field review/desktop research	The limits of the proposed W.W.T.P. improvements study area include this property parcel, however, no direct or indirect impacts to B.H.R. 7 are anticipated as the proposed infrastructure improvements are anticipated to be confined to the west and south of the existing W.W.T.P., greater than 100 metres from the structure. As the area to the west of the B.H.R. 7 is an active W.W.T.P., minor expansion does	If construction is anticipated within 50 metres of the structure on B.H.R. 7, undertake engineering assessment during detail design to determine potential vibration impacts.

Feature I.D.	Location/Name	Heritage Status and Recognition	Type and Description of Potential/Anticipated Impact	Mitigation Strategies
			not constitute a chance in land use or represent any direct or indirect adverse impacts to the structure. As the structure on the property is within the M.C.E.A. study area for the W.W.T.P. property, construction-related vibration impacts are possible if construction is planned within 50 metres of B.H.R. 7.	
C.H.L. 1	Hanover Community Trail	Potential C.H.L.– Identified during field review/desktop research	The 50-metre vibration buffer limits of the proposed W.W.T.P. improvements study area include this potential C.H.L., however, no direct or indirect impacts to C.H.L. 1 are anticipated as the proposed infrastructure improvements are anticipated to be confined to the existing W.W.T.P. property immediately to the northwest. Construction related vibration impacts are not considered to represent an adverse impact to the trail as it was constructed as a railway to withstand significant vibrations.	No cultural heritage mitigation measures required.
C.H.L. 2	Saugeen River	Potential C.H.L.– Identified during field review/desktop research	The limits of the proposed W.W.T.P. improvements study area include the watercourse, however, no direct or indirect impacts to C.H.L. 2 are anticipated as the proposed infrastructure improvements are anticipated to be confined to the existing W.W.T.P. property immediately to the east. As the existing W.W.T.P. releases treated wastewater into the Saugeen River, minor expansion does not constitute a change in land use or represent any direct or indirect adverse impacts to the watercourse from a cultural heritage perspective.	No cultural heritage mitigation measures required.

Feature I.D.	Location/Name	Heritage Status and Recognition	Type and Description of Potential/Anticipated Impact	Mitigation Strategies
C.H.L. 3	7th Avenue Streetscape	Potential C.H.L.– Identified during field review/desktop research	The limits of the proposed W.W.T.P. improvements study area include properties that constitute this streetscape, however, no direct or indirect impacts to C.H.L. 3 are anticipated as the proposed infrastructure improvements are anticipated to be confined to the west and south of the existing W.W.T.P, separated by the Hanover Community Trail and wooded areas from the properties fronting on 7th Avenue. As structures in this streetscape are within the 50-metre vibration buffer of the M.C.E.A. study area, construction-related vibration impacts are possible if construction is planned within 50 metres of any structure within C.H.L. 3. In particular, potential construction-related vibrations are possible for the residences at 664 and 658 7th Avenue. No other structures in CHL 3 are within the vibration buffer proposed for this undertaking.	If construction is anticipated within 50 metres of the structures in C.H.L. 3, undertake engineering assessment during detail design to determine potential vibration impacts.

The proposed capacity expansion to the existing Hanover W.W.T.P is not anticipated to result in direct or indirect negative impacts to any identified B.H.R. or C.H.L.

The limits of the proposed W.W.T.P. improvements study area include the property parcels of B.H.R. 5 (722 7th Avenue), B.H.R. 6 (710 7th Avenue), and B.H.R. 7 (702 7th Avenue), however, no direct or indirect impacts to these B.H.R.s are anticipated as the proposed infrastructure improvements are anticipated to be confined to the west and south of the existing W.W.T.P., greater than 100 metres from the structures.

Where identified B.H.R.s and C.H.L.s are located adjacent to works associated with the proposed Hanover W.W.T.P. Expansion, suitable mitigation including establishing no-go zones with fencing and issuing instructions to construction crews to avoid identified B.H.R.s and C.H.L.s should be considered to mitigate any unintended impacts during construction.

Indirect impact to B.H.R. 2-7 and C.H.L. 3 may occur as a result of their location within or adjacent to the proposed W.W.T.P. expansion area. To ensure the structures on the properties at 719 7th Avenue (B.H.R. 2), 713 7th Avenue (B.H.R. 3), 703 7th Avenue (B.H.R. 4), 722 7th Avenue (B.H.R. 5), 710 7th Avenue (B.H.R. 6), 702 7th Avenue (B.H.R. 7), and the 7th Avenue Streetscape between 664 and 590 7th Avenue (C.H.L. 3) are not adversely impacted during construction, a baseline vibration assessment should be undertaken during detailed design if construction is anticipated within 50 metres of any structures on these properties. Should this advance assessment conclude that the any structures will be subject to vibrations, a vibration monitoring plan should be prepared and implemented as part of the detailed design phase of the project to lessen vibration impacts related to construction.

6.0 Results and Mitigation Recommendations

The results of background historical research and a review of secondary source material, including historical mapping, indicate a study area with an Indigenous land use history spanning millennia and a Euro-Canadian rural/suburban land use history dating back to the mid nineteenth century. A review of federal, provincial,

and municipal registers, inventories, and databases revealed that there are no known built heritage resources (B.H.R.s) or known cultural heritage landscapes (C.H.L.s) in the Hanover Wastewater Treatment Plant study area. Seven potential B.H.R.s and three potential C.H.L.s were identified during the background information review and fieldwork.

6.1 Key Findings

A total of seven B.H.R.s and three C.H.L.s were identified within the study area:

- All of the 10 identified B.H.R.s and C.H.L.s were identified during background information review and field review.
- Identified B.H.R.s and C.H.L.s are historically, architecturally, and contextually associated with land use patterns in the Town of Hanover and more specifically representative of the early residential settlement of 7th Avenue, a nineteenth century roadway.

Results of Preliminary Impact Assessment

- No direct impacts to the B.H.R.s and C.H.L.s identified in this report are anticipated as a result of the proposed W.W.T.P. expansion.

6.2 Recommendations

Based on the results of the assessment, the following recommendations have been developed:

1. Construction activities and staging should be suitably planned and undertaken to avoid impacts to identified B.H.R.s and C.H.L.s.

2. Suitable mitigation including establishing no-go zones with fencing and issuing instructions to construction crews to avoid identified B.H.R.s and C.H.L.s should be considered to mitigate any unintended impacts during construction.

3. As B.H.R. 2-7 and C.H.L. 3 are located within 50 metres of the proposed Hanover W.W.T.P. Expansion study area, construction related vibration impacts may occur as a result of their location within or adjacent to the proposed W.W.T.P. expansion area. To ensure the structures on the properties at 719 7th Avenue (B.H.R. 2), 713 7th Avenue (B.H.R. 3), 703 7th Avenue (B.H.R. 4), 722 7th Avenue (B.H.R. 5), 710 7th Avenue (B.H.R. 6), 702 7th Avenue (B.H.R. 7), and the 7th Avenue Streetscape between 664 and 590 7th Avenue (C.H.L. 3) are not adversely impacted during construction, a baseline vibration assessment should be undertaken during detailed design if construction is anticipated within 50 metres of any structures on these properties.

4. Should future work require an expansion of the study area then a qualified heritage consultant should be contacted in order to confirm the impacts of the proposed work on B.H.R.s and C.H.L.s.

5. This report should be submitted by the proponent to heritage staff at the Town of Hanover, the Ministry of Citizenship and Multiculturalism, and any other relevant stakeholder with an interest in this project.

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Appendix A: Site Plan

Appendix G

Natural Environment Report

Natural Environment Report for the Town of Hanover Wastewater Treatment Plant Expansion

Town of Hanover

Ainley Group

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SLR Project No.: 209.V24150.00000

March 18, 2026

Revision: 0

Revision Record

Revision	Date	Prepared By	Checked By	Authorized By
0	March 18, 2026	Austin Adams	Kim Logan - revisions	Austin Adams

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Appendix B Breeding Bird List

Appendix C Species at Risk Screening

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Acronyms and Abbreviations

AGS	Aerobic Granular Sludge
CAS	Conventional Activated Sludge
DFO	Fisheries and Oceans Canada
ELC	Ecological Land Classification
ESA	Endangered Species Act
ESC	Erosion and Sediment Control
GIS	Geographic Information Systems
HHFE	Hurricane Hazel Flood Event
LIO	Land Information Ontario
m	Metres
MABR	Membrane Aerated Biofilm Reactor
MBBR	Moving Bed Biofilm Reactor
MCEA	Municipal Class Environmental Assessment
MECP	Ministry of Environment, Conservation and Parks
MNR	Ministry of Natural Resources
NER	Natural Environmental Report
NHIC	Natural Heritage Information Centre
ORRA	Ontario Reptile and Amphibian Atlas
SAC	Spills Action Centre
SAR	Species at Risk
SARO	Species at Risk in Ontario list
SCA	Species Conservation Act
SPRP	Spill Prevention and Response Plan
SVCA	Saugeen Valley Conservation Authority
SWH	Significant Wildlife Habitat
TPF	Tree Protection fencing
TPP	Tree Protection Plan
WWTP	Wastewater Treatment Plant

1.0 Introduction

SLR was retained by Ainley Group to complete this Natural Environmental Report (NER) as part of a Schedule C Municipal Class Environmental Assessment (MCEA) for the Town of Hanover Wastewater Treatment Plant (WWTP) (the Study Area – **Figure 1**). This NER should be read in conjunction with all other documents associated with the MCEA prepared by others.

Expansion of the WWTP is required due to the anticipated steady growth of the municipality over the next 25 years and plans to pump leachate from the Hanover-Walkerton landfill site to be treated at the WWTP. As such, design alternatives for upgrades and/or expansion of the WWTP require an understanding of the adjacent natural features and functions to understand the ecological implications of the potential alternatives in selecting a preferred design.

This report describes the background review, desktop analysis, and site investigations to used to assess the existing natural environmental conditions within the Study Area and evaluate the identification of a preferred alternative for secondary treatment from an ecological perspective. General mitigation measures are proposed, to be fully realized at detailed design. As part of this collaborative process, this report provides input to Ainley regarding ecological features.

The objectives of this assessment are to evaluate and determine the sensitivity of the existing natural heritage features and ecological functions within the Study Area. This information has been used as part of the MCEA, specifically to provide guidance on the proposed design and location, and consequent mitigation recommendations for implementation.

As part of this report the following supporting figures have been provided:

- **Figure 1** – Site Location
- **Figure 2** – Existing Environmental Conditions

2.0 Methods

2.1 Background Review

SLR has reviewed relevant background material to provide a focus to field investigations and ensure compliance with applicable regulations and policy. Ecological background information collection is guided by the *Natural Heritage Information Request Guide* (Ministry of Natural Resources and Forestry, 2018). Current direction from the Ministry of Natural Resources (MNR) and Ministry of Environment, Conservation and Parks (MECP) is to gather natural heritage information and species occurrence records from available sources; the Natural Heritage Information Centre (NHIC) Make Make-a-Map application being the main source of information and records from the Ministry itself (Ministry of Natural Resources and Forestry, 2023). Information gathered is recommended to be balanced and supplemented by professional ecological review of potential habitats and characteristics of a project site.

Background review included the collection and review of relevant mapping and resources, including the NHIC Make-a-Map application for species occurrences and designated area mapping. In addition to these, the following data sources were reviewed for the project:

- **Land Information Ontario (LIO):** certain data types including aquatic resource area (ARA) information is available through these publicly available data layers (2023).

- **Conservation Authorities:** Saugeen Valley Conservation Authority (SVCA) collect and maintain natural heritage mapping and data, and publish reports, that all provide regional and often site-specific ecological context.
- **Atlas of the Breeding Birds of Ontario:** Provides a range maps and other information regarding breeding birds in Ontario (Bird Studies Canada, 2023).
- **Ontario Reptile and Amphibian Atlas:** Ontario Nature maintains an identification resource including range maps (Ontario Nature, 2023).
- **Fisheries and Oceans Canada (DFO):** The DFO maintains mapping of aquatic species at risk (SAR) habitats, including the critical habitat, occupied and contributing habitat ranges of SAR and Special Concern species (Fisheries and Oceans Canada, 2023).

Correspondence from the MECP was received by the project team on February 4, 2026. Based on their review of the current MCEA documents, the concerns the MECP present in that correspondence have been incorporated into this report. Specific to SAR, the MECP comments included:

- That acoustic surveys for bats should be included to confirm presence (or absence) of species listed in the SAR screening.
- That a permit for destruction of bat habitat would be required if presence is confirmed.
- That the project could have negative impacts on Hungerford's Crawling Water Beetle, as this species is sensitive to changes in water quality and streamflow. The characteristics of the proposed expansion should consider these aspects.

Note, the MECP letter also comments on Air Quality and Odour, and Surface Water aspects, which are addressed in other reports under this MCEA application, including the Assimilative Capacity Study (Blue Sky 2024).

2.2 Field Investigations

The existing conditions comprising the Study Area were assessed during a total of eight (8) field investigations conducted in 2023. These investigations are summarized in **Table 1**, below.

Table 1: Field Investigations Summary (2023)

Date	Field Task(s)	Weather Conditions
May 29, 2023	Amphibian Survey 1	23°C, 6 km/h winds, clear skies
May 30, 2023	Breeding Bird Survey 1, Turtle Basking Survey 1, ELC and plant inventory	13°C, 6 km/hr winds, clear skies
June 7, 2023	Turtle Basking Survey 2	17°C, 5 km/hr winds, clear skies
June 14, 2023	Turtle Basking Survey 3	14°C, 10 km/h winds, partly cloudy (50%)
June 22, 2023	Amphibian Survey 2	19°C, 5 km/hr winds, clear skies
June 23, 2023	Breeding Bird Survey 2, Turtle Basking Survey 4, ELC and plant inventory	17°C, 8 km/hr winds, overcast
June 30, 2023	Turtle Basking Survey 5	26°C, low winds (<10 km/h), partly cloudy (25%)

Date	Field Task(s)	Weather Conditions
August 4, 2023	Aquatic Habitat Assessment	20°C, low winds (<10 km/h)
All Visits	Incidental Wildlife Observations	As above

2.2.1 Vegetation and Flora

Vegetation communities were mapped and described following the Ecological Land Classification (ELC) System for Southern Ontario (Lee, et al., 1998). Vegetation community boundaries were delineated on field maps through the interpretation of recent aerial photographs and refined in the field. SLR conducted a flora inventory and ELC with specific focus on the existing on-site wetland features. Botanical surveys were completed by traversing the site and recording species observed in each vegetation community. Provincial plant status was based on the *Provincially Rare Flora of Ontario* (Oldham & Brinker, 2009) and the Natural Heritage Information Centre (Ministry of Natural Resources and Forestry, 2023).

2.2.2 Wildlife

2.2.2.1 Breeding Birds

Breeding bird surveys were conducted at the property on May 30 and June 23, 2023, to document the presence of bird species and their breeding on the Study Area. Surveys were carried out between 06:48 and 10:00 a.m. to coincide with the dawn chorus. Surveys were conducted in general accordance with Breeding Bird Atlas protocols (Bird Studies Canada, 2023).

2.2.2.2 Breeding Amphibians

While three breeding amphibian surveys are typically conducted, only two surveys were conducted in 2023 due to timing of project retention. The two breeding amphibian surveys were completed throughout the Study Area, targeting adjacent aquatic habitat. The amphibian breeding surveys were completed on May 29 and June 22, 2022, following the Environment Canada's Marsh Monitoring Program protocol for surveying amphibians (Bird Studies Canada, 2009). The survey method provides an indication of amphibian abundance during the breeding season. Species were identified by call, and an abundance code for each species heard calling was assessed by the following the Amphibian Monitoring protocol:

- Code 0: No calls heard.
- Code 1: Calls not overlapping or simultaneous, number of individual frogs can be counted.
- Code 2: Calls overlapping or simultaneous, number of individuals can still be distinguished, number of individual frogs cannot be counted, but a reliable estimate of numbers can be made based on location and call voices.
- Code 3: Full chorus - calls simultaneous and overlapping, numbers of calling males cannot be reasonably counted or estimate.

2.2.2.3 Incidental Wildlife

Incidental observations of wildlife were made during the field investigation. SLR ecologists assessed the Study Area and adjacent lands, noting any evidence of wildlife or sensitive habitat

features (e.g., potential amphibian breeding habitat, stick nests) as well as gaining a general characterization of available habitat. Any wildlife or evidence of wildlife, including nests, tracks, scat observed during the ecological inventories was recorded. A habitat suitability assessment for Significant Wildlife Habitat (SWH) characteristics was conducted as part of the field information gathering efforts in order to determine whether SWH types are present, potentially present, or absent within or adjacent to the Study Area.

2.2.3 Aquatic Habitat Assessment

A general assessment of the existing aquatic habitat and riparian conditions within the adjacent reach of the Saugeen River was carried out on August 4, 2023. Data recorded during the assessment included stream morphology, flow regime, location of inflows, in-stream features, and habitat conditions. Also, while completing the habitat assessment, riparian characteristics, and disturbances to the natural environment in the vicinity of the Study Area were documented.

2.2.4 Species at Risk Habitat Assessment

For the purposes of this report, Species at Risk (SAR) include species listed as Endangered, Threatened or Special Concern under Ontario's *Endangered Species Act* (ESA). The protection provisions for species and their habitat within the ESA apply only to those species listed as Endangered or Threated on the Species at Risk in Ontario (SARO) list (Government of Ontario, 2007). Special Concern species may be afforded protection through policy instruments respecting significant wildlife habitat as defined by the Province or other relevant authority, or other protections contained in Official Plan policies.

Prior to field work, existing SAR records were queried with the NHIC database and other background resources. Habitat opportunities for SAR on the site were then assessed by comparing habitat preferences of species deemed to have potential to occur against current site conditions. The species noted during the NHIC and background data search, and others known through professional experience to have potential to occur, were considered in the assessment.

Note that under the Protect Ontario by Unleashing our Economy Act (Bill 5), the ESA is being replaced by the Species Conservation Act, 2025 (SCA). While the SCA will be proclaimed in 2026, many of the changes are already in force via amendments to the ESA. Any permitting or registry requirements for this project at detailed design are expected to fall under the SCA.

3.0 Existing Conditions

3.1 Natural Heritage

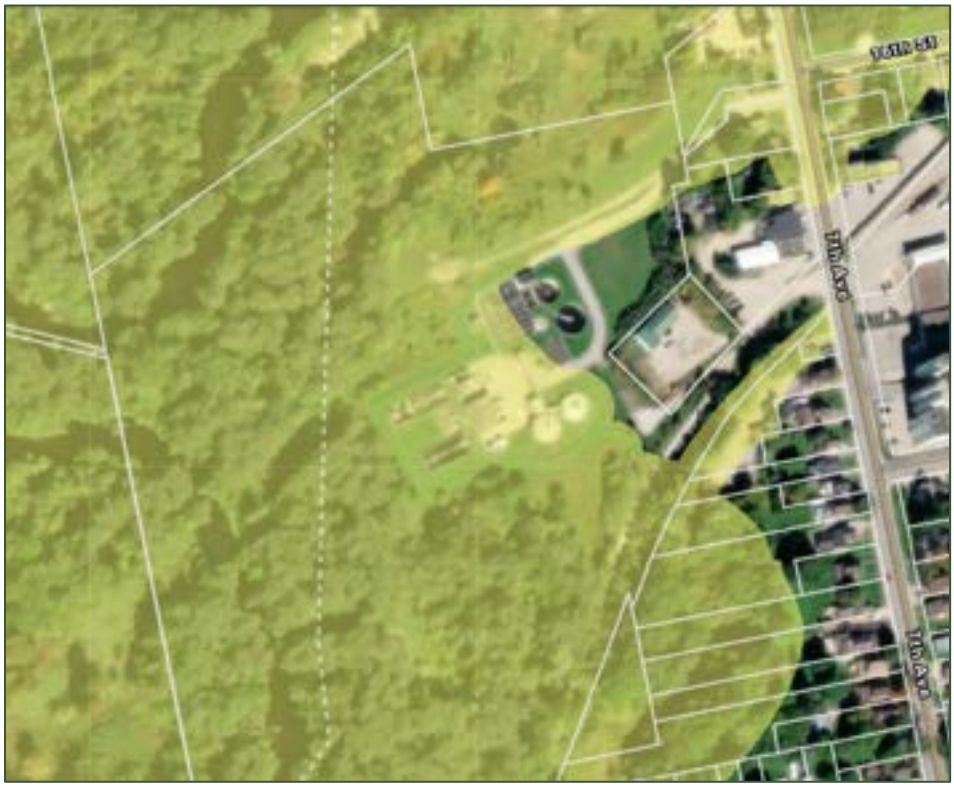
The Study Area is located within Ecoregion 6E (Crins, Gray, Uhlig, & Wester, 2009). As depicted on the Ministry of Natural Resources (MNR) NHIC mapping, most of the area surrounding the WWTP is a treed, unevaluated wetland (**Map A**). The WWTP and associated anthropogenic features are elevated and level, compared to the surrounding natural features.

The current footprint of the WWTP overlaps with the Regulated Areas of the Saugeen Valley Conservation Authority (SVCA), including all adjacent potential expansion areas (**Map B**). The Study Area is affected by the Saugeen River, its flooding hazards associated with the floodplain determined by the Hurricane Hazel Flood Event (HHFE), erosion hazards associated with the Saugeen River Valley, unevaluated wetlands, and potentially hazardous sites (unstable organic soils) associated with wetlands (Saugeen Valley Conservation Authority, 2023).

Map A: NHIC Make A Map depicts the Study Area within an Unevaluated Wetland (blue dotted layer), woodlands (dark green layer), and permanent watercourse, Saugeen River



Map B: SVCA Regulated Mapping depicts the Study Area within regulated lands (yellow layer). The dashed line depicts area outside of SVCA Jurisdiction.



3.2 Vegetation and Flora

3.2.1 Vegetation Communities

Field investigations identified four vegetation community types (two terrestrial and two wetland) as comprising the overall Study Area. The boundaries of these communities are depicted on **Figure 2** and described in the following subsections. The current WWTP footprint is a developed anthropogenic (ANTH) area and is not described.

Willow Mineral Deciduous Swamp Type (SWD4-1)

This treed wetland community occurs south and west of the of the WWTP (**Figure 2, Photo 1**). The community is characterized by a canopy of generally good health, mid-aged Willow species (*Salix* sp.), Balsam Poplar (*Populus balsamifera*), Silver Maple (*Acer saccharinum*) and Manitoba Maple (*Acer negundo*). Canopy cover is greater than 60% with heights ranging from 10 metres (m) to greater than 20 m. The trees in the canopy have abundant woodpecker cavities, which may provide suitable habitat for owls and/or bat species. The sub-canopy consists of Ash species (*Fraxinus* sp.), Balsam Poplar and American Basswood (*Tilia americana*). This layer is between 2 to 6 m in height and cover is between 25 to 60%. The understory predominately includes Eastern Ninebark (*Physocarpus opulifolius*), Red-osier Dogwood (*Cornus sericea*) and Tatarian Honeysuckle (*Lonicera tatarica*) providing 25 to 60% cover, at a height of 1 to 2 m. The ground layer has moist soils, which are dominated by True Forget-me-not (*Myosotis scorpioides*), Reed Canary Grass (*Phalaris arundinacea*) and Ostrich Fern (*Matteuccia struthiopteris*), providing greater than 60% cover at a height of 0.2 to 1 m.

Photo 1: Willow Mineral Deciduous Swamp



Cattail Mineral Shallow Marsh (MAS2-1)

This marsh community occurs north of the of the Wastewater Treatment Plant (**Figure 2, Photo 2**). This community contains standing water and is dominated by Narrow-leaved Cattail (*Typha angustifolia*).

Photo 2: Cattail Mineral Shallow Marsh



Dry-Moist Old Field Meadow Type (CUM1-1)

This meadow community occurs east of the WWTP (**Figure 2**). This community supports herbaceous species common to meadow communities in Southern Ontario such as Tall Goldenrod (*Solidago altissima*), Purple Crown-vetch (*Securigera varia*), Oxeye Daisy (*Leucanthemum vulgare*) and Wild Carrot (*Daucus carota*), as well as grass species. At the time of the survey this area appeared to unmaintained with tall vegetation.

Mineral Cultural Woodland (CUW1)

This overall small woodland community occurs north of the of the WWTP (**Figure 2**). The community is highly disturbed and characterized by a canopy of Manitoba Maple and non-native Black Locust (*Robinia pseudoacacia*). Canopy cover is roughly 50% with heights ranging from 10 to 15 m. The sub-canopy consists of Ash species. The understory is predominately non-native species including invasive European Buckthorn (*Rhamnus cathartica*) and Tatarian Honeysuckle, with occasional Eastern Ninebark, providing 25 to 60% cover at a height of 1 to 2 m. The ground layer is mixture of Garlic Mustard (*Alliaria petiolata*), Tall Goldenrod, Thicket Creeper (*Parthenocissus vitacea*) and Poison Ivy (*Toxicodendron radicans*), providing greater than 60% cover at a height of 0.2 to 1 m.

3.2.2 Flora

A total of 70 species were recorded during field surveys. Of the identified species, 38 (54%) are native, 26 (37%) are non-native and six species (9%) identified only to genus. Non-native

species were recorded from all vegetation community types. Several highly invasive species were observed on the Study Area, including Tartarian Honeysuckle (*Lonicera tatarica*), European Buckthorn (*Rhamnus cathartica*), and Garlic Mustard (*Alliaria petiolata*) (Ontario Invading Species Awareness Program, 2022). Non-native species were abundant along the trail edge, cultural meadow and the cultural woodland. A plant list for the Study Area is provided in **Appendix A**. No SAR trees or other flora of concern were observed during the surveys.

3.3 Breeding Birds

A total of 42 bird species were documented on the Study Area, as summarized in **Appendix B**. The most frequently observed species in order of abundance were Song Sparrow (*Melospiza melodia*), Black-capped Chickadee (*Poecile atricapillus*), Great Crested Flycatcher (*Myiarchus crinitus*) and Northern Flicker (*Colaptes auratus*). Most species were observed within the treed areas; however, a few wetland and aquatic species were recorded: Wood Duck (*Aix sponsa*), Mallard (*Anas platyrhynchos*), Green Heron (*Butorides virescens*) and Common Yellowthroat (*Geothlypis trichas*).

Two Species at Risk (SAR) were recorded on the Study Area. One Eastern Wood-pewee (*Contopus virens*) – Special Concern, was heard singing within the Deciduous Swamp (SWD4-1) during both surveys. Despite its status, this species is common in deciduous and mixed forests of many sizes, but those that usually have a closed canopy throughout southern Ontario. Five Chimney Swift (*Chaetura pelagica*) – Threatened, were observed foraging overhead during both surveys. This species is found in and around urban areas where they nest and roost in chimneys and other manmade structures and often stay close to water, where the flying insects they eat tend to congregate. No provincially ranked S1 through S3 (Critically Imperiled through to Vulnerable) species were recorded in the Study Area.

Five forest area-sensitive bird species were recorded in the Study Area (Ontario Ministry of Natural Resources 2000). Area-sensitive birds, while not necessarily rare, are species that are often associated with higher quality habitats, and which either require large areas of continuous habitat for breeding or are more productive in larger areas of suitable habitat. The specific habitat requirements vary by species – some species prefer deciduous forests, while many prefer mixed forests. The area-sensitive species observed were Yellow-bellied Sapsucker (*Sphyrapicus varius*), Hairy Woodpecker (*Picoides villosus*), White-breasted Nuthatch (*Sitta carolinensis*), Black-and-white Warbler (*Mniotilta varia*) and American Redstart (*Setophaga ruticilla*).

3.4 Breeding Amphibians

Surveys conducted on the evening of May 29 and June 22, 2023 targeted three potentially suitable features: Station 1 – vernal pool within deciduous swamp, Station 2 – cattail marsh and Station 3 – Saugeen River. No amphibians were heard at Station 1, which was completely dry during the second visit. In total, two amphibian species were recorded during the surveys. Grey Treefrog (*Hyla versicolor*) was recorded calling on May 29th, 2023, and Green Frog (*Lithobates clamitans*) was recorded on June 22nd, 2023. A summary of the surveys is provided in **Table 2** and monitoring station locations are shown on **Figure 2**.

Table 2: Breeding Amphibian Survey Results (2023)

Breeding Amphibian Monitoring Station	May 29	June 22
1	No amphibian calls	No amphibian calls
2	Gray Treefrog: code 3	Green Frog: code 1-2
3	No amphibian calls	No amphibian calls

*Note:

The calling codes are designated according to the Amphibian Road Call Counts (Gartshore *et al.,* 2004).

They are as follows:

1 – Individuals of one species can be counted, calls are not overlapping; second number denotes number of individuals.

2 – Calls of one species are overlapping; second number denotes estimated number of individuals.

3 – Full chorus of one species, calls continuous and overlapping, individuals not distinguishable.

During other ecological surveys, incidental observations noted one Green Frog at Station 1 and approximately 10 Green Frogs at Station 2 during the daytime survey on May 30, 2023.

3.5 Basking Turtle Surveys

Surveys conducted during five visits in May and June 2023, targeting the Saugeen River and potentially suitable habitat in the wetland north of the current WWTP. Two species were observed during these surveys: Midland Painted Turtle (*Chrysemys picta marginata*) and Snapping Turtle (*Chelydra serpentina*). A summary of the survey results is provided in **Table 3**. Snapping Turtle is a Species of Special Concern and is not afforded protection under the ESA/SCA, rather its habitat is protected should it be determined as SWH.

Table 3: Summary of Basking Survey Results (2023)

Survey Station	May 30, 2023	June 7, 2023	June 14, 2023	June 23, 2023	June 30, 2023
Saugeen River	No turtles	2 - Snapping Turtles	1 - Snapping Turtle	No turtles	1 - Snapping Turtle
Wetland	No turtles	No turtles	5 - Midland Painted Turtles, 3 - Snapping Turtles	No turtles	No turtles

Along the Saugeen River, one Snapping Turtle was observed basking in the mud, and another was observed swimming on June 7. A basking turtle was seen on June 14 and a swimming turtle on June 30.

Turtles were only observed in the wetland north of the WWTP on June 14. Three Snapping Turtles were observed basking with their head sticking out of the water within the wetland and five Midland Painted Turtles were observed basking on a log within the wetland.

3.6 Incidental Wildlife

Direct evidence (observation) and indirect evidence (scat) for the following wildlife species was incidentally observed during the 2023 surveys:

- Coyote (*Canis latrans*) – den observed;
- Eastern Chipmunk (*Tamias striatus*) – individuals observed;
- Muskrat (*Ondatra zibethicus*) – individual observed; and
- White-tailed Deer (*Odocoileus virginianus*) – scat and tracks observed.

All of the above-mentioned species are considered common. Due to the size and continuous habitat within and adjacent to the Study Area, there is abundant habitat for wildlife species. In addition to the species with observed evidence already reported, other wildlife expected include those adapted to living near residential environments such as Raccoon (Procyon lotor) and Red Fox (Vulpes vulpes).

3.7 Aquatic Habitat Assessment

The Study Area is situated next to the main branch of the Saugeen River, which drains a total area of approximate 4,120 km^2, across the Grey and Bruce Counties. The watercourse intersects the western portion of the Study Area, and through air photo interpretation is highly sinuous, with several 'oxbow' wetland features being noted in proximity to the Study Area. Oxbow wetlands are former watercourse segments that have been separated from the flowing portion of river through the river's own natural meandering processes. Oxbows, although mainly disconnected from the main watercourse, still offer many ecological functions including water storage and flood mitigation, water filtration, and wildlife habitat (The Nature Conservancy, 2021). One of the noted oxbow wetlands exists near the northern limit of the WWTP facility and forms a portion of the SWD4-1 (Willow Mineral Deciduous Swamp) wetland. During the August 2023 site visit, the feature was found to contain a significant amount of standing water, woody debris, and aquatic vegetation, mostly in the form of non-filamentous algae. Turtles were observed utilizing the oxbow wetland during the August 2023 site visit, and habitat conditions are generally considered suitable for warmwater fish species.

Photo 3: Oxbow wetland immediately north of the WWTP facility area.



The main branch of the Saugeen River, within the Study Area, features wide, long runs with deepened elongated pools (up to 2 m in depth) along the outside of meander bends. Riffle

areas were generally not observed; however, turbulent waters and eddies were observed around intermittent debris jams and in-stream woody debris piles (**Photo 4**). During the August 2023 site visit, waters were visibly cloudy, obscuring the riverbed in most places. Along the bank areas, river substrates included a mix of larger gravel and small cobble, while is other sections sands and silts were instead observed. Stream banks were eroded in certain sections of the watercourse and tree roots were exposed. Erosion was more pronounced in areas of human disturbance such as along the Hanover Disc Golf Park to the north of the Study Area, and along a series of informal trails that exist along the river corridor. Mature trees line the extent of the river corridor in vicinity to the Study Area, providing shading and thermal mitigation.

Photo 4: General conditions within the Saugeen River next to the Study Area.



Fish Community – Saugeen River

Through review of MNR background records (Ministry of Natural Resources and Forestry, 2020) and public fisheries data (Ministry of Natural Resources and Forestry, 2020), the reach of the Saugeen River next to the Study Area provides habitat for a predominantly cold to coolwater fish community. Noted species include the following:

- Blackside Darter (*Percina maculata*),
- Brassy Minnow (*Hybognathus hankinsoni*),
- Brown Trout (*Salmo trutta*),
- Central Stoneroller (*Campostoma anomalum*),
- Chinook Salmon (*Oncorhynchus tshawytscha*),
- Common Shiner (*Luxilus cornutus*),
- Creek Chub (*Semotilus atromaculatus*),
- Fantail Darter (*Etheostoma flabellare*),
- Hornyhead Chub (*Nocomis biguttatus*),

- Iowa Darter (*Etheostoma exile*),
- Johnny Darter (*Etheostoma nigrum*),
- Longnose Dace (*Rhinichthys cataractae*),
- Mottled Sculpin (*Cottus bairdii*),
- Muskellunge (*Esox masquinongy*)
- Northern Pike (*Esox Lucius*)
- Pumpkinseed (*Lepomis gibbosus*)
- Rainbow Darter (*Etheostoma caeruleum*),
- Rainbow Smelt (*Osmerus mordax*)
- Rainbow Trout (*Oncorhynchus mykiss*),
- Rosyface Shiner (*Notropis rubellus*),
- Smallmouth Bass (*Micropterus dolomieu*)
- White Sucker (*Catostomus commersonii*), and
- Yellow Perch (*Perca flavescens*).

It should be noted, through review of aerial imagery, that water control structures exist upstream and downstream of the Study Area near Karl Wilken Park, and Maple Hill Road, respectively. It is not confirmed if these water control structures (i.e., dams) have fish migration apparatuses in place, otherwise these structures may limit access into and out of the Study Area reach of the Saugeen River. Although no fish SAR are noted within the Study Area, it is noted that records for Northern Brook Lamprey (*Ichthyomyzon fossor*), a species of Special Concern, exist downstream of the Maple Hill Road (Saugeen Access #4) water control structure (Fisheries and Oceans Canada, 2023). Additionally, records for an Endangered aquatic beetle, the Hungerford's Crawling Aquatic Beetle (*Brychius hungerfordi*), are identified within the reach of the Saugeen River that intersects the Study Area.

3.8 Species at Risk Screening

A background review was completed for potential SAR habitat opportunities by comparing habitat preferences of species deemed to have potential to occur against current site conditions. The NHIC database, the Ontario Breeding Bird Atlas (OBBA), and the Ontario Reptile and Amphibian Atlas (ORAA) were screened for SAR records. A total of 25 SAR were screened, as identified through professional knowledge and background resources including nine bird species, six vascular plants, four mammals, two insects and one reptile (**Appendix C**). Of these species, three were recorded during site investigations, and a further four are considered to have potential habitat within the Study Area.

The three SAR observed during site investigations include Eastern Wood-Pewee, Snapping Turtle, and Chimney Swift. The territory of one male Eastern Wood-Pewee (Special Concern) was determined within the SWD4-1 deciduous swamp. As many as three Snapping Turtle (Special Concern) were observed within the Saugeen River and adjacent wetland. Five Chimney Swift (Threatened) were observed overhead the Study Area; however, there is no suitable breeding habitat within the Study Area.

Seven additional SAR have potential habitat within the Study Area:

- Hungerford's Crawling Water Beetle (Brychius hungerfordi - Endangered) could be present in the Saugeen River.
- Due to the presence of larger trees and proximity to water within the Study Area there is potential habitat opportunities for Endangered SAR bat species: Little Brown Myotis (Myotis lucifugus), Northern Myotis (Myotis septentrionalis) and Tri-colored Bat (Perimyotis subflavus). As of January 28, 2025, three migratory bat species have been newly listed as Endangered under the ESA/SCA: Eastern Red Bat (Lasiurus borealis), Hoary Bat (Lasiurus cinereus) and Silver-haired Bat (Lasionycteris noctivagans). One additional Endangered bat species, Eastern Small-footed Myotis (Myotis leibii) is not expected due to the absence of rocky habitat.

4.0 Assessment of Significance

4.1 Natural Features

Town of Hanover Official Plan Schedule B – Constraints, identifies the area surrounding the WWTP as significant woodlands (**Map C**). According to Official Plan Section E1.1.3 c) No development or site alteration shall occur within Significant Woodlands or their adjacent lands unless it has been demonstrated through an Environmental Impact Study, in accordance with Section E1.2, that there will be no negative impacts on the natural features or their ecological functions. The “adjacent lands” are defined as lands within 120 metres of the Significant Woodland.

The identification of Significant Woodlands was developed by the County of Grey with assistance from the Ministry of Natural Resources. The identification was primarily a desk-top based Geographic Information Systems (GIS) exercise and the County acknowledges that inaccuracies or omissions in the mapping may be present. As a result, site visits by qualified individuals may be required at the application stage to scope any potential studies.

Map C: Town of Hanover Schedule B – Constraints depicts the Study Area consisting of Significant Woodlands (green layer).



4.2 Species at Risk

The protection provisions for species and their habitat within the ESA/SCA apply only to those species listed as *Endangered* or *Threatened* on the SARO list, currently being Ontario Regulation 230/08 of the ESA. Species listed as *Special Concern* may be afforded protection through policy instruments respecting significant wildlife habitat (e.g., the Provincial Policy Statement) as defined by the Province or other relevant authority, or other protections contained in Official Plan policies.

No Threatened or Endangered species were confirmed breeding within the Study Area. Potential habitat for six Endangered bats species was identified associated with the treed swamp. However, SAR bat targeted surveys have not been completed. Hungerford's Crawling Water Beetle (Endangered) could also be present in the Saugeen River.

As Special Concern species, Eastern Wood-Pewee and Snapping Turtle are discussed in consideration of SWH (Section 4.3)

4.3 Significant Wildlife Habitat

Significant Wildlife Habitat (SWH) is considered a significant feature in Provincial, Regional, and Municipal policies. Significant Wildlife Habitat (SWH) is defined by the MNR in the Significant Wildlife Habitat Technical Guide (OMNR, 2000) and includes the following broad categories:

- Seasonal concentration areas;

- Rare vegetation communities or specialised habitats for wildlife;
- Habitats of species of conservation concern, excluding the habitats of endangered and threatened species; and
- Animal movement corridors.

Criteria for the identification of these features are provided in the *Significant Wildlife Habitat Criteria Schedules For Ecoregion 6E* (Ontario Ministry of Natural Resources and Forestry, 2015). In the absence of maternity roost survey and bat acoustic surveys, there is the potential for Bat Maternity Colonies SWH, due to the presence of treed communities.

Woodland Area-Sensitive Bird Breeding Habitat is classified as the presence of nesting or breeding pairs of three or more of the listed wildlife species (Ontario Ministry of Natural Resources and Forestry, 2015). While five forest area-sensitive birds were described in above in Section 3.3, only one of those species is a listed species for SWH (Ontario Ministry of Natural Resources, 2000). Therefore, the Study Area does not meet the criteria of Woodland Area-Sensitive Bird Breeding Habitat SWH.

As Green Heron was observed during both surveys, Marsh Bird Breeding Habitat was determined to be potentially present in association with the SWD4-1 Willow Mineral Deciduous Swamp. For Green Heron, *habitat is at the edge of water such as sluggish streams, ponds and marshes sheltered by shrubs and trees. Less frequently, it may be found in upland shrubs or forest a considerable distance from water* (Ontario Ministry of Natural Resources and Forestry, 2015).

Turtle Wintering Area may be present in association with the Saugeen River. Adequate numbers of both Midland Painted Turtles and Snapping Turtles were observed in June. For hibernation sites within a stream or river, the deep-water pool where the turtles are over wintering is the SWH (Ontario Ministry of Natural Resources and Forestry, 2015).

4.4 Aquatic Features and Fish Habitat

The reach of the Saugeen River that intersects the western portion of the Study Area is identified, through background resources, as supporting a diverse cool-cold water fish community. Through onsite observations, it appears that the reach of the Saugeen River remains in a fairly natural state, with some bank alterations and treatments being noted (channel hardening noted upstream of the Study Area next to the Hanover Disc Golf Course). Overall, the fish community is composed of several species that are intolerant to changes in pollution and general environmental perturbations. Potential impacts to the receiving aquatic system, as well as downstream environments, must be carefully mitigated to ensure maintenance of the fish community and general aquatic habitat within the Saugeen River.

In addition to the fish community, an Endangered aquatic beetle, the Hungerford's Crawling Aquatic Beetle, is also identified through background records within the Saugeen River. The beetle generally lives in small to medium-sized rivers with cool, high-quality, fast flowing water. Its preferred conditions are generally found immediately downstream of beaver dams, culverts, and other man-made barriers (Ministry of Environment, Conservation and Parks, 2014). Potential impacts to downstream environments should contemplate potential impacts to the Hungerford's Crawling Aquatic Beetle. To address potential impacts and appropriate mitigation, consultation with MECP regarding the species may also be necessary.



5.0 Secondary Treatment Alternatives Evaluation

In considering the secondary treatment options for the WWTP expansion, four alternatives were evaluated by the engineering team:

- Alternative 1 – Conventional Activated Sludge (CAS)
- Alternative 2 – Aerobic Granular Sludge (AGS)
- Alternative 3 – Membrane Aerated Biofilm Reactor (MABR)
- Alternative 4 – Moving Bed Biofilm Reactor (MBBR)

A Preferred Option through the overall MCEA process has not been selected at this time. However, in this NER, the four alternatives were evaluated from an ecological perspective on **Table 4**. Based on the evaluation, the four alternatives have been assigned a score from 1 to 4, where 1 represents the least preferable option and 4 represents the most preferable. This scoring can be transferred to the overall MCEA Evaluation Matrix for use in selecting a Preferred Option.

Ecologically, the four alternatives are relatively similar. All alternatives avoid the amphibian and turtle habitats identified on the north side of the WWTP, and are separated by distances >30 m from those features identified in the Saugeen River to the southwest. All options also take advantage of the culturally-influenced meadow (CUM1-1) area to the south of the current WWTP footprint.

The primary difference between the alternatives is size; those with a smaller footprint reduce the impact on terrestrial wildlife and vegetation. Those alternatives with smaller footprints are also the further away from the Saugeen River, reducing potential impacts to the watercourse (alternatives presented as a separate document (Blue Sky 2024)). The smaller options also avoid the Saugeen Ojibway Nation requested monitoring area.

Therefore, ecologically the Preferred Option would be the Moving Bed Biofilm Reactor (MBBR) – Alternative 4, as it provides the least ecological impact, requiring less encroachment into vegetation and potential SAR habitat located within the SWD4-1 wetland, and is the furthest from the Saugeen River. The Conventional Activated Sludge (CAS) – Alternative 1 is the least preferred, as its footprint is the largest and overlaps with the Saugeen Ojibway Nation requested monitoring area.

It should be noted that all alternatives will result in increases in expected outfall volumes to the Saugeen River. However, consultation between the engineering team and the MECP was completed (**Appendix D**), and preliminary design analysis and required targets indicate that the water quality targets of all alternatives will improve conditions of waters reaching the outfall (Blue Sky 2024). There will be an increase in volume and/or flow rates, and dissipation of outlet waters should be considered in future design. There is a rip-rap feature at the current outlet; it is recommended that this be evaluated for performance considering future water volumes and rates, to determine functionality.

Table 4: Ecological Evaluation of Options

Evaluation Criteria	Alternative 1 – CAS	Alternative 2 – AGS	Alternative 3 – MABR	Alternative 4 – MBBR
Size of footprint	Largest footprint, similar to MABR. Encroachment into the Saugeen Ojibway Nation requested monitoring area.	Footprint is the second largest. Minor encroachment into the Saugeen Ojibway Nation requested monitoring area.	Largest footprint, similar to CAS. Encroachment into the Saugeen Ojibway Nation requested monitoring area.	Most compact footprint. No encroachment into the Saugeen Ojibway Nation requested monitoring area.
Terrestrial Wildlife and Vegetation (including Species at Risk) – Potential to impact area wildlife and Species at Risk (SAR)	Largest amount of required tree removals. Tree removal may affect potential SAR bat habitat and reduce breeding habitat for Eastern Wood-pewee (SC) and five forest area-sensitive bird species. Mitigation can be implemented.	Tree removals are required. Tree removal may affect potential SAR bat habitat and reduce breeding habitat for Eastern Wood-pewee (SC) and five forest area-sensitive bird species. Mitigation can be implemented.	Largest amount of required tree removals. Tree removal may affect potential SAR bat habitat and reduce breeding habitat for Eastern Wood-pewee (SC) and five forest area-sensitive bird species. Mitigation can be implemented.	Smallest amount of required tree removal. Tree removal may affect potential SAR bat habitat and reduce breeding habitat for Eastern Wood-pewee (SC) and five forest area-sensitive bird species. Mitigation can be implemented.
Fisheries / Aquatic – Potential to impact fish habitat and aquatic features.	No in-water works required. Sedimentation and erosion are not concerns for the Saugeen River due to the distance of works (>30 m). Dissipation structure to be evaluated for functionality.	No in-water works required. Sedimentation and erosion are not concerns for the Saugeen River due to the distance of works (>30 m). Dissipation structure to be evaluated for functionality.	No in-water works required. Sedimentation and erosion are not concerns for the Saugeen River due to the distance of works (>30 m). Dissipation structure to be evaluated for functionality.	No in-water works required. Sedimentation and erosion are not concerns for the Saugeen River due to the distance of works (>30 m). Dissipation structure to be evaluated for functionality.
Wetlands – Potential to impact to existing vegetation.	Sedimentation is the predominant concern for the wetlands within the Study Area.	Sedimentation is the predominant concern for the wetlands within the Study Area.	Sedimentation is the predominant concern for the wetlands within the Study Area.	Sedimentation is the predominant concern for the wetlands within the Study Area.
Alternatives - Ecological Scoring	**1 – Least Preferred**	**3 – Preferred**	**2 – Less Preferred**	**4 – Most Preferred**

6.0 Potential Impacts

This section represents an assessment of potential impacts based on the current secondary treatment alternative design options (Section 5). Refinements to the assessment of impacts will be made as necessary to reflect the Preferred Option once chosen, as part of subsequent detailed design submissions. The impacts and recommended mitigations apply to all alternatives relatively similarly.

6.1 Vegetation

All alternatives will result in encroachment (to be determined at detailed design) into the Willow Mineral Deciduous Swamp (SWD4-1), requiring removals of trees, shrubs, and wetland species ground cover. At this stage, tree replacement and/or compensation is unknown.

6.2 Wildlife and Species at Risk

The primary concern for SAR habitat and wildlife impacts is associated with the permanent removal of trees and habitat area within the SWD4-1 treed swamp. Noise impacts to wildlife are possible, mainly associated with construction works, and are therefore considered short-term.

SAR identified that may be affected by the project include SAR Bats and Hungerford's Crawling Water Beetle. However, with measures described in Section 7.2, minimal to no impacts to these SAR are anticipated.

6.3 Fish and Aquatic Habitat

As there will be no in-water works, sedimentation and erosion are not a concern for Saugeen River as long as mitigation measures detailed in Section 7 below are applied.

6.4 Wetlands

Potential impacts associated with the SWD4-1 treed swamp community are predominantly sedimentation concerns. Therefore, appropriate design, maintenance and Erosion and Sediment Control (ESC) measures will be necessary to mitigate potential short- and long-term impacts. Potential impacts can be mitigated through the implementation of the mitigations detailed in Section 7.4 below.

7.0 Mitigation

The following outlines general mitigations that would be required for the Preferred Alternative, once selected. These mitigations are recommended to be reviewed and refined at the detailed design stage, once specific footprints and design elements are known. While other specific mitigation opportunities may arise during detailed design, the mitigations below should be incorporated into construction planning.

7.1 Tree Preservation

Based on the proposed works, tree removals will be required. An Arborist Report and Tree Protection Plan should be developed when the Preferred Alternative is selected to protect trees that can be retained. Trees proposed to be retained will be protected by tree protection fencing (TPF), which is to be placed at the dripline or in a location to minimize encroachment into the root zone and protect the trunk. Fencing provides protection from potential damage during



construction activities such as the use of machinery near trees and branches and stockpiling of materials over the root zone. TPF measures are to be inspected for placement and installation prior to commencement of any construction activities.

7.2 Wildlife

Vegetation removal for construction works could affect birds during the breeding bird season, or maternity roosting bats protected under the *Endangered Species Act*. Similarly, nesting birds protected under the *Migratory Birds Convention Act* (*MBCA*) could be present in any vegetation within the Study Area (Government of Canada, 1994). The active season in Southern Ontario for both birds and bats is currently understood to be between **April 1st** and **November 30th** of any calendar year. Any vegetation or tree removal that is required should be conducted outside of this active season (**December 1st – March 31st**) to avoid potential contravention of either of these *Acts***.**

Based on the regulations under the *MBCA,* any destructive or disruptive activity such as vegetation removal cannot occur during the breeding bird period. If vegetation removal is required during this period, a qualified ecologist should undertake a bird nesting survey before the works. If active nests are observed, then a site-specific mitigation measure (i.e., temporary avoidance of tree/area with active nest) may need to be implemented, including delaying tree removals until the young have fledged the nest. This survey does not focus on a search for nests but instead uses a variety of information (time of year, habitat present, bird song, bird behaviour etc.) to determine if birds are nesting. If nesting activity is detected, clearing activities should be delayed (potentially weeks or months) until it can be determined that the birds no longer have eggs or young in the nest.

7.3 Fish and Aquatic Habitat

Direct impacts to fish and aquatic habitat are not anticipated as part of the proposed works, as the Saugeen River is located outside the immediate vicinity of the proposed works. All construction activities are to be contained and isolated with appropriate ESC and exclusion measures, as defined in detail in Sections 7.4 below.

The expansion will improve the waste treatment capabilities of the WWTP, and the engineering design team indicates that the proposed outlet limits are significantly lower for biological oxygen demand, total phosphorus, and E. coli (**Appendix D**, (Blue Sky 2024)). This is expected to improve habitat quality for Hungerford's Crawling Aquatic Beetle. Outlet dissipation characteristics should be evaluated at detailed design.

7.4 Erosion and Sediment Control Measures

To minimize the potential for erosion and off-site transportation of sediment into surface water features and the natural environment, the project will implement best practices related to ESC measures.

In general, ESC measures should be installed before works commence and be maintained in good condition for the duration of the proposed works. ESC measures must meet guidelines outlined in the *Erosion and Sediment Control Guide for Urban Construction (Toronto and Region Conservation Authority, 2019)* or equivalent standards. With appropriate ESC measures and compensation, no negative impact to the watercourse, or its ecological functions are anticipated. The ESC plan to be implemented will address potential erosion and sediment



related impacts during the entirety of the proposed development. With respect to ESC measures, the contractor must:

- Isolate entire work areas with heavy duty silt fence;
- Retain existing vegetation and stabilize ground with native vegetation, where possible;
- Limit the duration of soil exposure and/or phase construction;
- Maintain overland sheet flow and avoid concentrating flow;
- Store and stockpile soil away from natural drainage features and/or shoreline areas; and,
- Assess ESC measures before and after significant rainfall and snowmelt events.

All repairs required to ESC measures will be completed within 48 hours of notice unless otherwise agreed by the Region, the Contractor, the regulatory authority and the environmental inspector(s). Stockpiles are to be protected immediately and, if placed for longer than 30 days, temporarily stabilized.

In the event that seasonal water levels require installation of a turbidity curtain for any proposed shoreline works, fish relocation efforts may be necessary to ensure fish are not stranded within the turbidity curtain enclosure.

7.5 Site Inspections

Record keeping is required throughout the project activities, with most of the record-keeping expected to be associated with construction practices adjacent to the wetlands, river, trees and ESC fencing maintenance. Environmental monitoring and inspections of works will meet regulatory agency direction and permit requirements and will be undertaken regularly by qualified and experienced inspectors. The minimum frequency of site inspections and reporting will be as follows:

- Environmental inspections before and after significant storm and snow melt events; and
- Daily during extended rain and snowmelt periods.

All records should be maintained on a regular basis. The records should be available for inspection and review by agencies upon request. The Environmental Inspector will prepare a Final Monitoring Report summarizing the environmental inspection program. This will be submitted to Grey County and regulatory agencies as necessary. The Monitoring Report will include:

- An overview of construction activities during the proposed works;
- A comprehensive list of environmental sensitivities associated with those works and environmental protection measures; and
- Significant deviations from approved environmental protection measures.

7.6 Vehicle Operations

Vehicular and equipment maintenance and refueling will be undertaken in designated areas a minimum of 30 m from the Saugeen River and controlled to prevent any discharge of equipment fuels and fluids onto the ground or into a waterway.

7.7 Spill Response Plan

The Contractor will be required to develop a comprehensive Spill Prevention and Response Plan (SPRP). Additionally, the contractor should have spill response equipment appropriate to handle any materials on site (i.e., fuel) or potential impacts from construction activities (i.e., release of spoils or fluid) readily available on site to limit the potential impact on the environment in the event of a spill. The following provides an outline of a general SPRP and associated protocols.

In standard spill situations, where there is no immediate threat to worker health and safety, upon the discovery of the spill the Contractor should implement the following measures to mitigate the potential impacts of the spill. These measures should be identified in the SPRP accordingly.

- Obtain proper PPE and appropriate spill cleanup equipment (maintained at the material staging area and in any other area where hazardous liquids are handled or stored) to handle the spilled material;
- Immediately isolate off or delineate the spill from the surrounding area (i.e., caution tape, signs, or pylons);
- Immediately repair punctures or broken equipment or infrastructure (either temporarily or permanently) and/or implement other spill control measures;
- Block any potential passageways to the excavation, creek, drainage ditches, or catch basins;
- Proceed to clean up the spill in accordance with the applicable legislation or retain an outside spill company to contain and clean the spill, if necessary. The name of a dedicated spill response company should be included in the Contractor's Spill Contingency Plan;
- Contact the Contact Administrator immediately should any spill occur. The Contractor will also report is the spill will impact project construction activities or if the spill cannot be cleaned using on-site resources or if the spill occurred in an unpaved area where potential impacts to underlying soil may have occurred;
- Document all spills including details with respect to the material spilled, volume, location, underlying material, clean-up required, materials used, and any potential environmental impacts of the spill; and,
- Submit the documentation to the Contact Administrator, along with a mitigation measure taking and future preventative action recommendations.

Spills must be reported to the Spills Action Centre (SAC) immediately, and other stakeholders as appropriate. Any spills to or adjacent to a watercourse or near a structure that connects to a watercourse must also be reported to Grey County, Town of Hanover, Saugeen Valley Conservation Authority, MNRF, and DFO. Spills occurring on roadways will require specific conditions as it relates to traffic safety and notification of the County Roads department.

It is recommended that the Contractor also prepare a site-specific Spill Prevention and Contingency Plan (SPCP) for the project. The SPCP includes:

- Names and telephone numbers of persons in local municipalities and SAC to be notified forthwith of a spill;



- Names and telephone numbers of representatives of fire, police, and health departments of local municipalities who are responsible to respond to emergency situations;
- Names and telephone numbers of companies experienced in control and cleanup of hazardous materials who will be contacted in an emergency involving a spill;
- Provisions for spills of hazardous or unknown materials;
- Proposal for immediate containment and control of a spill, clean-up procedures to be initiated immediately, and any other action to be taken to mitigate potential environmental damage while awaiting additional assistance; and,
- Responsibility for preparing, implementing, directing, and supervision of contingency measures.

7.8 Invasive Species Management

Non-native species and highly invasive species are not abundant within the Study Area, and their introduction should be avoided. To reduce the potential for invasive species establishment in construction-disturbed areas, these areas should be seeded as soon as possible using an appropriate native seed mixture in surrounding wetland areas, and seed/sod in areas to be landscaped. Certified weed-free topsoil and materials should be used to make up any shortfall in fill materials.

7.8.1 Construction Equipment

To prevent the spread of invasive species, construction equipment should arrive at the site clean and leave the site clean.

- Before arriving on site, construction equipment should be pressured washed with high-pressure steam-cleaning methods.
- Equipment cleaning stations should be established to ensure that invasive species seeds and other viable plant parts cannot escape in runoff or through other means.
- During construction, equipment used in areas with an abundance of invasive species should be cleaned prior to moving to another portion of the site.
- A high-pressure steam-cleaning should also be completed on vehicles prior to leaving the site.

7.8.2 Equipment Cleaning Stations

Equipment should be cleaned in an area where contamination and seed spread are not possible (or limited) (Ontario Invasive Plant Council, 2013). The site should be:

- Ideally, mud free, gravel covered or a hard surface. If this option is not available, choose a well maintained (i.e., regularly mowed) grassy area.
- Gently sloping to assist in draining water and material away from the vehicle or equipment. Care should be taken to ensure that localized erosion will not be created, and that water runs back into the area where contamination occurred.
- A means of collecting equipment washings and adding them to soils destined for landfills should be integrated into standard construction practices.

- Cleaning stations should be at least 30 m away from any watercourse, water body and natural vegetation.
- Cleaning stations should be large enough to allow for adequate movement of larger vehicles and equipment.

8.0 Permitting Requirements

Permitting will be required in support of the proposed works. A summary of the anticipated ecological permits to be required at detailed design is included in **Table 5**. Elaboration on each permitting process is provided below, based on the anticipated location of the WWTP. These are anticipated to be required regardless of the alternative selected.

Table 5: Permit Identification

Permitting Body	Relevant Permits/Reports	Description
Saugeen Valley Conservation Authority (SVCA)	Ontario Regulation 41/24 permit	SVCA Permitting is required as the WWTP expansion falls within the SVCA's regulated lands. The MECP requires SVCA approval to issue approval of the ECA.
Department of Fisheries and Oceans (DFO)	DFO Consultation	Permitting is unlikely to be required, as there is no in-water works. Through consultation with DFO staff it can be confirmed that a formal DFO Request for Review (RFR) and notification form are not required.
Grey County	Forest Management By-Law for tree clearing	An Arborist Report and Tree Protection Plan may be required for trees >10 cm DBH, to be disturbed, injured, or removed within 6 m of the footprint.
Ministry of Environment, Conservation and Parks (MECP)	MECP Consultation	No Threatened or Endangered species were confirmed breeding within the Study Area. Potential habitat for six Endangered bats species was identified associated with the treed swamp where tree removals are proposed. It is expected that bat acoustic monitoring or compensation habitat will be required. MECP consultation will inform next steps and any potential registry or permitting requirements under the SCA (i.e., Information Gathering Form and/or Registry).

It is in SLR's professional experience, due to the existing environmental conditions of the Study Area, the following reports and/or surveys may be required to adequately address the permitting requirements:

- An Environmental Management Plan (EMP) to outline detailed design and specific construction mitigations.
- Tree Inventory and Arborist Report/Tree Protection Plan.
- MECP consultation regarding SAR Bats as the SAR habitat screening has identified potential maternity roost habitat and potential impacts to Hungerford's Crawling Aquatic Beetle. Consultation will determine if a registry under the SCA will be required.

9.0 Next Steps

An EMP is to be developed at the detailed design stage of the project. This document will review the detailed design and provide specific mitigations to protect natural heritage features during construction and operation. Based on the preliminary mitigations (Section 7), the EMP will, at minimum, be required to expand upon those and provide:

- Confirmation of required wildlife timing windows
- A developed ESC plan, specific to the design
- Detail and expand upon construction best practices to be implemented
- Recommend any targeted invasive species control

The future detailed design phase is to also include monitoring for SAR bat species, with the results to be presented within the EMP. This activity should include the determination of potential habitat trees within the design limits of the preferred alternative, and acoustic monitoring of these trees. If SAR bats are determined to be present, a permit for destruction of bat habitat is to be submitted to the MECP. Mitigations to be developed in the EMP will be contingent on the results of the monitoring program.

Additionally, an April Breeding Amphibian survey is recommended to be completed, to confirm the observations made for this NER. The results should be summarized in the EMP.

A Tree Inventory and Arborist Report/Tree Protection Plan is to be developed for the detailed design, detailing trees to be removed, protections for retained trees, and compensation requirements, as needed.

The outfall design at the Saugeen River is recommended to be evaluated as part of the engineering detailed design, to ensure adequate dissipation of increased flow and velocities. It is understood that water quality targets for the expansion will provide increased water quality at the outlet. These mitigations will be combined to maintain or improve habitat characteristics for Hungerford's Crawling Aquatic Beetle, fish habitat characteristics, in addition to flow characteristics for Green Heron and Turtle Wintering Area SWH types. The design and mitigations should be reviewed and confirmed in the EMP.

10.0 Conclusions

The findings of this Natural Environment Report document the existing conditions of the Study Area, being the result of a background review and an analysis of data using current scientific understanding of the ecology of the area. This study also evaluates the secondary treatment alternatives and general mitigation measures to develop at detailed design. Anticipated ecological permitting requirements are also detailed. This information is provided as input into the detailed design in the context of existing conditions and protection of the natural environment.

11.0 Closure

Regards,

SLR Consulting (Canada) Ltd.



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Senior Ecologist



Austin Adams, M.Sc., EP
Technical Director – Arboriculture, Sr. Ecologist

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Figures

Natural Environment Report for the Town of Hanover Wastewater Treatment Plant Expansion

Town of Hanover

Ainley Group

SLR Project No.: 209.V24150.00000

March 18, 2026



KEY MAP



LEGEND

- Subject Site
- Watercourse[1]
- **Wetland[1]**
- Not Evaluated as per OWES

1. LIO/MNRF

0 40 80 120 160 200

METRE SCALE

North American Datum 1983
Universal Transverse Mercator Projection Zone 17

Scale: 1:3,000
Page Size: Tabloid (11 x 17 inches)

Drawn: CV
Checked: WC
Date: Feb 23, 2026

NORTH

Source Notes:
Imagery (2020) provided by Grey County map service. Contains information licensed under the Open Government Licence – Ontario.

CLIENT: Ainley Group

PROJECT: Hanover WWTP MCEA

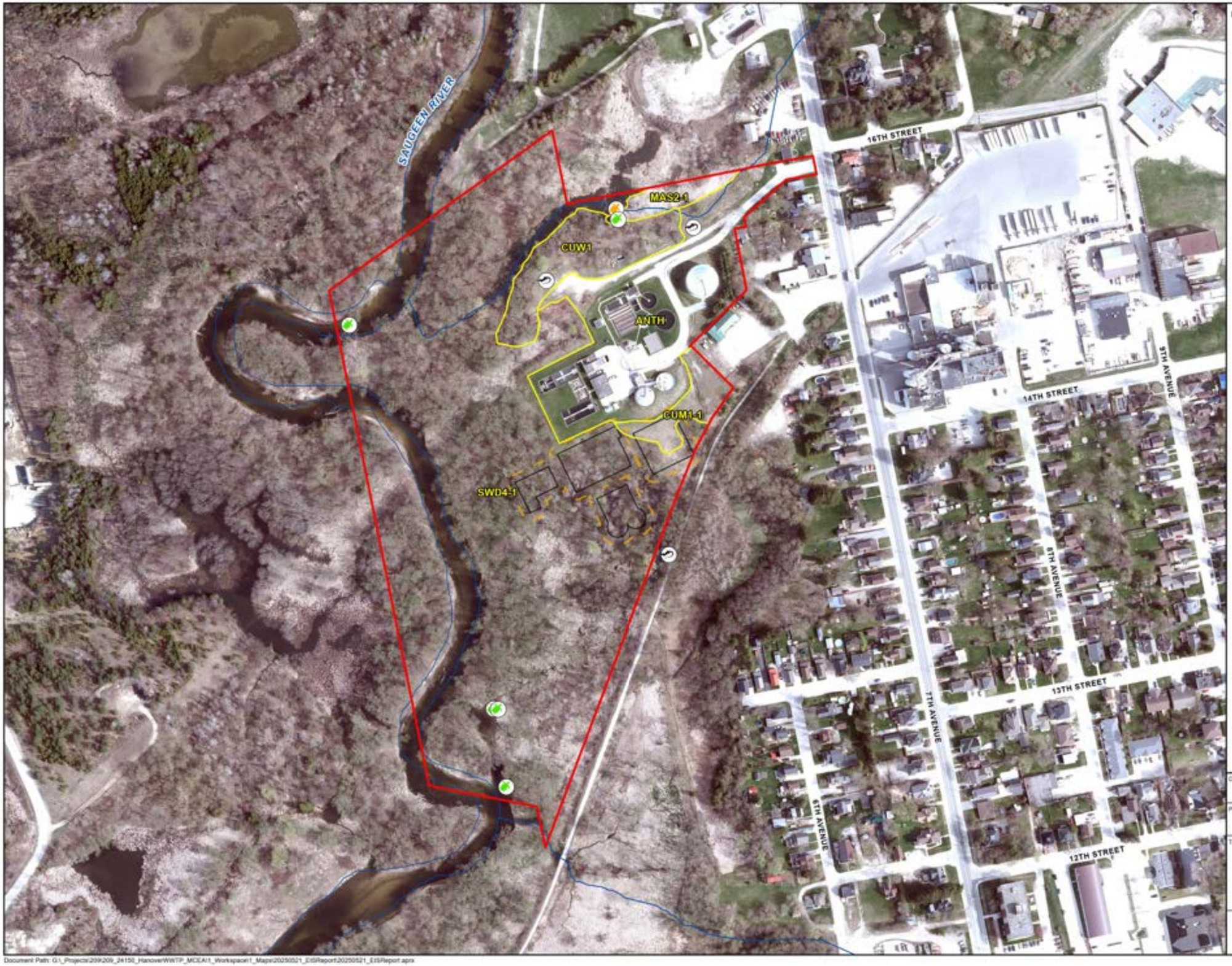
TITLE: **Site Location**

SLR

REF NO. 1705622-1-1

Figure 1

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LEGEND

- Amphibian Calling Station

Turtle Observation

- Midland Painted Turtle
- Snapping Turtle
- Watercourse[1]
- Ecological Land Classification (ELC)

Wetland[1]

- Not Evaluated as per OWES
- Subject Site

ELC Communities:
SWD4-1: Willow Mineral Deciduous Swamp
MAS2-1: Cattail Mineral Shallow Marsh
CUM1-1: Dry-Moist Old Field Meadow Type
CUW1: Mineral Cultural Woodland

1. LIO/MNRF

0 40 80 120 160 200
METRE SCALE

North American Datum 1983
Universal Transverse Mercator Projection Zone 17

Scale: 1:3,000
Page Size: Tabloid (11 x 17 inches)

Drawn: CV
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NORTH

Source Notes:
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CLIENT: Ainley Group

PROJECT: Hanover WWTP MCEA

TITLE: **Existing Environmental Conditions**

SLR

REF NO. 1705622-2-1

Figure 2

Document Path: G:_Projects\209\209_24150_Hanover\WWTP_MCEA\1_Workspace\1_Maps\20250521_EIS\Report\20250521_EIS\Report.aprx

Appendix A Flora List

Natural Environment Report for the Town of Hanover Wastewater Treatment Plant Expansion

Town of Hanover

Ainley Group

SLR Project No.: 209.V24150.00000

March 18, 2026

Flora List

Family	Scientific Name	Common Name	S Rank	COSEWIC	SARO	SARA	Native /Exotic Status
Aceraceae	*Acer negundo*	Manitoba Maple	S5				N
Aceraceae	*Acer platanoides*	Norway Maple	SNA				E
Aceraceae	*Acer saccharinum*	Silver Maple	S5				N
Apiaceae	*Aegopodium podagraria*	Goutweed	SNA				E
Brassicaceae	*Alliaria petiolata*	Garlic Mustard	SNA				E
Fabaceae	*Amphicarpaea bracteata*	American Hog-peanut	S5				N
Ranunculaceae	*Anemonastrum canadense*	Canada Anemone	S5				N
Apocynaceae	*Apocynum androsaemifolium*	Spreading Dogbane	S5				N
Apocynaceae	*Asclepias incarnata*	Swamp Milkweed	S5				N
Cyperaceae	*Carex retrorsa*	Retrorse Sedge	S5				N
Ranunculaceae	*Clematis virginiana*	Virginia Clematis	S5				N
Convolvulaceae	*Convolvulus arvensis*	Field Bindweed	SNA				E
Cornaceae	*Cornus sericea*	Red-osier Dogwood	S5				N
Apiaceae	*Daucus carota*	Wild Carrot	SNA				E

Family	Scientific Name	Common Name	S Rank	COSEWIC	SARO	SARA	Native /Exotic Status
Boraginaceae	*Echium vulgare*	Common Viper's Bugloss	SNA				E
Equisetaceae	*Equisetum scirpoides*	Dwarf Scouring-rush	S5				N
Asteraceae	*Erigeron* sp.	Fleabane Species					
Brassicaceae	*Erysimum cheiranthoides*	Wormseed Wallflower	S5				N
Rosaceae	*Fragaria virginiana*	Wild Strawberry	S5				N
Oleaceae	*Fraxinus* sp.	Ash Species					
Rubiaceae	*Galium palustre*	Common Marsh Bedstraw	S5				N
Geraniaceae	*Geranium robertianum*	Herb-Robert	S5				N
Rosaceae	*Geum aleppicum*	Yellow Avens	S5				N
Rosaceae	*Geum canadense*	Canada Avens	S5				N
Lamiaceae	*Glechoma hederacea*	Ground-ivy	SNA				E
Poaceae	*Glyceria striata*	Fowl Mannagrass	S5				N
Brassicaceae	*Hesperis matronalis*	Dame's Rocket	SNA				E
Hydrophyllaceae	*Hydrophyllum virginianum*	Virginia Waterleaf	S5				N
Balsaminaceae	*Impatiens capensis*	Spotted Jewelweed	S5				N
Iridaceae	*Iris versicolor*	Harlequin Blue Flag	S5				N

Family	Scientific Name	Common Name	S Rank	COSEWIC	SARO	SARA	Native /Exotic Status
Juglandaceae	*Juglans nigra*	Black Walnut	S4?				N
Asteraceae	*Leucanthemum vulgare*	Oxeye Daisy	SNA				E
Caprifoliaceae	*Lonicera tatarica*	Tatarian Honeysuckle	SNA				E
Fabaceae	*Lotus corniculatus*	Garden Bird's-foot Trefoil	SNA				E
Lamiaceae	*Lycopus asper*	Rough Water-horehound	S4				N
Primulaceae	*Lysimachia nummularia*	Creeping Yellow Loosestrife	SNA				E
Dryopteridaceae	*Matteuccia struthiopteris*	Ostrich Fern	S5				N
Menispermaceae	*Menispermum canadense*	Canada Moonseed	S4				N
Boraginaceae	*Myosotis scorpioides*	True Forget-me-not	SNA				E
Dryopteridaceae	*Onoclea sensibilis*	Sensitive Fern	S5				N
Vitaceae	*Parthenocissus vitacea*	Thicket Creeper	S5				N
Poaceae	*Phalaris arundinacea*	Reed Canarygrass	S5				N
Rosaceae	*Physocarpus opulifolius*	Eastern Ninebark	S5				N
Pinaceae	*Picea pungens*	Blue Spruce	SNA				E
Pinaceae	*Pinus sylvestris*	Scots Pine	SNA				E
Plantaginaceae	*Plantago lanceolata*	English Plantain	SNA				E

Family	Scientific Name	Common Name	S Rank	COSEWIC	SARO	SARA	Native /Exotic Status
Salicaceae	*Populus balsamifera*	Balsam Poplar	S5				N
Rosaceae	*Potentilla anserina ssp. anserina*	Common Silverweed	S5				N
Rosaceae	*Prunus avium*	Sweet Cherry	SNA				E
Ranunculaceae	*Ranunculus* sp.	Buttercup Species					
Rhamnaceae	*Rhamnus cathartica*	European Buckthorn	SNA				E
Fabaceae	*Robinia pseudoacacia*	Black Locust	SNA				E
Alismataceae	*Sagittaria latifolia*	Broad-leaved Arrowhead	S5				N
Salicaceae	*Salix* sp.	Willow Species					
Cyperaceae	*Scirpus microcarpus*	Red-tinged Bulrush	S5				N
Fabaceae	*Securigera varia*	Purple Crown-vetch	SNA				E
Caryophyllaceae	*Silene vulgaris*	Bladder Campion	SNA				E
Solanaceae	*Solanum dulcamara*	Bittersweet Nightshade	SNA				E
ASTERACEAE	*Solidago* sp.	Goldenrod Species					
Ranunculaceae	*Thalictrum* sp.	Meadowrue Species					
Cupressaceae	*Thuja occidentalis*	Eastern White Cedar	S5				N
Tiliaceae	*Tilia americana*	Basswood	S5				N

Family	Scientific Name	Common Name	S Rank	COSEWIC	SARO	SARA	Native /Exotic Status
Anacardiaceae	*Toxicodendron radicans*	Poison Ivy	S5				N
Asteraceae	*Tragopogon dubius*	Yellow Goatsbeard	SNA				E
Fabaceae	*Trifolium pratense*	Red Clover	SNA				E
Fabaceae	*Trifolium repens*	White Clover	SNA				E
Typhaceae	*Typha angustifolia*	Narrow-leaved Cattail	SNA				E
Ulmaceae	*Ulmus americana*	White Elm	S5				N
Urticaceae	*Urtica dioica*	Stinging Nettle	S5				N
Vitaceae	*Vitis riparia*	Riverbank Grape	S5				N

Appendix B Breeding Bird List

Natural Environment Report for the Town of Hanover Wastewater Treatment Plant Expansion

Town of Hanover

Ainley Group

SLR Project No.: 209.V24150.00000

March 18, 2026

Breeding Bird List

Common Name	Scientific Name	COSEWIC	SARO	S Rank	Area-sensitive	No. of Pairs or Territories
Green Heron	*Butorides virescens*			S4		1
Canada Goose	*Branta canadensis*			S5		1
Wood Duck	*Aix sponsa*			S5		2 (f)
Mallard	*Anas platyrhynchos*			S5		1
Spotted Sandpiper	*Actitis macularia*			S5		1
Mourning Dove	*Zenaida macroura*			S5		1
Yellow-billed Cuckoo	*Coccyzus americanus*			S4		1
Chimney Swift	*Chaetura pelagica*	THR	THR	S4		5 (f)
Belted Kingfisher	*Ceryle alcyon*			S4		1
Yellow-bellied Sapsucker	*Sphyrapicus varius*			S5	A	1
Red-bellied Woodpecker	*Melanerpes carolinus*			S4		1
Downy Woodpecker	*Picoides pubescens*			S5		1
Hairy Woodpecker	*Picoides villosus*			S5	A	1
Northern Flicker	*Colaptes auratus*			S4		2
Eastern Wood-Pewee	*Contopus virens*	SC	SC	S4		1

Common Name	Scientific Name	COSEWIC	SARO	S Rank	Area-sensitive	No. of Pairs or Territories
Great Crested Flycatcher	*Myiarchus crinitus*			S4		2
Eastern Kingbird	*Tyrannus tyrannus*			S4		1
Blue Jay	*Cyanocitta cristata*			S5		2
American Crow	*Corvus brachyrhynchos*			S5		1
Black-capped Chickadee	*Poecile atricapillus*			S5		2
White-breasted Nuthatch	*Sitta carolinensis*			S5	A	1
House Wren	*Troglodytes aedon*			S5		1
American Robin	*Turdus migratorius*			S5		2
Gray Catbird	*Dumetella carolinensis*			S4		1
Cedar Waxwing	*Bombycilla cedrorum*			S5		1
European Starling	*Sturnus vulgaris*			SE		1
Warbling Vireo	*Vireo gilvus*			S5		1
Yellow Warbler	*Setophaga petechia*			S5		1
Black-and-white Warbler	*Mniotilta varia*			S5	A	1
American Redstart	*Setophaga ruticilla*			S5	A	1
Mourning Warbler	*Geothlypis philadelphia*			S4		1

Common Name	Scientific Name	COSEWIC	SARO	S Rank	Area-sensitive	No. of Pairs or Territories
Common Yellowthroat	*Geothlypis trichas*			S5		1
Northern Cardinal	*Cardinalis cardinalis*			S5		1
Rose-breasted Grosbeak	*Pheucticus ludovicianus*			S4		1
Indigo Bunting	*Passerina cyanea*			S4		1
Song Sparrow	*Melospiza melodia*			S5		4
Swamp Sparrow	*Melospiza georgiana*			S5		1
Red-winged Blackbird	*Agelaius phoeniceus*			S4		2
Common Grackle	*Quiscalus quiscula*			S5		1
Brown-headed Cowbird	*Molothrus ater*			S5		1
Baltimore Oriole	*Icterus galbula*			S4		1
American Goldfinch	*Cardeulis tristis*			S5		2

Appendix C Species at Risk Screening

Natural Environment Report for the Town of Hanover Wastewater Treatment Plant Expansion

Town of Hanover

Ainley Group

SLR Project No.: 209.V24150.00000

March 18, 2026

Appendix C
Species at Risk Screening

NAME	SARA STATUS	SARO	COSEWIC	SCHEDULE	S-RANK	HABITAT REQUIREMENTS	SOURCE OF RECORD	POTENTIAL HABITAT PRESENT (Y/P/N)	RATIONALE
AVIFAUNA									
Bank Swallow (*Riparia riparia*)	THR	THR	THR	1	S4B	The Bank Swallow is threatened by loss of breeding and foraging habitat, destruction of nesting habitat and widespread pesticide use. Bank swallows are small songbirds with brown upperparts, white underparts and a distinctive dark breast band. It averages 12 cm long and weighs between 10 and 18 grams. The swallow can be distinguished in flight from other swallows by its quick, erratic wing beats and its almost constant buzzy, chattering vocalizations. They nest in burrows in natural and human-made settings where there are vertical faces in silt and sand deposit, including banks of rivers and lakes, active sand and gravel pits or former ones where the banks remain suitable. The birds breed in colonies ranging from several to a few thousand pairs (Ministry of Natural Resources and Forestry, 2014).	OBBA	N	No suitable habitat (i.e. steep banks or slopes). No individuals recorded.
Barn Swallow (*Hirundo rustica*)	THR	SC	SC	1	S4B	The Barn Swallow is a threatened species, is found throughout southern Ontario, and can range into the north as long as suitable nesting locations can be found. These birds prefer to nest within human made structures such as barns, bridges, and culverts. Barn Swallow nests are cup-shaped and made of mud; they are typically attached to horizontal beams or vertical walls underneath an overhang. A significant decline in populations of this species has been documented since the mid-1980s, which is thought to be related to a decline in prey. Since the Barn Swallow is an aerial insectivore, this species relies on the presence of flying insects at specific times during the year. Changes in building practices and materials may also be having an impact on this species (Ministry of Natural Resources and Forestry, 2015).	OBBA	N	No suitable nesting structures (i.e. barns) within the Study Area. No individuals recorded.
Bobolink (*Dolichonyx oryzivorus*)	THR	THR	THR	1	S4B	The Bobolink is found in grasslands and hayfields, and feeds and nests on the ground. This species is widely distributed across most of Ontario; however, are designated at risk because of rapid population decline over the last 50 years (Ministry of Natural Resources and Forestry, 2014). The historical habitat of the bobolink was tallgrass prairie and other natural open meadow communities; however, as a result of the clearing of native prairies and the post-colonial increase in agriculture, bobolinks are now widely found in hayfields. Due to their reproductive cycle, nesting habits, and use of agricultural areas, bobolink nests and young are particularly vulnerable to loss as a result of common agricultural practices (i.e. first cut hay).	OBBA	N	Meadow habitat is not large enough. No individuals recorded.
Chimney Swift (*Chaetura pelagica*)	THR	THR	THR	1	S4B,S4N	The Chimney Swift is a threatened species which breeds in Ontario and winters in northwestern South America. It is found mostly near urban areas where the presence of chimneys or other manmade structures provide nesting and roosting habitat. Prior to settlement, the Chimney Swift would mainly nest in cave walls and hollow tress. The Chimney Swift initially benefitted from human settlement; however, recent declines in flying insects and the modernization of chimneys are factors attributed to their current population declines. As a threatened species, the Chimney Swift receives protection for both species and habitat under the ESA (Ministry of Natural Resources and Forestry, 2014).	OBBA	N	Five individuals recorded overhead, however lack of suitable nesting features within the Study Area.
Common Nighthawk (*Chordeiles minor*)	SC	SC	SC	1	S4B	The Common Nighthawk is an extremely well camouflaged bird that inhabits gravel beaches, rock outcrops and burned woodlands, that have little to no ground vegetation. This species can also be found in highly disturbed locations such as clear cuts, mine tailings areas, cultivated fields, urban parks, gravel roads, and orchards. As an insectivore, the primary threat to this species is the widespread application of pesticides (Ministry of Natural Resources and Forestry, 2015). Special concern species do not receive habitat protection under the ESA.	OBBA	N	No suitable habitiat within the Study Area. No individuals recorded.
Eastern Meadowlark (*Sturnella magna*)	THR	THR	THR	1	S4B	The Eastern Meadowlark is a bird that prefers pastures and hayfields, but is also found to breed in orchards, shrubby fields and human use areas such as airports and roadsides. Eastern meadowlarks can nest from early May to mid-August, in nests that are built on the ground and well-camouflaged with a roof woven from grasses. The decline in population of these species is thought to be at least partially related to habitat destruction and agricultural practices (Ministry of Natural Resources and Forestry, 2014).	OBBA	N	Meadow habitat is not large enough. No individuals recorded.

NAME	SARA STATUS	SARO	COSEWIC	SCHEDULE	S-RANK	HABITAT REQUIREMENTS	SOURCE OF RECORD	POTENTIAL HABITAT PRESENT (Y/P/N)	RATIONALE
Eastern Wood-Pewee (*Contopus virens*)	SC	SC	SC	1	S4B	The Eastern Wood-pewee is classified as a species of special concern by COSSARO. Their population has been gradually declining since the mid-1960's (The Cornell Lab of Ornithology, 2015). The Eastern Wood-pewee is a "flycatcher", a bird that eats flying insects, that lives in the mid-canopy layer of forest clearings and edges of deciduous and mixed forests. It prefers intermediate-age forest stands with little understory vegetation. Threats to the population are largely unknown; however, causes may include loss of habitat due to urban development and decreases in the availability of flying insect prey (Ministry of Natural Resources and Forestry, 2014).	NHIC, OBBA	Y	One male territory recorded.
Red-headed Woodpecker (*Melanerpes erythrocephalus*)	END	END	END	1	S4B	The Red-headed Woodpecker is a medium-sized bird, with black and white colouring and a bright red head, neck, and breast. Adults often return to the same nesting site year after year. Between May and June, adults often return to the same nesting site and females lay from three to seven eggs. Habitat for the birds includes open woodland and woodland edges, often near man-made landscapes such as parks, golf courses and cemeteries. The red-headed woodpecker is widespread across southern Ontario but rare (Ministry of Natural Resource and Forestry, 2014).	OBBA	N	No individuals recorded.
Wood Thrush (*Hylocichla mustelina*)	THR	SC	THR	1	S4B	The Wood Thrush is a species of Special Concern because of habitat degradation or destruction by anthropogenic development. The Wood Thrush is a medium-sized songbird, generally rusty-brown on the upper parts with white under parts and large blackish spots on the breast and sides, and about 20 cm long. The Wood Thrush forages for food in leaf litter or on semi-bare ground, including larval and adult insects as well as plant material. They seek moist stands of trees with well-developed undergrowth in large mature deciduous and mixed (conifer-deciduous) forests. The Wood Thrush flies south to Mexico and Central America for the winter (Ministry of Natural Resources and Forestry, 2014).	OBBA	N	No individuals recorded.
HERPTILES									
Snapping Turtle (*Chelydra serpentina*)	SC	SC	SC	1	S3	The snapping turtle is a species of special concern in Ontario due to the potential for the species to become threatened or endangered as a result of biological factors or other identified threats. While not presently protected by law, the snapping turtle has been recognized as a species of special concern by COSSARO. Snapping turtles spend the majority of their lives in water and travel slightly upland to gravel or sandy embankments or beaches to lay their eggs (Ontario Ministry of Natural Resources and Forestry, 2014).	NHIC, ORRA (2010)	Y	Individuals recorded swimming and basking within Saugeen River and adjacent marsh.
VASCULAR PLANTS									
American Ginseng (*Panax quinquefolius*)	END	END	END	1	S2	American ginseng is a perennial plant that grows up to 60 centimetres in height. The leaves typically have five leaflets arranged in a whorl at the end of the leaf stem. The root looks like a gnarly parsnip. The flowers are inconspicuous green-white in colour, but the berries are bright red and arranged in a cluster. In Ontario, American ginseng typically grows in rich, moist, and mature deciduous woods dominated by sugar maple, white ash, and American basswood (Ministry of Natural Resources and Forestry, 2014).	Vascular Plants at Risk in Ontario - Grey County	N	No suitable habitat present within Study Area. No individuals recorded.
American Hart's-tongue Fern (*Asplenium scolopendrium americanum*)	SC	SC	SC	1	S3	Hart's-tongue fern is a strict calciphile (needs a basic, i.e., non-acidic, substrate). It is generally found only at sites on or near dolomitic limestone. Plants usually occur in damp crevices and on mossy, rock outcrops. In Ontario, many populations are found on steep, moderately moist slopes that face north to northeast, have calcareous soil derived from limestone bedrock and are under a hardwood canopy cover. Most Ontario sites are along or close to the Niagara Escarpment, or in rocky areas where rivers have cut through the glacial deposits and exposed bedrock composed of limestones and dolomites.	Vascular Plants at Risk in Ontario - Grey County	N	No suitable habitat present within Study Area. No individuals recorded.
Butternut (*Juglans cinerea*)	END	END	END	1	S2?	The butternut is designated as endangered by COSSARO and is tracked by the NHIC as a species at risk. The tree is federally regulated by the Species at Risk Act (2002). Butternut belongs to the walnut family and produces edible nuts which are a preferred food source for wildlife. The range of butternut trees is south of the Canadian Shield on soils derived from calcium rich limestone bedrock. Butternut trees, which at one time were much more common to the south extending to the northern aspect of zone 6E, have been declining due to factors including forest loss and disease. Butternut trees suffer from a highly transmissible fungal disease called butternut canker. Butternut canker is causing very rapid decline in this tree species across its native range. The fungal disease is easily transmitted by wind and is very difficult to prevent. Trees often die within a few years of infection by butternut canker (Ministry of Natural Resource and Forestry, 2014).	Vascular Plants at Risk in Ontario - Grey County	N	No individuals recorded.

NAME	SARA STATUS	SARO	COSEWIC	SCHEDULE	S-RANK	HABITAT REQUIREMENTS	SOURCE OF RECORD	POTENTIAL HABITAT PRESENT (Y/P/N)	RATIONALE
Eastern prairie fringed-orchid (*Platanthera leucophaea*)	END	END	END	1	S2	The eastern prairie fringed-orchid has distinctive white flowers with a deep nectar spur at the back and a flat, fringed surface for pollinating insects to land on. It can be found in areas of prairie or fen throughout the province and in some tamarack swamps of the Bruce Peninsula and Ottawa Area. Due to the decline of available prairie habitat there are only around 20 populations of eastern prairie fringed orchid currently known of in Ontario. In addition to habitat loss through development and agriculture, the suppression of fire has greatly limited suitable growing sites and the declines in pollinating insects may be impacting long-term recovery (Ontario Ministry of Natural Resources and Forestry, 2015).	Vascular Plants at Risk in Ontario - Grey County	N	No suitable habitat present within Study Area. No individuals recorded.
Hill's Pondweed (*Potamogeton hillii*)	SC	SC	SC	1	S2S3	Hill's pondweed is a submersed aquatic plant found in slow-moving streams, ditches, ponds, lakes, and wetlands. It grows in clear, cold, alkaline waters. Stems can grow up to one (1) metre long, with narrowly linear sharp-pointed or bristle-tipped leaves two (2) to six (6) centimetres long with three (3) to five (5) veins. Flower spikes are dense clusters, up to seven millimetres long, with flowers forming one (1) or two (2) whorls. In Ontario, Hill's pondweed has been recorded at 26 sites in the Bruce Peninsula, Manitoulin Island, Wellington County, and Peel Region. Only about 14 of these are presumed to provide suitable habitat for Hill's Pondweed. The main threats to threats to this plant are water diversion, drainage, and pollution (Ministry of Natural Resources and Forestry, 2015).	Vascular Plants at Risk in Ontario - Grey County	N	No individuals recorded.
Tuberous Indian-plantain (*Arnoglossum plantagineum*)	SC	SC	SC	1	S2	In Ontario, tuberous Indian-plantain grows along riverbanks and in wetlands near Lake Huron, especially along the west side of the Bruce Peninsula. It prefers open sunny areas in wet, calcium-rich meadows or shoreline fens (COSEWIC 2002).	Vascular Plants at Risk in Ontario - Grey County	N	No suitable habitat present within Study Area. No individuals recorded.
MAMMALS									
Tri-colored Bat (*Perimyotis subflavus*)	END	END	END	1	S3?	Tri-colored Bat is a small bat that is widely distributed in eastern North America and whose range extends north to southern Ontario. Tri-colored Bat is rare in this region of Ontario which is at the northernmost limit of the natural range for the species. These bats prefer to nest in foliage, tree cavities and woodpecker holes, and are occasionally found in buildings; though this is not their preferred habitat. Winter hibernation takes place in caves, mines and deep crevices. Tri-colored Bat feed primarily on small insects and prefer an open forest habitat type in proximity to water (University of Michigan Museum of Zoology, 2004).	Professional Knowledge	P	Potential suitable maternity roost habitat is present within the deciduous swamp within the Study Area.
Eastern Small-footed Myotis (*Myotis leibii*)	-	END	-	-	S2S3	The eastern small-footed myotis, a bat, are an endangered species threatened by a disease known as white nose syndrome, caused by a fungus from Europe. Eastern small-footed bat's fur has black roots and shiny light brown tips, giving it a yellowish-brown appearance. Its face mask, ears and wings are black, and its underside is grayish-brown, about 8 cm long in size and weighs 4-5 grams. In the spring and summer, eastern small-footed bats will roost in a variety of habitats, including in or under rocks, in rock outcrops, in buildings, under bridges, or in caves, mines, or hollow trees. They change their roosting locations daily and hunt at night for insects to eat, including beetles, mosquitos, moths, and flies. They hibernate in winter, often in caves and abandoned mines. They can be found from south of Georgian Bay to Lake Erie and east to the Pembroke area, and choose colder and drier sites (Ministry of Natural Resources and Forestry, 2014).	Professional Knowledge	N	Preferred habitat, rocky features are not present within the Study Area.
Little Brown Myotis (*Myotis lucifugus*)	END	END	END	1	S4	Little brown myotis, a bat, are an endangered species threatened by a disease known as white nose syndrome, caused by a fungus from Europe. Little brown bats have glossy brown fur and usually weigh between four and 11 grams. Bats are nocturnal. During the day they roost in trees and buildings. They often select attics, abandoned buildings and barns for summer colonies where they can raise their young. Little brown bats hibernate from October or November to March or April, most often in caves or abandoned mines that are humid and remain above freezing – an ideal environment for the fungus to grow and flourish. The syndrome affects bats by disrupting their hibernation cycle, so that they use up body fat supplies before the spring when they can once again find food sources (Ministry of Natural Resources and Forestry, 2014).	Professional Knowledge	P	Potential suitable maternity roost habitat is present within the deciduous swamp within the Study Area.

NAME	SARA STATUS	SARO	COSEWIC	SCHEDULE	S-RANK	HABITAT REQUIREMENTS	SOURCE OF RECORD	POTENTIAL HABITAT PRESENT (Y/P/N)	RATIONALE
Northern Myotis (*Myotis septentrionalis*)	END	END	END	1	S3	The northern long-eared myotis, a bat, are an endangered species threatened by a disease known as white nose syndrome, caused by a fungus from Europe. Northern long-eared bats have dull yellow-brown fur with pale grey bellies. They are approximately eight cm long, with a wingspan of about 25 cm, and usually weigh six to nine grams. Northern long-eared bats can be found in boreal forests, roosting under loose bark and in the cavities of trees. These bats hibernate from October or November to March or April, most often in caves or abandoned mines (Ministry of Natural Resources and Forestry, 2014).	Professional Knowledge	P	Potential suitable maternity roost habitat is present within the deciduous swamp within the Study Area.
Eastern Red Bat (*Lasiurus borealis*)	S3	END	END	-	-	Eastern red bats roost in the foliage of deciduous or sometimes evergreen trees and occassionally in shrubs (Bat Conservation International, 2024; COSEWIC, 2024). Trees used as maternity roosts tend to be large diameter and tall, reaching or exceeding the height of the surrounding canopy. Their solitary roosting behaviour and well-camouflaged fur results in roosts being highly cryptic. Roost sites that have overhead foliage for cover and open flight space below are selected. Eastern red bats typically uses several trees during the breeding season (COSEWIC, 2024).	Professional Experience	P	Potential suitable maternity roost habitat is present within the deciduous swamp within the Study Area.
Hoary Bat (*Lasiurus cinereus*)	S3	END	END	-	-	Hoary bats roost solitarily amoung the foliage of trees, with preferences including maple, oak, ash, elder, hemlock, and redwood trees (Bat Conservation International, 2024). Trees used as maternity roosts tend to be large diameter and tall, reaching or exceeding the height of the surrounding canopy. There is little information regarding roost switching and roost area for Hoary Bats (COSEWIC, 2024).	Professional Experience	P	Potential suitable maternity roost habitat is present within the deciduous swamp within the Study Area.
Silver-haired Bat (*Lasionycteris noctivagans*)	S3	END	END	-	-	Silver-haired Bats occurs primarily under bark and in the cavities of trees, making them reliant on habitats where large, decaying trees are available. Silver-haired Bats roost in a variety of large diameter coniferous and deciduous trees. Frequent roost switching is common (COSEWIC, 2024).	Professional Experience	P	Potential suitable maternity roost habitat is present within the deciduous swamp within the Study Area.
OTHER									
Hungerford's Crawling Water Beetle (*Brychius hungerfordi*)	END	END	END	1	S1	Hungerford's Crawling Water Beetle is a specialist of small to medium-sized streams characterized by a moderate to fast flow, good stream aeration, cool temperatures (15°C to 25°C), inorganic substrate, and alkaline water conditions. Populations are often, but not always, found immediately downstream from culverts, beaver dams, and human-made dams. The presence of the alga Dichotomosiphon may be a critical component of the habitat because the beetle larvae appear to be very dependent upon it as a food source. Some areas within two watersheds (Saugeen and Grey-Sauble) containing Hungerford's Crawling Water Beetle are relatively pristine while others are very degraded (COSEWIC, 2021)	NHIC	P	No individuals recorded. Potential habitat within the Saugeen River.
Monarch Butterfly (*Danaus plexippus*)	SC	SC	END	1	S2N,S4B	The monarch is an orange and black butterfly with small white spots and is classified as a species of special concern by COSSARO. The monarch relies on milkweed plants as a food source for growing caterpillars, but the adult butterflies forage in diverse habitats for nectar from wildflowers. The greatest threat to the monarch is loss of overwintering habitat in Mexico. Other threats include use of pesticides and herbicides throughout its range (Ministry of Natural Resources and Forestry, 2014).	Butterfly Atlas (2020)	N	Meadow habitat is small with rare milkweed. No individuals recorded.

Notes:
SC - Special Concern
THR - Threatened
END - Endangered
S1 - Extremely rare in Ontario
S2 - Very rare in Ontario
S3 - Rare to uncommon in Ontario
S4 - Considered to be common in Ontario
S5 - Species is widespread in Ontario
SH - Possibly extirpated
S#S# - Indicates insufficient information exists to assign a single rank.
S#? - Indicates some uncertainty with the classification due to insufficient data.
S#N - Nonbreeding
S#B - Breeding
Y= Yes, P = Potential, N = No

Appendix D Correspondence

Natural Environment Report for the Town of Hanover Wastewater Treatment Plant Expansion

Town of Hanover

Ainley Group

SLR Project No.: 209.V24150.00000

March 18, 2026

Outlook

Fw: RE: Assimilative Capacity Study to Support the Ongoing Hanover WWTP Class EA

From Austin Adams <Austin.Adams@slrconsulting.com>
Date Tue 3/10/2026 10:44 AM
To Austin Adams <Austin.Adams@slrconsulting.com>

From:
Sent: Wednesday, July 2, 2025 11:34 AM
To: Jatin Singh
Cc: Kate Zheng; Michael Hulley; Bechard, Marc (MECP); Beth Wang; Macki, Monika (MECP); Melody Johnson
Subject: RE: Assimilative Capacity Study to Support the Ongoing Hanover WWTP Class EA

Good afternoon, Jatin.

I conferred with an Engineering Advisor from our Technical Assessment and Standards Development Branch who reviewed your email. The Engineer noted that the wastewater treatment plant should be property designed to accommodate the anticipated influent contaminant loadings and variability to prevent future episodes of nitrification process overloading/upsets. With these controls in mind, a properly designed and functioning conventional activated sludge process with year round nitrification should be able to achieve the following objectives/limits:

Parameter	Season	Objective	Limit
TAN	Summer (June-Sep)	2 mg/L	4 mg/L
	Winter (Oct-May)	4 mg/L	6 mg/L
E. coli		80 cfu/100mL	100 cfu/100mL

It was also noted during the review that there are examples of ECAs for industrial WWTPs at meat processing facilities with more stringent criteria than that presented above.

Please use this email as a sign-off from RTSS when you apply for the ECA. If there are any further questions or concerns, they can be discussed with the Review Engineer upon application.

Take care,

Alison

Alison Munro, Surface Water Specialist

Ministry of the Environment, Conservation and Parks

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From: Jatin Singh <jatin.singh@ainleygroup.com >
Sent: Monday, May 26, 2025 8:24 AM
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Making Sustainability Happen

Appendix H
Floodplain Report

MARCH 6, 2024
PROJECT NO. 2023-174

718 7TH AVENUE, HANOVER WWTP FLOODPLAIN REPORT

TOWN OF HANOVER

CAPES ENGINEERING

355310 BLUE MOUNTAINS-EUPHRASIA TOWNLINE
CLARKSBURG, ON N0H 1J0

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Introduction

CAPES Engineering Ltd. has been retained by the Ainley Group on behalf of the Town of Hanover, to prepare a Floodplain Report for the Hanover Waste Water Treatment Plant (WWTP) and the Saugeen River which flows adjacent to the WWTP property.

The intent of this report is to demonstrate the existing floodplain extents from the Saugeen River on the WWTP property as requested by the Saugeen Valley Conservation Authority (SVCA) as part of the Municipal Class EA review of the proposed WWTP expansion.

Study Area

The parcel at 718 7th Avenue is a 13.6 ha (approx.) property located in the Municipality of Hanover. The property is irregularly shaped and is located on the west side of 7th Line. Please refer to the property extent figure contained in **Appendix A**. The study area extends from the west (downstream) side of the bridge at 7th Avenue to approximately 400 m north of the bridge at 10th Street/Bruce Road 4. The study area is roughly 700-800 m wide extending west from 7th Avenue.

The Saugeen River flows from the north to the south along the west edge the site, meandering on and off the site. The river, where it enters the north end of the property is approximately 23 m wide and is generally consistent in width between 17 m and 23 m along the 1.5 km of the study area.

Please refer to **Appendix B** for site photos of the river within the study area.

The majority of the study area is mapped from the SVCA as being within a regulated area, however the extent or depth of the floodplain from the Saugeen River has not previously been identified in the regulation mapping. We should note that any works proposed within the regulated area will require a permit from the SVCA. Please refer to **Figure 1** below for the SVCA mapping of the site and surrounding area.

Figure 1 – SVCA Regulated Area



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Please refer to **Appendix A** and to **Drawing F1** for the detailed extent of the study area and location of the watercourses for this report. Additional details on the watercourses and land use are provided below.

Background Information Review

In consultation with the SVCA it appears that there has never been a specific floodplain study for this portion of the Saugeen River. There has however been a study completed for the downstream portion of the Saugeen River in Walkerton.

Walkerton Floodline Mapping – Greenland Consulting Engineers – April 2009

Greenland Consulting Engineers (Greenland) was retained by the Municipality of Brockton to complete a flood line mapping study for the Town of Walkerton in 2007 and produced a report in 2009 with the final results. The hydraulic study area does not include the subject property, but the study did include a new hydrology study to determine the peak flows for the Saugeen River. The limits of the hydrology study include the subject site and delineated flow nodes for the river, one of which is relatively close to the property.

Greenland used Visual Otthymo (VO2) to create a stormwater model of the Saugeen River drainage basin and divided the model into several subcatchments. We have reproduced Greenland Figure 3-5 (Figure 1) below and denoted the location of the portion of the Saugeen River and the site location on the image.

Figure 1 - Greenland Figure 3-5 (modified)

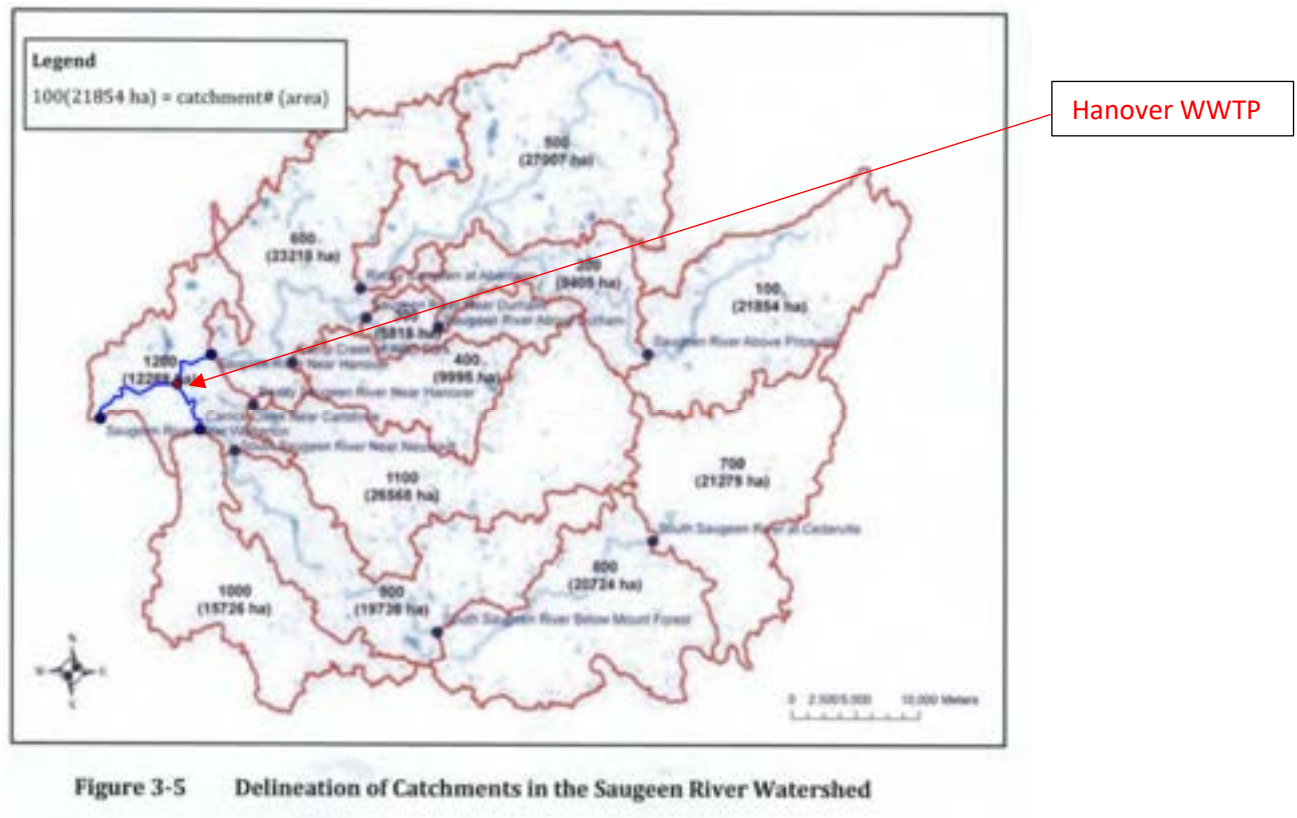


Figure 3-5 Delineation of Catchments in the Saugeen River Watershed

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The subject site is located approximately 3 km downstream of the junction between Subcatchments 600 and 1200. The Hanover WWTP is located upstream of a major junction (Carrick Creek and South Saugeen River) and as such the flows from that additional area will not be included in the calculated flows for this study.

The total upstream drainage area to the model node (Areas 100-600) at this point is 97,297 ha and we believe that at the south end of the subject property the additional drainage area would increase the total by 4440 ha. The additional 4440 ha represents approximately 36% of the Greenland catchment 1200.

Greenland calculated Regional Flood flows in the Saugeen River at the upstream node (ADD {401 + 0600] to be 463.42 cms multiplied by the areal adjustment 1.03 = 477.32 and the additional flow generated by catchment 1200 to be 85.65 cms x the overall areal adjustment of 1.03 = 88.22 cms. The total flow to the site would be equal to the node flow plus a prorated flow (36%) from catchment 1200 which equates to 509.08 cms.

Please refer to **Appendix C** which includes excerpts from the Greenland Report demonstrating the results of their calculations.

Flood Flow Statistics for the Great Lakes – St. Lawrence Watershed System – Ministry of Natural Resources and Forestry - 2014

The MNRF prepared a report in 2014 analyzing the flows in some of the watercourses in Ontario, including the Saugeen River. The report details the flows at three points in the Saugeen River including a point upstream of Durham, one on the South Saugeen River upstream of the connection to main branch of the river and a third point upstream of Walkerton.

The report details three methods of determining the peak flow and found that the 3 Parameter Lognormal Flow method produced the most reliable flows. The flow results are as follows:

- Flow station east of Durham (02FC016) - 3 Parameter Lognormal Flow = 160 cms
- Flow station East of Walkerton (02FC002) - 3 Parameter Lognormal Flow = 887 cms
- Flow station on the South Saugeen (02FC012) - 3 Parameter Lognormal Flow = 359 cms

We used the noted geographic coordinates for the flow stations along with the Grey County GIS site to determine the catchment sizes and the proportion of the overall flow that each station represents. Please refer to **Appendix C** for the mapped delineation of the contributing areas. We found that the flow station east of Walkerton with a flow of 887 cms had 207,445 ha drainage area which was comparable to the Greenland determined area at the same location of 201,059 ha but with a flow of 1087.68 cms (an 18% increase between the Great Lakes report total and the Greenland report).

The flow station on the South Saugeen at 359 cms only represents 57% of the total catchment to the confluence of the main Saugeen River. Prorating the flows for the entire catchment for the South Saugeen would result in a flow of 629 cms at the confluence with the main branch of the Saugeen. Deducting the South Saugeen flow from the flow at Walkerton should provide the flows in the main

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branch of the river in Hanover, which would result in a flow of 257 cms at the site. This value seems low based on the drainage area size.

Completing the same process for the flow station east of Durham on the main branch of the Saugeen shows that the 160 cms at that flow station only represents 19% of the catchment, and prorating the flows would result in 842 cms at Hanover and only 46 cms at the South Saugeen which is not consistent with the reported flows.

Unfortunately, it appears that prorating of the flows separately from these stations does not produce consistent flow results in Hanover. We suggest that prorating the entire drainage area based on the Walkerton location may give better results. The drainage area to the site at Hanover is 105,056 ha or 50% of the total area producing 887 cms of flow to Walkerton. Prorating the flows this way results in a total flow to the WWTP site of 443.5 cms and 443.5 cms from the South Saugeen which is more consistent with the reported flows from the Great Lakes report.

Based on the review of the previous information it is proposed to use the Regional Flow of 509.08 cms in keeping with the Greenland report as it is more conservative than the 443.5 cms from the Great Lakes Report.

Existing Study Area Conditions

Our description of the existing study area is based on review of aerial imagery (2020 data) obtained from Grey County (https://geo.grey.ca), review of Google Earth imagery from 2021, review of the topographic survey of the site (2023), LiDAR contour information obtained from the MNRF site https://geohub.lio.gov.on.ca/ as well as a site visit conducted by CAPES Engineering staff in November 2023.

Please refer to **Figure 2** below for the aerial image of the relevant part of the study area and to **Appendix B** for select photos of key locations.

The Saugeen River at the north end of the study area flows west over the Hanover Dam (uncontrolled, flow over three wide concrete steps) under a bridge at 7th Avenue. Flow continues west and then south along the west edge of the site. The river, through the study area is approximately 16-23 m wide, with relatively steep banks (3:1 to 1:1) and has a fairly regular section through the 1.5 km of the study area.

The river has a rocky/sandy bottom with little vegetation growing within the watercourse and is generally consistent in depth through the study area ranging from 1.6 m to 2.0 m deep with shallower portions on the depositional bends.

The river meanders on and off the WWTP property and several times and there is a total of 460 m of river on the property.

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Figure 2 – MNRF Aerial Image (2020)



On both the east and west sides of the river, for approximately 200 m either side of the river, through the study area there is generally a low-lying area of wetland, forest and long dense grasses and shrubs. This low-lying area is bound by low ridges 2-3 m high. The river also travels through a larger valley between 700 m and 1000 m wide with ridges at the edges of the valley 5 m to 12 m higher than the bottom of the valley.

The existing WWTP is located east of the Saugeen River on an elevated portion of land 3-4 m above the river surface. The area being considered for expansion of the WWTP is located west and south of the elevated area.

The existing concrete and steel bridges over the Saugeen River at 7th Avenue and over 10th Line/Bruce Road 4 are set significantly higher than the river surface with wide openings to allow flow through. We

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do not believe either bridge has any effect of the flood elevation on the WWTP site and have not been included in the study area.

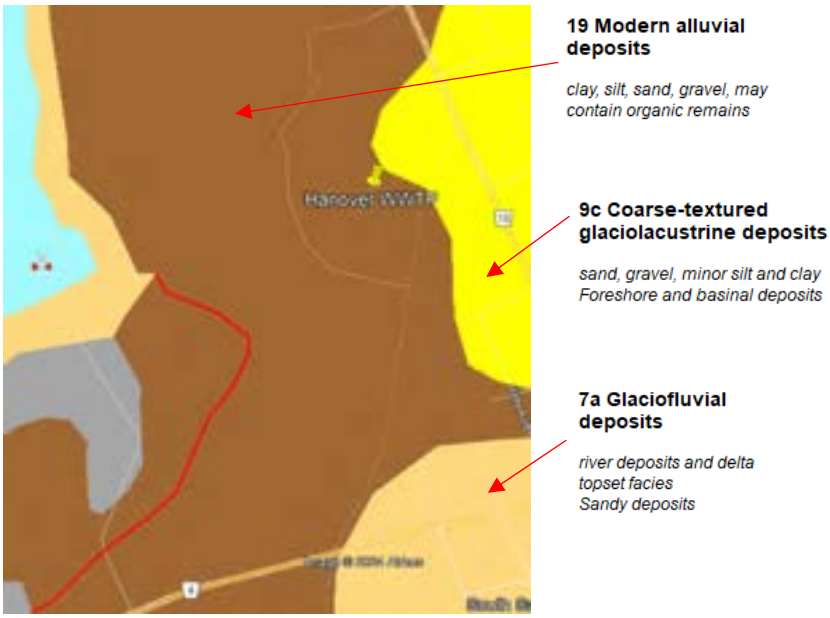
Geotechnical Information

We have utilized the most recent Geologic Survey of Canada mapping available as an add-on to Google Earth which is distributed by the Ministry of Energy Northern Development and Mines (https://www.mndm.gov.on.ca/en/mines-and-minerals/applications/ogsearth/surficial-geology) which contains the most up to date soil mapping for southern Ontario.

This mapping indicates the soils around the Saugeen River and low-lying adjacent areas are "Modern Alluvial Deposit" which are described as "clay, silt, sand, gravel, may contain organic remains". For the areas adjacent to the low-lying sections (ridges forming the valley walls) the soils are described as "Glaciofluvial Deposits" which are described as "river deposits and delta topset facies" and "Coarse Textured Glaciolacustrine Deposits". We believe that the soils of the WWTP site itself is largely imported fill.

Please refer to **Figure 3** below for the available soil mapping of the site.

Figure 3 – OGS Soil Mapping



The dominant soil type through the majority of the study are silts and clays and that will be the design assumption used in the report and any modelling of the site.

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Existing Condition Hydraulic Modelling

We have utilized the background hydrology results from the 2009 Greenland Study and 2014 MNRF Study to develop a new hydraulic HEC-RAS floodplain model. Civil 3D has been used to produce a digital terrain model for the subject area using new LiDAR derived GIS contour data and topographic survey information. The HEC-RAS import and export tools within Civil 3D allow the watercourse alignments, cross sections and profiles created from AutoCAD Tin surfaces to be exported as GIS entities, into the HEC-RAS environment. Working within the Civil 3D environment facilitates generation of geo-referenced cross sections and flood lines and tends to avoid errors associated with traditional approaches that rely on manual input.

HEC-RAS Version 6.4.1 (2023), developed by the U.S. Army Corps of Engineers, has been utilized in accordance with SVCA Hydraulic Standards. This model estimates the change in water surface elevation between selected valley cross sections and runs embedded computational routines to account for local increases in water levels due to bridges and/or other flow obstructions. The model is intended for utilization in the analysis of water surface profiles of steady state, gradually varied, one-dimensional flow, in natural and man-made channels.

A number of considerations are required in the selection of data and parameters to be used in the application of the HEC-RAS model to the floodplains of the study area, including the location of cross-sections and hydraulic structures, hydraulic input parameters and boundary conditions.

Cross Sections

Floodplain boundaries and the lateral extension of flows along a natural stream are typically controlled by the topographic relief and conveyance structures within the stream corridor. This relief is quantified in terms of ground surface elevations and/or contours. For utilization in the HEC-RAS program the topographic relief is represented by cross sections of the stream corridor taken perpendicular to the direction of flow.

Cross sections need to be taken at small enough spacing to accurately represent the channel geometry and to ensure sudden changes in cross section or slope are accounted for in the model. The total distance between the first and last cross sections required to represent the valley system is referred to as the reach length. Please refer to the defined reaches in **Table 1**. In this case we have utilized a single reach as the river and adjacent floodplain were similar throughout the study area.

Table 1 – River Reaches

Reach	Upstream Cross Section	Downstream Cross Section
EX SAUGEEN	RS 2040.09	RS 644.65

The digitized cross sections were initially taken looking from left to right in the upstream direction in CIVIL3D, which is opposite to the orientation required in HEC RAS. The sections were cut in 20 m

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intervals where possible, however due to the meandering nature of the river it was not possible to maintain 20 m intervals throughout the study area. Once the cross sections were imported to HEC RAS they need to be reversed to have the proper orientation (left to right looking downstream).

Cross sections have been cut perpendicular to the anticipated major system flow path through the site and watercourses, and at key locations as follows:

- Changes in channel and/or valley cross-sectional shape.
- Rapid changes in channel or valley slope.
- Significant changes in channel or valley roughness.
- Upstream and downstream of bridges.
- At all defined control points.
- Upstream and downstream of all channel confluences.

Following the initial evaluation of the cross-section selections as noted above, additional sections were added to the model when calculations indicated any of the following conditions:

- Where energy slope decreased or increased significantly.
- When significant changes in the conveyance of adjacent sections were observed.
- Where topographic representation of flow between cross sections indicated unrealistic transition.

Upon using this set of criteria to select the cross sections, these were then reviewed, and edits were made where necessary in the HEC-RAS software. HEC-RAS input geometry files were re-cut from the topographic survey data and iterated through a visual examination of plotted cross sections and model-generated warnings until the number of warnings generated by the software were minimize, eliminated or deemed to not have any impact on the generated floodplain extents.

Hydraulic Structures

Hydraulic structure information was confirmed with site investigation. This data included the location, orientation, elevation, width and height, composition, inlet/outlet characteristics.

Hydraulic structures, were limited to structures within the study area which have the greatest potential to change the flood elevation for a given reach assuming a constant flow. In this case only the bridges over the Saugeen River at 7th Avenue and Bruce Road 4 were considered but neither were deemed to have any impact on the floodplain of the site. The upstream end of the model was started downstream of the 7th Avenue bridge which is set significantly higher (6 m) than the river and was deemed to have sufficiently large openings as to not impact the upstream end of the model. The bridge at Bruce Rd. 4 is 400 m downstream of the end of the study area and more than 600 m south of the WWTP. The bridge is also set well above the river surface (7-8 m) and has a sufficiently large opening that we do not believe there will be a significant backwater effect on the site floodplain.

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Hydraulic Parameters

HEC RAS requires the input of various hydraulic parameters which have been referenced from the HEC-RAS User Manual and Design Chart 2.01 from the 1997 MTO Drainage Management Manual as follows:

Manning's 'n' values are used to compute flow friction losses and have been summarized in the HEC-RAS description editor. Please refer to **Table 2** below for the Mannings n values for the reach used in the HEC RAS Model. It was found that conditions on the site were similar across the study area with a fairly regular channel with sand, rocks and some weeds on the bottom and tall grasses/shrubs/trees on either side of the channel.

Table 2 – Manning's n values Channel & Overbank Areas

Reach	Left of Bank Manning n	Channel Manning n	Right of Bank Manning n
EX –Saugeen River STA 2040.09 – STA 644.65	0.10 – Med. To Dense Vegetation - Summer	0.06 – Some Weeds, heavy brush on banks	0.10 – Med. To Dense Vegetation - Summer

Boundary Conditions

A review of the existing conditions was completed to determine to what extent the upstream and downstream reaches would impact the hydraulics on the site. The boundary conditions of the area immediately downstream, within the hydraulic model, has a significant influence on the water surface profiles of the reach of the study area. There are however no major structures (bridges, culverts etc) immediately (within 400 m) downstream of study area. The river downstream of the site is also fairly consistent in shape and depth and we do not anticipate that there would be a significant backwater effect from the downstream hydraulic structure.

We have made the assumption that the reaches are flowing under normal (uniform) flow conditions at the upstream and downstream ends of the study area. We have measured the bed slope of the channel at the boundary using information obtained from LiDAR contour mapping and topographic survey and utilized that as the energy slope for the normal boundary condition on the upstream and downstream side. The Saugeen River is very flat through the study area with a slope of approximately 0.2%.

We have opted to use the normal depth boundary condition to determine the regional flood elevations. A summary of boundary condition parameters used has been outlined in **Table 3** below.

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Table 3 – Reach Boundary Conditions

Reach	Upstream Boundary Condition	Downstream Boundary Condition
EX SAUGEEN RIVER	Normal Depth – S=0.002	Normal Depth – S=0.002

Ineffective Flow Areas/Levees/Obstructed Flow

The significant flow for the Saugeen River at this location and the two stage valley geometry results in some ineffective flow areas and the need for the use levees in the model. We set levees at the following sections and stations (see **Table 4**)

Table 4 – HEC RAS Levees

HEC RAS X-SECT	Left of Channel		Right of Channel	
	Station	Elevation	Station	Elevation
1962.24	319.57	264.81		
1899.44	278.87	263.53		
1568.56			558.7	263.28
1510.24			593.39	263.11
1460.07			588.75	263.55
1449.13			605.74	263.61
1429.92			628.5	263.37
1331.01	220.29	263.10		
821.48	68.55	263.62		
801.94	82.17	263.48		
779.75	113.25	263.09	490.09	263.78
761.88	81.67	262.86	424.96	264.10
728.85	101.18	262.61	436.83	263.20
706.64	120.58	262.61	455.34	262.25
689.58	125.19	262.61	488.68	263.03
668.63	110.07	262.61	501.55	263.11
644.65	114.8	262.60	532.70	262.72

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Existing Condition Hydraulic Modelling Results

The floodplain results for the Regional storm event have been plotted on **Drawing F1** and the summary table results have been provided in **Appendix D** along with cross sections from the model.

The resulting floodplain map shows that there is a significant floodplain through the study area and adjacent to the existing WWTP. During the Regional event the flood water is highest (263.62) at the upstream end west of the 7th Avenue bridge. This flow elevation does not impact on the entrance to the WWTP site which has an elevation of approximately 265.00. The existing entrance driveway to the WWTP is not within the flood limits and therefore safe access and egress is provided for the site with no alterations required.

The floodplain reaches a low of 261.95 at the south end of the study area.

Through the existing WWTP (proper) cross sections 1510.24 to 840.15 the floodplain elevation varies from of 262.70 at the north end of the existing WWTP down to 262.19 at the south end of the WWTP area.

Two areas have been identified as potential areas for WWTP expansion, please refer to information in **Appendix C** which shows the areas as well as to Floodplain **Drawing F1**. The large potential expansion area on the south side of the WWTP (Area #1 on **Drawing F1**) has flood elevations between 262.22 to 262.19, which translate into flood depths between 2.19 and 2.22 m.

The smaller potential expansion area on the north side of the WWTP is also flooded under existing conditions. The flood elevations in this area are between 262.70 and 262.41, or between 2.41 to 2.70 m flood depth.

Proposed Development Footprint

We have been provided with a map of the WWTP site with potential expansion areas identified including two preferred areas highlighted. The first is located south of the plant (Area #1) and the second is located north of the plant (Area #2).

The existing floodplain modelling shows that both preferred proposed expansion areas are completely within the regional floodplain extent.

As per SVCA Guidelines (2017) Policy 4.7.1-2 (One Zone – Permitted) development of

'Public infrastructure, including but not limited to roads, sanitary sewers, utilities, water supply wells, well houses and pipelines"

subject to appropriate EA processes and provided that

"it has been demonstrated to the satisfaction of SVCA that the control of flooding, erosion, pollution and the conservation of land will not be negatively affected."

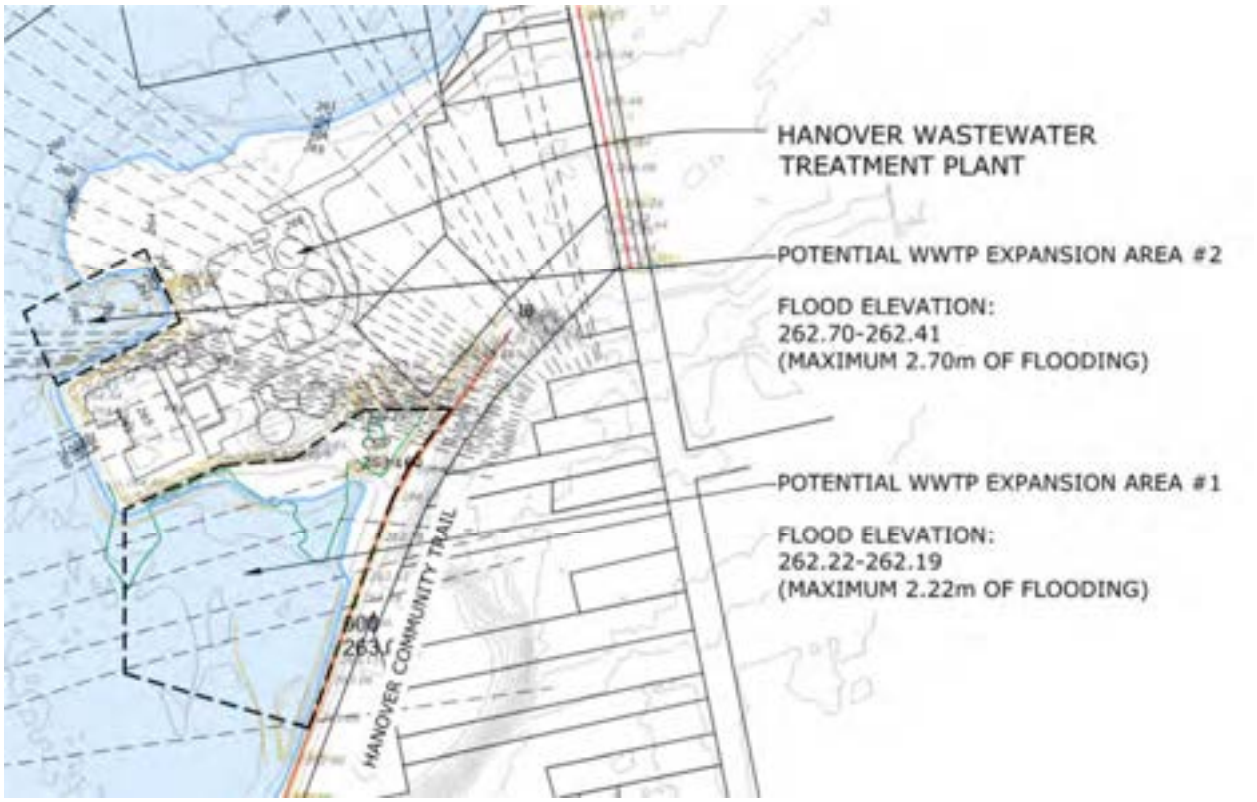
We believe, based on the size of the floodplain as well as the flooding depth that an expansion of the WWTP by filling in the preferred areas is unlikely to significantly alter the flood elevations beyond the

immediate area of the fill, however this will need to be confirmed once a proposed grading design has been developed.

See **Figure 5** below where we have highlighted the areas identified for potential expansion with the floodplain extents shown.

There are other areas (from a floodplain point of view) on the WWTP property other than the identified preferred proposed expansion areas which are outside of the floodplain, however these are located east of the plant infrastructure to the north and south of the access road and at higher elevations than the existing plant infrastructure, which may not be technically feasible for the proposed expansion infrastructure.

Figure 5 – Existing Condition Development Area



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Proposed Condition Hydraulic Model

In order to demonstrate the potential impact on the floodplain of expanding the WWTP we have completed a conceptual hydraulic model for the proposed condition.

We have assumed that the most likely area to be developed is Expansion Area #1 and we further assumed that the elevation of the area would be brought equal to the existing WWTP which is between 264.50 and 265.00. We also assumed that the edge of the platform would be sloped at approximately 3:1. We made an allowance in the conceptual grading for a low area between the expansion area and the Hanover Community trail for drainage to be directed south along the west side of the trail.

This grading is conceptual at this time and is intended to only demonstrate the impact of filling the expansion area. We expect that a far more detailed, and possibly completely different grading configuration may be proposed at later stages of design and approval.

We adjusted 4 cross sections in the existing condition model to reflect the conceptual grading as outlined in Table 5.

Table 5 – Modifications to HEC RAS Cross Sections

XSECT 859.00		XSECT 840.15		XSECT 821.48		XSECT 801.94	
STA	ELEV.	STA	ELEV	STA	ELEV	STA	ELEV
66.56	264.00	41.56	264.00	72.13	264.00	90.00	264.00
70.37	264.50	43.55	264.50	75.30	264.50	92.00	264.50
171.06	264.00	160.00	264.00	179.60	264.00	176.00	264.00
176.00	263.00	163.00	263.00	182.60	263.00	183.25	263.00
179.00	262.00	166.00	262.00	185.60	262.00	188.60	262.00
182.17	261.00	169.00	261.00	188.60	261.00	196.94	261.00

No other alterations to the existing condition model were made for the conceptual proposed condition. Please refer to **Drawing F2** for the proposed condition results which demonstrates that there is a negligible change in the floodplain elevation (maximum of 2 cm increase) and no increase in the floodplain extents.

We believe that proposed Expansion Area #1 can be filled to create a platform for the expansion of the WWTP without any negative impact on the floodplain as is required under SVCA regulations.

We would recommend that if the proposed expansion area is to be significantly larger than depicted on **Drawing F2** that an updated proposed condition hydraulic may be required by the SVCA to demonstrate that there are no adverse effects.

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Recommendations

We provide the following recommendations for the proposed WWTP expansion:

1. If the proposed WWTP expansion is to be located in areas identified as within the floodplain extent, it is proposed to fill the area, and the proposed fill area is larger in extent then modelled in this report then an updated proposed condition floodplain model should be created using the proposed grading plan to ensure SVCA Policy 4.7.1-2 is met with respect to flooding.

2. Design of the WWTP expansion infrastructure (new pipe outfalls, stormwater management facilities, access roads etc.) in Expansion Area #1 should incorporate the existing floodplain elevation of 262.22 into the design assumptions as required.

Conclusions

The Hanover WWTP parcel at 718 7th Avenue is a 13.6 ha (approx.) property located in the Municipality of Hanover. The property is irregularly shaped and is located on the west side of 7th Line. We have undertaken a comprehensive review of the previous hydraulic and hydrology work completed for the study area and downstream lands.

The Saugeen River flows from the north to the south along the west edge the site, meandering on and off the site within a wide valley system and no previous flood studies have been completed for this specific site.

The peak flows generated in previous studies and new topographic information combined with current LiDAR information have been used to develop a new hydraulic (floodplain) model for the site. The new hydraulic model indicates a floodplain that covers the majority of the western half of the property but does not flood the area covered by the WWTP infrastructure which appears to have been constructed on an area of fill to elevate it above the floodplain. The existing driveway entrance to the WWTP is also not within the floodplain and as such safe access and egress to the site is provided.

The identified preferred areas for the expansion of the WWTP are both within the floodplain with flood depths between 2.19 and 2.71 m deep. There are other, non preferred, areas on the site which are not within the floodplain which could potentially be developed.

Current SVCA policy allows for the development of Municipal infrastructure within flooded areas provided no negative impact can be demonstrated. We have demonstrated in this report that proposed Expansion Area #1 can be filled to an elevation of at least 264.50 with 3:1 side slopes and it will not negatively impact the floodplain depth or extents.

We recommend that, should the Municipal EA identify areas within the floodplain for development that are larger than outlined in this report that an updated proposed condition hydraulic model may be required by the SVCA, based on the specific grading for the expansion, to investigate the impact of the proposed works on the floodplain.

Report Prepared By:





Clayton Capes, MSc. P.Eng.

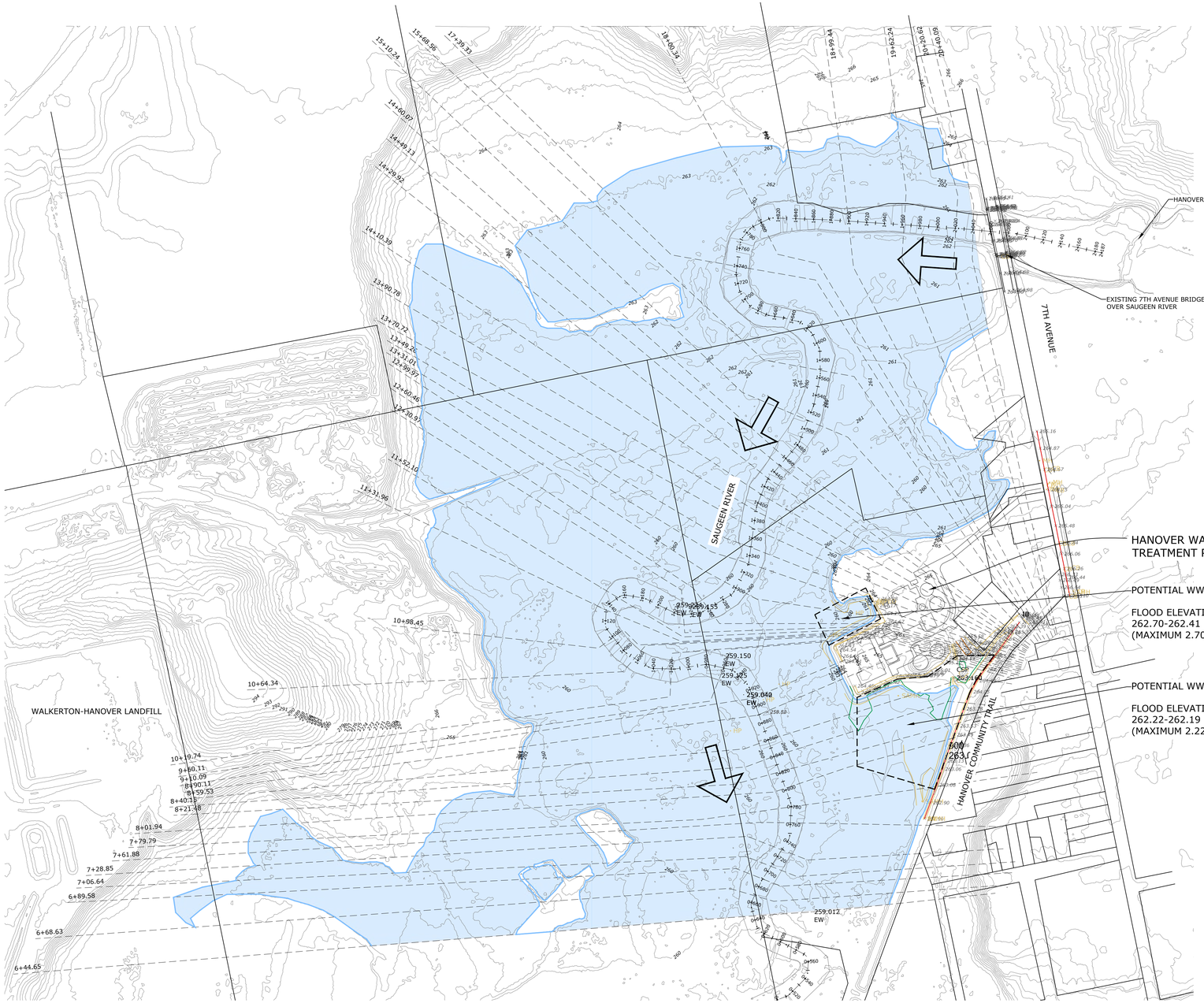
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Drawings

Drawing F1 – Existing Condition Floodplain Extents

Drawing F2 – Conceptual Proposed Condition Floodplain Extents



N

LEGEND

EXTENT OF EXISTING FLOODPLAIN

DIRECTION OF FLOW

EXISTING FLOODPLAIN CONDITIONS	
STATION	ELEVATION
2+040.09	263.62
2+020.62	263.56
1+962.24	263.45
1+899.44	263.34
1+800.34	263.23
1+739.33	263.18
1+568.56	263.03
1+510.24	262.97
1+460.07	262.88
1+449.13	262.86
1+429.92	262.82
1+410.39	262.79
1+390.78	262.77
1+370.72	262.74
1+349.26	262.72
1+331.01	262.70
1+299.97	262.68
1+260.46	262.65
1+230.97	262.62
1+152.10	262.55
1+131.96	262.53
1+098.45	262.49
1+064.34	262.45
1+019.74	262.41
0+960.11	262.34
0+910.09	262.28
0+890.11	262.26
0+859.53	262.23
0+840.15	262.22
0+821.48	262.20
0+801.94	262.19
0+779.79	262.16
0+761.88	262.14
0+728.85	262.10
0+706.64	262.06
0+689.58	262.04
0+668.63	262.00
0+644.65	261.95

Notes
1. This drawing is the exclusive property of CAPES Engineering Ltd. The reproduction of any part without express written consent of this Corporation is strictly prohibited.
2. The contractor shall verify all dimensions, levels, and datums on site and report any discrepancies or omissions to CAPES Engineering Ltd. prior to construction.
3. This drawing is to be read and understood in conjunction with all other plans and documents applicable to this project.

No	Revision	Date
1	HYDRAULIC ANALYSIS	24/02/28

NOTES:

DETAILED TOPOGRAPHIC SURVEY DATA PROVIDED BY SMC GEOMATICS

LIDAR DATA ILLUSTRATED DERVIED FROM THE ONTARIO CLASSIFIED POINT CLOUD, GLOBALLY ADJUSTED BY 0.35m VERTICALLY TO MATCH DETAILED TOPOGRAPHIC DATA

PROPERTY BOUNDARIES ILLUSTRATED ARE APPROXIMATE ONLY FOR REFERENCE PURPOPSES; THIS IS NOT A PLAN OF SURVEY.

LICENSED PROFESSIONAL ENGINEER
C. CAPES
100056104
FEB. 28, 2024
PROVINCE OF ONTARIO

Client
TOWN OF HANOVER

CAPES ENGINEERING
355310 BLUE MOUNTAINS - EUPHRASIA TOWNLINE
CLARKSBURG, ON N0H 1J0
WWW.CAPESENGINEERING.COM

HANOVER WASTEWATER TREATMENT PLANT
718 7TH AVENUE, HANOVER ON
EXISTING CONDITIONS FLOODPLAIN EXTENTS

Designed	Checked	Date	Drawing No.
K. GRIFFIN	C. CAPES	24/02/28	F1
Project No. 2022-169		Rev No. 1	
Scale 1:2,500	0 50 100 150m		

File: C:\CES\Capes Engineering Dropbox\Projects\2022\2022-169 718 7th Avenue\Drawings\01_Models\Dwg\2022-169 718 7TH AVENUE.dwg Date Plotted: February 29, 2024 - 9:40 AM

Appendices

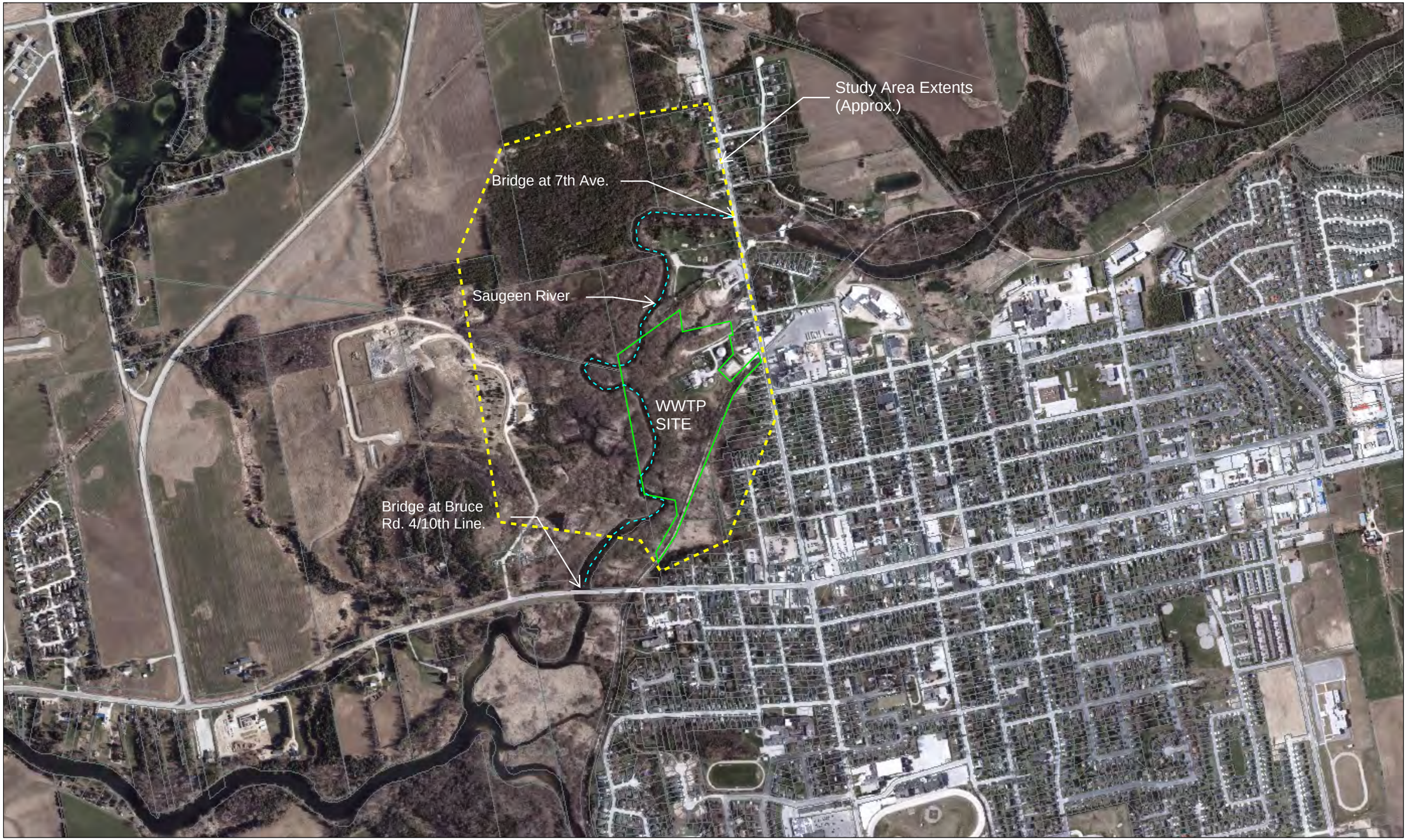
Appendix A – Study Area Extents

CAPES Engineering Ltd.
355310 Blue Mountains-Euphrasia Townline
Clarksburg, ON
N0H 1J0

Ontario MINISTRY OF NATURAL RESOURCES AND FORESTRY
Make a Topographic Map

WWTP Floodplain Study Area Extents

Notes:



Legend

Building as Symbol
Building to Scale
Airport
Heliport \ Hospital Heliport
Seaplane Base
Ferry Route
Trail
Bruce Trail
Greenbelt Route
Rideau Trail
Trans Canada Trail
Voyageur Trail
Waterfront Trail
Railway \ Train Station
Railway with Bridge
Railway with Tunnel
Road (Major ⇔ Minor)
Winter Road
Road with Bridge
Road with Tunnel
Primary, Kings or 400 Series Highway
Secondary Highway
Tertiary Highway
District, County, Regional or Municipal Road
Toll Highway
One Way Road
Road with Permanent Blocked Passage
Road with Address Ranges
Hydro Line, Communication Line or Unknown Transmission Line
Natural Gas Pipeline, Water Pipeline or Unknown Pipeline
Spot Height
Index Contour
Contour
Wooded Area
Wetland
Waterbody
Waterbody Elevation
Watercourse
Falls
Rapids
Rapids \ Falls
Rapids
Rocks
Lock Gate
Dam \ Hydro Wall
Dam \ Hydro Wall
Provincial \ State Boundary
International Boundary
Upper Tier \ District Municipal Boundary
Lower Tier \ Single Tier Municipal Boundary
Lot Line
Indian Reserve
Provincial Park
National Park
Conservation Reserve
Military Lands

0 0.6 km

Projection: Web Mercator



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Appendix B – Site Photos



Photo 1 (Above) –Saugeen River (looking east at dam) at 7th Avenue

Photo 2 (Below) – Saugeen River (looking west) at 7th Avenue





Photo 3 (Above) – Saugeen River (looking north) from Bruce Rd. 4

Photo 4 (Below) – Saugeen River Looking adjacent to WWTP



Appendix C – Background Information

Walkerton Floodline Mapping







Final Report

Saugeen Valley
Conservation Authority

Revised April 2009
07-G-1976

Prepared by:
GREENLAND CONSULTING ENGINEERS

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E-MAIL: greenland@gmland.com WEBSITE: www.gmland.com

Offices: Greater Toronto and Collingwood

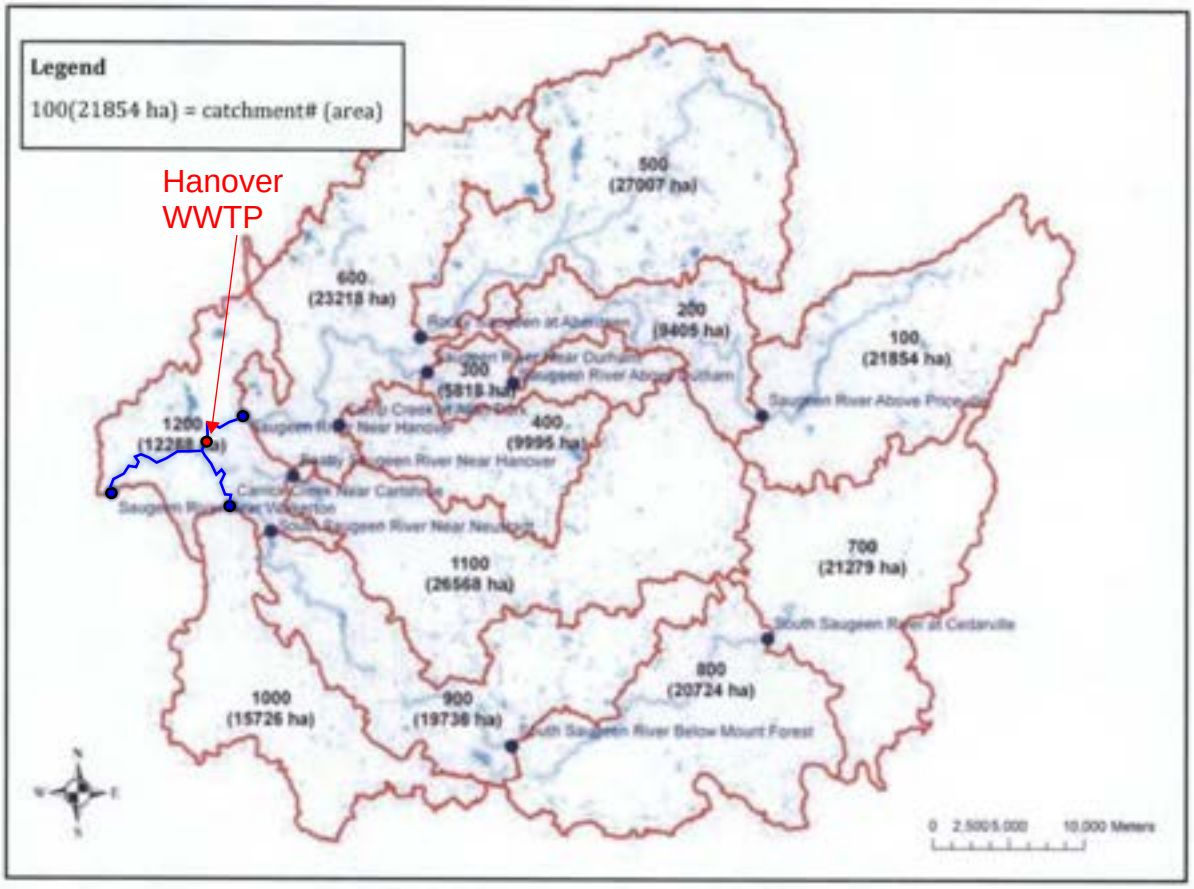


Figure 3-5 Delineation of Catchments in the Saugeen River Watershed

The catchment delineation included establishing the catchments serving the four main gauges located on the two main tributaries of the Saugeen River used to establish the timing of flows. The remaining eight catchments include the other main tributaries. **Figure 3-6** shows the VO2 model schematic generated for the Saugeen River watershed upstream of the flow gauge location upstream of the geographic Town of Walkerton.

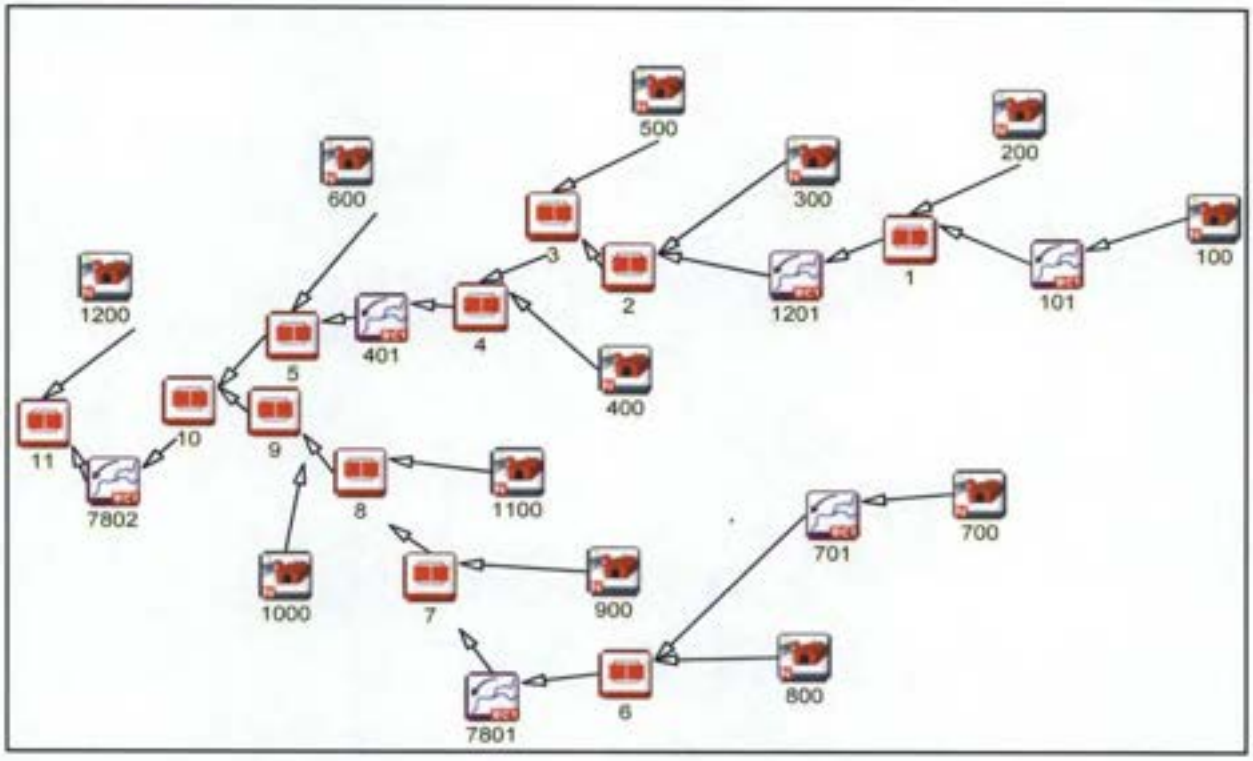


Figure 3-6 VO2 Schematic of the Hydrologic Model for the Saugeen River Watershed

The ADD HYD icon shown as No 11 in the model schematic shows the outlet point at the flow gauge upstream of Walkerton. It is important to note that the model was developed also with ROUTE CHANNEL commands to simulate the timing of flows through reaches with more than one catchment. This enabled the calibration and validation procedures have the additional flexibility of introducing the timing of flows by a physical process instead of attempting to establish the timing by runoff response from the individual catchments alone. The additional flow gauges enabled an estimate of physical response to be determined as well. The model calibration is described in **Section 3.4** and in **Appendix B**.

3.3.3 Easterly Tributary

The Easterly Tributary is the smallest watershed being investigated in the study area. The entire watershed is around the same size of an individual rural catchment in the Silver Creek model. Using the GIS tools, the watershed for the Easterly Tributary was divided into 6 catchments. All the catchments were determined to be rural catchments due to the prevailing land use and low impervious levels (less than 20%). The catchment delineation is shown in **Figure 3-7** with each catchment including the ID number and then the catchment area in hectares.

3.7 Hydrologic Modelling Results

The following tables list the flows acquired from the hydrologic modeling and verification. These flows were used as inputs to the hydraulic models of the three watercourses.

Table 3-23: Flows for Silver Creek

Location		Discharge (cms)						
Node (VO2)	River Stn (HEC-RAS)	2-year	5-year	10-year	25-year	50-year	100-year	Regional
13	2955.824	10.032	15.800	19.993	25.619	29.899	34.315	101.215
16	1994.528	10.633	16.770	21.231	27.188	31.728	36.401	106.341
17	1624.168	10.740	16.914	21.422	27.393	31.926	36.651	106.198
22	785.1412	10.821	17.024	21.545	27.538	32.051	36.810	107.472

The flows used for the Saugeen River for the hydraulic model were obtained from the calibrated VO2 model for the Hurricane Hazel Flood Event standard and by frequency analysis of the flows recorded at the Walkerton gauge for the remaining return periods. **Table 3-24** summarizes these flows.

Table 3-24: Flows for the Saugeen River

Location	Discharge (cms)						
River Stn (HEC-RAS)	2-year	5-year	10-year	25-year	50-year	100-year	Regional
5413.769	274	375.9	447	530	604	670	1087.7

Table 3-25: Flows for the Easterly Tributary

Location		Discharge (cms)						
Node	River Stn	2-year	5-year	10-year	25-year	50-year	100-year	Regional
7	2209.124	0.497	0.79	1.006	1.299	1.524	1.761	6.755
8	1962.997	0.837	1.324	1.682	2.165	2.536	2.921	10.922
11	1860.014	1.168	1.848	2.348	3.022	3.538	4.076	15.105
9	1564.031	1.493	2.349	2.976	3.818	4.463	5.133	18.762
9	1472.945	1.493	2.349	2.976	3.818	4.463	5.133	18.762
10	21.78632	1.733	2.734	3.472	4.462	5.223	6.014	22.362

[N = 1.7:Tp24.42]
*
ADD [0401 + 0600] 0005 3 5.0 ******* 535.25 63.67 130.11 n/a .000
*
ADD [0009 + 0005] 0010 3 5.0 ******* 1125.99 63.42 131.08 n/a .000
*
CHANNEL[2 : 0010] 7802 1 5.0 ******* 1125.07 64.33 130.88 n/a .000
*
* CALIB NASHYD 1200 1 10.0 ******* 98.69 57.50 138.80 .68 .000
[CN=75.0]
[N = 1.7:Tp13.71]
*
ADD [7802 + 1200] 0011 3 5.0 ******* 1217.88 63.67 131.34 n/a .000
*
*****
** SIMULATION NUMBER: 4 **
*****

W/E COMMAND HYD ID DT AREA Qpeak Tpeak R.V. R.C. Qbase
min ha cms hrs mm cms

START @ .00 hrs

READ STORM 15.0
[Ptot=183.54 mm]
fname : C:\SVCA_Saugeen_2008\calibration_model\Storm Events\48hr Regional_64.4% areal reduction.stm
remark: Regional 48 hour/Schroeter
*
** CALIB NASHYD 0700 1 10.0 ******* 148.23 57.67 122.10 .67 .000
[CN=76.0]
[N = 1.7:Tp13.96]
*
CHANNEL[2 : 0700] 0701 1 5.0 ******* 147.40 59.50 121.97 n/a .000
*
* CALIB NASHYD 0800 1 10.0 ******* 124.68 60.33 124.50 .68 .000
[CN=78.0]
[N = 1.7:Tp16.89]
*
ADD [0701 + 0800] 0006 3 5.0 ******* 272.01 59.83 123.23 n/a .000
*
CHANNEL[2 : 0006] 7801 1 5.0 ******* 270.72 61.67 123.06 n/a .000
*
* CALIB NASHYD 0900 1 10.0 ******* 67.99 71.67 104.19 .57 .000
[CN=75.0]
[N = 1.7:Tp28.66]
*
ADD [7801 + 0900] 0007 3 5.0 ******* 335.34 62.58 117.05 n/a .000
*
* CALIB NASHYD 1100 1 10.0 ******* 95.69 70.50 106.06 .58 .000
[CN=75.0]
[N = 1.7:Tp27.38]
*
ADD [0007 + 1100] 0008 3 5.0 ******* 428.10 63.58 113.76 n/a .000
*
* CALIB NASHYD 1000 1 10.0 ******* 85.18 61.33 117.50 .64 .000
[CN=75.0]
[N = 1.7:Tp17.92]
*
ADD [0008 + 1000] 0009 3 5.0 ******* 512.93 63.25 114.33 n/a .000
*
* CALIB NASHYD 0400 1 10.0 9995.00 64.12 58.67 119.54 .65 .000
[CN=75.0]

```
 [ N = 1.7:Tp14.98]
*
 * CALIB NASHYD     0500  1 10.0 *******  114.83 66.33 111.95  .61   .000
 [CN=75.0       ]
 [ N = 1.7:Tp23.07]
*
 * CALIB NASHYD     0100  1 10.0 *******  110.05 61.83 111.16  .61   .000
 [CN=72.0       ]
 [ N = 1.7:Tp18.34]
*
 CHANNEL[ 2 : 0100] 0101  1  5.0 *******  109.74 63.58 110.91  n/a   .000
*
 * CALIB NASHYD     0200  1 10.0 9405.00   48.94 61.33 111.67  .61   .000
 [CN=72.0       ]
 [ N = 1.7:Tp17.72]
*
 ADD [0101 + 0200]  0001  3  5.0 *******  158.49 62.92 111.15  n/a   .000
*
 CHANNEL[ 2 : 0001] 1201  1  5.0 *******  158.45 63.42 111.07  n/a   .000
*
 * CALIB NASHYD     0300  1 10.0 5818.00   37.07 58.83 119.48  .65   .000
 [CN=75.0       ]
 [ N = 1.7:Tp15.09]
*
 ADD [1201 + 0300]  0002  3  5.0 *******  194.68 62.50 112.39  n/a   .000
*
 ADD [0500 + 0002]  0003  3  5.0 *******  308.65 63.58 112.23  n/a   .000
*
 ADD [0400 + 0003]  0004  3  5.0 *******  371.14 62.67 113.21  n/a   .000
*
 CHANNEL[ 2 : 0004] 0401  1  5.0 *******  371.07 63.08 113.15  n/a   .000
*
 * CALIB NASHYD     0600  1 10.0 *******   93.44 67.67 110.19  .60   .000
 [CN=75.0       ]
 [ N = 1.7:Tp24.42]
*
 ADD [0401 + 0600]  0005  3  5.0 *******  463.42 63.75 112.46  n/a   .000
*
 ADD [0009 + 0005]  0010  3  5.0 *******  976.29 63.50 113.43  n/a   .000
*
 CHANNEL[ 2 : 0010] 7802  1  5.0 *******  975.49 64.42 113.26  n/a   .000
*
 * CALIB NASHYD     1200  1 10.0 *******   85.65 57.50 120.14  .65   .000
 [CN=75.0       ]
 [ N = 1.7:Tp13.71]
*
 ADD [7802 + 1200]  0011  3  5.0 ******* 1056.01 63.75 113.65  n/a   .000
*
 ******************************
 ** SIMULATION NUMBER:  5 **
 ******************************

 W/E COMMAND          HYD ID  DT   AREA  Qpeak Tpeak  R.V. R.C.  Qbase
                      min     ha    cms  hrs    mm       cms

   START @   .00 hrs
   ----------------------
   READ STORM              15.0
   [ Ptot=199.50 mm ]
   fname : C:\SVCA_Saugeen_2008\calibration_model\Storm Events\48hr Regional_70.2% areal reduction.stm
   remark: Regional 48 hour/Schroeter
*
```

Flow at Upstream Node = 463 cms x 1.03 = 476.89 cms

Prorate Catchment 1200 - 36% of flow to be added to upstream node (x 1.03) = 32.19 cms

Flood Flow Statistics:
For the Great Lakes- St. Lawrence Watershed System

November 2014

Spatial Data Infrastructure Unit

Mapping and Information Resources Branch

Corporate Management and Information Division

Ministry of Natural Resources and Forestry

Ontario

FREQUENCY ANALYSIS - THREE-PARAMETER LOGNORMAL DISTRIBUTION
02FC016 SAUGEEN RIVER ABOVE DURHAM

SAMPLE STATISTICS

	MEAN	S.D.	C.V.	C.S.	C.K.
X SERIES	67.940	26.234	.386	.273	2.854
LN X SERIES	4.137	.428	.103	-.624	3.385
LN(X-A) SERIES	5.133	.153	.030	-.037	2.757

X(MIN)= 22.100 TOTAL SAMPLE SIZE= 29
X(MAX)= 126.000 NO. OF LOW OUTLIERS= 0
LOWER OUTLIER LIMIT OF X= 21.031 NO. OF ZERO FLOWS= 0

SOLUTION OBTAINED VIA MAXIMUM LIKELIHOOD

3LN PARAMETERS: A= -103.507 M= 5.133 S= .153

FLOOD FREQUENCY REGIME

RETURN PERIOD	EXCEEDANCE PROBABILITY	FLOOD
1.003	.997	7.73
1.050	.952	27.8
1.250	.800	45.5
2.000	.500	66.0
5.000	.200	89.3
10.000	.100	103
20.000	.050	115
50.000	.020	129
100.000	.010	139
200.000	.005	148
500.000	.002	160

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FREQUENCY ANALYSIS - THREE-PARAMETER LOGNORMAL DISTRIBUTION
02FC002 SAUGEEN RIVER NEAR WALKERTON

SAMPLE STATISTICS

	MEAN	S.D.	C.V.	C.S.	C.K.
X SERIES	319.913	130.523	.408	1.295	5.487
LN X SERIES	5.691	.398	.070	-.219	4.089

X(MIN)= 82.800 TOTAL SAMPLE SIZE= 97
X(MAX)= 774.000 NO. OF LOW OUTLIERS= 1
LOWER OUTLIER LIMIT OF X= 89.503 NO. OF ZERO FLOWS= 0

AFTER REMOVAL OF ZEROES AND/OR LOW OUTLIERS

	MEAN	S.D.	C.V.	C.S.	C.K.
X SERIES	322.383	128.909	.400	1.366	5.591
LN X SERIES	5.704	.378	.066	.046	3.623
LN(X-A) SERIES	5.726	.370	.065	.077	3.603

SOLUTION OBTAINED VIA MAXIMUM LIKELIHOOD

PARAMETERS OF THE 3LN WHICH DUPLICATES THE CONDITIONAL FUNCTION:
A= -6.161 M= 5.720 S= .373

FLOOD FREQUENCY REGIME

RETURN PERIOD	EXCEEDANCE PROBABILITY	FLOOD
1.003	.997	103
1.050	.952	157
1.250	.800	217
2.000	.500	299
5.000	.200	411
10.000	.100	486
20.000	.050	557
50.000	.020	650
100.000	.010	721
200.000	.005	792
500.000	.002	887

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FREQUENCY ANALYSIS - THREE-PARAMETER LOGNORMAL DISTRIBUTION
02FC012 SOUTH SAUGEEN RIVER NEAR HANOVER

SAMPLE STATISTICS

	MEAN	S.D.	C.V.	C.S.	C.K.
X SERIES	142.077	51.552	.363	.404	3.223
LN X SERIES	4.886	.400	.082	-.798	4.750

X(MIN)= 39.900 TOTAL SAMPLE SIZE= 31
X(MAX)= 251.000 NO. OF LOW OUTLIERS= 1
LOWER OUTLIER LIMIT OF X= 47.280 NO. OF ZERO FLOWS= 0

AFTER REMOVAL OF ZEROES AND/OR LOW OUTLIERS

	MEAN	S.D.	C.V.	C.S.	C.K.
X SERIES	145.483	48.757	.335	.610	3.146
LN X SERIES	4.926	.338	.069	-.097	2.904
LN(X-A) SERIES	5.018	.308	.061	-.031	2.865

SOLUTION OBTAINED VIA MAXIMUM LIKELIHOOD

PARAMETERS OF THE 3LN WHICH DUPLICATES THE CONDITIONAL FUNCTION:
A= -12.592 M= 5.003 S= .317

FLOOD FREQUENCY REGIME

RETURN PERIOD	EXCEEDANCE PROBABILITY	FLOOD
1.003	.997	49.7
1.050	.952	75.1
1.250	.800	101
2.000	.500	136
5.000	.200	182
10.000	.100	211
20.000	.050	238
50.000	.020	273
100.000	.010	298
200.000	.005	324
500.000	.002	358

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FREQUENCY ANALYSIS - THREE-PARAMETER LOGNORMAL DISTRIBUTION
02FC002 SAUGEEN RIVER NEAR WALKERTON

SAMPLE STATISTICS

	MEAN	S.D.	C.V.	C.S.	C.K.
X SERIES	319.913	130.523	.408	1.295	5.487
LN X SERIES	5.691	.398	.070	-.219	4.089

X(MIN)= 82.800 TOTAL SAMPLE SIZE= 97
X(MAX)= 774.000 NO. OF LOW OUTLIERS= 1
LOWER OUTLIER LIMIT OF X= 89.503 NO. OF ZERO FLOWS= 0

AFTER REMOVAL OF ZEROES AND/OR LOW OUTLIERS

	MEAN	S.D.	C.V.	C.S.	C.K.
X SERIES	322.383	128.909	.400	1.366	5.591
LN X SERIES	5.704	.378	.066	.046	3.623
LN(X-A) SERIES	5.726	.370	.065	.077	3.603

SOLUTION OBTAINED VIA MAXIMUM LIKELIHOOD

PARAMETERS OF THE 3LN WHICH DUPLICATES THE CONDITIONAL FUNCTION:
A= -6.161 M= 5.720 S= .373

FLOOD FREQUENCY REGIME

RETURN PERIOD	EXCEEDANCE PROBABILITY	FLOOD
1.003	.997	103
1.050	.952	157
1.250	.800	217
2.000	.500	299
5.000	.200	411
10.000	.100	486
20.000	.050	557
50.000	.020	650
100.000	.010	721
200.000	.005	792
500.000	.002	887

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FREQUENCY ANALYSIS - THREE-PARAMETER LOGNORMAL DISTRIBUTION
02FC012 SOUTH SAUGEEN RIVER NEAR HANOVER

SAMPLE STATISTICS

	MEAN	S.D.	C.V.	C.S.	C.K.
X SERIES	142.077	51.552	.363	.404	3.223
LN X SERIES	4.886	.400	.082	-.798	4.750

X(MIN)= 39.900 TOTAL SAMPLE SIZE= 31
X(MAX)= 251.000 NO. OF LOW OUTLIERS= 1
LOWER OUTLIER LIMIT OF X= 47.280 NO. OF ZERO FLOWS= 0

AFTER REMOVAL OF ZEROES AND/OR LOW OUTLIERS

	MEAN	S.D.	C.V.	C.S.	C.K.
X SERIES	145.483	48.757	.335	.610	3.146
LN X SERIES	4.926	.338	.069	-.097	2.904
LN(X-A) SERIES	5.018	.308	.061	-.031	2.865

SOLUTION OBTAINED VIA MAXIMUM LIKELIHOOD

PARAMETERS OF THE 3LN WHICH DUPLICATES THE CONDITIONAL FUNCTION:
A= -12.592 M= 5.003 S= .317

FLOOD FREQUENCY REGIME

RETURN PERIOD	EXCEEDANCE PROBABILITY	FLOOD
1.003	.997	49.7
1.050	.952	75.1
1.250	.800	101
2.000	.500	136
5.000	.200	182
10.000	.100	211
20.000	.050	238
50.000	.020	273
100.000	.010	298
200.000	.005	324
500.000	.002	358

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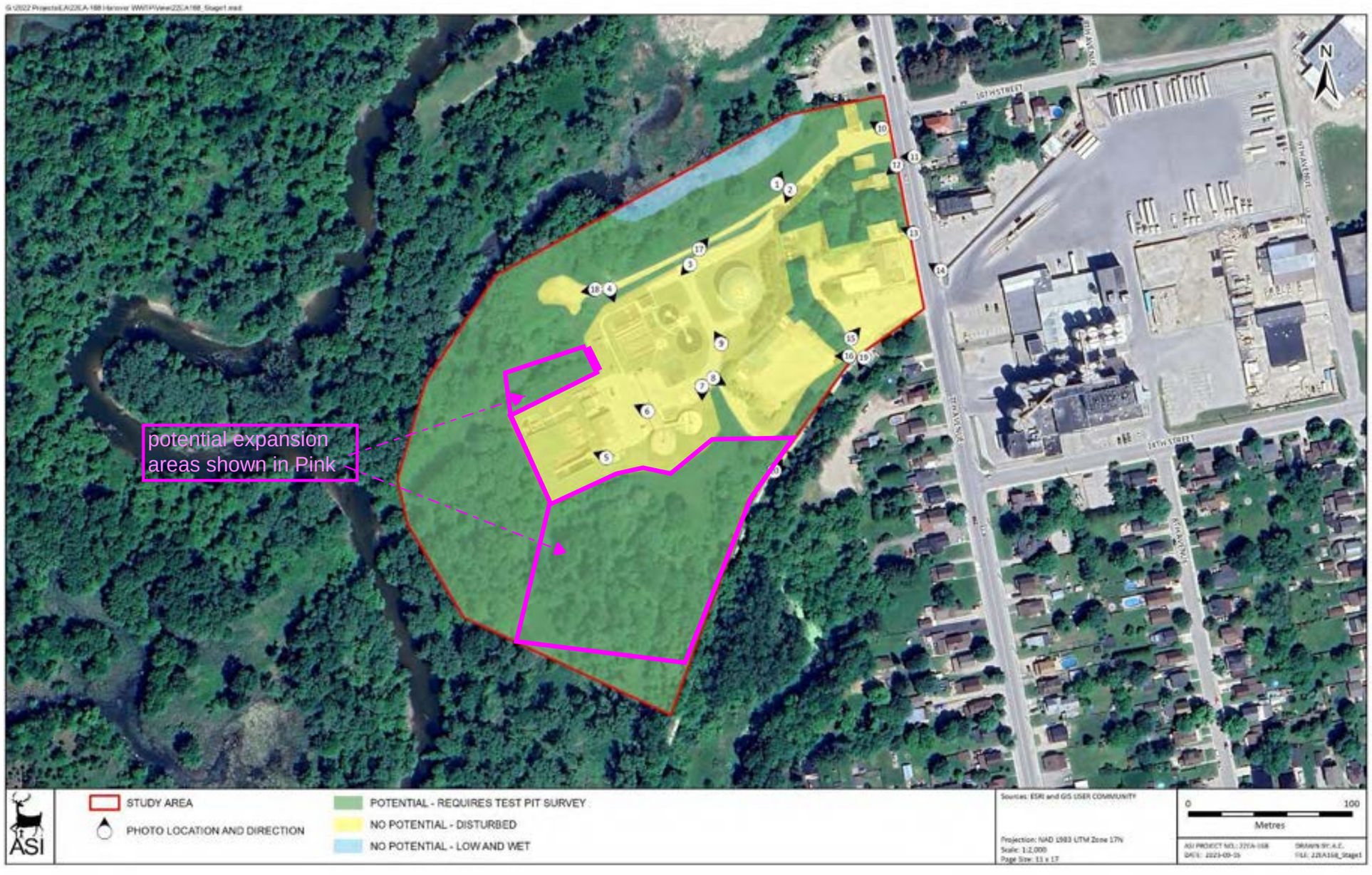
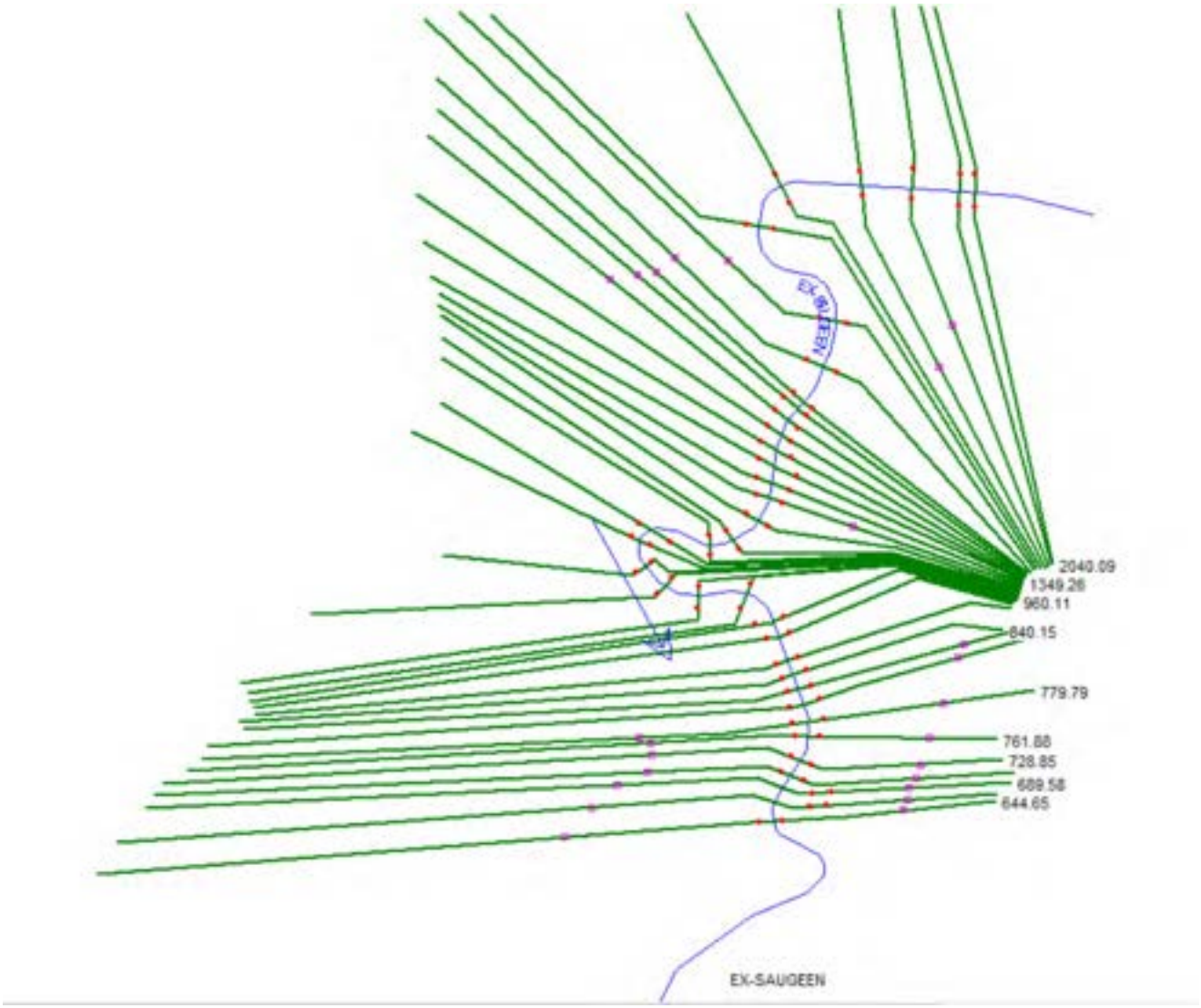


Figure 10: Hanover Wastewater Treatment Plant – Results of Stage 1.

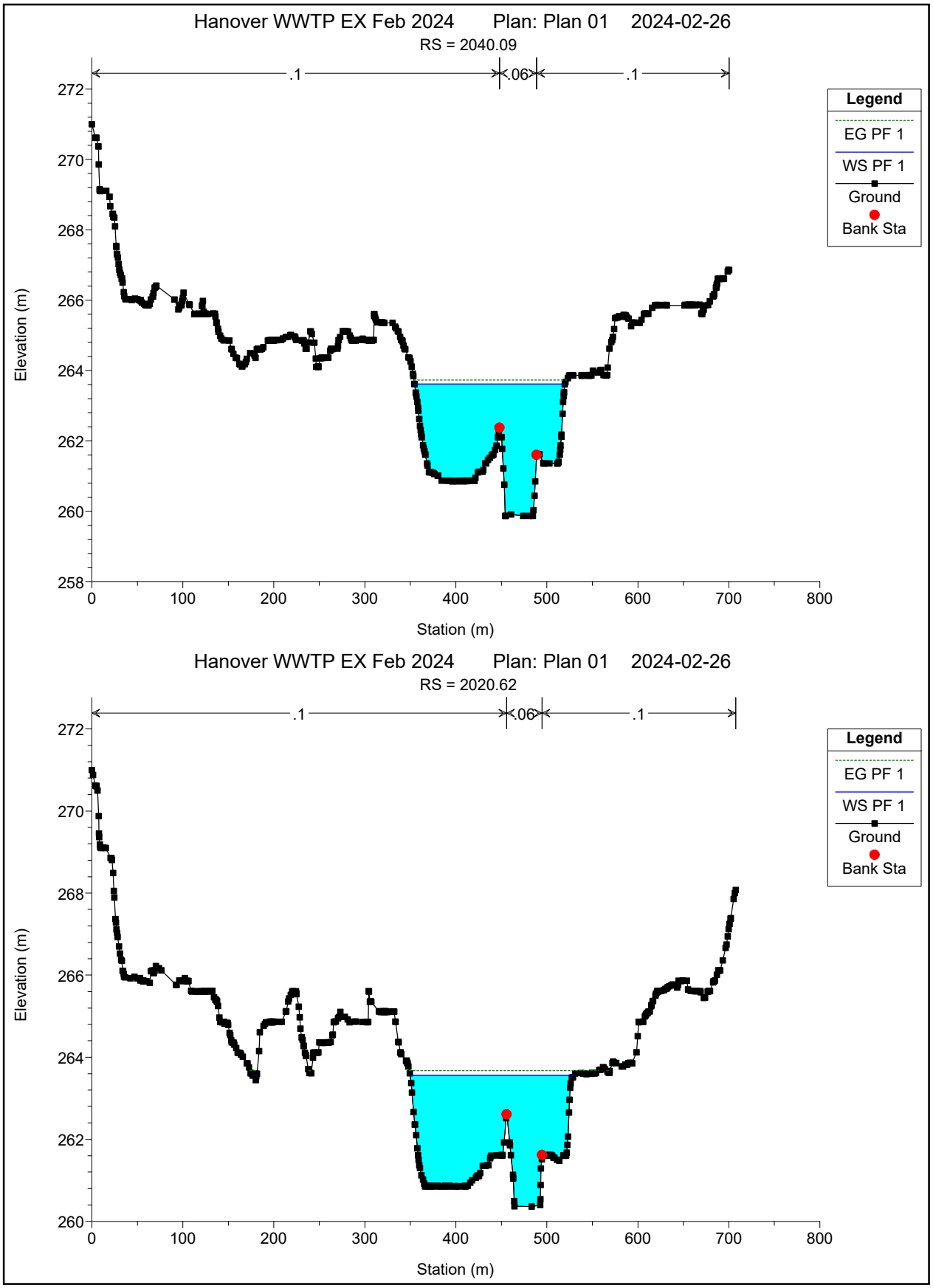
Appendix D – Existing Condition HEC RAS Information

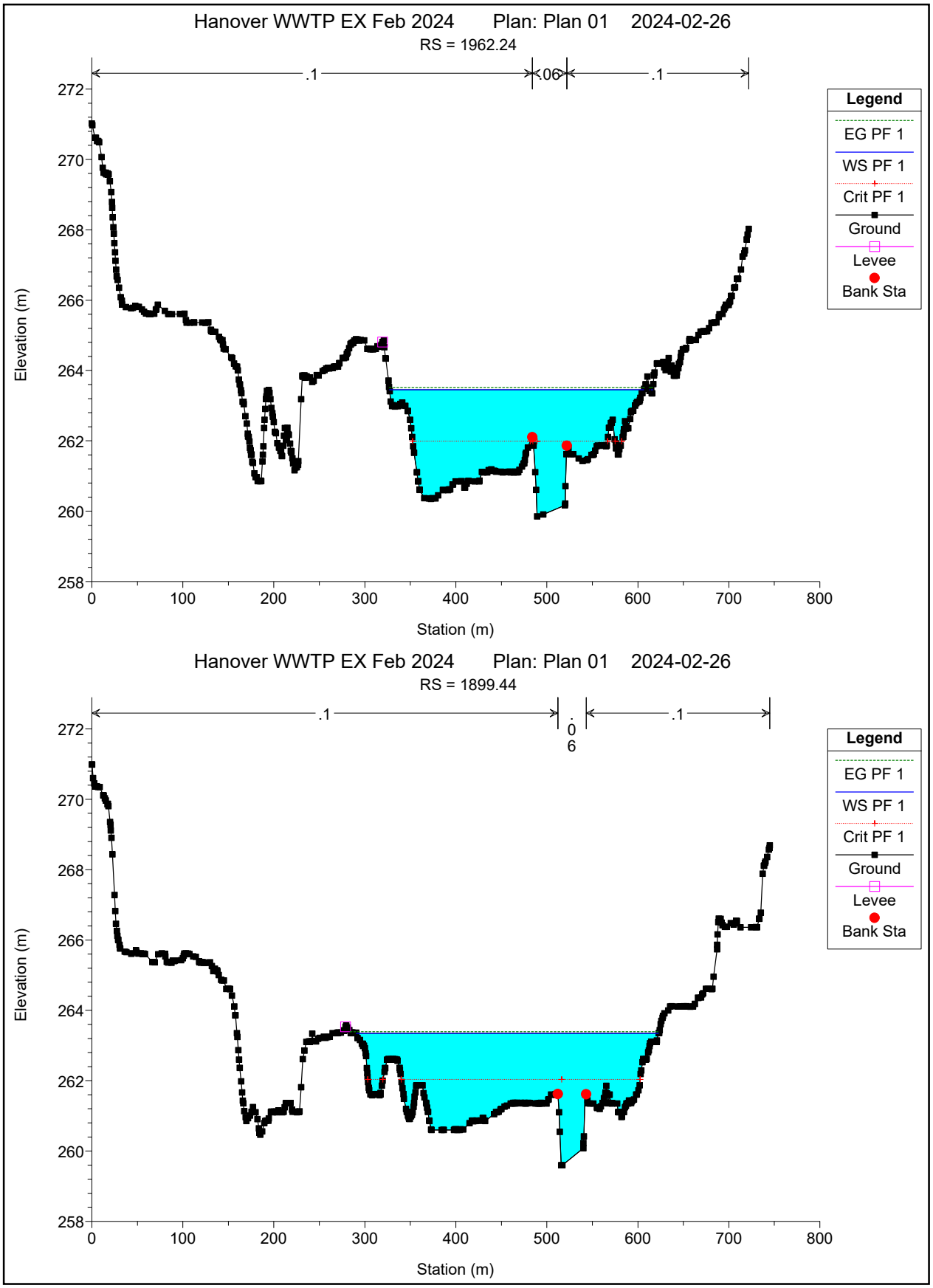
Existing Condition HEC RAS Model Plan View

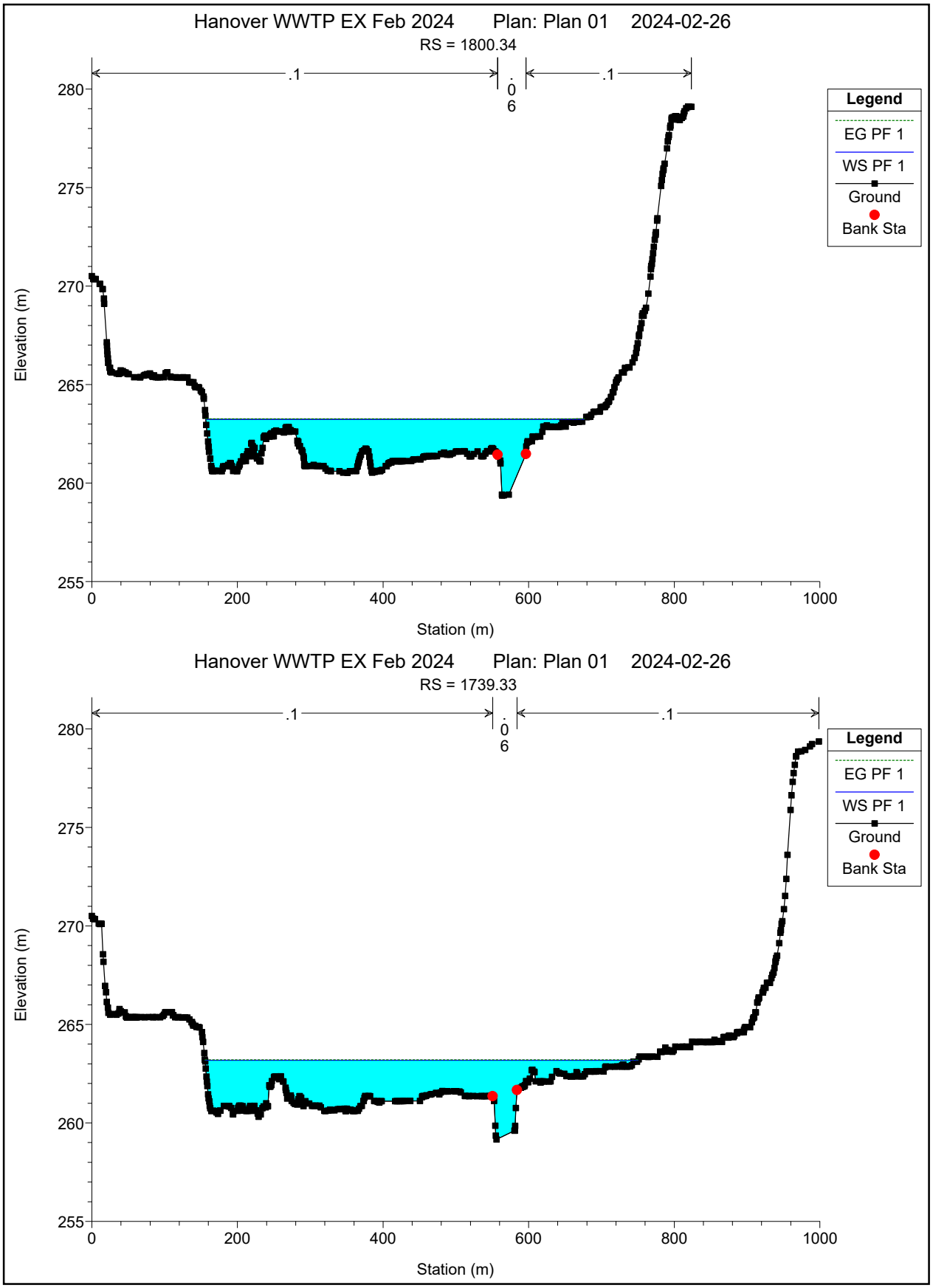


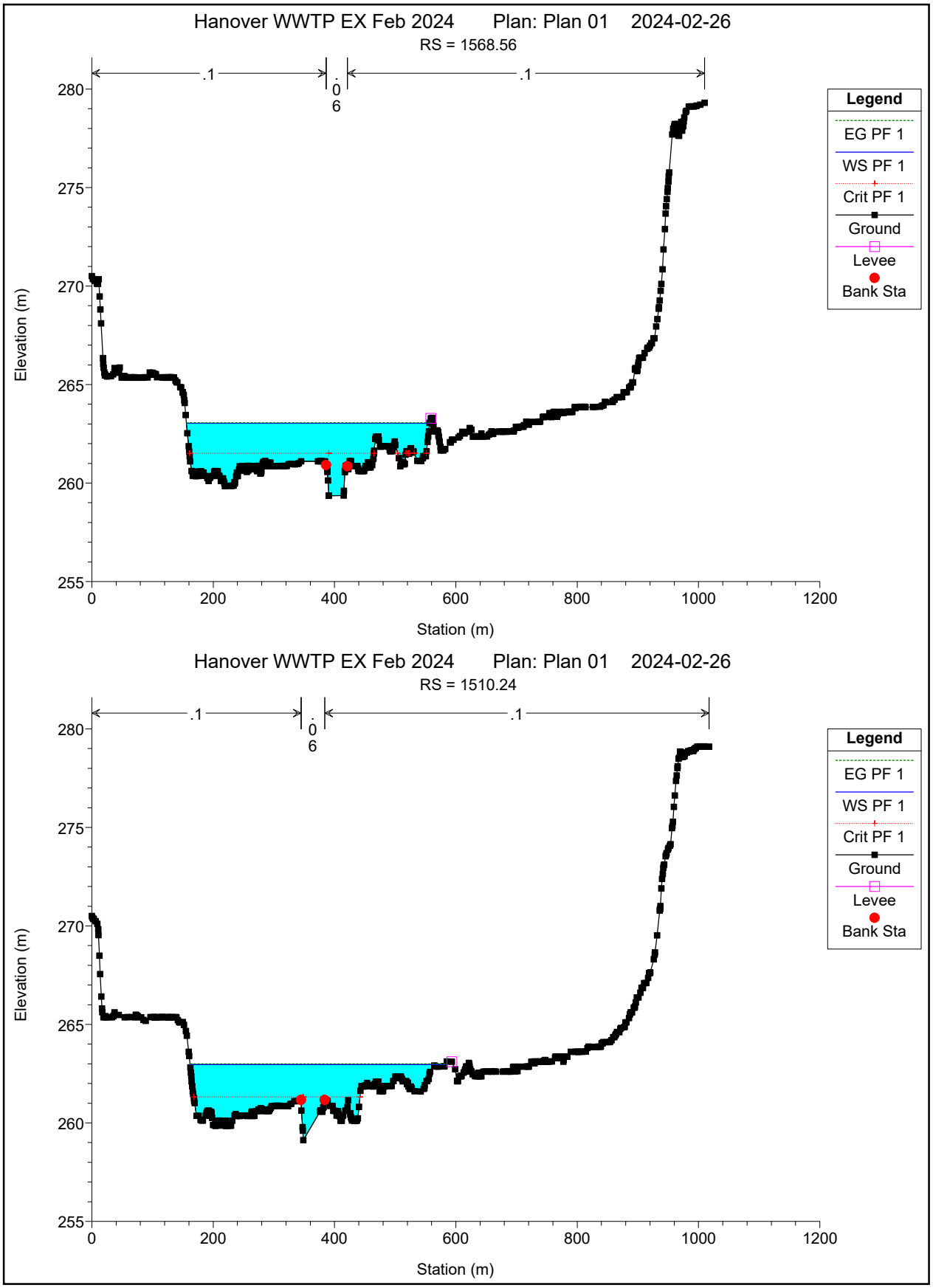
HEC-RAS Plan: Plan 01 River: EX-SAUGEEN Reach: EX-SAUGEEN Profile: PF 1

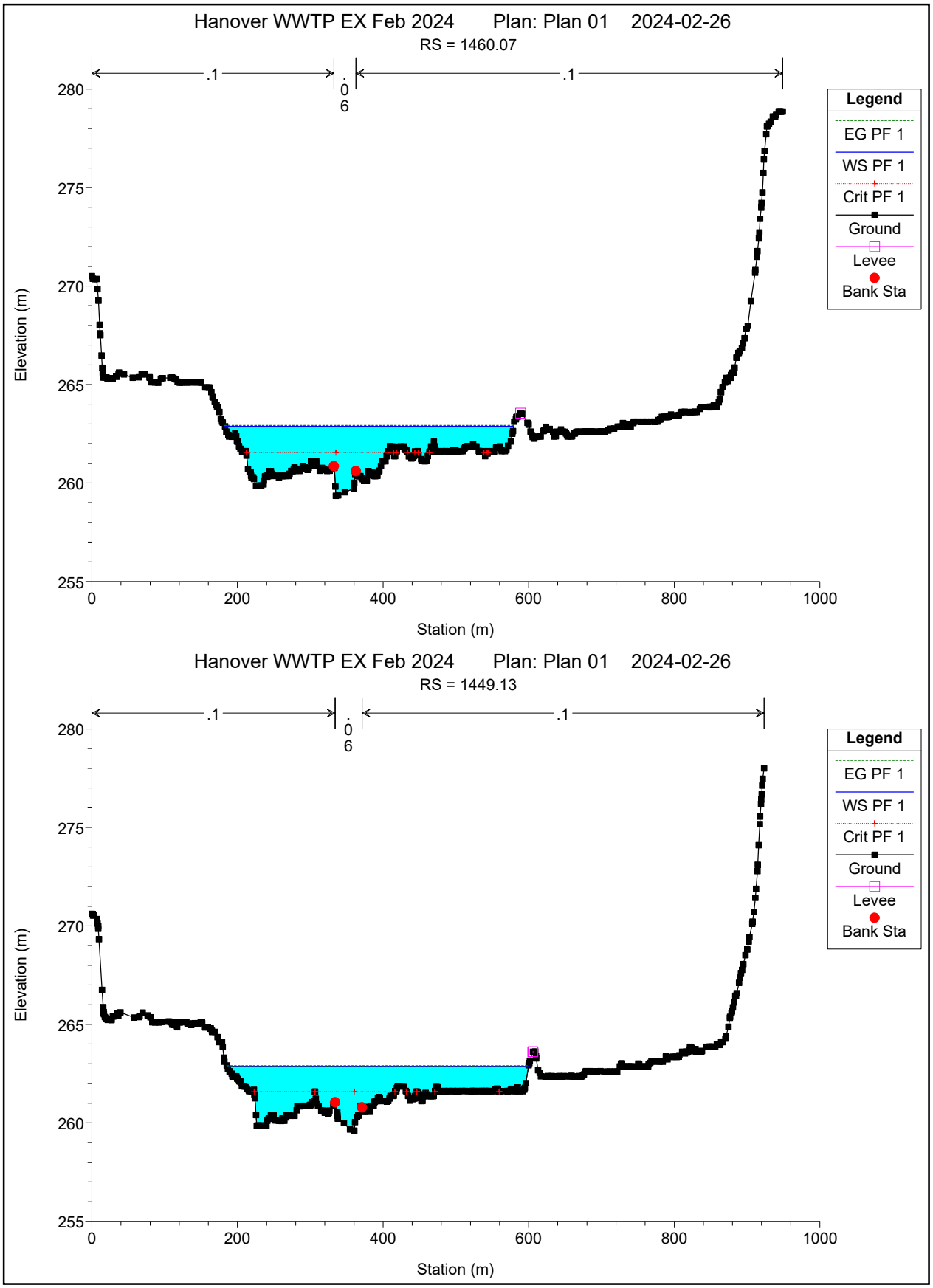
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
EX-SAUGEEN	2040.09	PF 1	509.08	259.86	263.62		263.73	0.002626	1.90	417.91	165.17	0.33
EX-SAUGEEN	2020.62	PF 1	509.08	260.36	263.56		263.67	0.003336	1.91	416.66	182.54	0.36
EX-SAUGEEN	1962.24	PF 1	509.08	259.85	263.45	261.99	263.51	0.001932	1.56	583.21	281.07	0.28
EX-SAUGEEN	1899.44	PF 1	509.08	259.60	263.34	262.04	263.39	0.001746	1.50	662.78	332.12	0.26
EX-SAUGEEN	1800.34	PF 1	509.08	259.36	263.23		263.26	0.001008	1.08	922.64	519.76	0.20
EX-SAUGEEN	1739.33	PF 1	509.08	259.16	263.18		263.20	0.000764	1.04	1044.49	594.97	0.18
EX-SAUGEEN	1568.56	PF 1	509.08	259.35	263.03	261.51	263.06	0.000937	1.12	871.32	400.54	0.20
EX-SAUGEEN	1510.24	PF 1	509.08	259.12	262.97	261.31	263.00	0.001161	1.15	819.45	420.80	0.21
EX-SAUGEEN	1460.07	PF 1	509.08	259.35	262.88	261.55	262.92	0.001703	1.47	714.59	396.58	0.26
EX-SAUGEEN	1449.13	PF 1	509.08	259.61	262.86	261.58	262.90	0.001877	1.41	708.08	414.01	0.27
EX-SAUGEEN	1429.92	PF 1	509.08	259.61	262.82	261.74	262.87	0.002235	1.47	683.11	424.03	0.29
EX-SAUGEEN	1410.39	PF 1	509.08	259.10	262.79		262.83	0.001551	1.33	846.38	588.15	0.25
EX-SAUGEEN	1390.78	PF 1	509.08	259.51	262.77		262.80	0.001351	1.20	871.46	562.66	0.23
EX-SAUGEEN	1370.72	PF 1	509.08	259.44	262.74		262.77	0.001214	1.11	887.65	537.86	0.22
EX-SAUGEEN	1349.26	PF 1	509.08	259.11	262.72		262.74	0.001123	1.11	915.02	530.17	0.21
EX-SAUGEEN	1331.01	PF 1	509.08	259.42	262.70	261.25	262.72	0.001047	1.11	946.28	527.96	0.20
EX-SAUGEEN	1299.97	PF 1	509.08	259.29	262.68		262.69	0.000778	1.00	1083.33	581.77	0.18
EX-SAUGEEN	1260.46	PF 1	509.08	259.11	262.65		262.66	0.000858	0.97	1071.68	580.00	0.18
EX-SAUGEEN	1230.97	PF 1	509.08	259.39	262.62		262.64	0.000839	0.97	1089.12	586.22	0.18
EX-SAUGEEN	1152.1	PF 1	509.08	259.16	262.55		262.57	0.000783	0.94	1026.96	530.99	0.18
EX-SAUGEEN	1131.96	PF 1	509.08	259.10	262.53		262.55	0.001224	1.11	907.18	496.36	0.22
EX-SAUGEEN	1098.45	PF 1	509.08	259.49	262.49		262.51	0.001119	1.08	881.93	423.25	0.21
EX-SAUGEEN	1064.34	PF 1	509.08	259.19	262.45		262.47	0.001132	1.13	854.52	406.07	0.21
EX-SAUGEEN	1019.74	PF 1	509.08	259.83	262.41		262.43	0.000933	0.92	929.08	415.79	0.19
EX-SAUGEEN	960.11	PF 1	509.08	258.92	262.34		262.36	0.001121	1.10	830.47	379.71	0.21
EX-SAUGEEN	910.09	PF 1	509.08	259.36	262.28		262.30	0.001373	1.07	762.10	352.19	0.23
EX-SAUGEEN	890.11	PF 1	509.08	259.40	262.26		262.28	0.001109	1.00	840.67	371.62	0.20
EX-SAUGEEN	859.53	PF 1	509.08	259.47	262.23		262.25	0.000809	0.84	1008.12	458.61	0.17
EX-SAUGEEN	840.15	PF 1	509.08	259.56	262.22		262.23	0.000763	0.83	1056.27	502.14	0.17
EX-SAUGEEN	821.48	PF 1	509.08	258.94	262.20	260.53	262.22	0.000663	0.89	1148.31	564.12	0.16
EX-SAUGEEN	801.94	PF 1	509.08	259.32	262.19	260.37	262.20	0.000699	0.74	1139.26	593.45	0.16
EX-SAUGEEN	779.79	PF 1	509.08	259.21	262.16	260.42	262.18	0.000927	0.97	859.43	356.09	0.19
EX-SAUGEEN	761.88	PF 1	509.08	259.10	262.14	260.43	262.17	0.001173	1.06	785.69	332.23	0.21
EX-SAUGEEN	728.85	PF 1	509.08	258.86	262.10	260.45	262.12	0.001351	1.14	741.03	317.30	0.23
EX-SAUGEEN	706.64	PF 1	509.08	259.06	262.06	260.59	262.09	0.001404	1.22	730.77	326.61	0.23
EX-SAUGEEN	689.58	PF 1	509.08	258.85	262.04	260.64	262.07	0.001524	1.29	736.82	347.00	0.25
EX-SAUGEEN	668.63	PF 1	509.08	258.86	262.00	260.60	262.03	0.001917	1.42	693.54	355.51	0.27
EX-SAUGEEN	644.65	PF 1	509.08	259.10	261.95	260.72	261.98	0.002002	1.27	707.62	381.69	0.27

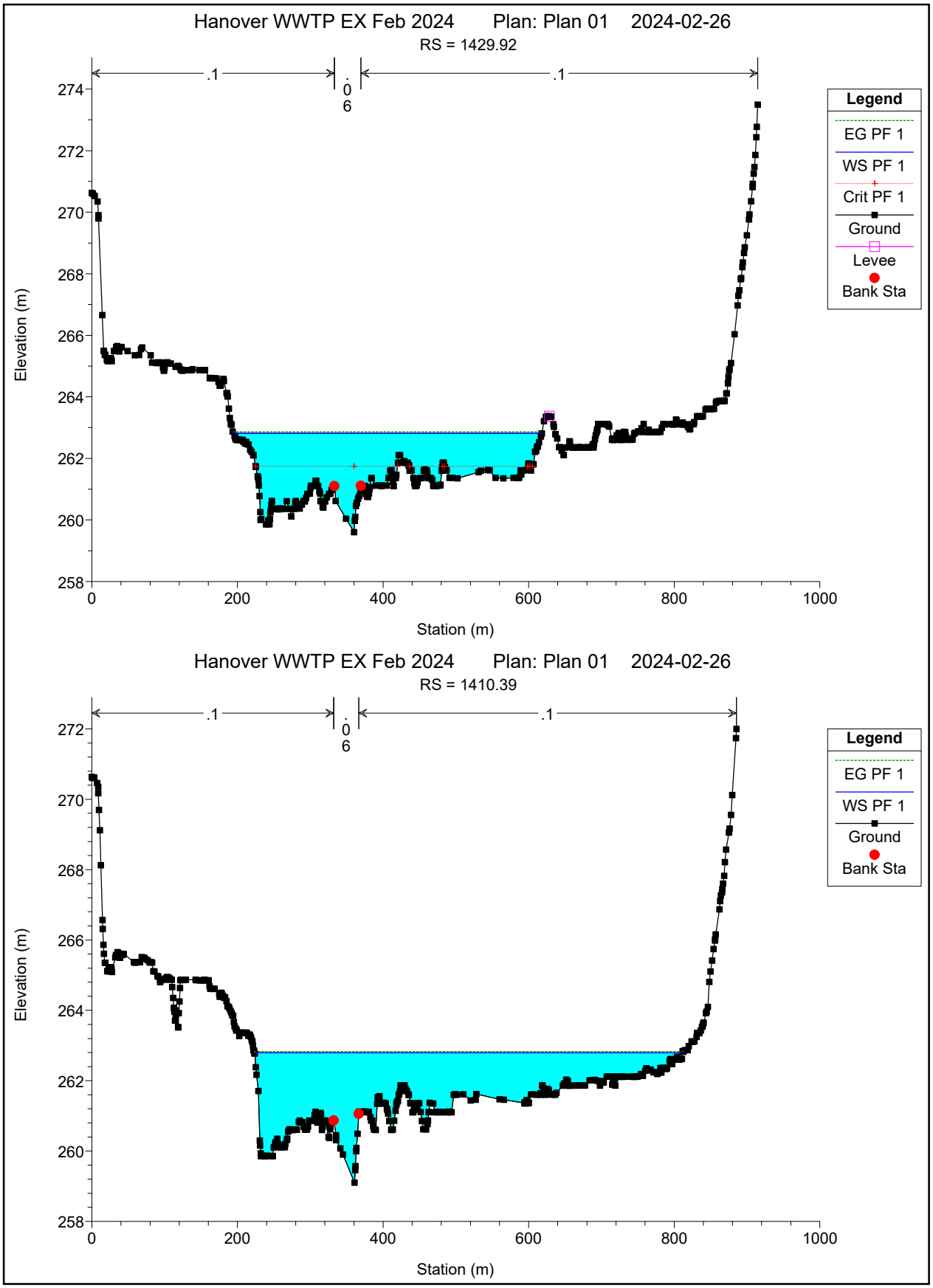

Hanover WWTP EX Feb 2024 Plan: Plan 01 2024-02-26
RS = 2040.09
.1
.06
.1
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (m)
Station (m)
Hanover WWTP EX Feb 2024 Plan: Plan 01 2024-02-26
RS = 2020.62
.1
.06
.1
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (m)
Station (m)

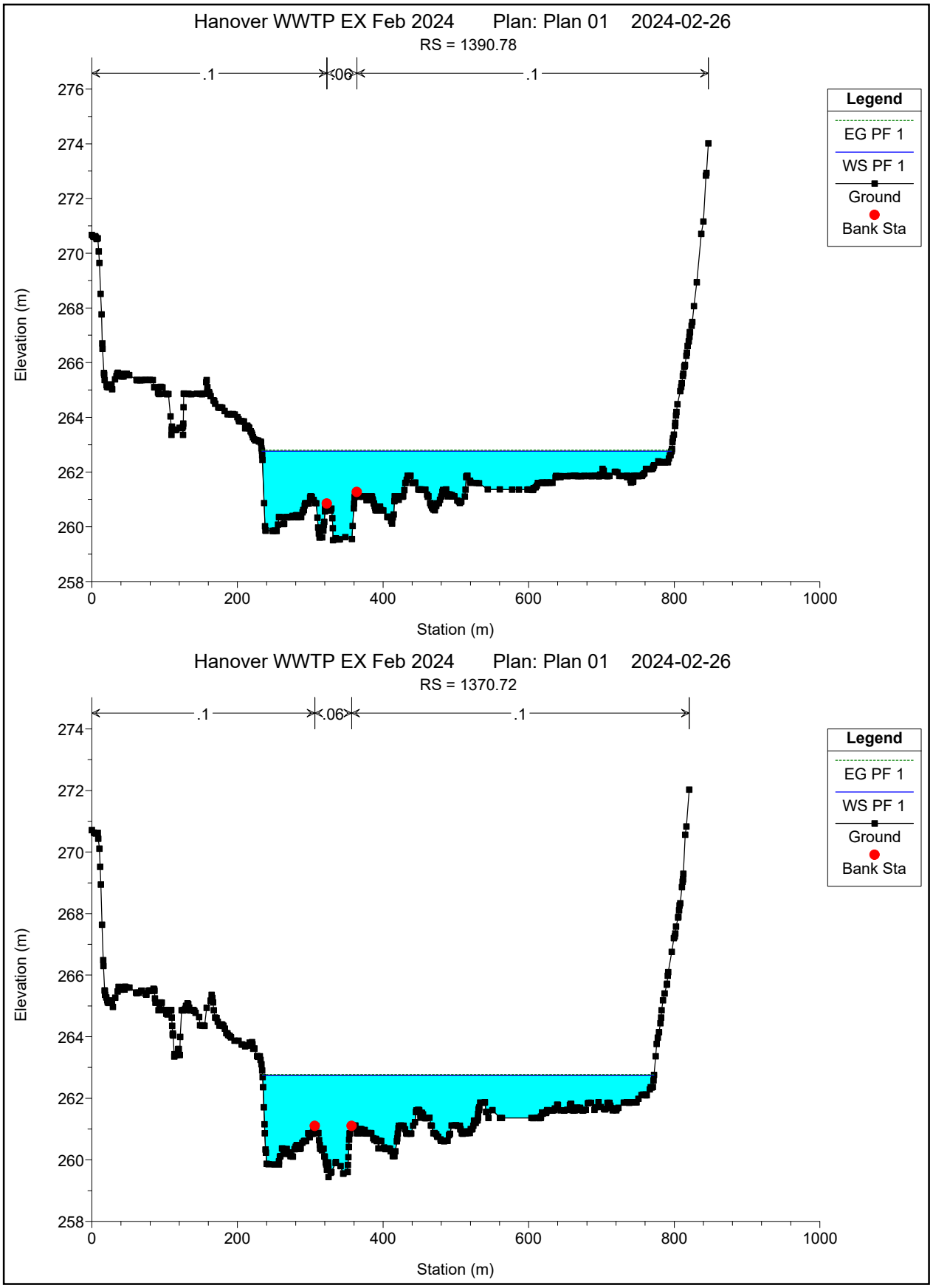

Hanover WWTP EX Feb 2024 Plan: Plan 01 2024-02-26
RS = 1962.24
.1
.06
.1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (m)
Station (m)
Hanover WWTP EX Feb 2024 Plan: Plan 01 2024-02-26
RS = 1899.44
.1
.06
.1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (m)
Station (m)

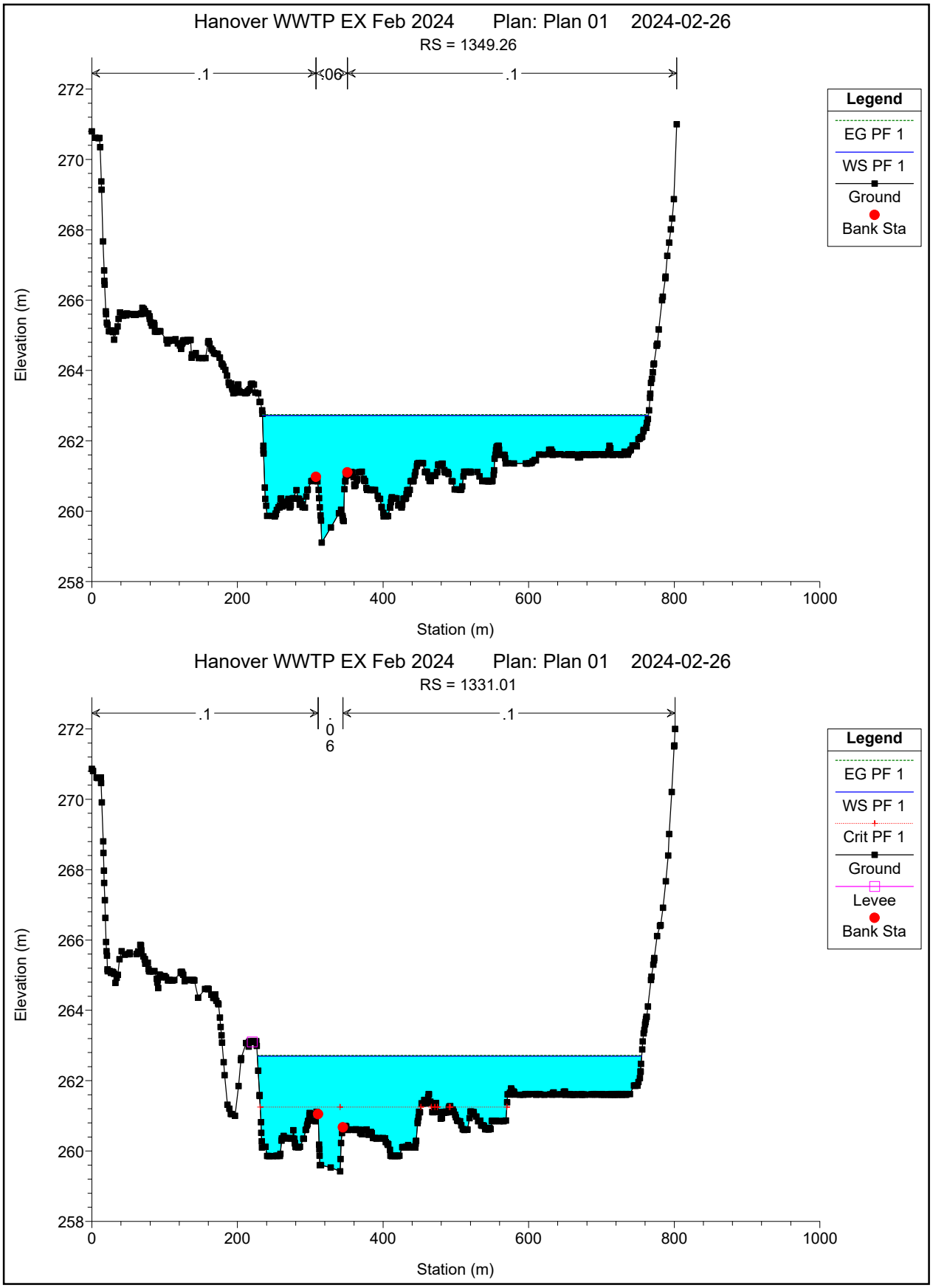

Hanover WWTP EX Feb 2024 Plan: Plan 01 2024-02-26
RS = 1800.34
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.06
.1
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (m)
Station (m)
280
275
270
265
260
255
0
200
400
600
800
1000
Hanover WWTP EX Feb 2024 Plan: Plan 01 2024-02-26
RS = 1739.33
.1
.06
.1
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (m)
Station (m)

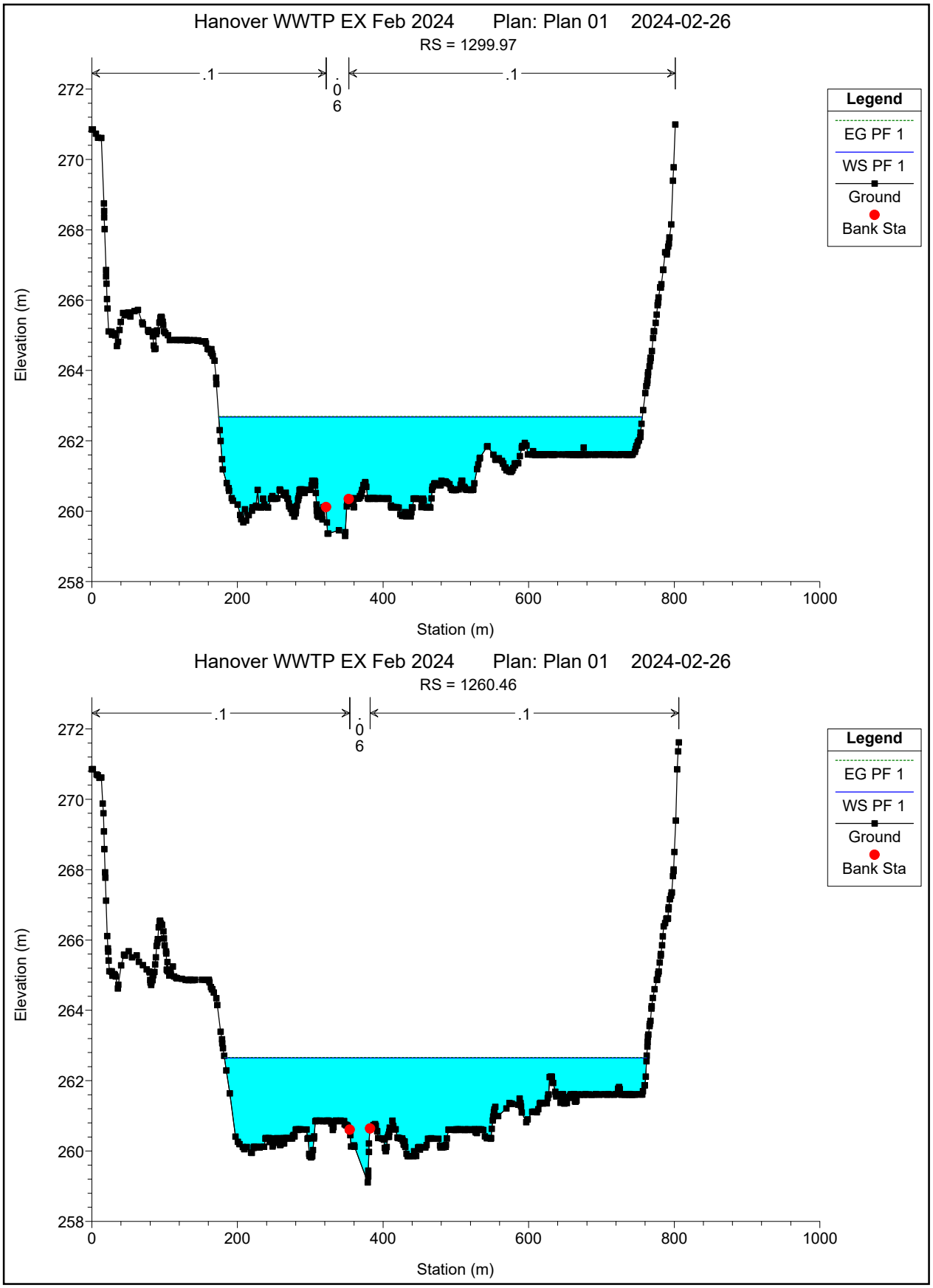

Hanover WWTP EX Feb 2024 Plan: Plan 01 2024-02-26
RS = 1568.56
.1
.06
.1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (m)
Station (m)
280
275
270
265
260
255
0
200
400
600
800
1000
1200
Hanover WWTP EX Feb 2024 Plan: Plan 01 2024-02-26
RS = 1510.24
.1
.06
.1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (m)
Station (m)

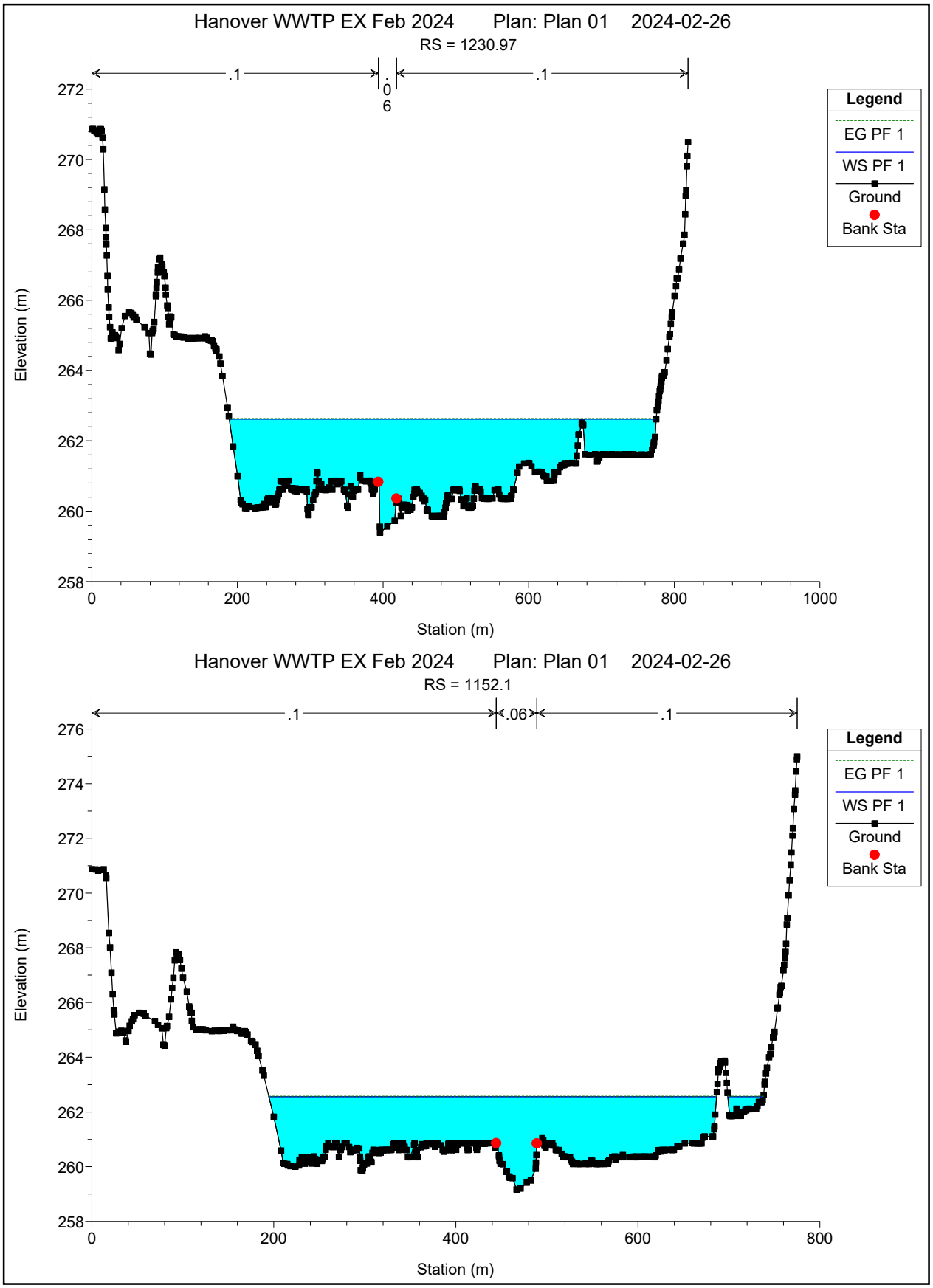

Hanover WWTP EX Feb 2024 Plan: Plan 01 2024-02-26
RS = 1460.07
.1
.06
.1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (m)
280
275
270
265
260
255
0
200
400
600
800
1000
Station (m)
Hanover WWTP EX Feb 2024 Plan: Plan 01 2024-02-26
RS = 1449.13
.1
.06
.1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (m)
280
275
270
265
260
255
0
200
400
600
800
1000
Station (m)

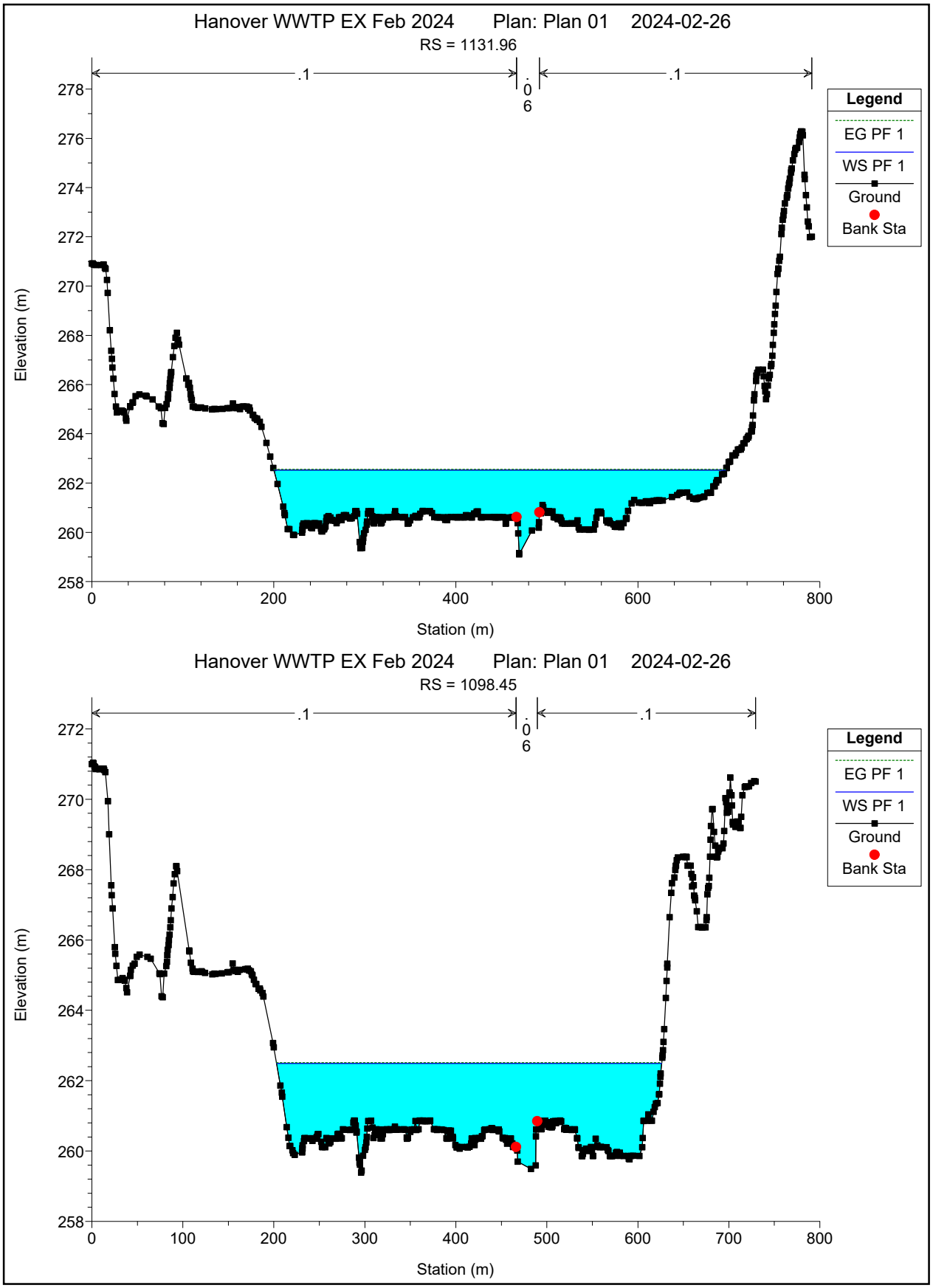

Hanover WWTP EX Feb 2024 Plan: Plan 01 2024-02-26
RS = 1429.92
.1
.06
.1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (m)
Station (m)
Hanover WWTP EX Feb 2024 Plan: Plan 01 2024-02-26
RS = 1410.39
.1
.06
.1
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (m)
Station (m)

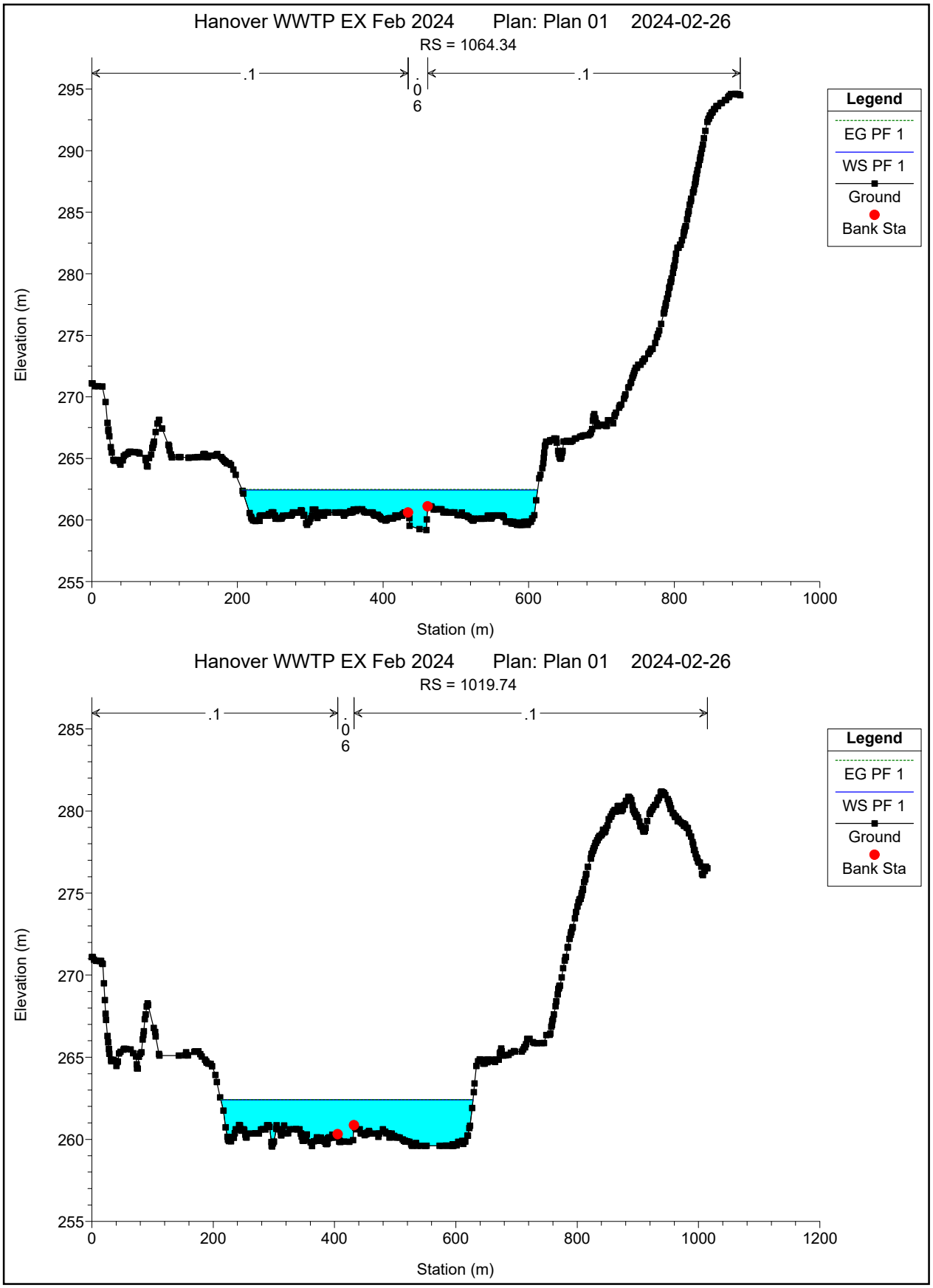

Hanover WWTP EX Feb 2024 Plan: Plan 01 2024-02-26
RS = 1390.78
.1
.06
.1
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (m)
Station (m)
Hanover WWTP EX Feb 2024 Plan: Plan 01 2024-02-26
RS = 1370.72
.1
.06
.1
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (m)
Station (m)

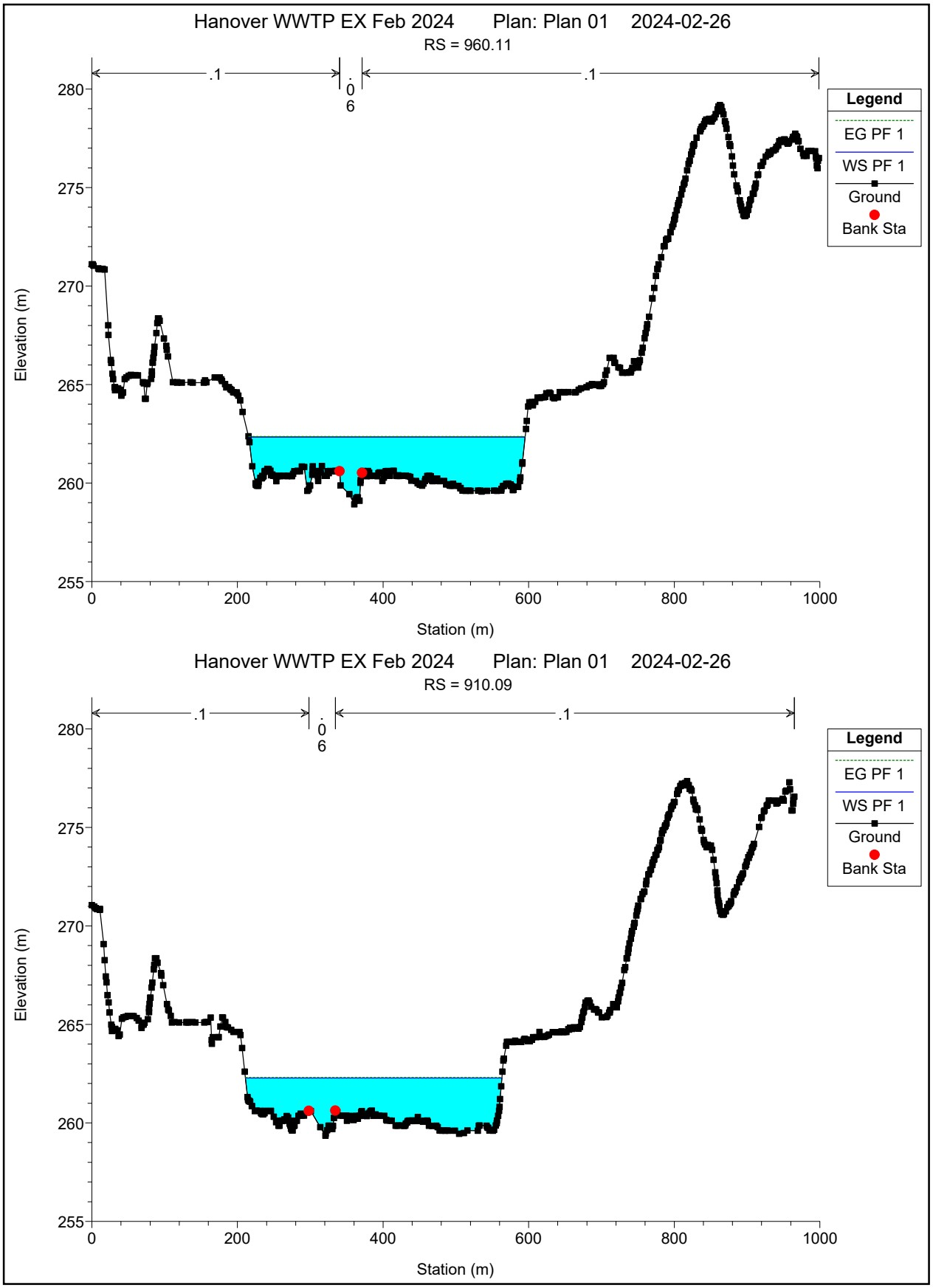

Hanover WWTP EX Feb 2024 Plan: Plan 01 2024-02-26
RS = 1349.26
.1
.06
.1
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (m)
Station (m)
Hanover WWTP EX Feb 2024 Plan: Plan 01 2024-02-26
RS = 1331.01
.1
.06
.1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (m)
Station (m)

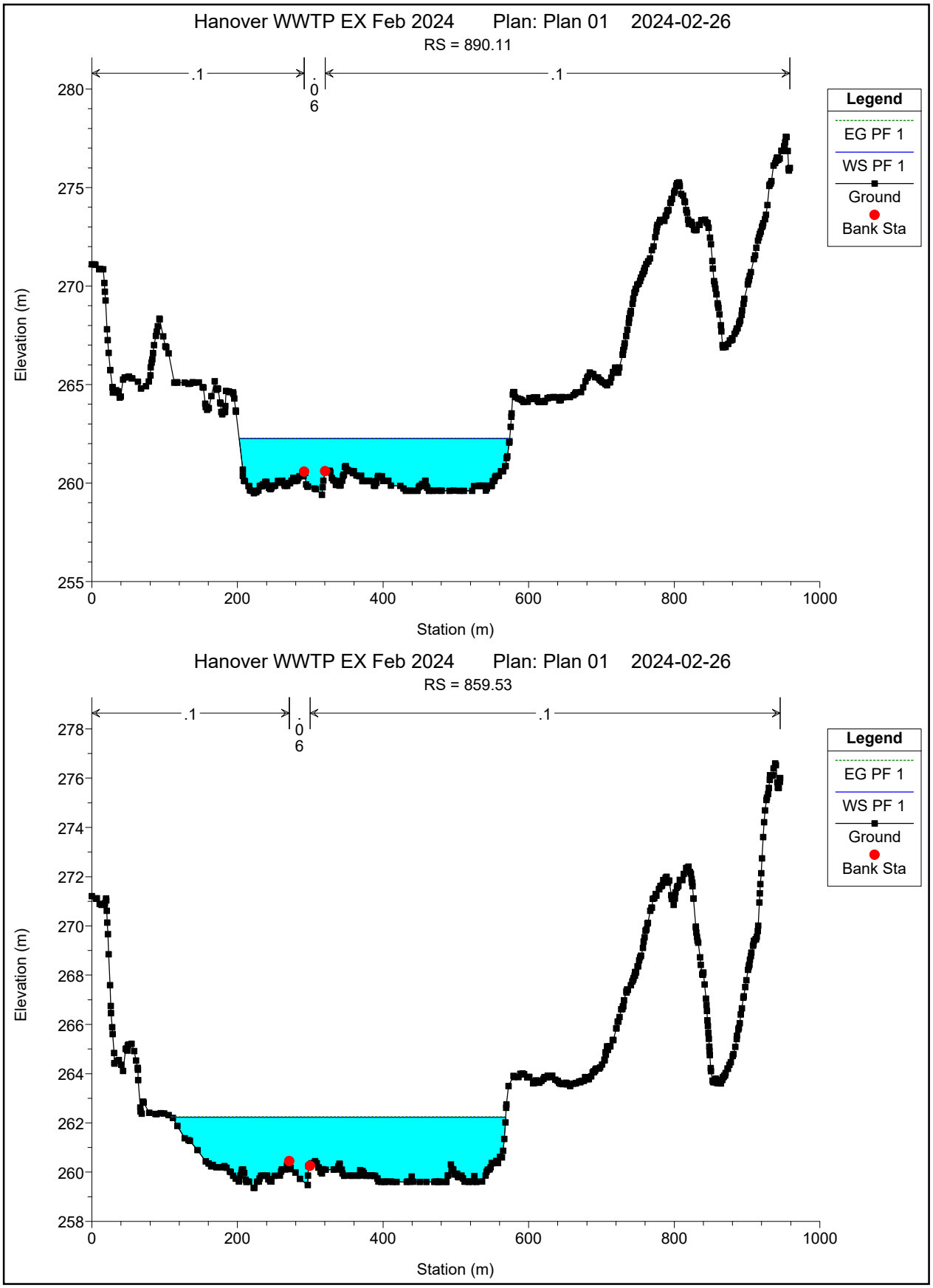

Hanover WWTP EX Feb 2024 Plan: Plan 01 2024-02-26
RS = 1299.97
.1
.06
.1
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (m)
272
270
268
266
264
262
260
258
0
200
400
600
800
1000
Station (m)
Hanover WWTP EX Feb 2024 Plan: Plan 01 2024-02-26
RS = 1260.46
.1
.06
.1
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (m)
272
270
268
266
264
262
260
258
0
200
400
600
800
1000
Station (m)

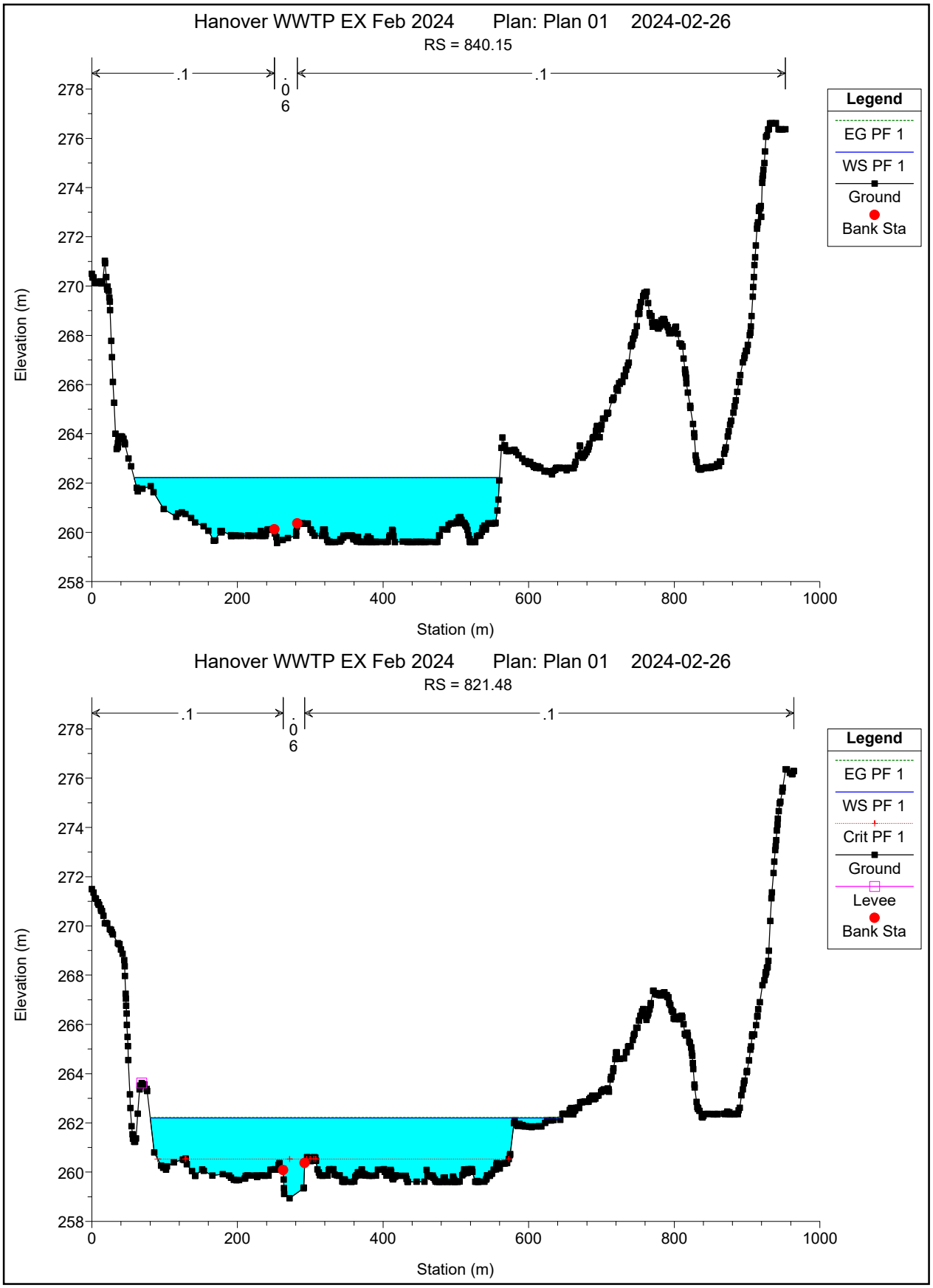

Hanover WWTP EX Feb 2024 Plan: Plan 01 2024-02-26
RS = 1230.97
.1
.06
.1
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (m)
Station (m)
Hanover WWTP EX Feb 2024 Plan: Plan 01 2024-02-26
RS = 1152.1
.1
.06
.1
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (m)
Station (m)

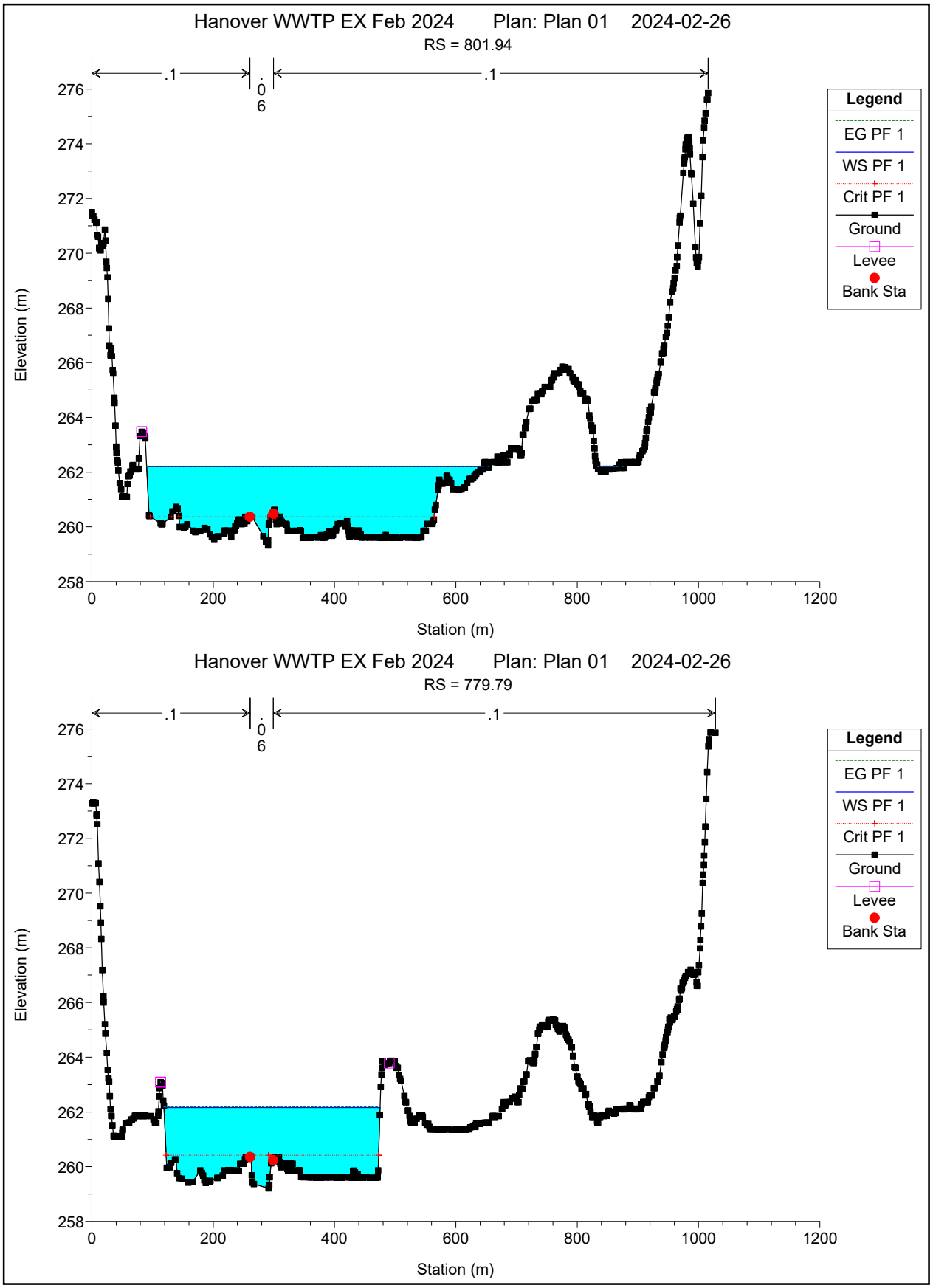

Hanover WWTP EX Feb 2024 Plan: Plan 01 2024-02-26
RS = 1131.96
.1
.06
.1
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (m)
Station (m)
Hanover WWTP EX Feb 2024 Plan: Plan 01 2024-02-26
RS = 1098.45
.1
.06
.1
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (m)
Station (m)

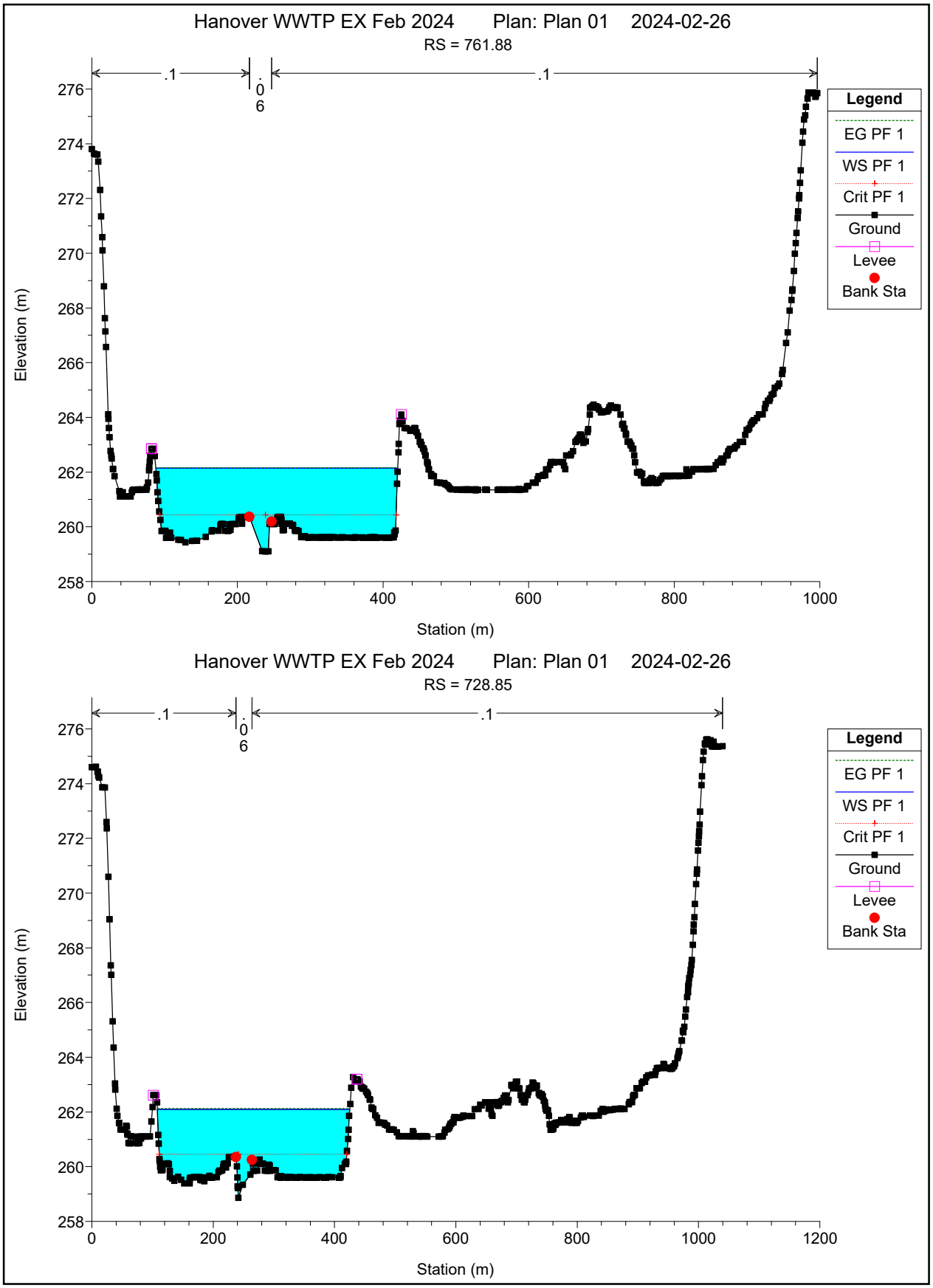

Hanover WWTP EX Feb 2024 Plan: Plan 01 2024-02-26
RS = 1064.34
.1
.06
.1
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (m)
Station (m)
Hanover WWTP EX Feb 2024 Plan: Plan 01 2024-02-26
RS = 1019.74
.1
.06
.1
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (m)
Station (m)

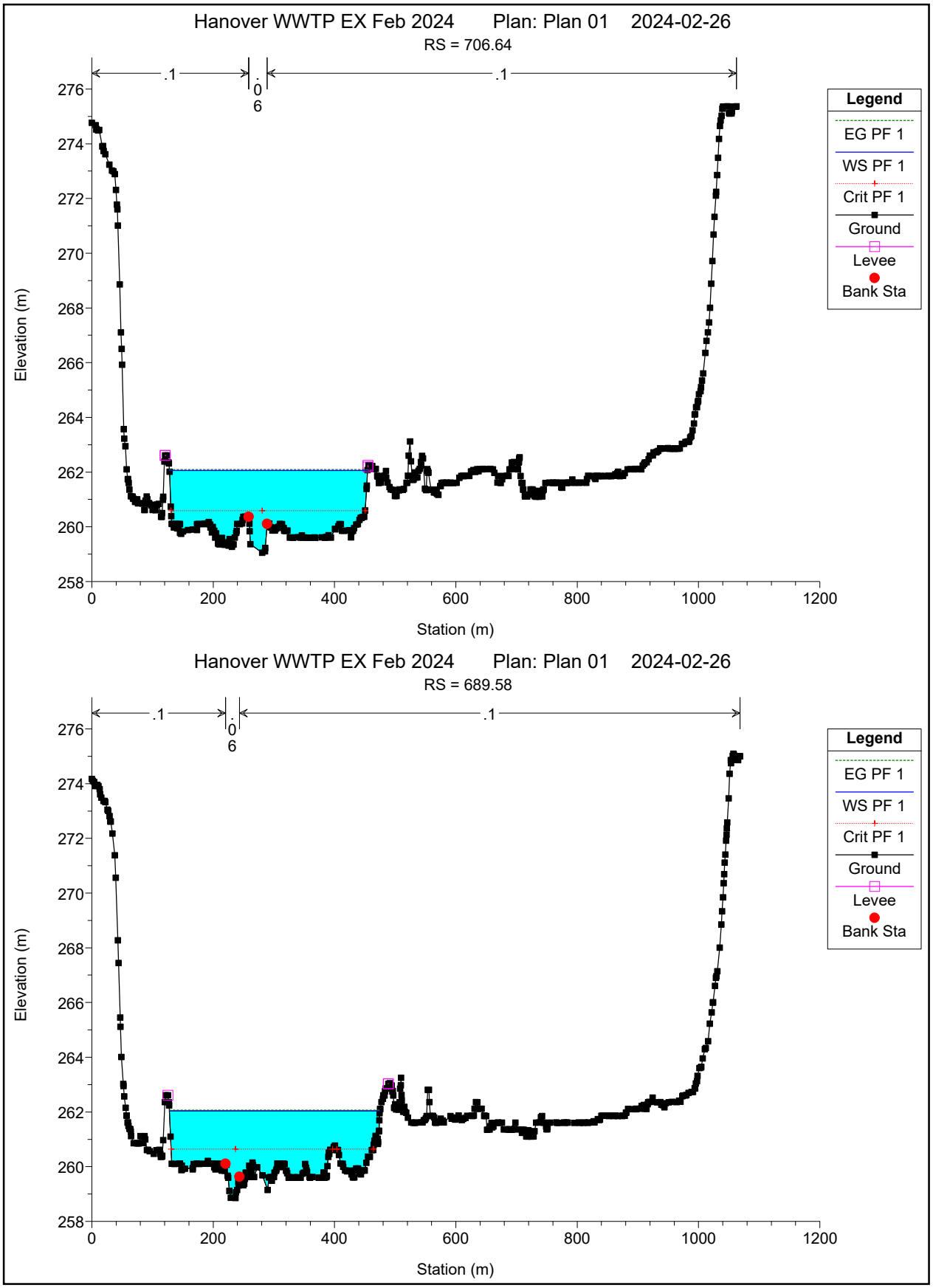

Hanover WWTP EX Feb 2024 Plan: Plan 01 2024-02-26
RS = 960.11
.1
.06
.1
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (m)
280
275
270
265
260
255
0
200
400
600
800
1000
Station (m)
Hanover WWTP EX Feb 2024 Plan: Plan 01 2024-02-26
RS = 910.09
.1
.06
.1
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (m)
280
275
270
265
260
255
0
200
400
600
800
1000
Station (m)

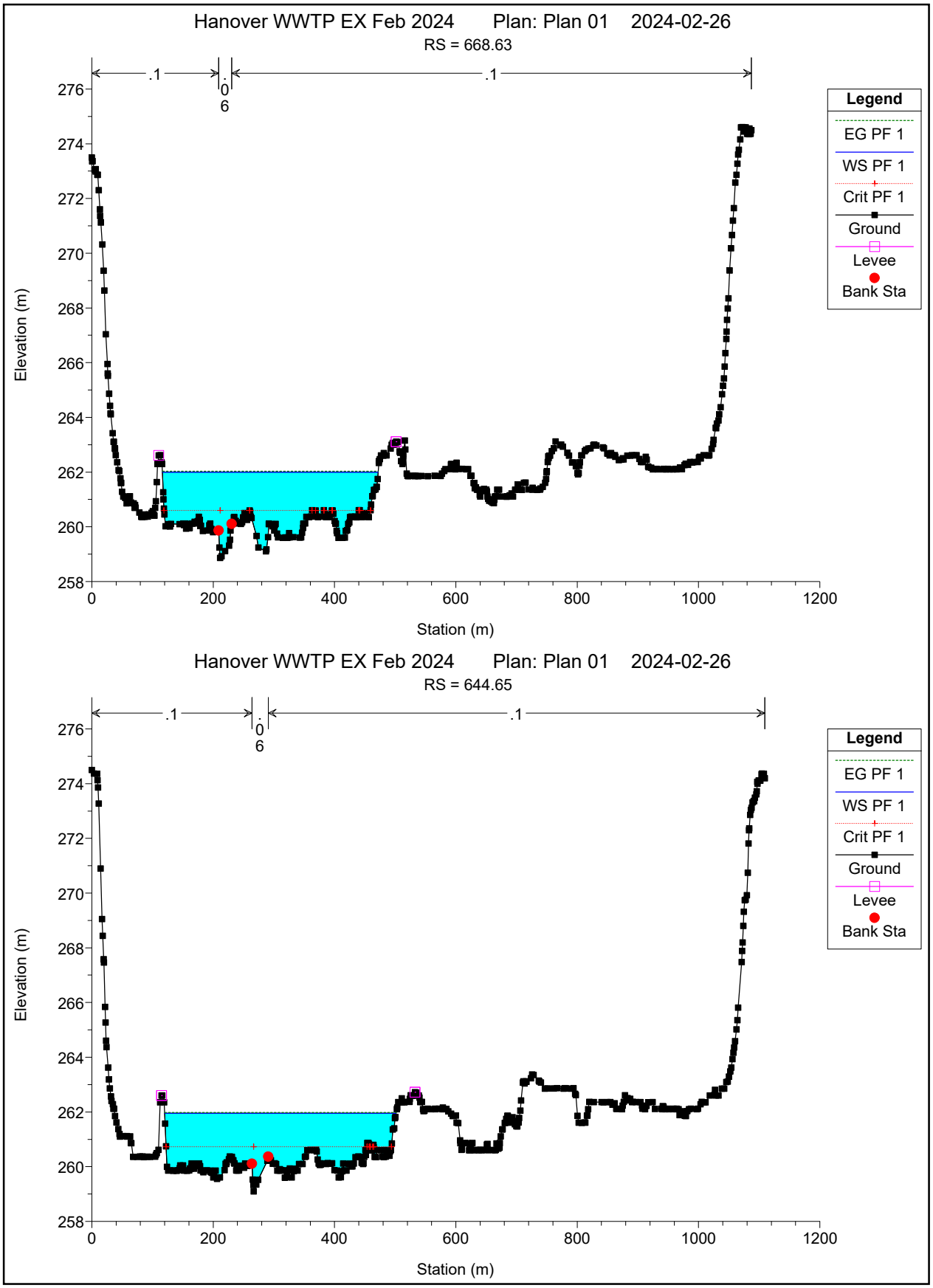

Hanover WWTP EX Feb 2024 Plan: Plan 01 2024-02-26
RS = 890.11
.1
.06
.1
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (m)
Station (m)
Hanover WWTP EX Feb 2024 Plan: Plan 01 2024-02-26
RS = 859.53
.1
.06
.1
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (m)
Station (m)


Hanover WWTP EX Feb 2024 Plan: Plan 01 2024-02-26
RS = 840.15
.1
.06
.1
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (m)
Station (m)
Hanover WWTP EX Feb 2024 Plan: Plan 01 2024-02-26
RS = 821.48
.1
.06
.1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (m)
Station (m)


Hanover WWTP EX Feb 2024 Plan: Plan 01 2024-02-26
RS = 801.94
.1
.06
.1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (m)
Station (m)
Hanover WWTP EX Feb 2024 Plan: Plan 01 2024-02-26
RS = 779.79
.1
.06
.1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (m)
Station (m)


Hanover WWTP EX Feb 2024 Plan: Plan 01 2024-02-26
RS = 761.88
.1
.06
.1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (m)
Station (m)
Hanover WWTP EX Feb 2024 Plan: Plan 01 2024-02-26
RS = 728.85
.1
.06
.1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (m)
Station (m)

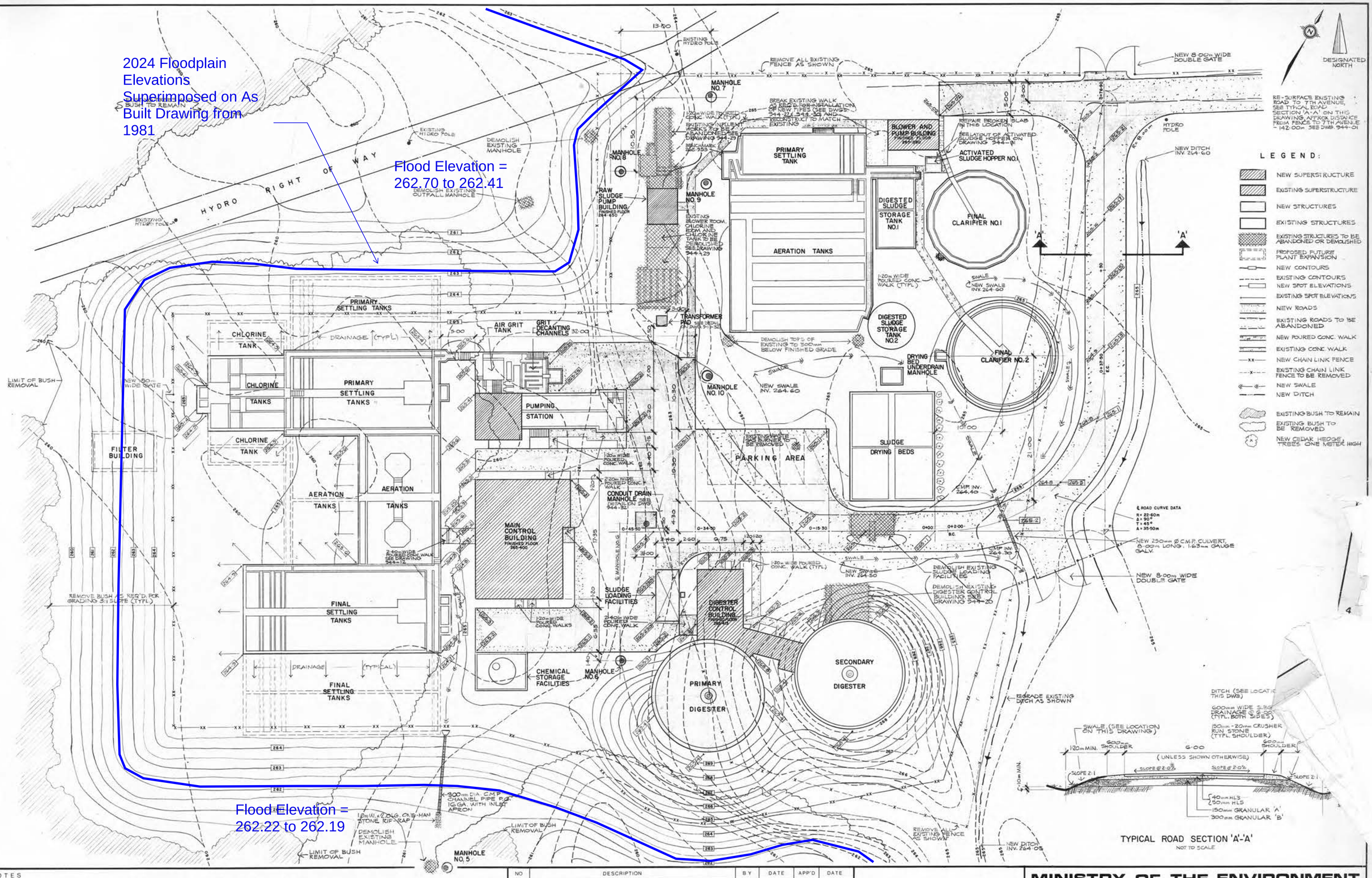

Hanover WWTP EX Feb 2024 Plan: Plan 01 2024-02-26
RS = 706.64
.1
.06
.1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (m)
Station (m)
276
274
272
270
268
266
264
262
260
258
0
200
400
600
800
1000
1200
Hanover WWTP EX Feb 2024 Plan: Plan 01 2024-02-26
RS = 689.58
.1
.06
.1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (m)
Station (m)


Hanover WWTP EX Feb 2024 Plan: Plan 01 2024-02-26
RS = 668.63
.1
.06
.1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (m)
Station (m)
Hanover WWTP EX Feb 2024 Plan: Plan 01 2024-02-26
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.06
.1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Elevation (m)
Station (m)

2024 Floodplain Elevations Superimposed on As Built Drawing from 1981

Flood Elevation = 262.70 to 262.41

Flood Elevation = 262.22 to 262.19



NOTES

1. - ALL DIMENSIONS (UNLESS SHOWN OTHERWISE) AND ELEVATIONS ARE IN METRES
2. SOD AND STAKE THE BERM AND SOD ALL DISTURBED AREAS WITHIN THE FINAL FENCE. SEED ALL DISTURBED AREAS BEYOND THESE LIMITS - SEE NOTE ON DWG's 944-04 AND 944-08
3. - BENCHMARK 265.953 - LOCATED TOP CONCRETE WALL, NORTH WEST CORNER, EXISTING PRIMARY TANK INFLUENT AREA AS SHOWN ON THIS DRAWING
4. - SEE DRAWING 944-04 FOR CONTINUATION OF GRADING ALONG NEW OUTFALL SEWER
5. - SEE DRAWING 944-01 FOR LAYOUT OF NEW CHAIN LINK FENCE
6. - DESIGN FLOOD ELEVATION 264.640 (SEE ALSO DIVISION 1.)

NO	DESCRIPTION	BY	DATE	APP'D	DATE
1	ISSUED TO M.O.E. FOR APPROVAL	ARM	MAR. 1979		MAR. 1979
2	ISSUED FOR TENDER	ARM	AUG. 1979		AUG. 1979
3.	REVISED AS CONSTRUCTED	ARM	NOV. 1981		NOV. 1981

R.V. BAKER — REGISTERED PROFESSIONAL ENGINEER — PROVINCE OF ONTARIO

A. TOMLIN — REGISTERED PROFESSIONAL ENGINEER — PROVINCE OF ONTARIO

Ontario

MINISTRY OF THE ENVIRONMENT

R.V.ANDERSON ASSOCIATES LTD.
CONSULTING ENGINEERS AND PLANNERS
TORONTO THUNDER BAY WELLAND

TOWN OF HANOVER
WATER POLLUTION CONTROL PLANT EXPANSION

SITE LAYOUT & GRADING

SCALE	DESIGNED	ARM	DRAWING NO.
1:250 OR AS SHOWN	CHECKED		944-02
DATE MARCH 1979	DRAWN	D.T.	NO 1 2 3

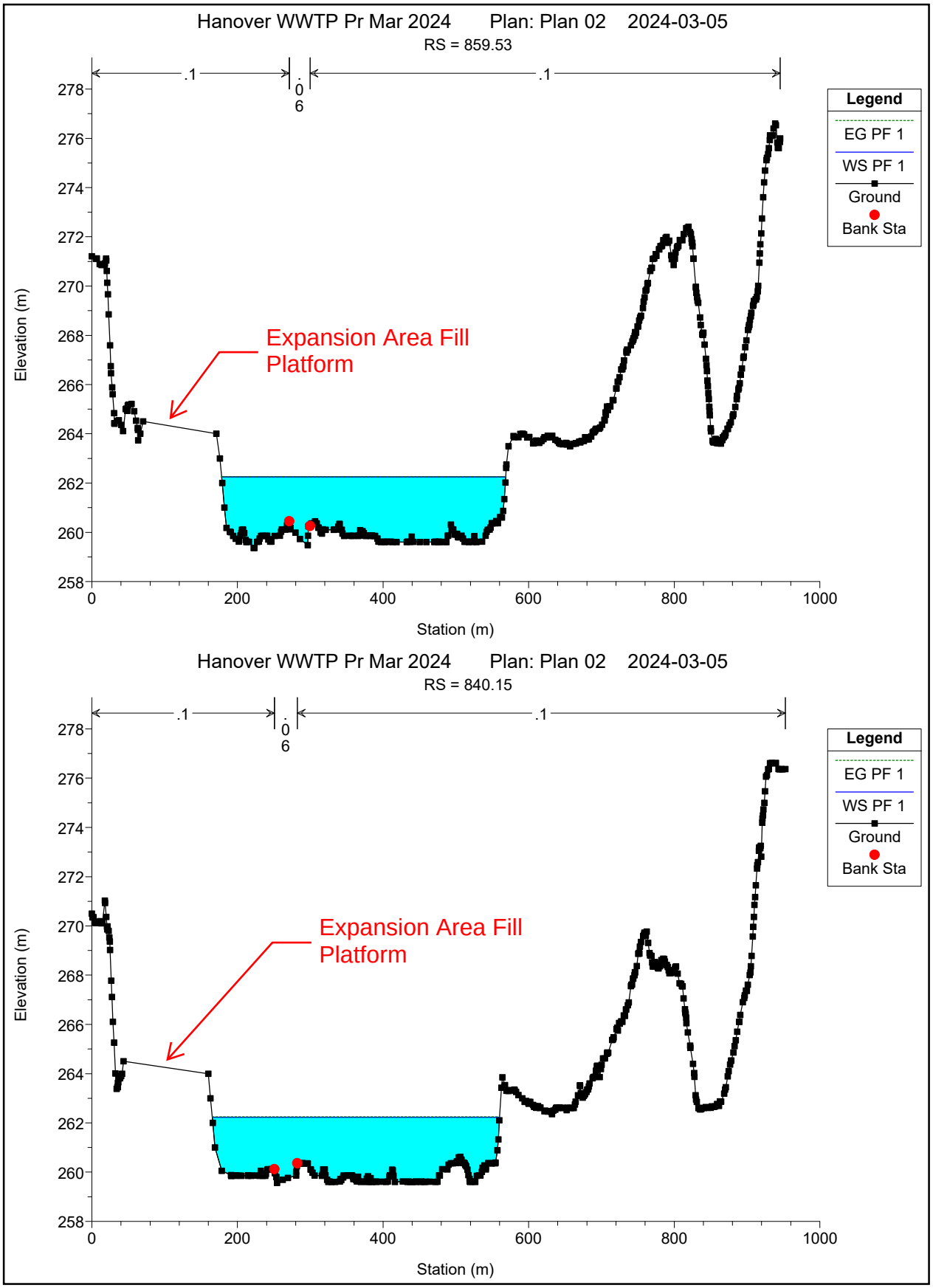
Appendix E – Proposed Condition HEC RAS Information

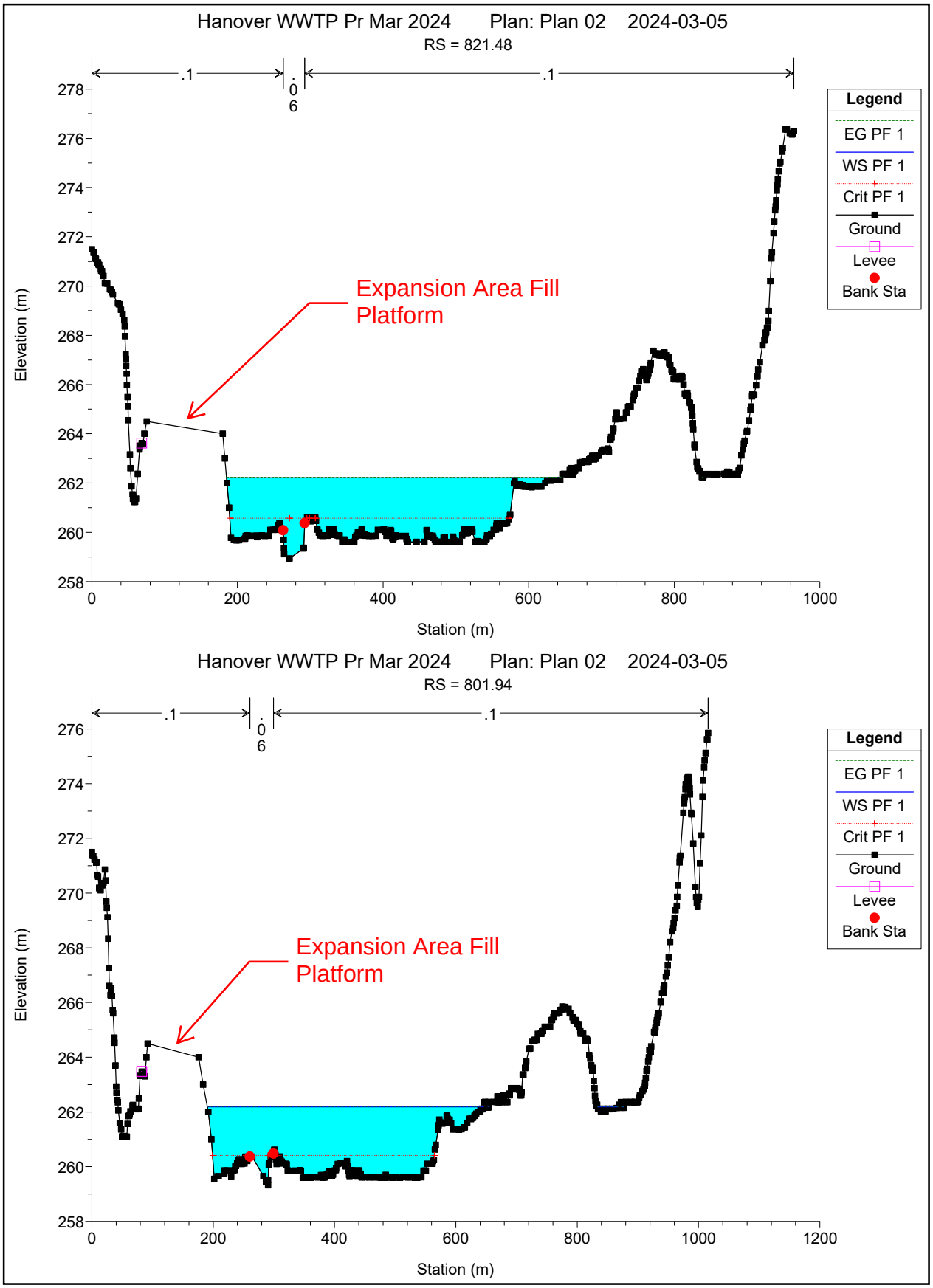
Proposed Condition HEC RAS Results - Conceptual Expansion of WWTP Footprint

HEC-RAS Plan: Plan 02 River: EX-SAUGEEN Reach: EX-SAUGEEN Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
EX-SAUGEEN	2040.09	PF 1	509.08	259.86	263.62		263.73	0.002621	1.90	418.22	165.25	0.33
EX-SAUGEEN	2020.62	PF 1	509.08	260.36	263.57		263.67	0.003327	1.91	417.03	182.74	0.36
EX-SAUGEEN	1962.24	PF 1	509.08	259.85	263.45	261.99	263.51	0.001925	1.56	583.91	281.16	0.28
EX-SAUGEEN	1899.44	PF 1	509.08	259.60	263.35	262.04	263.40	0.001738	1.50	663.76	332.18	0.26
EX-SAUGEEN	1800.34	PF 1	509.08	259.36	263.24		263.26	0.001002	1.08	924.50	519.85	0.20
EX-SAUGEEN	1739.33	PF 1	509.08	259.16	263.19		263.21	0.000759	1.03	1046.83	595.06	0.18
EX-SAUGEEN	1568.56	PF 1	509.08	259.35	263.04	261.51	263.06	0.000931	1.12	873.28	400.57	0.20
EX-SAUGEEN	1510.24	PF 1	509.08	259.12	262.97	261.31	263.00	0.001152	1.14	821.73	420.91	0.21
EX-SAUGEEN	1460.07	PF 1	509.08	259.35	262.89	261.55	262.93	0.001686	1.47	717.05	396.70	0.26
EX-SAUGEEN	1449.13	PF 1	509.08	259.61	262.87	261.58	262.91	0.001856	1.40	710.73	414.10	0.27
EX-SAUGEEN	1429.92	PF 1	509.08	259.61	262.83	261.74	262.87	0.002206	1.46	686.06	424.20	0.29
EX-SAUGEEN	1410.39	PF 1	509.08	259.10	262.80		262.83	0.001528	1.32	850.77	588.23	0.25
EX-SAUGEEN	1390.78	PF 1	509.08	259.51	262.77		262.80	0.001331	1.19	875.86	562.79	0.23
EX-SAUGEEN	1370.72	PF 1	509.08	259.44	262.75		262.78	0.001196	1.11	892.04	537.92	0.22
EX-SAUGEEN	1349.26	PF 1	509.08	259.11	262.73		262.75	0.001106	1.10	919.54	530.23	0.21
EX-SAUGEEN	1331.01	PF 1	509.08	259.42	262.71	261.25	262.73	0.001031	1.11	950.93	528.01	0.20
EX-SAUGEEN	1299.97	PF 1	509.08	259.29	262.69		262.70	0.000767	0.99	1088.67	581.85	0.18
EX-SAUGEEN	1260.46	PF 1	509.08	259.11	262.66		262.67	0.000844	0.96	1077.30	580.09	0.18
EX-SAUGEEN	1230.97	PF 1	509.08	259.39	262.63		262.65	0.000825	0.97	1095.03	586.33	0.18
EX-SAUGEEN	1152.1	PF 1	509.08	259.16	262.57		262.58	0.000769	0.93	1032.93	531.19	0.18
EX-SAUGEEN	1131.96	PF 1	509.08	259.10	262.54		262.56	0.001200	1.10	912.98	496.58	0.21
EX-SAUGEEN	1098.45	PF 1	509.08	259.49	262.50		262.52	0.001098	1.07	887.19	423.39	0.20
EX-SAUGEEN	1064.34	PF 1	509.08	259.19	262.46		262.49	0.001110	1.12	859.89	406.19	0.21
EX-SAUGEEN	1019.74	PF 1	509.08	259.83	262.42		262.44	0.000915	0.91	934.94	415.92	0.18
EX-SAUGEEN	960.11	PF 1	509.08	258.92	262.36		262.38	0.001096	1.10	836.37	379.81	0.21
EX-SAUGEEN	910.09	PF 1	509.08	259.36	262.29		262.32	0.001339	1.06	768.10	352.28	0.22
EX-SAUGEEN	890.11	PF 1	509.08	259.40	262.27		262.29	0.001081	0.99	847.22	371.71	0.20
EX-SAUGEEN	859.53	PF 1	509.08	259.47	262.25		262.26	0.000888	0.88	920.77	390.18	0.18
EX-SAUGEEN	840.15	PF 1	509.08	259.56	262.23		262.25	0.000916	0.92	911.08	394.70	0.19
EX-SAUGEEN	821.48	PF 1	509.08	258.94	262.21	260.57	262.23	0.000967	1.07	935.60	459.45	0.20
EX-SAUGEEN	801.94	PF 1	509.08	259.32	262.19	260.41	262.21	0.001065	0.91	921.23	493.07	0.20
EX-SAUGEEN	779.79	PF 1	509.08	259.21	262.16	260.42	262.18	0.000927	0.97	859.43	356.09	0.19
EX-SAUGEEN	761.88	PF 1	509.08	259.10	262.14	260.43	262.17	0.001173	1.06	785.69	332.23	0.21
EX-SAUGEEN	728.85	PF 1	509.08	258.86	262.10	260.45	262.12	0.001351	1.14	741.03	317.30	0.23
EX-SAUGEEN	706.64	PF 1	509.08	259.06	262.06	260.59	262.09	0.001404	1.22	730.77	326.61	0.23
EX-SAUGEEN	689.58	PF 1	509.08	258.85	262.04	260.64	262.07	0.001524	1.29	736.82	347.00	0.25
EX-SAUGEEN	668.63	PF 1	509.08	258.86	262.00	260.60	262.03	0.001917	1.42	693.54	355.51	0.27
EX-SAUGEEN	644.65	PF 1	509.08	259.10	261.95	260.72	261.98	0.002002	1.27	707.62	381.69	0.27

Proposed Condition Modified Cross Sections




Hanover WWTP Pr Mar 2024 Plan: Plan 02 2024-03-05
RS = 821.48
.1
.06
.1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Expansion Area Fill Platform
Elevation (m)
Station (m)
278
276
274
272
270
268
266
264
262
260
258
0
200
400
600
800
1000
Hanover WWTP Pr Mar 2024 Plan: Plan 02 2024-03-05
RS = 801.94
.1
.06
.1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Levee
Bank Sta
Expansion Area Fill Platform
Elevation (m)
Station (m)
276
274
272
270
268
266
264
262
260
258
0
200
400
600
800
1000
1200

Appendix I

Technology Alternative Technical Memorandum

Hanover Wastewater Treatment Plant (HWWTP) Upgrades Class Environmental Assessment

Technical Memorandum

Technology Alternatives

Prepared For:

Town of Hanover

March 2025

CREATING QUALITY SOLUTIONS TOGETHER

Ainley GROUP

HANOVER WASTEWATER TREATMENT PLANT (HWWTP) UPGRADES CLASS ENVIRONMENTAL ASSESSMENT

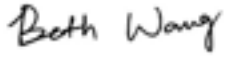
TECHNICAL MEMORANDUM
TECHNOLOGY ALTERNATIVES

PROJECT NO. 122059

Prepared For:

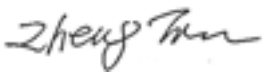
Town of Hanover

By:



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Appendix J....Tertiary Treatment Technology Alternatives Evaluation Matrix
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1 Introduction

This Schedule C Municipal Class Environmental Assessment (Class EA) is being undertaken to provide recommendations for wastewater treatment for the Town of Hanover to the year 2052. The Hanover Wastewater Treatment Plant (HWWTP) is currently (2018-2022) operating at 85% of rated capacity and uncommitted capacity reserves are limiting development. The purpose of this Class EA is to identify a general approach for the management of future wastewater flows, evaluate design alternatives.

In 2021, the Town of Hanover initiated a Municipal Servicing Needs Assessment to determine planning needs for water and wastewater servicing to the year 2046, including four Special Policy Areas (SPAs) within the current municipal boundary and four Potential Expansion Areas (PEAs) beyond the current municipal boundary. The 2021 assessment is based on the Town of Hanover's Official Plan Amendment #11 (OPA#11). The assessment identified where future growth can be accommodated within future development lands situated within and beyond the existing boundary of the Town of Hanover. Based on the projected growth identified in the OPA#11 and the understanding of limited reserve capacity at the HWWTP, it is known that local servicing upgrades will be required to satisfy future wastewater treatment needs.

The rated capacity of the plant, as cited in Environmental Compliance Certificate (ECA, Number 6173-BKNLVM, dated March 2, 2020), is 6,360 m^3/d. Figure 1 shows the location and components of the plant.



Figure 1 – Hanover Wastewater Treatment Plant

1.1 Service Area & Service Population

The Town of Hanover is situated in southwestern Ontario and is bordered to the east by Grey County and the municipality of West Grey, and Bruce County and the municipality of Brockton to the west.

The study area for the HWWTP Class EA includes the Town of Hanover, two areas in West Grey County, as well as two areas in Bruce County, which are all adjacent to the Town of Hanover (shown in Figure 2).

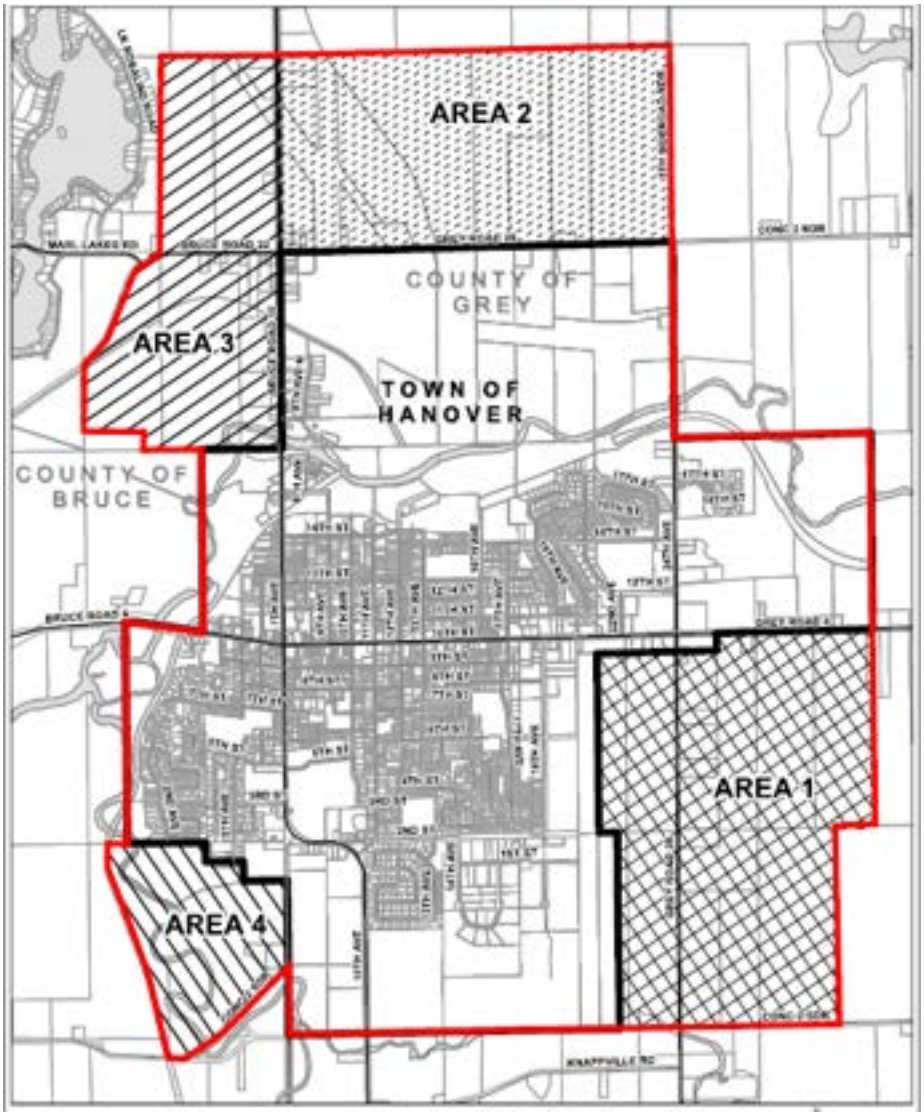


Figure 2 – Study Area

1.2 HWWTP Historical Influent Characteristics

Table 1 shows the average influent sewage quality of the plant from 2018 to 2022. BOD_5, TSS, and TP concentrations have been consistently at the lower and medium range of the typical values for these parameters.

Table 1 – Monthly Average Influent Parameters

Year	Flow (m^3/d)	BOD_5 (mg/L)	TSS* (mg/L)	TP* (mg/L)	TAN (mg/L)
2018	5,619	169.8	162.9	3.5	18.5
2019	5,297	135.2	118.7	3.0	22.2
2020	5,056	158.3	185.2	2.8	18.8
2021	5,186	187.4	209.9	2.0	20.7
2022	5,289	191.8	232.6	2.0	20.9
Average	**5,289**	**168.5**	**181.9**	**2.7**	**20.2**

*Extraordinary data has been excluded from the calculation as it might be due to sampling error.

2 Objectives

This Technical Memorandum (TM) presents the evaluation of treatment technology alternatives available for the HWWTP. The information presented in this TM constitutes a component of Phase 3 of the Class EA process, which involves examination of alternative methods of implementing the preferred solution(s) as determined in the previous phases of the MCEA. The expanded WWTP will be designed to service the existing community plus projected residential, commercial, and industrial growth in the study area.

3 Design Basis

The basis of design for the treatment plant was developed using information from the following documents:

- Technical Memorandum: Projected Future Sewage Flows (Ainley 2024);
- HWWTP Capacity Assessment and Plant Optimization Study Report (Ainley 2024);
- Assimilative Capacity Study (ACS) Report (Blue Sky, 2024);
- Municipal Servicing Needs Assessment Technical Memorandum (GM BluePlan, 2021)

3.1 Flow Projection

Table 2 below summaries 2052 Average Daily Flow (ADF) and Peak Daily Flow estimated based on population growth, leachate contribution, unconnected approved lots, and I&I consideration. Refer to Technical Memorandum Project Future Sewage Flows (Appendix A) for details of flow projections.

While available plant data does not provide a direct basis for projecting peak hourly and peak instantaneous flows, a Peak Hourly Factor (PHF) of 3.2 and a Peak Instantaneous Factor (PIF) of 3.5 have been assumed for the purposes of this study. Since PHF and PIF were not monitored in-plant, the values were assumed based on data from a facility with similar flow projections.

Table 2 – 2052 Flow Projection Summary

Parameter	Projected Flow
Average Daily Flow	13,789 m^3/d
Peak Daily Flow	32,329 m^3/d
Peak Hourly Flow	44,125 m^3/d (511 L/s)
Peak Instantaneous Flow	48,262 m^3/d (559 L/s)

3.2 HWWTP Existing Flow Capacity

Per the HWWTP's approved ECA, the rated capacity of the plant is 6,360 m^3/d, however, the results of the HWWTP capacity assessment show that the actual capacity of the plant could increased to 7,000 m^3/d. Refer to Capacity Assessment and Plant Optimization Study Report (Appendix B) for details.

The plant historical performance shows that the plant effluent consistently meets the current discharge limits at the 5-year average daily flow rate of 5,289 m^3/d from 2018 to 2022. The plant effluent maximum monthly $CBOD_5$ (5-day Carbonaceous Biochemical Oxygen Demand), TSS (Total Suspended Solids), and TP (Total Phosphorus) concentrations were 75%, 60% and 60% lower than the current discharge limit, respectively. This indicates that the plant's actual liquid treatment capacity is probably 7,000 m^3/d or higher.

3.3 The Existing Effluent Limits and Objectives

The required performance level for HWWTP is governed by the effluent limits and objectives set out in the ECA (Number 6173-BKNLVM, dated March 2, 2020). The current effluent limits and objectives are presented in Table 3.

Table 3 – Existing Plant Effluent Objectives and Limits

Effluent Parameter	Effluent Objectives	Effluent Limit
$CBOD_5$	15.0 mg/L	25.0 mg/L
TSS	15.0 mg/L	25.0 mg/L
TP	0.8 mg/L	1.0 mg/L
E. coli [1] (May 15 – Sep 15)	150 CFU/ 100 ml	200 CFU/ 100 ml
pH [2]	6.5 - 8.5	6.0 - 9.5

Notes:
Monthly average concentrations unless otherwise noted.
.1 Based on monthly geometric mean density.
.2 Based on single sample results.

3.4 The Proposed and Approved Effluent Limits and Objectives

An ACS was performed to establish effluent limits for the expanded HWWTP. Table 4 summarizes the new effluent limits for the plant for 13,789 m^3/d. Refer to Appendix C for full

description of ACS. The proposed effluent limits and objectives were provided to MECP for review in November 2024.

Table 4 – Proposed Effluent Objectives and Limits for 13,789 m³/d

Effluent Parameter	Proposed Effluent Objectives	Proposed Effluent Limit
$CBOD_5$	9.0 mg/L	11.5 mg/L
TSS	9.0 mg/L	11.5 mg/L
TAN		
Spring (Mar - May)	7.2 mg/L	9.0 mg/L
Summer (Jun - Sep)	2.2 mg/L	2.7 mg/L
Fall (Oct - Nov)	5.6 mg/L	7.0 mg/L
Winter (Dec - Feb)	10.4 mg/L	13.0 mg/L
TP	0.2 mg/L	0.25 mg/L
E. coli [1]	150 CFU/ 100 ml	200 CFU/ 100 ml
pH [2]	6.5 - 8.5	6.0 - 9.5
TRC [3]	Non-Detect	0.02

Notes:
Monthly average concentrations unless otherwise noted.
.1 Based on monthly geometric mean density.
.2 Based on single sample results.
.3 Based on single sample results and only apply if the upgraded and expanded HWWTP utilizes chlorination / dichlorination for disinfection.

4 Evaluation Methodology

An evaluation methodology to identify a recommended treatment technology alternative for HWWTP has been developed based on methodologies and guidelines outlined in the Municipal Class Environmental Assessment. It is proposed to conduct the evaluation based on two (2) distinct WWTP components, which are outlined below:

- Liquid Treatment
- Sludge/Biosolids Treatment/Management

Liquid Treatment refers to the process (treatment train) that treats raw sewage to produce the liquid effluent that will be released into Saugeen River.

Sludge/Biosolids Treatment/Management refers to the system that will treat the solids component of the raw sewage. Treatment can be to a level where the final product can be used or disposed off-site, i.e., applied to agricultural land, to a level that would allow commercial marketing as a fertilizer, or to the minimum level required to allow trucking the sludge/biosolids to an off-site facility for final treatment and use and/or disposal. In this report, sludge is used to indicate unstabilized sludge and biosolids is used to indicate sludge that has been digested or stabilized by another methods.

Evaluation of each of the two (2) treatment mythologies will involve two main steps:

- Identification of a long list of all potential design alternatives and the screening of this list down to a shortlist of viable alternatives.

- A detailed evaluation of the shortlist of design alternatives to identify a recommended alternative solution.

To achieve this goal, the following steps will be undertaken:

- Develop a set of screening criteria to screen the long list of technology alternatives to a short list. This set of criteria is meant to capture features that are considered essential to the success of the WWTP and to establish viability of the alternative.
- Develop a set of evaluation criteria to evaluate the short-listed alternatives. This set of criteria consists of primary and secondary criteria and weightings. These criteria provide a more in-depth analysis of the technologies, sufficient to identify the recommended technology.
- Generate a long list of technologies that could be used for the process being evaluated.
- Use the long-list screening criteria to screen the long listed technologies to a short list.
- Develop design concepts (treatment trains) using the short-listed technologies.
- Perform detailed evaluations of each design concept, including a life-cycle cost analysis, using the short-list evaluation criteria.
- Identify the recommended treatment technology alternative, based on the results of the detailed evaluation.

4.1 Treatment Process Design Basis

The basis of design used for each treatment process are summarized in Table 5.

Table 5 – Treatment Process Design Basis

Treatment Process		Basis of Design
Liquid Treatment	Headworks	Peak Instantaneous Flow
	Primary Clarification	Peak Hourly Flow
	Aeration	Average Daily Flow
	Secondary Clarification	Peak Hourly Flow
	Tertiary Treatment	Peak Hourly Flow
	Disinfection	Peak Hourly Flow
Sludge/Biosolids Treatment/Management	On-site Sludge Stabilization	Maximum Monthly Flow
	On-site Biosolids Storage	Average Daily Flow

4.2 Approach to Life-Cycle Cost Analysis

A life-cycle cost analysis was carried out on each short-listed alternative as part of the detailed evaluation. The analyses incorporated factors such as equipment costs, construction costs, annual operating and maintenance costs, and the net present value (NPV) over the expected life of the facility.

Equipment and annual operational (power and chemical consumption) costs for each alternative were obtained from budgetary quotes, solicited from relevant equipment suppliers. Construction costs for common systems were estimated from data in Ainley's possession from projects of a similar nature and scope. The NPV of each short-listed alternative were developed based on the following assumptions:

- It was assumed that the design would take two years to complete followed by three years of construction, with a 30%, 40% and 30% split in construction costs for each year.
- Annual discount rate and inflation rate were assumed as 5% and 3%, respectively.
- Site works and yard piping costs were estimated based on 20% of equipment and building/tankage construction costs, respectively.
- Electrical and instrumentation costs were estimated based on 15% of equipment and building/tankage construction costs.
- Equipment installation costs were estimated based on 60% of bare equipment costs.
- Concrete tankage installation costs were estimated based on 10% of the concrete costs.
- Annual maintenance and repair costs were estimated based on 1% of bare equipment costs.

Actual costs associated with each alternative may be significantly affected by inflation and market conditions, however, changes in the conditions that affect these cost estimates would affect all alternatives proportionately, since the same assumptions and rationale were used to evaluate all alternatives. In this regard, the results of the comparative cost evaluation should remain the same.

5 Plant Upgrades Approach Discussion

The following existing plant conditions are considered in the general plant upgrades approach:

- Per the HWWTP's approved ECA, the rated capacity of the plant is 6,360 m^3/d. However, the results of the HWWTP capacity assessment, summarized in Capacity Assessment and Plant Optimization Study Report (Appendix B), show that the actual treatment capacity of HWWTP is 7,000 m^3/d. Higher capacity should be verified with on-going stress testing. The desktop verified capacity of 7,000 m^3/d will be used in the following evaluation and discussion,
- The existing site has a high density and does not have space for major upgrade to expand the existing plant to the 2052 projected capacity.
- The above-ground biosolid storage tank was constructed in 2017, and is in good condition.

- The existing HWWTP consists of Plant 1 (constructed in 1960s) and Plant 2 (constructed in 1980s). Existing processes of each plant and shared processes are identified in Figure 3.

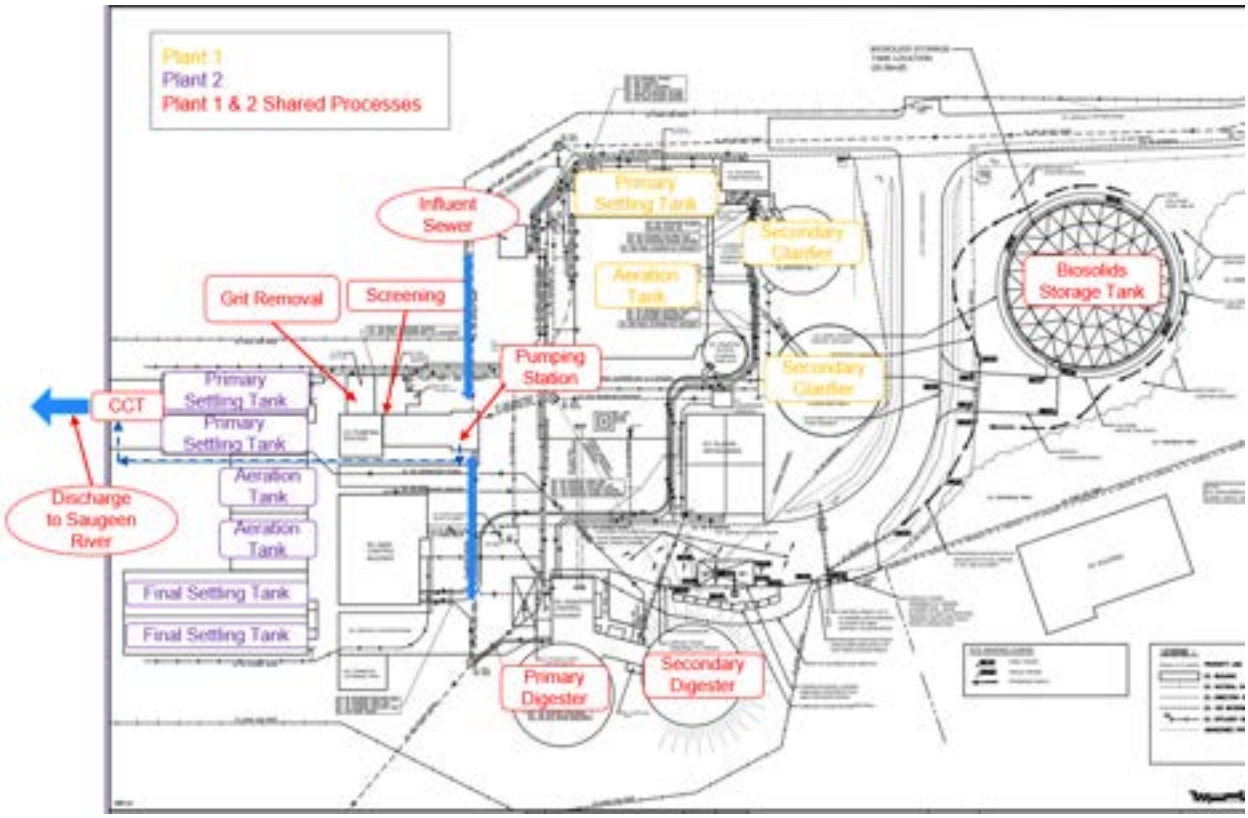


Figure 3 – HWWTP Plant 1 and Plant 2 Processes

The following plant upgrades approach will be applied to the following alternative discussion, selection, and design:

- Upgrade and expand the existing plant in three phases to reduce construction and maintenance costs while satisfying treatment needs.
  - Phase 1: Conduct plant wide Stress Test to confirm plant can handle 7,000 m³/d with both Plant 1 and Plant 2 operational. Replace exiting old equipment with new as part of ongoing Optimization project.
  - Phase 2: Construct a new facility to increase the treatment capacity to 10,500 m³/d with Plant 1 decommissioned. The new facilities include:
    - New headwork building sized for a treatment capacity of 13,789 m³/d, including an influent pumping station, screen channel, and grit channel, with equipment initially installed for a capacity of 10,500 m³/d.
    - New primary and/or secondary treatment, total capacity of 10,500 m³/d with Plant 2 capacity verified in Phase 1.

- New tertiary and disinfection building sized for a treatment capacity of 13,789 m³/d, with equipment initially installed for a capacity of 10,500 m³/d.
- New sludge stabilization and storage system, capacity of 10,500 m³/d.
- Re-purpose the existing primary and secondary sludge digesters to biosolids storage tanks.

- Phase 3: Expand the new plant to bring the treatment capacity to 13,789 m³/d. The expansion includes:
  - New screen, grit removal, and pumps in the Phase 2 headworks building
  - Expand Phase 2 primary and/or secondary treatment system
  - Expand the capacity of Phase 2 tertiary and disinfection system.
  - Expand the sludge stabilization tank and build a new biosolids storage tank to store.

Table 6 summarizes the recommended timeline for the implementation of each phase.

Table 6 – Recommended Implementation Timeline

Phasing	Timeline
Phase 1	Stress Testing: 2024 and 2025
Phase 2	Design: 2026-2028; Construction: 2029-2031
Phase 3	Design: 2034-2035; Construction: 2036-2038

The expansion area is located south of the plant within the Town's property and has been approved by the Town for use. The land is similar in size to the existing plant, making it sufficient for all alternatives proposed in the following sections.

6 Liquid Treatment

6.1 Objectives and Overview

Treatment of the liquid component of wastewater involves several stages, typically starting with the removal of grit and larger particles and ending with disinfection of the treated effluent just prior to release into the environment. The stages traditionally associated with treating the liquid train are described below.

Preliminary Treatment

Raw sewage arriving at the treatment plant by gravity or from a pumping station is first subjected to preliminary treatment which involves the removal of larger objects and grit from the wastewater. Technologies used for preliminary treatment include various types of screens and

grit removal systems. This process results in screenings and grit waste that is typically sent to a landfill.

Although a new preliminary treatment facility is necessary to be added to the plant, for the purposes of the evaluation, preliminary treatment was not considered since the alternatives available will not vary appreciably in terms of environmental impact or cost. In the final design, the screen system selection will be selected to suite the biological treatment requirements.

The new preliminary treatment will include the following:

- New lift pumping system
- New screens and channels
- New grit removal system
- New building and related utility systems
- New solids removal systems
- New odour control system

Primary Treatment

Primary treatment removes particles that can be easily removed without the addition of chemicals or biological means. Coagulant can be added to improve particle removal for Chemical Enhanced Primary Treatment operation. Typically, gravity settling technologies, such as clarification, are used for primary treatment. However, other technologies, such as filters, can be used. Some secondary treatment technologies do not require primary treatment. The primary treatment produces primary sludge, which is sent to the sludge treatment system.

Secondary Treatment

Once solids, grit, and settleable are removed from the wastewater, secondary treatment is implemented to remove organics and other contaminants such as phosphorous, nitrogen, and ammonia. Technologies used for secondary treatment are usually biological in nature, such as aeration tanks, biological filters, and biofilm reactors. Secondary treatment produces secondary sludge (waste activated sludge), which is sent to the sludge treatment system.

Tertiary Treatment

Where secondary treatment alone cannot meet a facility's required effluent limits for particular parameters, it may be necessary to add a further treatment stage referred to as tertiary treatment. Tertiary treatment typically focuses on the removal of parameters with low effluent limits, including phosphorous, and suspended solids. Examples of tertiary treatment technologies include membrane filtration and sand filters.

In this report, tertiary treatment is considered to blend with the secondary effluent from all plants to meet the proposed total phosphorus discharge limit of 0.25 mg/L for the HWWTP.

Disinfection

Disinfection is performed to deactivate and/or kill pathogenic micro-organisms found in the liquid stream. Typically, E. coli is used as the indicator organism to measure the effectiveness of the disinfection process. Traditionally, chlorination has been used for disinfection, however, ultra-violet radiation and ozonation are becoming more common.

6.2 Liquid Train Evaluation Criteria

6.2.1 Long-List Screening Criteria

The criteria selected for the long-list screening for the liquid train are presented in Table 7.

Table 7 – Liquid Train Long-List Screening Criteria

Criteria	Description
Proven Reliability	Demonstrated track record of consistently meeting and/or exceeding the treatment objectives set forth for the HWWTP Class EA.
Ease of Expansion to Buildout	The system's ability to easily expand to meet the HWWTP's full buildout capacity and the feasibility of the system footprint fitting into the available site.
Operation and Maintenance (O&M)	The simplicity of operation and maintenance and level of staffing required.
Cost	Have benefits/value in-line with the anticipated capital costs and operation and maintenance costs.

Proven Reliability

In order for a technology to be carried forward for detailed analysis, the technology must have a demonstrated history of being reliable and able to meet the performance requirements set out for the HWWTP.

For primary and secondary treatment, technology would have to have been successfully used in at least three operating plants of a similar size and capacity, in a climate similar to Hanover's, meeting similar effluent limits as Hanover's in order to be considered compatible with HWWTP.

Other factors taken into consideration include the technology's ability to adjust to changing influent conditions, such as high/low flows or fluctuations in sewage characteristics.

Ease of Expansion to Buildout

This criterion reviews how easily the technology can be expanded to match the facility's planned upgrade and expansion from initial construction. Alternatives that require minimal component upgrades, financial investment, and interruption of plant operation were rated more favourably.

Operation / Maintenance Complexity

This criterion reviews how complex the technology/system is to operate and maintain. It also reviews the required operator skill level and staffing requirements. Technologies that are deemed very complex to operate or have intensive maintenance schedules were excluded from the shortlist of alternatives, as are technologies that require a large staff contingent or highly skilled operators.

Cost

The cost criterion looks at the capital cost of the equipment and costs associated with operation and maintenance. Capital costs include equipment purchase and installation. Operation and

maintenance aspects include costs related to utilities (electricity, gas, potable water), chemicals, etc.

6.2.2 Short-List Evaluation Criteria

The criteria selected as the liquid train short-list criteria are presented in Table 8 and descriptions follow.

Table 8 – Liquid Train Short-List Screening Criteria

Primary Criteria	Weight	Secondary Criteria	Weight
Social / Culture	15%	Aesthetic Impacts (plant appearance)	10%
		Traffic Impacts (during construction and operation)	30%
		Noise Impacts (during operation)	20%
		Odours Impacts (during operation)	40%
Technical	30%	Ability to Meet Regulatory Objectives	25%
		Technology / Process Robustness	25%
		Ease of Expansion and Phasing to Buildout	10%
		Energy Requirements	10%
		Operation & Maintenance Requirements (simplicity, operator skill level/quantity)	10%
		Site Requirements (plant footprint)	20%
Environmental	30%	Climate Change Impacts / Greenhouse Gas Generation	10%
		Natural Environment Vegetation and Flora Impacts	10%
		Natural Environment Woodland Impacts	15%
		Natural Environment Wildlife Impacts	15%
		Natural Environment Fisheries and Aquatic Impacts	15%
		Natural Environment Species at Risk Impacts	15%
		Archaeological Impacts	10%

Primary Criteria	Weight	Secondary Criteria	Weight
		Stormwater Impacts/Waste Generation	10%
Economic	25%	Capital Cost	30%
		Operation and Maintenance Costs	40%
		Net Present Value	30%

Social/Culture

Aesthetic Impacts: Aesthetic impacts relate to the technologies or facility's physical appearance and how aesthetically pleasing it might be. Alternatives that are more likely to blend in with the area and/or future development scored higher in the evaluation.

Traffic Disruption/Truck Traffic: The criterion captures the level of traffic disruption that could exist during the facility's construction and day-to-day operation. Factors considered would be the delivery of large amounts of concrete during construction, which would result in numerous concrete trucks travelling to the site. Pre-fabricated units have a lesser impact on the local traffic during construction. Traffic impacts during operation would include increased traffic due to such activities as frequent chemical deliveries. A higher score was given to technologies/systems that would minimize traffic disruptions.

Noise Impacts: The criterion relates to the amount of noise that would be generated during the normal operation of the facility. For example, systems with blowers tend to emit more noise, unless appropriate attenuation measures are taken. Technologies with lower noise generation were scored higher.

Odours: The odours criterion relates to the likelihood for a technology to emit/generate odours during normal operation. For example, odours from systems housed in an enclosed space/building may be more easily controlled than odours from open tanks. Technologies that minimize odours were scored higher than those prone to emitting odours.

Technical

Ability to Meet Regulatory Objectives: The ability to meet regulatory objectives relates to a technology's ability to consistently achieve the effluent limits and objectives.

Process Robustness: The robustness of technology refers to its ability to cope with or adjust to changing operational demands and adverse events. Examples include the system's ability to cope with unexpected high flow events, variations in sewage strength, temperature variations, process upsets, weather events, or utility interruptions. A higher score was applied to technologies/systems that are more flexible to operational fluctuations.

Ease of Expansion and Phasing to Buildout: The technology chosen for the plant must be able to expand relatively easily to grow with the Hanover service area population. The technology will also need to be able to facilitate expansion under a phased development plan to Hanover's ultimate population. Processes or technologies which require minimal component upgrades as the system expands were rated more favourably.

Energy Requirements: The energy requirements for some technologies can be higher than others and would have a higher environmental and cost impact. Alternatives with lower energy requirements were scored higher in the evaluation.

Operation and Maintenance Requirements: The criterion captures the level of effort required by operations staff to operate and maintain the system as well as staffing requirements and operator skill level. Systems that require minimal operational intervention, standard operator skill level, and fewer staff were rated more favourably.

Site Requirements: Site requirements relate to the space that will be needed for the technology/system as compared to the space available for the treatment facility.

Environmental

Climate Change Impacts / Greenhouse Gas Generation: The criterion relates to how the technology might contribute to climate change and greenhouse gas generation. Factors such as minimization of greenhouse gas emissions and the generation of wastes, including waste chemicals, filter media, etc. are considered. Processes with lower impacts on climate change triggers were scored higher in the evaluation.

Natural Environment Vegetation and Flora Impacts: The criterion captures impacts on the local vegetation and flora during construction and operation. If the construction will require the removal of vegetable or flora, it scored lower in the evaluation.

Natural Environment Woodland Impacts: The criterion captures impacts on the local woodland during construction and operation. If the construction will require the removal of trees, it scored lower in the evaluation.

Natural Environment Wildlife Impacts: The criterion captures impacts on the local wildlife during construction and operation. If the construction will have significant disturbance to local wildlife, it scored lower in the evaluation.

Natural Environment Fisheries and Aquatic Impacts: The criterion captures impacts on local fisheries and aquatic impacts. If the construction and operation will have impact on the aquatic habitat conditions of the Saugeen River, it scored lower in the evaluation.

Natural Environment Species at Risk Impacts: The criterion captures impacts on local species at risk. If the construction will have significant disturbance to local species at risk, it scored lower in the evaluation.

Archaeological Impacts: The criterion looks at the level of risks posed to the archaeological potential of the site. Processes with higher risks will be scored lower in the evaluation.

Stormwater Impacts/ Waste Generation: Stormwater impacts capture a technology's ability to maintain its performance during wet weather flows for liquid treatment technologies. Processes with better performance will be scored higher in the evaluation. Waste generation captures a technology's ability to reduce total amount of volatile solids for solids treatment technologies. Processes with higher reduction rate will be scored higher in the evaluation.

Economic

Capital Cost: This criterion relates to the financial investment required to purchase and install the technology/system. Factors such as equipment cost, installation costs, and construction costs of any ancillary infrastructure that may be required are considered. Technologies/systems with lower capital costs were rated more favourably.

Operation and Maintenance Costs: This criterion captures the estimated cost to operate and maintain the system. Aspects considered include the cost of utilities (electricity, gas, water), cost of chemicals, such as coagulants, and frequency of major equipment replacements.

Net Present Value: The Net Present Value analysis captures the present value of all costs associated with the initial construction and operation and maintenance of the technology/system for the expected life span of the technology/system. The net present value analysis in the report used a 20-year life cycle.

6.3 Screening of Long List of Liquid Train Treatment Technologies

The long list of technologies considered for the primary, secondary, tertiary, and disinfection treatment process of the liquid treatment train are listed, described, and evaluated in **Error! Reference source not found.**9.

Table 9 – Evaluation of Long List of Liquid Train Treatment Technologies

No.	Technology	Description	Screening Criteria					Rationale
			Track Record	Ease of Expansion	O&M	Cost	Carry Forward	
Secondary Treatment								
S1	Conventional Activated Sludge System (CAS) with nitrification	▪ The traditional CAS process involves primary settling via a standard clarifier, followed by aeration, and completed by secondary clarification. ▪ The CAS process is a flexible process that can be modified to denitrify (if needed) by adding one or more anoxic/anaerobic tanks with sludge retention time of 10-40 days. ▪ Aeration tank effluent flows to a secondary clarifier for solids separation.	✓	✓	✓	✓	**Yes**	▪ Well-established and extensively used technology. ▪ Same technology as currently implemented in the existing plant. ▪ Well-established and understood O&M requirements. ▪ Construction and operation cost is comparable with other technologies.
S2	Extended Aeration (EA) with nitrification and denitrification	▪ The extended aeration process is similar to the CAS process, except the primary clarification step can be removed. Preliminarily treated sewage can be fed directly to the aeration tank. ▪ Aeration tank effluent flows to a secondary clarifier for solids separation.	✓	x	✓	✓	No	▪ Well-established technology. ▪ Large footprint required, unable to expand to full build-out capacity on the Hanover site. ▪ O&M requirement is comparable with other technologies. ▪ Construction and operation cost is comparable with other technologies.
S3	Membrane Bioreactor (MBR)	▪ An MBR is a modified CAS process with membranes submerged in the aeration tank or installed downstream of the aeration tank. ▪ The membranes combine microfiltration or ultrafiltration with a suspended growth process. The combination provides high nutrient and suspended solids removal. Nitrification, denitrification, and phosphorus removal can be achieved. ▪ A secondary clarifier and tertiary treatment system are not required in an MBR system.	✓	✓	x	x	No	▪ MBR has a proven track record for advanced nutrient removal. ▪ Relatively easy to expand by adding membrane cartridges and no secondary clarifier or tertiary system to expand. ▪ Very small footprint. ▪ O&M requirement is high. However, MBR system will be used in St George WWTP. The operations will have operational experience in MBR system. ▪ Tertiary treatment is not required to meet discharge requirements ▪ Generally speaking, costs are comparable with other technologies. But in Hanover WWTP upgrades, due to the age of the existing plant 2, retrofit existing tanks into MBR tanks is not feasible, which increase its construction cost. ▪ Level of performance is significantly higher than what is needed.
S4	SBR (Sequencing Batch Reactor)	▪ The SBR process performs BOD and nitrogen removal and settling in the same tank. The phases in the SBR process are filled, react, settle, decant, and idle. During the react stage, the air is introduced into the reactor to facilitate biological growth. ▪ Primary treatment and secondary clarification are not required in an SBR system. ▪ SBRs can accommodate fluctuations in flows by adjusting cycle times and can also achieve advanced nutrient removal.	✓	✓	✓	x	No	▪ Well-established technology, mainly installed in small to medium size plants. ▪ Easily expandable due to the minimal number of tanks/reactors in the process. ▪ No secondary clarifier is required. ▪ O&M requirements are comparable with other technologies. ▪ Large footprint on-site required. ▪ Compared to the conventional activated sludge system, a higher level of maintenance can be associated with more automated switches and valves.
S5	Aerobic Granular Sludge Reactor (AGS)	▪ Similar to SBR process, the phases in the process are filled, react, settle, decant, and idle. During the react stage, the air is introduced into the reactor to facilitate biological growth.	✓	✓	✓	✓	**Yes**	▪ Relative new technology with two plants under construction. ▪ Relatively easily expandable. ▪ No secondary clarifier is required. ▪ Relatively compact footprint. ▪ O&M requirement is comparable to SBR.

No.	Technology	Description	Screening Criteria					Rationale
			Track Record	Ease of Expansion	O&M	Cost	Carry Forward	
		▪ An anaerobic phase and light sludge withdraw from tank middle select the granular sludge with the Lower SVI and allow high mixed liquor suspended solids (MLSS) to reach 8g/L. ▪ Anaerobic and anoxic phases can be included for nitrogen removal.						▪ Construction and operation cost is lower than SBR due to smaller reactors/tanks in the process.
S6	Rotating Biological Contactors (RBC)	▪ An RBC consists of a cylinder of plastic discs that are mounted on a rotating shaft. ▪ The cylinder is partially submerged in the wastewater and continuously rotated. Micro-organisms attach to and grow on the discs. Exposure to air when portions of the discs are out of the wastewater provides oxygen to the organisms and submergence causes the organisms to take up the nutrients in the wastewater. ▪ Nitrification and denitrification both occur on the RBC.	x	✓	x	✓	No	▪ Lack of operational flexibility to achieve advanced nutrient removal ▪ Easily expandable. ▪ O&M difficulties in high flow periods where biomass tends to get washed off the discs, and the system is lack of capacity to treat peak loading. ▪ Construction and operation cost is comparable with other technologies.
S7	Membrane Aerated Biofilm Reactor (MABR)	▪ An MABR delivers oxygen into the attached-growth biofilm and wastewater through the membrane tubes in MABR modules submerged into the biological reaction tank. ▪ A layer of aerobic bacteria forms against the oxygen-rich membrane surface and anoxic adapted bacteria develop in the rest of the tank, where anoxic conditions exist. In this way, an MABR simultaneously nitrifies and denitrifies. ▪ The oxygen passively passes through the membranes and is not lost via bubbles rising to the surface as with traditional aeration. ▪ The blower discharge head is significantly lower than traditional aeration. ▪ MABR can also provide a drop-in solution for increasing the capacity of existing treatment Plants.	✓	✓	✓	✓	**Yes**	▪ Relatively new technology. Recent successfully installations locally include Elmira and Hespeler. ▪ Intensify the existing aeration process and increase the nutrient removal capacity within the existing aeration tanks. ▪ The MABR module can be dropped in the aeration tank in a non disruptive development. ▪ The MABR process needs to be combined with CAS process
S8	Moving Bed Biofilm Reactors (MBBR)	▪ An MBBR uses plastic media, suspended in an aeration tank. Micro-organisms attach to and grow on the media. ▪ Nitrification takes place in the aeration tank. The MBBR system achieves BOD removal and nitrification via the biofilm on the media. ▪ Effluent from the MBBR tank goes to a clarifier to separate solids.	✓	✓	✓	✓	**Yes**	▪ MBBR is a well-established technology. ▪ Easily expanded by adding media to void space. ▪ Compact footprint. ▪ Operational requirements are comparable with other advanced technologies. ▪ Construction and operation cost is higher than modified CAS due to the media cost and coarse bubble aeration, but comparable with other advanced technologies.
S9	Integrated Fixed Film Activated Sludge (IFAS) Process with Chemical Addition for Phosphorous Removal	▪ The IFAS process is a variation of an MBBR. IFAS combines the CAS system (suspended growth) with a biofilm on media system (attached growth). A separate CAS tank can be also provided prior to or following IFAS tank. ▪ Plastic media is added to the aeration stage to provide surface area for micro-organisms to attach and grow. ▪ The IFAS system achieves BOD removal and nitrification and denitrification via the MLSS and the biofilm on the media. ▪ Effluent from the IFAS tank goes to a clarifier to separate solids.	✓	✓	x	x	No	▪ Well-established technology. ▪ Easily expanded by adding more media to void space or CAS tank. ▪ The IFAS process needs to be complied with CAS process. ▪ Higher footprint required. ▪ Construction and operation cost is higher than modified CAS due to the media cost and coarse bubble aeration, but comparable with other advanced technologies.
S10	Biological Aerated Filters (BAF)	▪ BAFs are usually up-flow filters that use granular or plastic media. ▪ BOD removal and nitrification would take place in an aerated BAF and denitrification would occur in a subsequent anoxic BAF. An	✓	✓	x	✓	No	▪ Well-established technology, with successful installations in Ontario.

No.	Technology	Description	Screening Criteria					Rationale
			Track Record	Ease of Expansion	O&M	Cost	Carry Forward	
		external carbon source would be needed in the anoxic tank to feed the biomass. ▪ A clarifier is not needed downstream of a BAF. ▪ The system needs a complicated backwash system and sometimes extra hydraulic lifting. ▪ Coarse or medium bubble aeration system are used in BAF. Aeration energy cost represents more than 80% of BAF operation cost.						▪ Packaged system. Ease of expansion is comparable with other technologies. ▪ Compact footprint. ▪ Requires greater than 85% of TSS removal rate for primary clarifier based on the projected maximum monthly TSS concentration of HWWTP, which would result in a heavy coagulant dosage and high chemical sludge generation. ▪ O&M requirements are high. ▪ Construction and operation cost is comparable with other technologies.
Tertiary Treatment								
T1	Adsorptive Deep Bed Filtration (e.g. BluePro)	▪ A deep bed filtration process where a hydrous ferric coating is continuously applied to the sand media. Phosphorous in the wastewater chemically binds with the coating on the sand particles. ▪ The sand is continuously pumped to a washing-off and recoating system to remove adsorbed phosphorous and then recoated with the ferric coating, then recycled to the filter for reused.	✓	✓	x	✓	No	▪ A few full-scale Canadian installations and several US installations. ▪ Some systems achieve phosphorous removal as low as 0.02 mg/L, however this performance level is excessive for HWWTP upgrades. ▪ Easy to expand. ▪ Relatively complex O&M due to coating recovering. ▪ High performance.
T2	Two-Stage Continuous Backwash Up-Flow Sand Filters (e.g. DynaSand)	▪ Two stage filtration refers to up-flow filters that use sand as the filter media. Chemical addition is used to facilitate phosphorous removal. ▪ The majority of removal occurs in the first stage. The second stage is a polishing step. Achieve the best performance among traditional filtration process.	✓	✓	✓	x	No	▪ Well established technology, applied to wastewater advanced treatment. ▪ Stable and high performance. ▪ Easy to expand. ▪ Comparable O&M. ▪ Construction and operation cost is relatively high when compared to other technologies.
T3	Disc Filters	▪ Disc filters are high rate inside-out filtration systems where the dirty water flows into a central drum, then out through discs. They are comprised of woven filter fabrics that remove solids from the influent stream. ▪ For example, cloth disc filters consist of a cartridge of circular filters that are made of a specialized cloth material. Solids accumulate on both sides of the filters. When solids accumulation reaches the upper limit, a backwash cycle is initiated to clean the filters ▪ Each disk components are easy to remove for maintenance	✓	✓	✓	✓	**Yes**	▪ Established technology, numbers of successful installations in Ontario. ▪ Complete modular supply, easier to expand. ▪ Lower requirement and cost to O&M. ▪ Comparable cost to traditional technologies.
T4	Tertiary Membrane Filters	▪ Use of microfiltration membranes to remove phosphorous. Commonly ▪ used in drinking water systems. Sewage temperature will impact treatment capacity of tertiary membranes. ▪ To prevent excessive fouling of the tertiary membranes, a pre-filter is required upstream of the tertiary membranes to remove particulates that can clog the membranes.	✓	✓	x	x	No	▪ New technology. Well-applied for drinking water installations in Ontario. ▪ Can be expanded by adding membrane cartridges. ▪ Relatively complex O&M requirements and cost. ▪ Membranes require regular replacement at ten-year intervals. ▪ Expensive relative to other technologies.
T5	High-Rate Clarifiers (e.g. Actiflo)	▪ High-rate clarifiers employ flocculation then use of micro-sand and a Polymer to increase the weight of floc and hence the clarification.	✓	✓	✓	✓	**Yes**	▪ Established technology, mainly used in stormwater management, wastewater reuse, and facility water apply.

No.	Technology	Description	Screening Criteria					Rationale
			Track Record	Ease of Expansion	O&M	Cost	Carry Forward	
		▪ Coagulant is added to the secondary treatment effluent after which polymer and micro-sand are introduced into the wastewater stream. ▪ The flocs are then settled out of the water using a lamella clarifier, then being recovered prior to return the flocculation process.						▪ Easy to expand. ▪ Relatively complex O&M due to micro-sand and polymer recovery. ▪ Comparable cost to traditional filter technologies.
Disinfection								
D1	Chlorination / De-chlorination	▪ A chlorination/dichlorination system uses sodium hypochlorite to disinfect the wastewater. ▪ The chlorinated wastewater is sent through a contact chamber to provide the required contact time. ▪ Sodium bisulphite is added to the contact tank effluent to remove residual chlorine, which is harmful to the environment.	✓	x	x	✓	No	▪ Well established technology. ▪ Easily expanded. ▪ large footprint required, not feasible for HWWTP site. ▪ Dosing systems can be complex to operate but manageable ▪ Construction costs are comparable with other technologies. ▪ High O&M costs
D2	Ultra-Violet Radiation	▪ High-intensity ultra-violet lamps are used to irradiate the wastewater with ultraviolet radiation which inactivates pathogens.	✓	✓	✓	✓	**Yes**	▪ Proven effective on multiple installations in Ontario. ▪ Easily expandable. ▪ Very compact footprint. ▪ Relatively simple operation and maintenance requirements. ▪ Construction and operation costs are comparable with other technologies. ▪ Effective against a wide range of micro-organisms. ▪ Does not produce harmful by-products. ▪ Higher energy costs. ▪ Preferred technology for disinfection by Ministry of Environment.
D3	Ozonation	▪ An on-site ozone generator is used to generate ozone, which is then dosed into the wastewater. ▪ Ozone inactivates pathogens and quickly degrades, leaving no by-products in the wastewater.	✓	✓	x	✓	No	▪ Newer but, a proven technology. ▪ Easily expandable. ▪ Ozone is very reactive and more hazardous than chlorination/de-chlorination chemicals, which may cause operational safety issue. ▪ Construction and operation cost is comparable with other technologies.

6.3.1 Summary of Short-Listed Technologies

The technologies that were short-listed for detailed evaluation for the liquid train treatment are listed below.

Secondary Treatment

- Conventional Activated Sludge (CAS) System
- Aerobic Granular Sludge Reactor (AGS)
- Membrane Aerated Biofilm Reactor (MABR)
- Moving Bed Biofilm Reactors (MBBR)

Tertiary Treatment

- Disc Filters
- High-Rate Clarifiers

Disinfection Treatment

- Ultraviolet Radiation (UV)

6.4 Detailed Description of Short-Listed Technologies for Liquid Train

6.4.1 Technology Alternatives for Secondary Treatment

6.4.1.1 Conventional Activated Sludge (CAS) System

The CAS process consists of preliminary treatment, primary clarification, aeration, and secondary clarification. Wastewater flows from the preliminary treatment system (grit and solids removal) to the primary treatment system. For a CAS process, primary treatment is typically accomplished using a primary clarifier and this alternative includes a primary clarifier as the primary treatment technology.

The primary clarifier removes settleable solids, which are sent to the sludge treatment system.

From the primary clarifier, wastewater flows into the aeration tank where aeration facilitates the biological conversion of ammonia and ammonium to nitrate and lowers BOD levels. An aeration and blower system is equipped to provide oxygen for biological reduction of BOD and ammonia-nitrogen.

The final step in the CAS process is removal of solids, which is typically done by a secondary/final clarifier. Some of the sludge from the secondary clarifier is recycled to the head of the aeration tank. This recycle stream is called the recycle activated sludge (RAS). The balance of the sludge is either pumped directly to the sludge treatment system or sent to the primary clarifier sludge hoppers for co-thickening before being sent to the sludge treatment system. This sludge stream is called the waste activated sludge stream (WAS).

Figure 4 shows a flow schematic of the conventional CAS process.

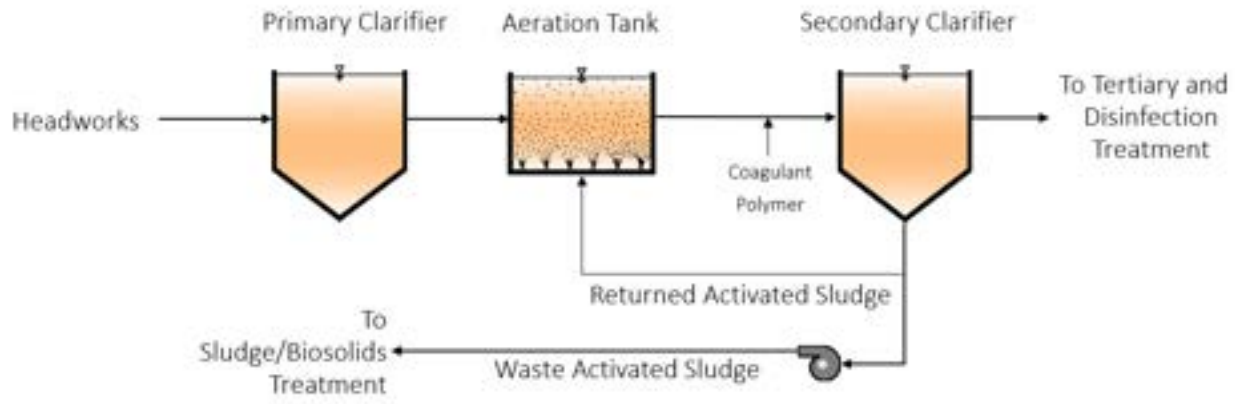


Figure 4 – Conventional Activated Sludge System Process Flow Schematic

Rectangular clarifiers are chosen based on the ease of construction and expansion compared with circular clarifiers. However, circular clarifiers have equivalent benefits and are also viable. Selection of rectangular or circular clarifiers can be made during the design phase.

Advantages and disadvantages of the CAS process are listed in Table 10.

Table 10 – Advantages and Disadvantages of CAS Process

Advantages	Disadvantages
▪ Well understood process and easy to operate ▪ System is relatively flexible for high flow events, but not as flexible as MBBR. ▪ Construction is straightforward. ▪ Lower aeration demand/costs when coupled with primary treatment. ▪ Relatively easy to expand if clarifiers and biological system constructed as rectangular tanks.	▪ Tertiary treatment stage would be needed for the required advanced phosphorous removal. ▪ Requires chemical if phosphorous removal is required in the secondary treatment stage to facilitate advanced removal in the tertiary treatment stage.

6.4.1.2 Aerobic Granular Sludge Reactor (AGS)

The AGS process is considered SBR 2.0 which is a sequencing batch reactor process. Its process including influent filling, react, settle and drain. The supernatant (effluent) is discharged, then flow to tertiary treatment.

The AGS process represents an aerobic biological treatment method that produces dense sludge pellets. In this process, wastewater flow into a bioreactor where specially cultivated microbial aggregates called “granules” are formed.

The AGS process operates under aerobic conditions. Oxygen is supplied to the bioreactor through aerators/diffusers that introduce air into the system. Microorganisms within the granules use this oxygen to metabolize and break down the organic pollutants present in the wastewater.

Within the granules, various simultaneous biological processes occur, allowing efficient removal of organic contaminants and nutrients from the wastewater.

One of the key features of the AGS process is the rapid settling of granules in the bioreactor. This rapid settling allows for effective separation of treated water from the microbial biomass, eliminating the need for secondary clarifiers.

Figure 5 shows a flow schematic of an AGS system.

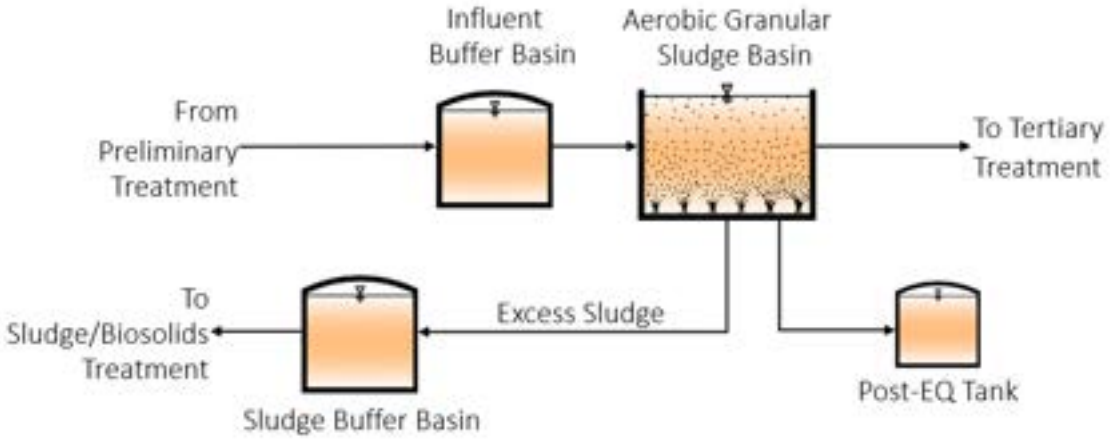


Figure 5 – Aerobic Granular Sludge Process Flow Schematic

Table 11 presents the advantages and disadvantages of the AGS treatment process.

Table 11 – Advantages and Disadvantages of the AGS Process

Advantages	Disadvantages
▪ Smaller footprint. ▪ Simultaneous nitrification/denitrification and lower energy due to operating regime (reduced effluent nitrate). ▪ Higher effluent quality comparing to other secondary treatment.	▪ Developing technology – limited full-scale application in North America; but a number of plants using batch technology worldwide. ▪ Capital and long-term O&M costs are provided by the system supplier, but not well understood by general. ▪ MECP approvals may require pilot testing.

6.4.1.3 Membrane Aerated Biofilm Reactor (MABR)

The MABR process combines activated sludge treatment with fixed-membrane biological treatment with gas transfer through specially designed membranes. In this process, air is introduced into hollow-fiber, composite membranes submerged in the wastewater to be treated. Microorganisms grow on the surface of the membrane and create a biofilm. Oxygen from the introduced air diffuses through the membrane to support the microbial activity, allowing efficient removal of organic contaminants and nutrients from the wastewater.

Figure 6 shows a flow schematic of a MABR system.

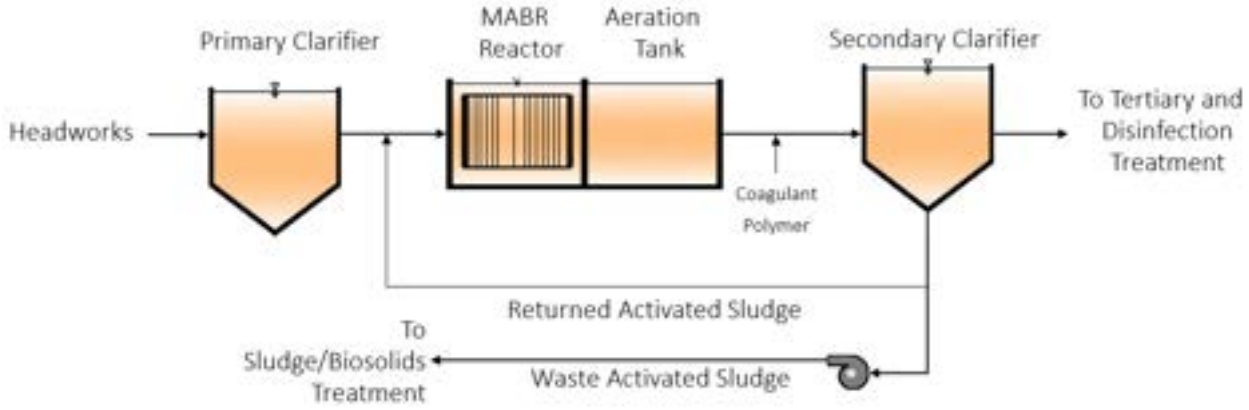


Figure 6 – MABR Process Flow Schematic

Table 12 presents the advantages and disadvantages of the MABR technology.

Table 12 – Advantages and Disadvantages of the MABR Process

Advantages	Disadvantages
▪ Smaller footprint than CAS. ▪ Reduced energy consumption (very efficient, lower pressure oxygen transfer across membrane). ▪ Simultaneous nitrification/denitrification (reduced effluent nitrate). ▪ Easy to increase the existing tank capacity by simply dropping new MABR modules.	▪ Developing technology – limited full-scale applications. ▪ Capital and long-term O&M costs are provided by the system supplier, but not well understood by general. ▪ MECP approvals may require pilot testing.

6.4.1.4 Moving Bed Biofilm Reactors (MBBR)

The MBBR solution is a biological wastewater treatment processes where biofilm grows on HDPE (PVC) carriers suspended in wastewater that removes pollutants in a cost-efficient way. The MBBR is a stand-alone system which means there is no need for sludge recirculation, leaving only surplus biomass (waste sludge) to be removed through downstream separation technology.

MBBR manufacture proposed dissolved air flotation (DAF) system as a more economic clarification technology than conventional clarifiers to remove waste sludge from MBBR effluent. DAF clarifies wastewaters by the removal of suspended solids. The removal is achieved by dissolving air in the water or wastewater under pressure and then releasing the air at atmospheric pressure in a flotation tank basin. DAF effluent is saturated with oxygen. As DAF is proposed downstream of MBBR, effluent re-oxygenation is not required for this alternative to achieve the effluent DO level requirement.

Figure 7 shows a flow schematic of a MBBR system.

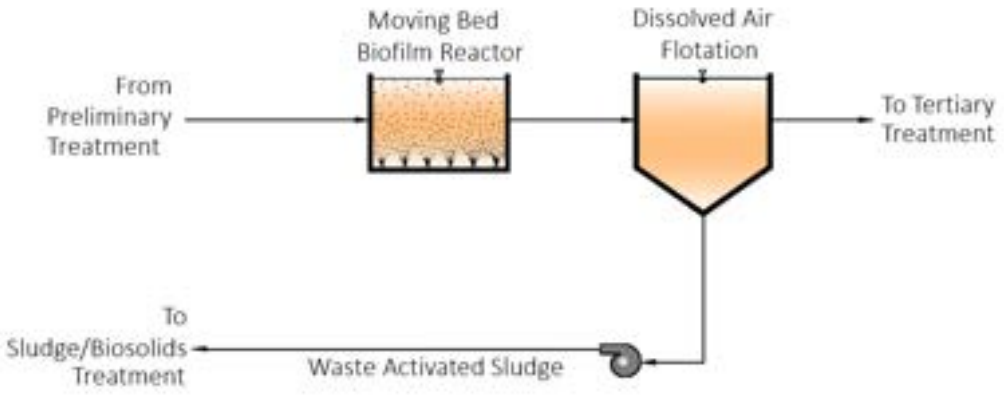


Figure 7 – Moving Bed Biofilm Reactors Process Flow Schematic

Table 13 presents the advantages and disadvantages of the MBBR treatment process.

Table 13 – Advantages and Disadvantages of MBBR Process

Advantages	Disadvantages
▪ Compact footprint ▪ Simple to operate ▪ Flexibility in choosing downstream separation ▪ Robust and stable with influent changes ▪ Ease to retrofit to existing infrastructure ▪ Easily expanded by adding media to void space	▪ MBBR is a well-established technology. ▪ Operational difficulties associated with retaining media in tank without affecting hydraulics and foaming issues reported ▪ Construction and operation cost is higher than CAS due to the media cost and coarse bubble aeration, but comparable with other advanced technologies.

6.4.2 Technology Alternatives for Tertiary Treatment

6.4.2.1 Disc Filters

Disc filers are high-rate inside-out filtration systems, which uses coagulant and polymers addition for phosphorus removal and are capable of producing reuse quality effluent. Backwash and solids wasting are accomplished in the filter tank during continuous filtration operation.

Wastewater from the secondary treatment system enters the filter tank by gravity. The filtrate is collected inside the disks and discharged to the effluent chamber. The solids are captured by media with heavier solids settled to the tank bottom. The backwash shoes contact the media directly and solids are removed by vacuum pressure using the backwash pump. The heavier solids on the tank bottom are removed on an intermittent basis while the solids collected on the media will be pumped back to the solids collection system.

The technology is used in multiple wastewater treatment plants across Canada and can produce a high-quality effluent.

6.4.2.2 High-rate Clarifiers

High-rate clarifier is a proven, compact and robust wastewater clarification system. The technology can be implemented at all stages of the treatment of municipal effluents and real-time treatment of wet weather flows.

A high-rate clarifier cleans water by rapidly removing suspended solids and turbidity through an enhanced sedimentation process. Pre-treated water, with coagulants and flocculants added, flows into the clarifier, where inclined plates or tubes create a large surface area for particles to settle efficiently under gravity. These particles slide down to the bottom as sludge, which is periodically removed, while the clarified water flows upward and is collected through an overflow system. This efficient design produces clear water with significantly reduced impurities, ready for further treatment or discharge.

6.4.3 Technology Alternatives for Disinfection

6.4.3.1 UV Disinfection

Disinfection via UV radiation involves exposing micro-organisms in wastewater to UV light within the 200 to 300 nanometer wavelength range. This range is called the germicidal range because micro-organisms, such as bacteria, viruses, and protozoa, are deactivated and lose the ability to reproduce after exposure.

A UV disinfection system consists of a bank of UV radiation emitting tubes, which are submerged in the wastewater, usually a concrete channel. As the wastewater flows across the UV tubes, micro-organisms are exposed to the radiation and become deactivated.

Advantages and disadvantages of the UV disinfection alternative are listed in Table 14.

Table 14 – Advantages and Disadvantages of UV Disinfection

Advantages	Disadvantages
▪ Proven effective on multiple installations in Ontario. ▪ Smaller footprint than chlorination. ▪ Effective against a wide range of micro-organisms. ▪ Does not produce harmful by-products.	▪ Effectiveness depends on water quality, i.e., transmissivity and turbidity. ▪ Not very flexible to large variations in water quality. ▪ Requires building to house UV system. ▪ Energy costs

6.5 Development of Preferred Alternative Solution for Liquid Treatment Train

6.5.1 Cost Estimates of Liquid Treatment Alternatives

6.5.1.1 Preliminary Treatment

Based on the Capacity Assessment and Plant Optimization Study findings detailed in Appendix B, the existing headworks is in poor condition, and the capacity of both the screening and grit removal systems is insufficient to manage additional flows caused by population growth. This necessitates significant upgrades to the plant's headworks building.

To address this, a new headworks building with an ADF capacity of 13,789 m³/d is proposed for construction during Phase 2. This phase will also include the installation of process, electrical, and other supporting equipment to meet the treatment requirements. The ultimate capacity can be achieved by adding additional equipment in Phase 3.

The new headworks building will feature an influent pumping station, 6mm mechanical bar screens, and vortex grit removal equipment. Equipment can be installed based on treatment capacity requirement; however, to ensure ease of construction and cost efficiency, the headwork building should be designed and sized to accommodate the ultimate capacity.

The results of the 30-year period life-cycle cost analyses for headworks are summarized below in Table 15. Estimates have been rounded to the nearest thousand dollars. Details of the life-cycle cost analysis can be found in Appendix D.

Table 15 – Cost Estimates for Headworks

	Headworks
Capital Cost	$32,065,000
Annual O&M Cost	$320,000
NPV Value	**$57,076,000**

6.5.1.2 Secondary Treatment

As outlined in Section 5, a stress test is recommended to re-rate the plant before its expansion. The purpose of the stress test is to establish the plant's reliable capacity and determine its ultimate treatment potential.

For cost estimation, as discussed in Section 5, a conservative plant capacity of 7,000 m³/d, has been assumed and used in the evaluation. Similarly, the capacity of Plant 2 is currently assumed to be 3,500 m³/d. The final expansion plan will depend on the stress test outcomes.

The results of the 30-year period life-cycle cost analyses for the four (4) short-listed secondary treatment alternatives are summarized in Table 16. Estimates have been rounded to the nearest thousand dollars. Details of the life-cycle cost analysis can be found in Appendix E.

Table 16 – Cost Estimates for Secondary Treatment Alternatives

	Conventional Activated Sludge		Aerobic Granular Sludge		Membrane Aerated Biofilm Reactor		Moving Bed Biofilm Reactor	
	Phase 2	**Phase 3**	**Phase 2**	**Phase 3**	**Phase 2**	**Phase 3**	**Phase 2**	**Phase 3**
Capital Cost	$22,388,000	$5,410,000	$26,154,000	$6,290,000	$29,288,000	$5,853,000	$24,070,000	$5,684,000
Annual O&M	$392,000	$575,000	$501,000	$753,000	$542,000	$778,000	$460,000	$690,000
Net Present Value	**$52,059,000**		**$61,889,000**		**$66,769,000**		**$56,681,000**	

6.5.1.3 Tertiary Treatment

The plant's historical performance shows that the plant existing effluent quality meets the proposed effluent objectives (Section 3.3). The necessity of installing tertiary treatment has not yet been decided, and will be further evaluated and determined during future design phases. In the following sections, tertiary treatment will be evaluated to provide a complete perspective for future expansion.

The existing HWWTP has no tertiary treatment system on site. Therefore, it is proposed that a new tertiary treatment building sized for an equivalent ADF capacity of 13,789 m^3/d will be built in Phase 2. The installation of the process, electrical and other equipment will be proposed accordingly.

Based on the results presented in Table 20 in following section 6.5.2, disc filter has a higher total score than high-rate clarifier in the detailed evaluation. Additionally, packaged secondary and tertiary treatment systems were proposed by the equipment suppliers for performance guarantees when soliciting budgetary quotes. Disc filters were recommended by all the equipment suppliers. Therefore, disc filters are chosen to be the downstream tertiary treatment technology for CAS, AGS, MABR and MBBR in the cost comparison.

The results of the 30-year period life-cycle cost analyses for the two (2) short-listed tertiary treatment alternatives are summarized in Table 17. Estimates are based on the ultimate capacity of 13,789 m^3/d and have been rounded to the nearest thousand dollars. Details of the life-cycle cost analysis can be found in Appendix F.

Table 17 – Cost Estimates for Tertiary Treatment Alternatives

	Disc Filter	High-rate Clarifier
Capital Cost	$8,545,000	$12,600,000
Annual O&M Cost	$124,000	$211,000
NPV Value	**$16,773,000**	**$24,964,000**

6.5.1.4 Disinfection

Based on the Capacity Assessment and Plant Optimization Study findings in Appendix B, the existing chlorine contact tank (CCT), constructed in 1980', has been in service for over 40 years. To streamline operations and maintenance requirements, it is recommended to replace the existing CCT with a new UV disinfection system.

A new disinfection building and UV channel, sized for an equivalent ADF capacity of 13,789 m^3/d, will be constructed during Phases 2. The structure will accommodate the full capacity, but UV banks will be added incrementally: a UV bank for a flow of 10,500 m^3/d in Phase 2 and an additional UV bank for a flow of 3,289 m^3/d in Phase 4. The installation of process, electrical, and other equipment will align with the plant capacity requirements for each phase. Portable water style UV system, which is simpler and cost less, can be applied to disc filter effluent. The suitability of the portable water style UV system will be evaluated and discussed in the later design stage of the plant expansion. The more conservative channel UV system is considered in this report.

The result of the 30-year period life-cycle cost analyses for UV Radiation is summarized in Table 18. Estimates have been rounded to the nearest thousand dollars. Details of the life-cycle cost analysis can be found in Appendix G.

Table 18 – Cost Estimates for Disinfection

	UV Disinfection	
	Phase 2	**Phase 3**
Capital Cost	$1,103,000	$155,000
Annual O&M	$79,000	$117,000
Net Present Value	**$3,581,000**	

6.5.2 Detailed Evaluation of Liquid Treatment Train Alternatives

The evaluation criteria and weightings used to evaluate the short-listed liquid treatment technology alternatives were presented in **Section 6.2.2**.

Table 19 and Table 20 summarize the results of the detailed evaluation of the secondary treatment and tertiary treatment alternatives respectively.

The full evaluation matrix can be found in Appendix I and Appendix J.

Table 19 – Evaluation Matrix for Short-Listed Secondary Treatment Alternatives

PRIMARY CRITERIA		SECONDARY CRITERIA		ABSOLUTE WEIGHT (WT)	SHORT LISTED ALTERNATIVES							
					Alternative 1 CAS		Alternative 2 AGS		Alternative 3 MABR		Alternative 4 MBBR	
CRITERIA	WEIGHT	CRITERIA	WEIGHT		SCORE*	WT SCORE	SCORE*	WT SCORE	SCORE*	WT SCORE	SCORE*	WT SCORE
Social/Culture	15%	Aesthetic Impacts (plant appearance)	10	1.5	3	0.9	2	0.6	2	0.6	4	1.2
		Traffic (during construction and operation)	30	4.5	3	2.7	3	2.7	3	2.7	3	2.7
		Noise Impacts (during operation)	20	3	3	1.8	3	1.8	3	1.8	3	1.8
		Odour Impacts (during operation)	40	6	4	4.8	4	4.8	4	4.8	4	4.8
Technical	30%	Ability to Meet Regulatory Objectives	25	7.5	5	7.5	5	7.5	5	7.5	5	7.5
		Technology/Process Robustness	25	7.5	5	7.5	5	7.5	5	7.5	5	7.5
		Ease of Expansion and Phasing to Buildout	10	3	3	1.8	3	1.8	3	1.8	4	2.4
		Energy Requirements	10	3	3	1.8	4	2.4	4	2.4	4	2.4
		Operation & Maintenance Requirements (simplicity, operator skill level/quantity)	10	3	4	2.4	3	1.8	4	2.4	3	1.8
		Site Requirements (plant footprint)	20	6	4	4.8	3	3.6	4	4.8	5	6
Environmental	30%	Climate Change Impacts / Greenhouse Gas Generation	10	3	4	2.4	4	2.4	4	2.4	4	2.4
		Natural Environment Vegetation and Flora Impacts	10	3	4	2.4	4	2.4	4	2.4	4	2.4
		Natural Environment Woodland Impacts	15	4.5	4	3.6	4	3.6	4	3.6	4	3.6
		Natural Environment Wildlife Impacts	15	4.5	4	3.6	4	3.6	4	3.6	4	3.6
		Natural Environment Fisheries and Aquatic Impacts	15	4.5	4	3.6	4	3.6	4	3.6	4	3.6
		Natural Environment Species at Risk Impacts	15	4.5	4	3.6	4	3.6	4	3.6	4	3.6
		Archaeological Impacts	10	3	5	3	5	3	5	3	5	3
		Stormwater Impacts	10	3	5	3	5	3	5	3	5	3
Economic	25%	Capital Cost	30	7.5	5	7.5	3	4.5	4	6	4	6
		Operation and Maintenance Costs	40	10	5	10	3	6	3	6	4	8
		Net Present Value	30	7.5	5	7.5	2	3	4	6	3	4.5
		TOTAL SCORE	**100**		**86.2**		**73.2**		**79.5**		**81.8**	

Table 20 – Evaluation Matrix for Short-listed Tertiary Treatment Alternatives

PRIMARY CRITERIA		SECONDARY CRITERIA		ABSOLUTE WEIGHT (WT)	SHORT LISTED ALTERNATIVES			
					Alternative 1 Disc Filter		Alternative 2 High-rate Clarifier	
CRITERIA	WEIGHT	CRITERIA	WEIGHT		SCORE*	WT SCORE	SCORE*	WT SCORE
Social/Culture	15%	Aesthetic Impacts (plant appearance)	10	1.5	3	0.9	4	1.2
		Traffic (during construction and operation)	30	4.5	4	3.6	3	2.7
		Noise Impacts (during operation)	20	3	4	2.4	4	2.4
		Odour Impacts (during operation)	40	6	4	4.8	4	4.8
Technical	30%	Ability to Meet Regulatory Objectives	25	7.5	5	7.5	5	7.5
		Technology/Process Robustness	25	7.5	4	6	4	6
		Ease of Expansion and Phasing to Buildout	10	3	4	2.4	4	2.4
		Energy Requirements	10	3	5	3	4	2.4
		Operation & Maintenance Requirements (simplicity, operator skill level/quantity)	10	3	4	2.4	4	2.4
		Site Requirements (plant footprint)	20	6	3	3.6	4	4.8
Environmental	30%	Climate Change Impacts / Greenhouse Gas Generation	10	3	4	2.4	2	1.2
		Natural Environment Vegetation and Flora Impacts	10	3	4	2.4	4	2.4
		Natural Environment Woodland Impacts	15	4.5	4	3.6	4	3.6
		Natural Environment Wildlife Impacts	15	4.5	4	3.6	4	3.6
		Natural Environment Fisheries and Aquatic Impacts	15	4.5	4	3.6	4	3.6
		Natural Environment Species at Risk Impacts	15	4.5	4	3.6	4	3.6
		Archaeological Impacts	10	3	5	3	5	3
		Stormwater Impacts	10	3	5	3	5	3
Economic	25%	Capital Cost	30	7.5	4	6	3	4.5
		Operation and Maintenance Costs	40	10	4	8	3	6
		Net Present Value	30	7.5	4	6	3	4.5
		TOTAL SCORE		100	**81.8**		**75.6**	

6.5.3 Preferred Alternative for Liquid Treatment Train

Based on a detailed analysis of liquid treatment technologies, Conventional Activated Sludge (CAS) achieved the highest overall score among the four evaluated technologies. Given that the existing liquid treatment system also utilizes CAS, continuing with this technology is recommended to simplify operations and minimize operational complexity for operators.

For tertiary treatment, the Disc Filter outperformed the High-Rate Clarifier, making it the preferred choice.

For disinfection treatment, UV Disinfection has been selected as the recommended technology.

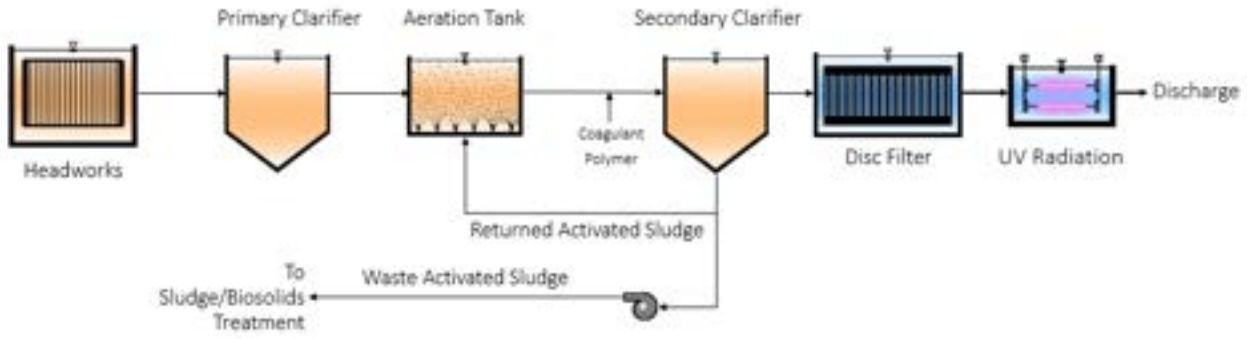


Figure 8 – Preferred Liquid Train Treatment Technology

7 Sludge/Biosolids Treatment and Management

7.1 Objectives and Overview

For the purposes of this assessment, sludge refers to wastewater solids that have not been stabilized and biosolids refers to wastewater solids that have been stabilized. Sludge does not include screenings and grit that has been removed during preliminary treatment, as these are typically hauled off site.

Sludge is progressively removed from the liquid stream during primary, secondary, and tertiary treatment. The quantity of sludge removed and/or generated in each process depends on the process itself. For example, processes that add coagulants to the liquid system will generate more sludge than processes that do not use coagulants.

Biosolids from the HWWTP is stored on-site in the biosolids storage tank. Stabilized biosolids is hauled off-site for sale or use.

Biosolids are a nutrient-rich product of the wastewater treatment process, with many options available for recovering and using the nutrients in a beneficial way, often termed as “beneficial reuse”. Biosolids can be treated by various methods to produce products that can be used agriculturally, commercially marketed, or used as an energy source. Some of the possible end-use options for biosolids include:

- Potentially applied to agricultural land as fertilizer;
- Used as a soil amendment;
- Commercially marketable fertilizer;

- Incinerated for heat and the ash used in the cement industry.

Several factors were considered when developing a management strategy for the sludge/biosolids generated. Factors considered include:

- Whether or not to stabilize the sludge on site or have unstabilized sludge hauled off-site for treatment and disposal at another facility;
- What on-site stabilization technology to use; and
- To what level should the biosolids be processed for beneficial re-use and/or commercial marketing.

7.1.1 Evaluation of Sludge Stabilization Alternatives

7.1.1.1 Alternatives Related to Hauling Unstabilized Sludge Off-Site

Alternatives for management/disposal of unstabilized sludge involve performing no on-site sludge stabilization. Unstabilized sludge would be hauled off-site for either disposal or treatment by another party.

The alternatives considered for management of unstabilized sludge were:

- Disposal at a landfill, licensed to accept unstabilized sludge;
- Treatment at another municipal facility, and
- Treatment/disposal by an independent, Biosolids Management Contractor.

All alternatives involving disposing or hauling unstabilized sludge off site were considered not sustainable as they carry a high degree of risk due to dependence on the receiving facility. The existing plant is currently operating with on-site sludge stabilization method with co-thickening and temporary biosolids storage on site. As there are no reliable off-site facilities nearby, large on-site unstabilized sludge storage is required. Therefore, alternatives related to hauling unstabilized sludge off-site were eliminated from the evaluation.

7.1.1.2 Alternatives Related to On-Site Sludge Stabilization

Unlike unstabilized sludge, biosolids can be readily land applied locally. There are numerous contractors who offer land application services. End-use options related to biosolids do not carry the same risk of dependence on a third part as alternatives related to unstabilized sludge.

Due to the flexibility associated with stabilizing the plant's sludge on site, it is the recommended alternative for the HWWTP.

7.1.2 Evaluation of On-Site Biosolids Storage

At the HWWTP, waste activated sludge (WAS) is co-thickened in the primary clarifiers and then discharged to the primary digester. The digested biosolids are stored in the secondary digester and three (3) on-site storage tanks, with a combined capacity of 1,679 m^3. Additionally, an above-ground glass-fused-to-steel biosolids storage tank, built in 2017, provides an additional 5,000 m^3 of storage capacity.

In Plant 1, there is a primary clarifier and a secondary digester. The primary digester has a total volume of 1,327 m^3, while the secondary digester has a total volume of 1,215 m^3. Upon completion of the Phase 2 work, the new sludge digestion system will be operational, allowing the two existing digesters to be reused as biosolids storage facilities.

7.2 Sludge/Biosolids Treatment and Management Evaluation Criteria

The methodology used to evaluate the technologies available for sludge/biosolids treatment and management was a modified version of that used for the liquid train evaluation. A long-list set of screening criteria, specific to sludge/biosolids, was developed and used to short list the technology alternatives. This approach was used because the objectives for sludge/biosolids treatment and management vary from those associated with the liquid train. For example, the ability for beneficial reuse is a criterion that is specific to sludge/biosolids and is not relevant to the liquid treatment process.

7.2.1 Long-List Screening Criteria

The criteria selected for screening the long list of sludge/biosolids treatment and management technologies are presented in Table 21 and descriptions of each criterion follow.

Table 21 – Sludge/Biosolids Treatment and Management Long-List Screening Criteria

Criteria	Description
Regulatory Compliance	Ability to meet current and anticipated future regulations for processing and end-use/disposal.
Proven Reliability and Sustainability	Demonstrated successful projects of similar size and high level of flexibility to variations in sludge/biosolids quality and adverse weather conditions.
Staging/Phasing	Ability to easily expand to meet the HWWTP full buildout capacity.
Cost	Have benefits/value that are in line with the capital and operation and maintenance costs.
Resource Recovery/ Revenue Generation	Ability for end product to be used beneficially (e.g. land application) or to generate revenue (e.g. sold commercially as compost or fertilizer)

Regulatory Compliance

In order for an alternative to be carried forward for detailed analysis, the alternative must be one that produces a final product that meets the current and anticipated regulations for the intended use of the end product. For example, processes that produce compost must be able to adhere to the stringent metals content as prescribed by the guidelines for the production of compost in Ontario, if the compost is to be commercially marketed in Ontario.

Proven Reliability and Sustainability

The preferred alternative must have a demonstrated history of reliably processing biosolids from a facility or facilities of a similar scale for at least two years in Ontario. The preferred alternative must be sustainable and be able to provide year-round treatment and/or storage, where required.

Staging/Phasing

The staging / phasing criterion reviews how easily an alternative can be expanded to match the planned expansion of the facility. Alternatives that require minimal component upgrades and financial investment were rated more favourably.

Cost

This cost criterion looks at the capital cost of the alternative and the costs associated with its operation and maintenance. Capital costs include equipment purchase and installation. Operation and maintenance aspects include costs related to utilities (electricity, gas, potable water), chemicals, and the level of effort required for regular maintenance of the equipment.

Beneficial Use/Revenue Generation

This criterion relates to whether or not the final product produced by the alternative can be beneficially reused and/or commercially marketed. Alternatives that do not provide nutrient recovery or revenue generation from biosolids are excluded from the short-list.

7.2.2 Short-List Screening Criteria

The screening criteria used to evaluate the short-listed sludge/biosolids treatment technologies were the same with liquid train treatment. Refer to Section 6.2.2 for a list of criteria and their description.

7.3 Screening of Long List of Sludge/Biosolids Treatment and Management Technologies

The long list of alternatives considered for sludge/biosolids treatment and management technologies and the rationale used for short-listing are presented in Table 22.

Table 22 – Evaluation of Long-List of Sludge/Biosolids Treatment and Management Technology Alternatives

No.	Technology	Description	Screening Criteria						Rationale
			Regulatory Compliance	Proven Reliability & Sustainability	Staging / Phasing	Cost	Resource / Recovery / Revenue Generation	Carry Forward	
On-Site Sludge Stabilization									
S1	Mesophilic Anaerobic Digestion	▪ The digester is heated to a temperature between 35°C to 38°C and bacteria break down the organic matter in the sludge. The process produces methane gas as a by-product, which can be converted to heat and/or energy. ▪ The biosolids produced is suitable for land application only. A local contractor would be retained for the services of land application. ▪ The solids content of biosolids from an anaerobic digester is typically lower than 2%. Thickening from 2% to 4% would reduce haulage costs by 50%. This alternative includes a biosolids thickening system. ▪ Regulations require facilities to include means to store biosolids during the winter months when land application is not feasible.	✓	✓	✓	✓	✓	**Yes**	▪ Anaerobic digestion is not economically sound for smaller plants, as the system is relatively complicated. ▪ Complicated system with sludge recycling, mixing, heat exchange systems. ▪ Specialized components, such as gas-tight covers, are required. ▪ Boiler, gas collection and treatment systems required for energy reuse. ▪ Equipment needs to be designed for isolation and service in an explosive environment due to the presence of methane ▪ Digester operation is complicated and digester's performance would be severely hindered if operated improperly ▪ Higher level of operation certificate and long experience in anaerobic digester operation is required. ▪ Is currently operated in HWWTP and the operators are familiar with operation and maintenance.
S2	Aerobic Digestion	▪ This process is similar to conventional activated sludge process in treatment principles and operation. ▪ This alternative involves stabilizing the sludge using aerobic digestion. Micro-organisms consume the organics in the presence of oxygen. ▪ Longer retention time and oxidation air should be provided for primary sludge because of higher oxygen demand and larger amount of biomass produced. ▪ The biosolids produced is suitable for land application only. A local contractor would be retained for the services of land application. ▪ Thickening or dewatering can be used to reduce the volume of biosolids with polymer addition.	✓	✓	✓	✓	✓	**Yes**	▪ Relatively simpler system than anaerobic digestion. ▪ Commonly used and well understood technology, especially for smaller plants. Operation and maintenance are easier to manage. ▪ Expansion is straightforward as the system is mainly composed by open tanks, pumps and blowers. ▪ Capital costs are not high, but operating costs can be due to requirement for aeration ▪ Digested product can be land-applied in Ontario
S3	Thermal Hydroysis (e.g. Lyster)	▪ Thermal hydrolysis process stabilizes the sludge at high pH and high temperature. Shearing could be used to enhance the process.	✓	x	✓	✓	✓	No	▪ System product cannot reach Class A for fertilizer sometimes. The plant needs an alternative

No.	Technology	Description	Screening Criteria						Rationale
			Regulatory Compliance	Proven Reliability & Sustainability	Staging / Phasing	Cost	Resource / Recovery / Revenue Generation	Carry Forward	
		▪ Untreated sludge is dewatered to 16-20% TS, then fed into the reactor. The stabilized biosolid can reach Class A product, which is allowed for commercial fertilizer. ▪ Complete packaged system. ▪ Piping and accessories corrosion due to high temperature and pH. ▪ Complaints on the working environment due to the corrosive steam leaked from reactor.							receiver and the revenue recovery is not always reliable. ▪ Operation and maintenance are complex due to piping corrosion. ▪ Potential unpleasant working environment.
S4	Lime Stabilization	▪ This alternative involves stabilizing the sludge through the addition of lime to raise the pH to approximately 12 thus destroying the pathogens. ▪ The biosolids produced is suitable for land application and unrestricted use as a fertilizer product. A local contractor would be retained for the services of land application. ▪ Regular importing of lime to the WPCP would be needed. ▪ Process produces 15% to 50% more material to be hauled off-site and larger off-site storage capacity, due to the addition of lime.	✓	x	✓	x	✓	No	▪ It could be operational trouble to store and operate lime as it is easy for lime to absorb and react with water. ▪ Health and safety issues related to the handling high pH material. ▪ Potential for significant odour generation if system is not operated properly. ▪ Higher haulage costs due to increased volume due to lime addition. ▪ Product has lower nitrogen content than other stabilization processes – may be less desirable as a fertilizer.
S5	Autothermal Thermophilic Aerobic Digestion (ATAD)	▪ ATAD uses the heat generated by the digestion process to keep the digester temperature between 55°C and 65°C. No external heat source is usually required. ▪ Underground tank with insulation is required to maintain operation temperature. ▪ Odour collection and control are required. ▪ The required hydraulic retention time is 10 days as compared with 15 days for anaerobic or 30 days for traditional aerobic digestion. ▪ The volatile solids destruction is higher than traditional aerobic and anaerobic digestion, which means less biosolids to haul off site. ▪ A sludge thickening system would be needed upstream of the ATAD to reach VS% feeding of 2.5 - 5 %. ▪ The biosolids produced is suitable for land application and unrestricted use as a fertilizer product. A local contractor would be retained for the services of land application.	✓	x	✓	x	✓	No	▪ Well-understood technology with several installations in Ontario ▪ O&M is more complicated than aerated digester ▪ No external heating system required ▪ Short hydraulic retention time results in smaller digester, lower operation cost, smaller footprint than aerobic digestion system, and possible lower construction cost. ▪ Digested product can be land-applied and land fertilizer in Ontario. ▪ High capital cost due to proprietary technology

No.	Technology	Description	Screening Criteria						Rationale
			Regulatory Compliance	Proven Reliability & Sustainability	Staging / Phasing	Cost	Resource / Recovery / Revenue Generation	Carry Forward	
S6	Thermal Drying	▪ This alternative involves heating the sludge either through direct or indirect heating to reduce the pathogen level and evaporate water. Dryer types include rotary dryers, fluidized beds, hollow-flight dryers, and steam dryers. ▪ A sludge thickening system would be needed upstream of the dryer, since a thickened sludge removes water thereby reducing the amount of heat needed for drying. ▪ A biosolids cooling technology is needed prior to and during storage to prevent ignition of the dried product. ▪ The biosolids produced is suitable for land application and unrestricted use as a fertilizer product. A local contractor would be retained for the services of land application.	✓	x	✓	x	✓	No	▪ Produces high quality product and reduces volume of biosolids to be hauled off site ▪ High capital costs ▪ Increased operational hazard due to risk of fires ▪ System is relatively complex and requires skilled operators

7.3.1 Summary of Short-Listed Sludge/Biosolids Alternatives

The technologies that were short-listed for detailed evaluation for the sludge/biosolids treatment and management are listed below.

On-Site Sludge Stabilization

- Mesophilic Anaerobic Digestion
- Aerobic Digestion

7.4 Detailed Description of Short-Listed Sludge/Biosolids Alternatives

7.4.1 Technology Alternatives for On-site Sludge Stabilization

7.4.1.1 Mesophilic Anaerobic Digestion

Mesophilic anaerobic digestion is a biological process that treats organic waste, such as sewage sludge and food waste, in an oxygen-free environment at moderate temperatures typically between 35°C and 38°C. In this process, a diverse community of anaerobic microorganisms breaks down complex organic materials through stages including hydrolysis, acidogenesis, acetogenesis, and methanogenesis, ultimately producing biogas composed mainly of methane and carbon dioxide. This biogas can be used as a renewable energy source, while the resulting nutrient-rich digestate can be utilized as a fertilizer or soil conditioner. Mesophilic anaerobic digestion is widely used in wastewater treatment plants, agricultural waste management, and food waste processing, offering an efficient and sustainable method for waste reduction and resource recovery.

Figure 9 shows a flow schematic of the process steps associated with the anaerobic digestion alternative.

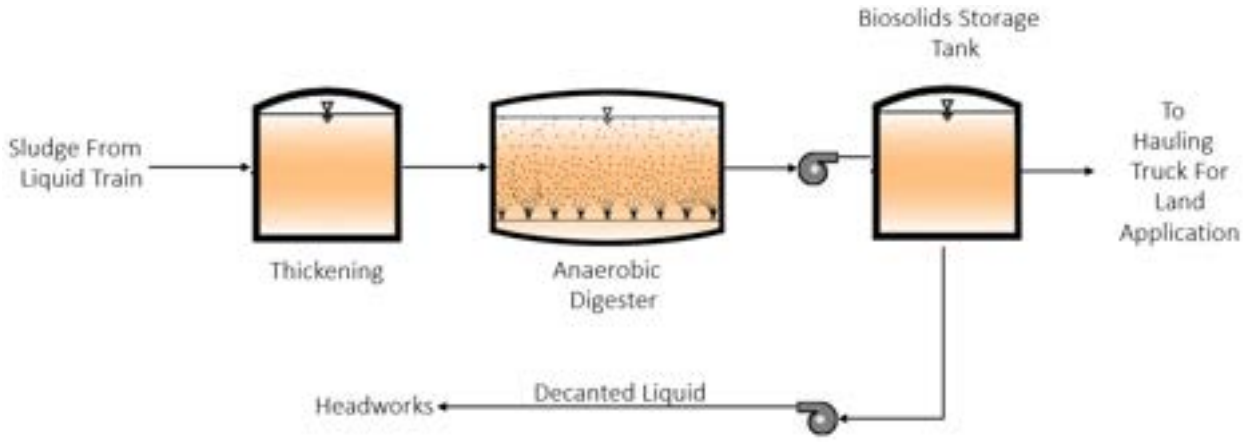


Figure 9 – Mesophilic Anaerobic Digestion Process Flow Schematic

The sludge entering the anaerobic digester will first be thickened to achieve an approximate 5% sludge concentration. Polymer will be added to the thickening process.

The biosolids from the digester will then be pumped into on-site biosolids storage tanks before being transferred to haulage trucks and transported off-site for land application.

Advantages and disadvantage of this alternative are presented in Table 23.

Table 23 – Advantages and Disadvantages of the Anaerobic Digestion Alternative

Advantages	Disadvantages
▪ Biosolids produced is relatively odour-free. ▪ Biosolids contains nutrients beneficial for agriculture. ▪ Same sludge treatment technology as the existing plant.	▪ Takes longer to process organic material. ▪ Potential for incomplete pathogen removal. ▪ Hazard risk operation environment and special requirement for all equipment.

7.4.1.2 Aerobic Digestion

Figure 10 shows a flow schematic of the process steps associated with the aerobic digestion alternative. Sludge and scum from the liquid train are directed to the aerobic digester, which is equipped with an aeration and mixing systems.

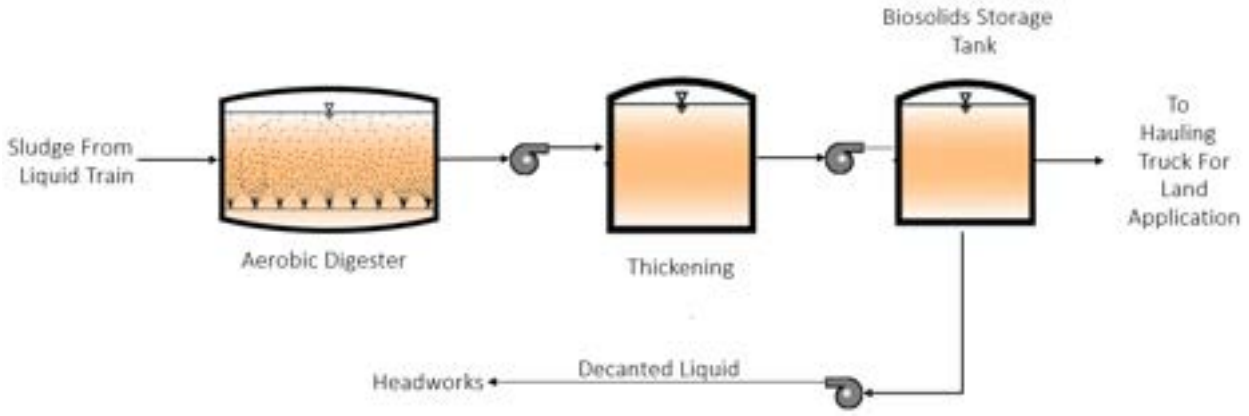


Figure 10 – Conventional Aerobic Digester Process Flow Schematic

Biosolids is pumped from the digester to the biosolids thickening/dewatering system with polymer addition at approximately 1.5% solids. Thickened or dewatered biosolids will be stored in onsite biosolid storage facility. During summer months, thickened/dewatered biosolids is hauled off-site for land application.

Advantages and disadvantage of this alternative are presented in Table 24.

Table 24 – Advantages and Disadvantages of the Aerobic Digestion Alternative

Advantages	Disadvantages
▪ Requires simpler thickening system. ▪ Safer operation environment ▪ Simpler operation and maintenance. ▪ Biosolids produced is relatively odour-free. ▪ Well-understood technology.	▪ Higher operation costs due to requirement of aeration. ▪ Degree of stabilization is weather dependent, with lower levels seen in the colder months. ▪ Hazard risk operation environment and special requirement for all equipment.

7.5 Development of Preferred Alternative Solution for Sludge/Biosolids Treatment and Management

7.5.1 Cost Estimates of Solids/Biosolids Treatment and Management Alternatives

7.5.1.1 On-site Sludge Stabilization

As noted in **Section** Error! Reference source not found., a conservative assumption is made to the result of the optimization study that the existing plant could be re-rated to an ADF capacity of 7,000 m^3/d. The ultimate capacity would be 13,789 m^3/d. Therefore, with existing digesters to be transferred to biosolids storage tanks, it is proposed that a new on-site sludge stabilization system sized for an equivalent ADF capacity of 10,500 m^3/d will be built in Phase 2, with additional 3,289 m^3/d and Phase 3.

The results of the 30-year period life-cycle cost analyses for the two (2) short-listed on-site sludge stabilization alternatives are summarized in Table 25. Estimates have been rounded to the nearest thousand dollars. Details of the life-cycle cost analysis can be found in Appendix H.

Table 25 – Cost Estimates for On-site Sludge Stabilization Alternatives

	Anaerobic Digestion		Aerobic Digestion	
	Phase 2	Phase 3	Phase 2	Phase 3
Capital Cost	$15,095,000	$2,254,000	$19,255,000	$1,923,000
Annual O&M	$299,000	$422,000	$473,000	$619,000
Net Present Value	**$33,629,000**		**$55,070,000**	

7.5.2 Detailed Evaluation of Sludge/Biosolids Treatment and Management Alternatives

7.5.2.1 On-site Sludge Stabilization

Table 26 summarizes the results of the detailed evaluation of the Sludge/Biosolids treatment alternatives.

The full evaluation matrix can be found in Appendix K.

Table 26 – Evaluation Matrix for Short-listed On-site Sludge Stabilization Treatment Alternatives

PRIMARY CRITERIA		SECONDARY CRITERIA		ABSOLUTE WEIGHT (WT)	SHORT LISTED ALTERNATIVES			
					Alternative 1 Anaerobic Digestion		Alternative 2 Aerobic Digestion	
CRITERIA	WEIGHT	CRITERIA	WEIGHT		SCORE*	WT SCORE	SCORE*	WT SCORE
Social/Culture	15%	Aesthetic Impacts (plant appearance)	10	1.5	4	1.2	3	0.9
		Traffic (during construction and operation)	30	4.5	3	2.7	3	2.7
		Noise Impacts (during operation)	20	3	3	1.8	3	1.8
		Odour Impacts (during operation)	40	6	3	3.6	3	3.6
Technical	30%	Ability for Beneficial Reuse	25	7.5	4	6	3	4.5
		Technology/Process Robustness	25	7.5	4	6	4	6
		Ease of Expansion and Phasing to Buildout	10	3	4	2.4	4	2.4
		Energy Requirements	10	3	4	2.4	3	1.8
		Operation & Maintenance Requirements (simplicity, operator skill level/quantity)	10	3	4	2.4	3	1.8
		Site Requirements (plant footprint)	20	6	4	4.8	3	3.6
Environmental	30%	Climate Change Impacts / Greenhouse Gas Generation	10	3	4	2.4	4	2.4
		Natural Environment Vegetation and Flora Impacts	10	3	4	2.4	4	2.4
		Natural Environment Woodland Impacts	15	4.5	4	3.6	4	3.6
		Natural Environment Wildlife Impacts	15	4.5	4	3.6	4	3.6
		Natural Environment Fisheries and Aquatic Impacts	15	4.5	4	3.6	4	3.6
		Natural Environment Species at Risk Impacts	15	4.5	4	3.6	4	3.6
		Archaeological Impacts	10	3	5	3	5	3
		Waste Generation	10	3	3	1.8	3	1.8
Economic	25%	Capital Cost	30	7.5	4	6	3	4.5
		Operation and Maintenance Costs	40	10	4	8	3	6
		Net Present Value	30	7.5	4	6	3	4.5
		TOTAL SCORE		**100**	**77.3**		**68.1**	

7.5.3 Preferred Alternative for Sludge/Biosolids Treatment and Management

Based on the detailed analysis of on-site sludge stabilization technologies, anaerobic digestion achieved a higher overall score compared to aerobic digestion. Given that the existing sludge treatment technology at the plant is anaerobic digestion, it is recommended to continue with this technology to simplify operations and reduce operational complexity for operators.

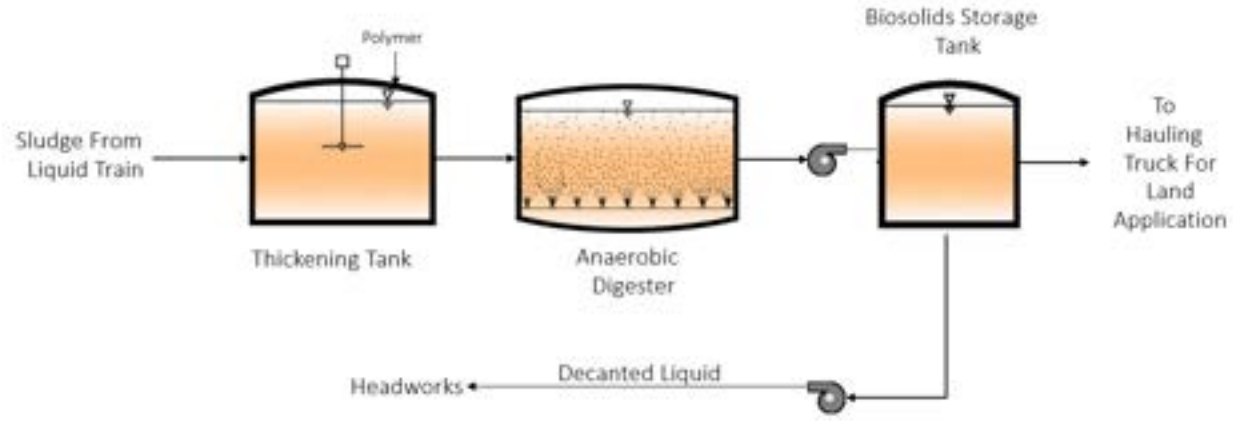


Figure 11 – Preferred Sludge/Biosolids Treatment Technology – Anaerobic Digestion

8 Preliminary Preferred Design Concept for WPCP

The results of the technology alternative evaluations are summarized in Table 27.

Table 27 – Summary of Recommended Treatment Technologies

Process	Recommended Treatment Technology
Preliminary Treatment	Mechanical Screening and Grit Removal with Odour Control
Secondary Treatment	Conventional Activated Sludge
Tertiary Treatment	Disc Filters
Disinfection	UV Radiation
On-site Sludge Stabilization	Anaerobic Digestion

Figure 12 shows the flow schematic of the recommended treatment technologies.

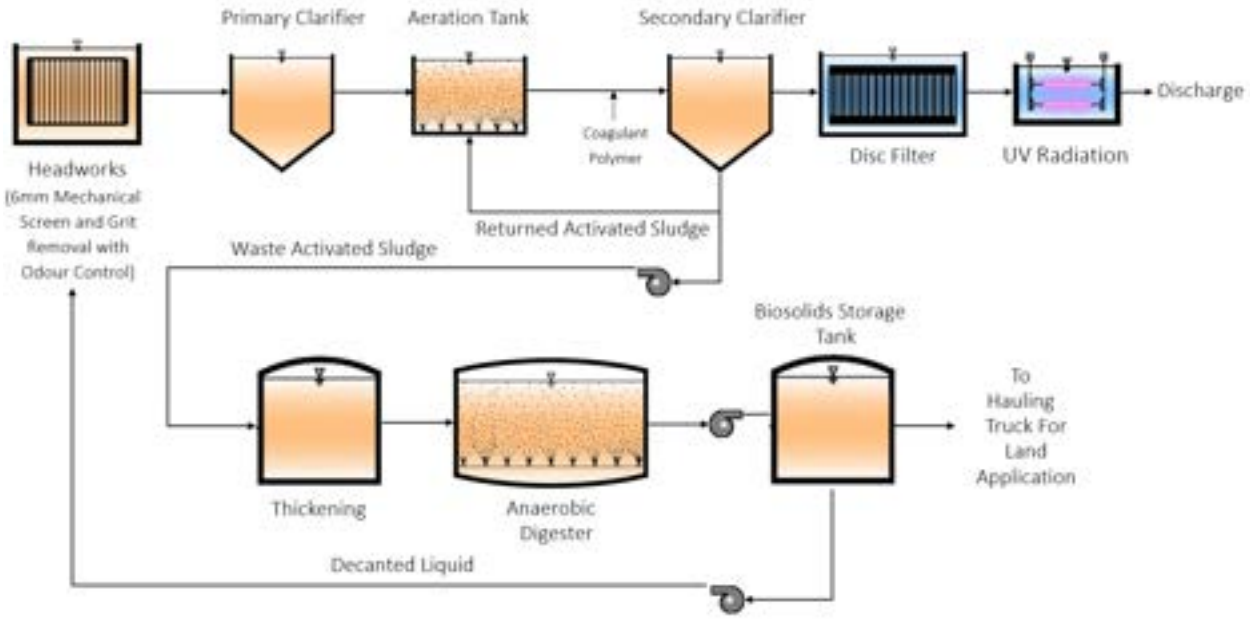


Figure 12 – Flow Schematic of Recommended Treatment Technologies

8.1 WWTP Site Plan

The conceptual plant layouts developed based on the recommended treatment technologies of the expansion is presented in Figure 13. The plant layout also includes common facilities such as the administration building and parking lot. The site plan is colour coded based on the planned expansion of the HWWTP in Phase 2 and Phase 3.

According to the floodplain assessment report, which will be included and appended in the Environmental Study Report (ESR), the current SVCA policy allows the development of municipal infrastructure within flooded areas, provided it can be demonstrated that no negative impacts will occur.

The report confirms that the proposed expansion area can be filled to an elevation of at least 264.5m with 3:1 side slope and that this will not negatively impact the floodplain depth or extents.

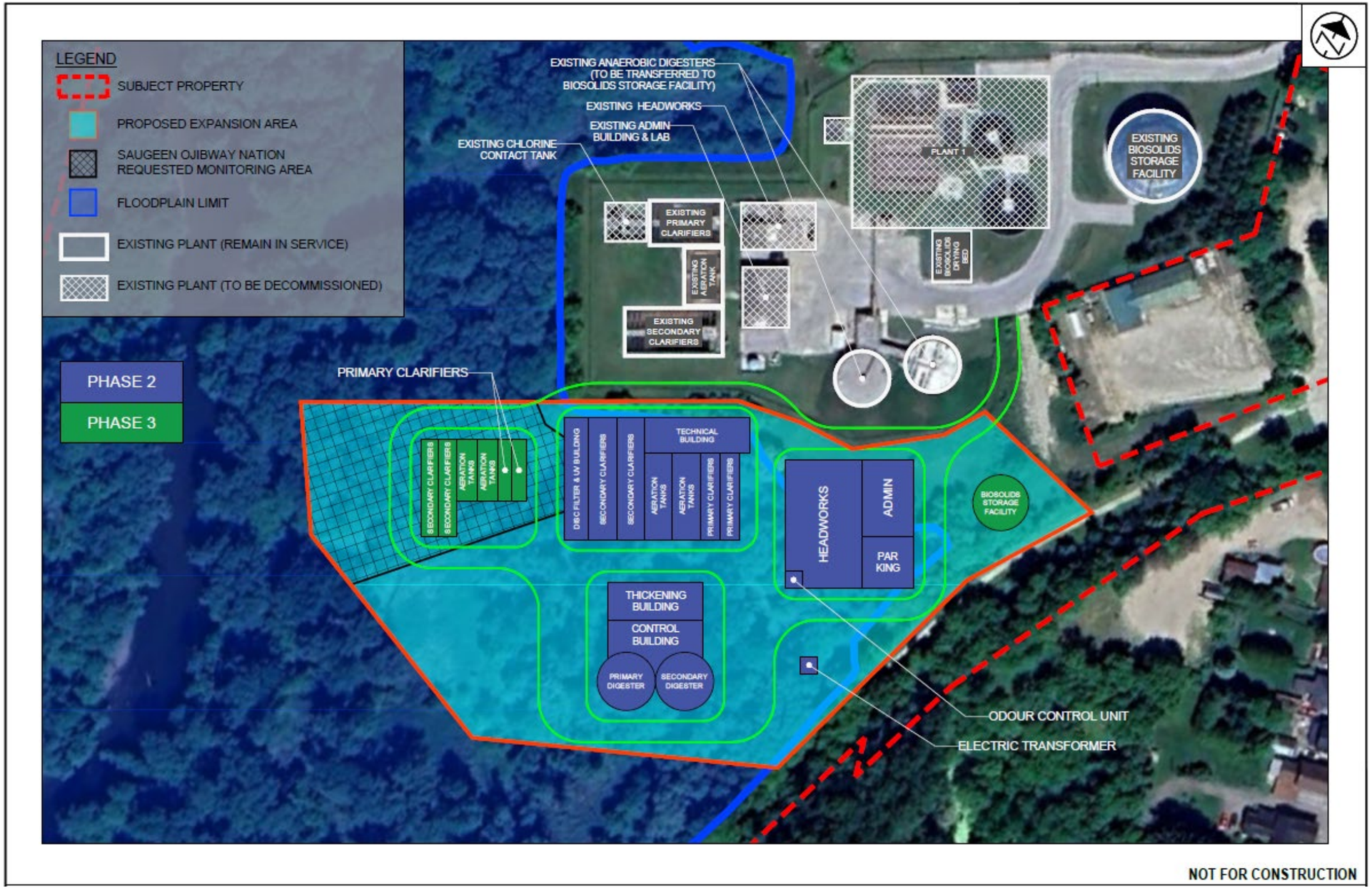


Figure 13 – Conceptual Site Layout of CAS

8.2 Capital Costs of WWTP Construction

Ainley Group has prepared a rough order of magnitude capital construction probable cost (**Class 5 estimate per AACE International)** for the HWWTP based on the following assumptions:

- Costing of common equipment and construction materials are developed based on Ainley's past project experience.
- Supplier quotes for major equipment.
- Structural and architectural cost estimate is based on Ainley's past experience with similar scope projects as Geotechnical investigation is not available at this time.
- No contaminated soils have been assumed on site.
- Cost for any required site investigations is not included in the estimate.
- Any direct costs from utilities and required permits will be paid by the Town directly.
- Costs to replace existing old equipment in plant 2 is not included in this estimate.

The breakdown of cost estimates is presented in the tables below. The estimates are based on 2024 dollars, as the quotations and calculations were completed in 2024.

Table 28 – WWTP Expansion Capital Cost

	PHASE 1 CAPITAL COST ESTIMATE (2024 Dollars)	PHASE 2 CAPITAL COST ESTIIMATE (2024 Dollars)	PHASE 3 CAPITAL COST ESTIIMATE (2024 Dollars)
Phase 1 Stress Test	$200,000		
Preliminary Treatment / (6mm Screening)	-	$32,065,000	-
Secondary Treatment / (CAS)	-	$22,388,000	$5,410,000
Tertiary Treatment / (Disc Filter)	-	$8,545,000	-
Disinfection/ (UV Radiation)	-	$1,103,000	$155,000
On-site Sludge Stabilization/ (Anaerobic Digestion)	-	$15,095,000	$2,254,000
Miscellaneous Upgrades (Optimization)	$2,000,000	-	-
SUB TOTAL	**$2,200,000**	**$79,196,000**	**$7,819,000**

	PHASE 1 CAPITAL COST ESTIMATE (2024 Dollars)	PHASE 2 CAPITAL COST ESTIIMATE (2024 Dollars)	PHASE 3 CAPITAL COST ESTIIMATE (2024 Dollars)
General Requirements including Mobilization and Demobilization, Insurance and Bonding, etc. (20%)	$440,000	$15,840,000	$1,564,000
Contractors Profit (8%)	$176,000	$6,336,000	$626,000
Contingency (40%)	$880,000	$31,679,000	$3,128,000
Engineering Fees (15%)	$330,000	$11,880,000	$1,173,000
TOTAL COSTS	**$4,026,000**	**$144,931,000**	**$14,310,000**

9 Conclusions and Recommendations

- The Official Plan Amendment #11, adopted in 2022, outlines population, employment, and household growth projections over a 25-year planning horizon.
- The 2021 Municipal Servicing Needs Assessment identified the water and wastewater servicing requirements from 2021 to 2046. It highlighted potential development areas within the current municipal boundary and areas outside the boundary that could be serviced by the HWWTP.
- To implement the recommended design alternative, Ainley Group conducted the “Schedule C” Class EA, updated the future flows and loadings projection, reviewed the existing condition and capacity, and investigated technology alternatives.
- The 2052 projected wastewater flows.

Parameter	Projected Flow (m^3/d)
Average Daily Flow	13,789
Peak Daily Flow	32,329
Peak Hourly Flow	44,302
Peak Instantaneous Flow	48,293

- Results of the HWWTP capacity assessment showed that the actual capacity can reach 7,000 m^3/d. However, this need to be confirmed with a Stress Test.
- To reduce the construction and maintenance cost, it is envisaged that the expansion of the HWWTP would be constructed in three phases:

  - Phase 1: During this stage, with in-plant optimizations and modifications, the plant's treatment capacity should maintain 7,000 m³/d (verified by stress test) with both Plant 1 and Plant 2 operational.
  - Phase 2: Construct a new plant to increase the treatment capacity to 10,500 m³/d and decommission Plant 1 (East Plant). Existing west plant (plant 2) and new expansion will provide total flow of10,500 m³/d. This phase includes the construction of a new headworks facility, featuring an influent pumping station, screening, and grit removal systems. Additionally, a new sludge stabilization system will be installed.
  - Phase 3: Demolish the existing Plant 1. Expand the new plant to bring the treatment capacity to 13,789 m³/d. A new biosolids storage tank will be built to store increased biosolids amount. The existing two digesters will be transitioned to biosolids storage tanks.
- This Class EA evaluated technology alternatives for preliminary, secondary, tertiary, disinfection, and on-site sludge stabilization stages.
- Life-cycle cost analysis was performed for each treatment stage considered in the evaluation. Life-cycle analysis included equipment costs, building and tankage construction costs, operating cost associated with power and chemical consumption and annual maintenance and repair costs, and a 20-year net present value analysis.
- The recommended treatment technologies for the water pollution control plant are summarized below:

Process	Recommended Treatment Technology
Preliminary Treatment	Mechanical Screening and Grit Removal with Odour Control
Secondary Treatment	Conventional Activated Sludge
Tertiary Treatment	Disc Filters
Disinfection	UV Radiation
On-site Sludge Stabilization	Anaerobic Digestion

Appendix D

Life Cycle Cost Evaluation of Headworks

HANOVER CLASS EA: PHASE 2 & 3
WWTP TECHNOLOGY EVALUATION
LIFE CYCLE ANALYSIS

AINLEY: 122059
Headworks

Economic Factors	
Discount Rate (Interest):	5%
Inflation Rate	3%
General Requirements	20%
Contractors Profit	8%
Contingency	40%
Engineering Fees	15%
Year to Begin Phase 2 Construction	2029
Estimated Phase 2 Construction Complete	2031

CAPITAL COST	Phase 2				
	Units	Unit Cost	Cost	Installation	Total
EQUIPMENT					
Plant Main Transformer	1	$ 2,000,000	$ 2,000,000	60%	$ 3,200,000
Screening					
6mm Mechanical Bar Screen + Conveyor + Control Panel	3	$ 409,400	$ 1,228,200	60%	$ 1,965,120
Gates and Valving	1	$ 1,616,000	$ 1,616,000	60%	$ 2,585,600
Grit Removal					
Vortex grit removal mechanism, blowers, grit washer/classifier	2	$ 238,000	$ 476,000	60%	$ 761,600
Pumps and VFD	5	$ 94,000	$ 470,000	60%	$ 752,000
Total Equipment Cost					$ 9,265,000
CONSTRUCTION					
Site Work				20%	$ 4,295,000
Yard Piping				20%	$ 4,295,000
Headworks Building	1	$ 12,210,000	$ 12,210,000		$ 12,210,000
Office and Lab	1	$ 2,000,000	$ 2,000,000		$ 2,000,000
Electrical					
Total Construction Cost					$ 22,800,000
General Requirements including Mobilization and Demobilization, Insurance and Bonding, etc. (20%)					$ 6,413,000
Contractors Profit (8%)					$ 2,565,200
Contingency (40%)					$ 12,826,000
Engineering Fees (15%)					$ 4,809,750
Total Capital Cost					$ 58,679,000

OPERATIONAL COST	Phase 2			
	Rating/ Number	Units	Unit Cost	Yearly Cost
SYSTEM				
Power Consumption				
Screening	220	kWh/d	$ 0.15	$ 12,045
Vortex System	270	kWh/d	$ 0.15	$ 14,783
Grit Classifier	45	kWh/d	$ 0.15	$ 2,464
Odour Control System	282	kWh/d	$ 0.15	$ 15,440
Pumps and VFD	1620	kWh/d	$ 0.15	$ 88,695
Total Power Cost				$ 134,000
Total Operational Costs				$ 134,000

MAINTENANCE AND REPAIR COST	Phase 2			
	Units	Unit Cost	Cost	Yearly Cost
SYSTEM				
Maintenance and Repair	2	$ 92,650	$ 185,300	$ 185,300
Total Maintenance and Repair Cost				$ 186,000
Total Cost				$ 320,000

NPV Calculation	Total	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052
CAPITAL COSTS																														
Equipment	$ 16,954,950						$ 5,086,485	$ 6,781,980	$ 5,086,485																					
Construction Costs	$ 41,724,000						$ 12,517,200	$ 16,689,600	$ 12,517,200																					
Maintenance and Repair Cost	$ 3,906,000									$ 186,000	$ 186,000	$ 186,000	$ 186,000	$ 186,000	$ 186,000	$ 186,000	$ 186,000	$ 186,000	$ 186,000	$ 186,000	$ 186,000	$ 186,000	$ 186,000	$ 186,000	$ 186,000	$ 186,000	$ 186,000	$ 186,000	$ 186,000	$ 186,000	$ 186,000
Total Capital Cost in 2024 Dollars	$ 62,584,950	$ -	$ -	$ -	$ -	$ -	$ 17,603,685	$ 23,471,580	$ 17,603,685	$ 186,000	$ 186,000	$ 186,000	$ 186,000	$ 186,000	$ 186,000	$ 186,000	$ 186,000	$ 186,000	$ 186,000	$ 186,000	$ 186,000	$ 186,000	$ 186,000	$ 186,000	$ 186,000	$ 186,000	$ 186,000	$ 186,000	$ 186,000	$ 186,000
Capital Costs Total NPV	$ 55,072,000	$ -	$ -	$ -	$ -	$ -	$ 15,989,807	$ 20,913,652	$ 15,386,473	$ 159,476	$ 156,439	$ 153,459	$ 150,536	$ 147,669	$ 144,856	$ 142,097	$ 139,390	$ 136,735	$ 134,131	$ 131,576	$ 129,069	$ 126,611	$ 124,199	$ 121,834	$ 119,513	$ 117,237	$ 115,004	$ 112,813	$ 110,664	$ 108,556
OPERATIONAL COSTS																														
Power Consumption Cost	$ 2,814,000									$ 134,000	$ 134,000	$ 134,000	$ 134,000	$ 134,000	$ 134,000	$ 134,000	$ 134,000	$ 134,000	$ 134,000	$ 134,000	$ 134,000	$ 134,000	$ 134,000	$ 134,000	$ 134,000	$ 134,000	$ 134,000	$ 134,000	$ 134,000	$ 134,000
Total Operational Cost in 2024 Dollars	$ 2,814,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 134,000	$ 134,000	$ 134,000	$ 134,000	$ 134,000	$ 134,000	$ 134,000	$ 134,000	$ 134,000	$ 134,000	$ 134,000	$ 134,000	$ 134,000	$ 134,000	$ 134,000	$ 134,000	$ 134,000	$ 134,000	$ 134,000	$ 134,000	$ 134,000
Operational Costs Total NPV	$ 2,005,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 114,892	$ 112,703	$ 110,556	$ 108,451	$ 106,385	$ 104,359	$ 102,371	$ 100,421	$ 98,508	$ 96,632	$ 94,791	$ 92,986	$ 91,214	$ 89,477	$ 87,773	$ 86,101	$ 84,461	$ 82,852	$ 81,274	$ 79,726	$ 78,207
Current Year Sub-total	$ 65,398,950	$ -	$ -	$ -	$ -	$ -	$ 17,603,685	$ 23,471,580	$ 17,603,685	$ 320,000	$ 320,000	$ 320,000	$ 320,000	$ 320,000	$ 320,000	$ 320,000	$ 320,000	$ 320,000	$ 320,000	$ 320,000	$ 320,000	$ 320,000	$ 320,000	$ 320,000	$ 320,000	$ 320,000	$ 320,000	$ 320,000	$ 320,000	$ 320,000
Inflation Adjusted	$ 81,708,586	$ -	$ -	$ -	$ -	$ -	$ 20,407,496	$ 28,026,294	$ 21,650,312	$ 405,366	$ 417,527	$ 430,053	$ 442,955	$ 456,243	$ 469,931	$ 484,029	$ 498,550	$ 513,506	$ 528,911	$ 544,779	$ 561,122	$ 577,956	$ 595,294	$ 613,153	$ 631,548	$ 650,494	$ 670,009	$ 690,109	$ 710,812	$ 732,137
NPV	**$ 57,076,000**	$ -	$ -	$ -	$ -	$ -	$ 15,989,807	$ 20,913,652	$ 15,386,473	$ 274,368	$ 269,142	$ 264,015	$ 258,987	$ 254,053	$ 249,214	$ 244,467	$ 239,811	$ 235,243	$ 230,762	$ 226,367	$ 222,055	$ 217,825	$ 213,676	$ 209,606	$ 205,614	$ 201,697	$ 197,855	$ 194,087	$ 190,390	$ 186,763

Appendix E

Life Cycle Cost Evaluation of Secondary Treatment

HANOVER CLASS EA: PHASE 2 & 3
WWTP TECHNOLOGY EVALUATION
LIFE CYCLE ANALYSIS

AINLEY: 122059
Conventional Activated Sludge Process

Economic Factors	
Discount Rate (Interest):	5%
Inflation Rate	3%
General Requirements	20%
Contractors Profit	8%
Contingency	40%
Engineering Fees	15%
Year to Begin Phase 2 Construction	2029
Estimated Phase 2 Construction Complete	2031
Year to Begin Phase 3 Construction	2036
Estimated Phase 3 Construction Complete	2038

CAPITAL COST	Phase 2					Phase 3				
	Units	Unit Cost	Cost	Installation	Total	Units	Unit Cost	Cost	Installation	Total
EQUIPMENT										
Primary Clarifier	2	$ 354,000	$ 708,000	60%	$ 1,132,800	2	$ 177,000	$ 354,000	60%	$ 566,400
Aeration Tank	2	$ 347,000	$ 694,000	60%	$ 1,110,400	2	$ 173,500	$ 347,000	60%	$ 555,200
Secondary Clarifier	2	$ 508,000	$ 1,016,000	60%	$ 1,625,600	2	$ 254,000	$ 508,000	60%	$ 812,800
Chemical Dosing	1	$ 130,000	$ 130,000	60%	$ 208,000	0	$ 130,000	$ -	60%	$ -
Cloth Media Filters										
Packaged Disc Filter System, including:										
Tanks/Basins										
Centertube Assemblies										
Drive Assemlies	1	$ 1,864,000	$ 1,864,000	60%	$ 2,982,400	0	$ 1,864,000	$ -	60%	$ -
Backwash/Sludge Assemblies										
Instrumentation/Valves										
Controls/Starters										
Total Equipment Cost					$ 7,060,000					$ 1,935,000
CONSTRUCTION										
Site Work				20%	$ 2,242,600				20%	$ 512,840
Yard Piping				20%	$ 2,242,600				20%	$ 512,840
Primary Clarifier	2	$ 440,000	$ 880,000	10%	$ 968,000	2	$ 286,000	$ 572,000	10%	$ 629,200
Aetation Tank	2	$ 558,000	$ 1,116,000	10%	$ 1,227,600	2	$ 365,000	$ 730,000	10%	$ 803,000
Secondary Clarifier Tank	2	$ 710,000	$ 1,420,000	10%	$ 1,562,000	2	$ 462,000	$ 924,000	10%	$ 1,016,400
Technical Building	1	$ 3,900,000	$ 3,900,000		$ 3,900,000	0	$ 3,900,000	$ -		$ -
Tertiary & UV Building	1	$ 3,185,000	$ 3,185,000		$ 3,185,000	0	$ 3,185,000	$ -		$ -
Total Construciton Cost					$ 15,328,000					$ 3,475,000
General Requirements including Mobilization and Demobilization, Insurance and Bonding, etc. (20%)					$ 4,477,600					$ 1,082,000
Contractors Profit (8%)					$ 1,791,040					$ 432,800
Contingency (40%)					$ 8,955,200					$ 2,164,000
Engineering Fees (15%)					$ 3,358,200					$ 811,500
Total Capital Cost					$ 40,971,000					$ 9,901,000

OPERATIONAL COST	Phase 2				Phase 3			
	Rating/ Number	Units	Unit Cost	Yearly Cost	Rating/ Number	Units	Unit Cost	Yearly Cost
SYSTEM								
Power Consumption								
CAS Overall Power Consumption	60	kWh/d	$ 0.15	$ 3,285	90	kWh/d	$ 0.15	$ 4,928
Cloth Media Filters								
Disk Drive Motor	810	kWh/yr	$ 0.15	$ 122	1215	kWh/yr	$ 0.15	$ 182
Power Control Panel	4725	kWh/yr	$ 0.15	$ 709	7088	kWh/yr	$ 0.15	$ 1,063
Total Power Cost				$ 5,000				$ 7,000
Chemical Consumption								
Alum Dosage	2	$/yr	$ 84,589	$ 169,178	3	$/yr	$ 84,589	$ 253,767
Polyer Dosage	2	$/yr	$ 84,589	$ 169,178	3	$/yr	$ 84,589	$ 253,767
Total Chemical Cost				$ 339,000				$ 508,000
Total Operational Cost				$ 344,000				$ 515,000

MAINTENANCE AND REPAIR COST	Phase 2				Phase 3			
	Units	Unit Cost	Cost	Yearly Cost	Units	Unit Cost	Cost	Yearly Cost
SYSTEM								
Maintenance and Repair	1	$ 70,600	$ 70,600	$ 47,067	1	$ 89,950	$ 89,950	$ 59,967
Total Maintenance and Repair Cost				$ 48,000				$ 60,000
Total Cost				$ 392,000				$ 575,000

NPV Calculation	Total	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052
CAPITAL COSTS																														
Equipment Cost	$ 16,460,850						$ 12,919,800							$ 3,541,050																
Construction Cost	$ 34,409,490						$ 8,415,072	$ 11,220,096	$ 8,415,072					$ 1,907,775	$ 2,543,700	$ 1,907,775														
Maintenance and Repair Cost	$ 696,000									$ 48,000	$ 48,000	$ 48,000	$ 48,000	$ 48,000	$ 48,000	$ 48,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000
Total Capital Cost in 2024 Dollars	$ 51,566,340	$ -	$ -	$ -	$ -	$ -	$ 21,334,872	$ 11,220,096	$ 8,415,072	$ 48,000	$ 48,000	$ 48,000	$ 48,000	$ 5,496,825	$ 2,591,700	$ 1,955,775	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000
Capital Costs Total NPV	$ 45,026,000	$ -	$ -	$ -	$ -	$ -	$ 19,378,924	$ 9,997,332	$ 7,355,180	$ 41,155	$ 40,371	$ 39,602	$ 38,848	$ 4,364,023	$ 2,018,402	$ 1,494,135	$ 44,965	$ 44,108	$ 43,268	$ 42,444	$ 41,635	$ 40,842	$ 40,064	$ 39,301	$ 38,553	$ 37,818	$ 37,098	$ 36,391	$ 35,698	$ 35,018
OPERATIONAL COSTS																														
Power Consumption Cost	$ 77,000									$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 7,000	$ 7,000	$ 7,000	$ 7,000	$ 7,000	$ 7,000	$ 7,000	$ 7,000	$ 7,000	$ 7,000	$ 7,000	$ 7,000	$ 7,000	$ 7,000
Chemical Consumption Cost	$ 5,421,000									$ 339,000	$ 339,000	$ 339,000	$ 339,000	$ 339,000	$ 339,000	$ 339,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000
Total Operational Cost in 2024 Dollars	$ 5,498,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 344,000	$ 344,000	$ 344,000	$ 344,000	$ 344,000	$ 344,000	$ 344,000	$ 515,000	$ 515,000	$ 515,000	$ 515,000	$ 515,000	$ 515,000	$ 515,000	$ 515,000	$ 515,000	$ 515,000	$ 515,000	$ 515,000	$ 515,000	$ 515,000
Operational Costs Total NPV	$ 4,159,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 294,946	$ 289,328	$ 283,817	$ 278,411	$ 273,107	$ 267,905	$ 262,802	$ 385,946	$ 378,594	$ 371,383	$ 364,309	$ 357,370	$ 350,563	$ 343,885	$ 337,335	$ 330,910	$ 324,607	$ 318,424	$ 312,358	$ 306,409	$ 300,572
Current Year Sub-total	$ 57,064,340	$ -	$ -	$ -	$ -	$ -	$ 21,334,872	$ 11,220,096	$ 8,415,072	$ 392,000	$ 392,000	$ 392,000	$ 392,000	$ 5,840,825	$ 2,935,700	$ 2,299,775	$ 575,000	$ 575,000	$ 575,000	$ 575,000	$ 575,000	$ 575,000	$ 575,000	$ 575,000	$ 575,000	$ 575,000	$ 575,000	$ 575,000	$ 575,000	$ 575,000
Inflation Adjusted	$ 72,469,316	$ -	$ -	$ -	$ -	$ -	$ 24,732,964	$ 13,397,381	$ 10,349,477	$ 496,574	$ 511,471	$ 526,815	$ 542,620	$ 8,327,620	$ 4,311,174	$ 3,478,616	$ 895,831	$ 922,706	$ 950,387	$ 978,899	$ 1,008,266	$ 1,038,514	$ 1,069,669	$ 1,101,759	$ 1,134,812	$ 1,168,857	$ 1,203,922	$ 1,240,040	$ 1,277,241	$ 1,315,558
NPV	**$ 52,059,000**	$ -	$ -	$ -	$ -	$ -	$ 19,378,924	$ 9,997,332	$ 7,355,180	$ 336,101	$ 329,699	$ 323,419	$ 317,258	$ 4,637,130	$ 2,286,308	$ 1,756,937	$ 430,910	$ 422,702	$ 414,651	$ 406,753	$ 399,005	$ 391,405	$ 383,950	$ 376,636	$ 369,462	$ 362,425	$ 355,522	$ 348,750	$ 342,107	$ 335,591

HANOVER CLASS EA: PHASE 2 & 3
WWTP TECHNOLOGY EVALUATION
LIFE CYCLE ANALYSIS

AINLEY: 122059
Aerobic Granular Sludge

Economic Factors	
Discount Rate (Interest):	5%
Inflation Rate	3%
General Requirements	20%
Contractors Profit	8%
Contingency	40%
Engineering Fees	15%
Year to Begin Phase 2 Construction	2029
Estimated Phase 2 Construction Complete	2031
Year to Begin Phase 3 Construction	2036
Estimated Phase 3 Construction Complete	2038

CAPITAL COST	Phase 2					Phase 3				
	Units	Unit Cost	Cost	Installation	Total	Units	Unit Cost	Cost	Installation	Total
EQUIPMENT										
Aerobic Granular Sludge (AGS)										
Packaged AGS System, including:										
Influent Valves										
Influent Distribution System										
Effluent Weir Assembly										
Sludge Removal System	1	$ 4,330,000	$ 4,330,000	60%	$ 6,928,000	1	$ 2,743,000	$ 2,743,000	60%	$ 4,388,800
Fixed Fine Bubble Diffusers										
Positive Displacement Blowers										
Air Valves										
Level Sensor Assemblies										
Instrumentation										
Cloth Media Filters										
Packaged Disc Filter System, including:										
Tanks/Basins										
Centertube Assemblies	1	$ 1,864,000	$ 1,864,000	60%	$ 2,982,400	0	$ 1,864,000	$ -	60%	$ -
Drive Assemlies										
Backwash/Sludge Assemblies										
Instrumentation/Valves										
Controls/Starters										
Chemical Dosing	1	$ 130,000	$ 130,000	60%	$ 208,000	0	$ 130,000	$ -	60%	$ -
Total Equipment Cost					$ 10,119,000					$ 4,389,000
CONSTRUCTION										
Site Work				20%	$ 3,736,260				20%	$ 898,480
Yard Piping				20%	$ 3,736,260				20%	$ 898,480
AGS Basins	2	$ 404,000	$ 808,000	10%	$ 888,800	0	$ 491,000	$ -	10%	$ -
Influent Buffer Tank	1	$ 404,000	$ 404,000	10%	$ 444,400	0	$ 404,000	$ -	10%	$ -
Sludge Buffer Tank	1	$ 94,000	$ 94,000	10%	$ 103,400	1	$ 94,000	$ 94,000	10%	$ 103,400
Water Level Correction Tank	1	$ 37,000	$ 37,000	10%	$ 40,700	0	$ 37,000	$ -	10%	$ -
Technical Building	1	$ 3,900,000	$ 3,900,000		$ 3,900,000	0	$ 3,900,000	$ -		$ -
Tertiary & UV Building	1	$ 3,185,000	$ 3,185,000		$ 3,185,000	0	$ 3,185,000	$ -		$ -
Total Construction Cost					$ 16,035,000					$ 1,901,000
General Requirements including Mobilization and Demobilization, Insurance and Bonding, etc. (20%)					$ 5,230,800					$ 1,258,000
Contractors Profit (8%)					$ 2,092,320					$ 503,200
Contingency (40%)					$ 10,461,600					$ 2,516,000
Engineering Fees (15%)					$ 3,923,100					$ 943,500
Total Capital Cost					$ 47,862,000					$ 11,511,000

OPERATIONAL COST	Phase 2				Phase 3			
	Rating	Units	Unit Cost	Yearly Cos!	Rating	Units	Unit Cost	Yearly Cost
SYSTEM								
Aerobic Granular Sludge								
Power	1034	kWh/d	$ 0.15	$ 56,612	1722	kWh/d	$ 0.15	$ 94,280
Cloth Media Filters								
Backwash/ Solids Waste Pump	9800	kWh/yr	$ 0.15	$ 1,470	14700	kWh/yr	$ 0.15	$ 2,205
Disk Drive Motor	1600	kWh/yr	$ 0.15	$ 240	2400	kWh/yr	$ 0.15	$ 360
Power Control Panel	9300	kWh/yr	$ 0.15	$ 1,395	13950	kWh/yr	$ 0.15	$ 2,093
Total Power Cost				$ 60,000				$ 99,000
Chemical Consumption								
Alum Dosage	2	$/yr	$ 84,589	$ 169,178	3	$/yr	$ 84,589	$ 253,767
Polyer Dosage	2	$/yr	$ 84,589	$ 169,178	3	$/yr	$ 84,589	$ 253,767
Total Chemical Cost				$ 339,000				$ 508,000
Total Operational Costs				$ 399,000				$ 607,000

MAINTENANCE AND REPAIR COST	Phase 2				Phase 3			
	Units	Unit Cost	Cost	Yearly Cost	Units	Unit Cost	Cost	Yearly Cost
SYSTEM								
Maintenance and Repair	1	$ 101,190	$ 101,190	$ 101,190	1	$ 145,080	$ 145,080	$ 145,080
Total Maintenance and Repair Cost				$ 102,000				$ 146,000
Total Cost				$ 501,000				$ 753,000

NPV Calculation	Total	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052
CAPITAL COSTS																														
Equipment	$ 26,549,640						$ 18,517,770							$ 8,031,870																
Construction Costs	$ 32,822,880						$ 8,803,215	$ 11,737,620	$ 8,803,215					$ 1,043,649	$ 1,391,532	$ 1,043,649														
Maintenance and Repair Cost	$ 1,590,000									$ 102,000	$ 102,000	$ 102,000	$ 102,000	$ 102,000	$ 102,000	$ 102,000	$ 146,000	$ 146,000	$ 146,000	$ 146,000	$ 146,000	$ 146,000	$ 146,000	$ 146,000	$ 146,000	$ 146,000	$ 146,000	$ 146,000	$ 146,000	$ 146,000
Total Capital Cost in 2024 Dollars	$ 60,962,520	$ -	$ -	$ -	$ -	$ -	$ 27,320,985	$ 11,737,620	$ 8,803,215	$ 102,000	$ 102,000	$ 102,000	$ 102,000	$ 9,177,519	$ 1,493,532	$ 1,145,649	$ 146,000	$ 146,000	$ 146,000	$ 146,000	$ 146,000	$ 146,000	$ 146,000	$ 146,000	$ 146,000	$ 146,000	$ 146,000	$ 146,000	$ 146,000	$ 146,000
Capital Costs Total NPV	$ 53,260,000	$ -	$ -	$ -	$ -	$ -	$ 24,816,240	$ 10,458,457	$ 7,694,436	$ 87,455	$ 85,789	$ 84,155	$ 82,552	$ 7,286,188	$ 1,163,155	$ 875,231	$ 109,414	$ 107,330	$ 105,285	$ 103,280	$ 101,313	$ 99,383	$ 97,490	$ 95,633	$ 93,811	$ 92,024	$ 90,272	$ 88,552	$ 86,865	$ 85,211
OPERATIONAL COSTS																														
Power Consumption Cost	$ 1,014,000									$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 99,000	$ 99,000	$ 99,000	$ 99,000	$ 99,000	$ 99,000	$ 99,000	$ 99,000	$ 99,000	$ 99,000	$ 99,000	$ 99,000	$ 99,000	$ 99,000
Chemical Consumption Cost	$ 5,421,000									$ 339,000	$ 339,000	$ 339,000	$ 339,000	$ 339,000	$ 339,000	$ 339,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000
Total Operational Cost in 2024 Dollars	$ 6,435,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 399,000	$ 399,000	$ 399,000	$ 399,000	$ 399,000	$ 399,000	$ 399,000	$ 607,000	$ 607,000	$ 607,000	$ 607,000	$ 607,000	$ 607,000	$ 607,000	$ 607,000	$ 607,000	$ 607,000	$ 607,000	$ 607,000	$ 607,000	$ 607,000
Operational Costs Total NPV	$ 4,865,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 342,103	$ 335,586	$ 329,194	$ 322,924	$ 316,773	$ 310,739	$ 304,820	$ 454,891	$ 446,227	$ 437,727	$ 429,389	$ 421,211	$ 413,188	$ 405,317	$ 397,597	$ 390,024	$ 382,595	$ 375,307	$ 368,158	$ 361,146	$ 354,267
Current Year Sub-total	$ 67,397,520	$ -	$ -	$ -	$ -	$ -	$ 27,320,985	$ 11,737,620	$ 8,803,215	$ 501,000	$ 501,000	$ 501,000	$ 501,000	$ 9,576,519	$ 1,892,532	$ 1,544,649	$ 753,000	$ 753,000	$ 753,000	$ 753,000	$ 753,000	$ 753,000	$ 753,000	$ 753,000	$ 753,000	$ 753,000	$ 753,000	$ 753,000	$ 753,000	$ 753,000
Inflation Adjusted	$ 85,527,737	$ -	$ -	$ -	$ -	$ -	$ 31,672,510	$ 14,015,332	$ 10,826,844	$ 634,652	$ 653,691	$ 673,302	$ 693,501	$ 13,653,826	$ 2,779,247	$ 2,336,420	$ 1,173,149	$ 1,208,344	$ 1,244,594	$ 1,281,932	$ 1,320,390	$ 1,360,002	$ 1,400,802	$ 1,442,826	$ 1,486,111	$ 1,530,694	$ 1,576,615	$ 1,623,913	$ 1,672,631	$ 1,722,810
NPV	**$ 61,889,000**	$ -	$ -	$ -	$ -	$ -	$ 24,816,240	$ 10,458,457	$ 7,694,436	$ 429,557	$ 421,375	$ 413,349	$ 405,476	$ 7,602,961	$ 1,473,894	$ 1,180,051	$ 564,305	$ 553,556	$ 543,012	$ 532,669	$ 522,523	$ 512,570	$ 502,807	$ 493,230	$ 483,835	$ 474,619	$ 465,579	$ 456,711	$ 448,011	$ 439,478

HANOVER CLASS EA: PHASE 2 & 3
WWTP TECHNOLOGY EVALUATION
LIFE CYCLE ANALYSIS

AINLEY: 122059
Membrane Aerated Biofilm Reactor

Economic Factors	
Discount Rate (Interest):	5%
Inflation Rate	3%
General Requirements	20%
Contractors Profit	8%
Contingency	40%
Engineering Fees	15%
Year to Begin Phase 2 Construction	2029
Estimated Phase 2 Construction Complete	2031
Year to Begin Phase 3 Construction	2036
Estimated Phase 3 Construction Complete	2038

CAPITAL COST	Phase 2					Phase 3				
	Units	Unit Cost	Cost	Installation	Total	Units	Unit Cost	Cost	Installation	Total
EQUIPMENT										
Membrane Aerated Biofilm Reactor (MABR)										
Packaged MABR System, including:										
MABR OxyFAS Module										
Steelwork to Support										
Process Air Blower										
Scour Air Blowers										
PLC Control Panel	1	$ 2,200,000	$ 2,200,000	60%	$ 3,520,000	0	$ 4,620,000	$ -	60%	$ -
O2 Analyzers										
Ammonia Analyzers										
Temperature Transmitters										
Pressure Transmitters										
Flow Transmitters										
Freight										
Primary Clarifier	2	$ 316,000	$ 632,000	60%	$ 1,011,200	2	$ 158,000	$ 316,000	60%	$ 505,600
Aeration Tank	2	$ 312,000	$ 624,000	60%	$ 998,400	2	$ 156,000	$ 312,000	60%	$ 499,200
Secondary Clarifier	2	$ 454,000	$ 908,000	60%	$ 1,452,800	2	$ 227,000	$ 454,000	60%	$ 726,400
Chemical Dosing	1	$ 104,000	$ 104,000	60%	$ 166,400	0	$ 104,000	$ -	60%	$ -
Cloth Media Filters										
Packaged Disc Filter System, including:										
Tanks/Basins										
Centertube Assemblies	1	$ 1,864,000	$ 1,864,000	60%	$ 2,982,400	0	$ 1,864,000	$ -	60%	$ -
Drive Assemlies										
Backwash/Sludge Assemblies										
Instrumentation/Valves										
Controls/Starters										
Total Equipment Cost					$ 10,132,000					$ 1,732,000
CONSTRUCTION										
Site Work				20%	$ 4,183,920				20%	$ 836,120
Yard Piping				20%	$ 4,183,920				20%	$ 836,120
MABR Tank	2	$ 67,000	$ 134,000	10%	$ 147,400	0	$ 157,000	$ -	10%	$ -
Primary Clarifier	2	$ 418,000	$ 836,000	10%	$ 919,600	2	$ 286,000	$ 572,000	10%	$ 629,200
Aetation Tank	2	$ 520,000	$ 1,040,000	10%	$ 1,144,000	2	$ 365,000	$ 730,000	10%	$ 803,000
Secondary Clarifier Tank	2	$ 678,000	$ 1,356,000	10%	$ 1,491,600	2	$ 462,000	$ 924,000	10%	$ 1,016,400
Technical Building	1	$ 3,900,000	$ 3,900,000		$ 3,900,000	0	$ 3,900,000	$ -		$ -
Tertiary & UV Building	1	$ 3,185,000	$ 3,185,000		$ 3,185,000	0	$ 3,185,000	$ -		$ -
Total Construction Cost					$ 19,156,000					$ 4,121,000
General Requirements including Mobilization and Demobilization, Insurance and Bonding, etc. (20%)					$ 5,857,600					$ 1,170,600
Contractors Profit (8%)					$ 2,343,040					$ 468,240
Contingency (40%)					$ 11,715,200					$ 2,341,200
Engineering Fees (15%)					$ 4,393,200					$ 877,950
Total Capital Cost					$ 53,598,000					$ 10,711,000

OPERATIONAL COST	Phase 2				Phase 3			
	Rating	Units	Unit Cost	Yearly Cost	Rating	Units	Unit Cost	Yearly Cost
SYSTEM								
MABR								
Process Blower	680	kWh/d	$ 0.15	$ 37,230	1020	kWh/d	$ 0.15	$ 55,845
Scour Blower	100	kWh/d	$ 0.15	$ 5,475	150	kWh/d	$ 0.15	$ 8,213
Dutty Mixer	975	kWh/d	$ 0.15	$ 53,381	1463	kWh/d	$ 0.15	$ 80,072
CAS								
Overall Power Consumption	60	kWh/d	$ 0.15	$ 3,285	90	kWh/d	$ 0.15	$ 4,928
Cloth Media Filters								
Disk Drive Motor	810	kWh/yr	$ 0.15	$ 122	1215	kWh/yr	$ 0.15	$ 182
Power Control Panel	4725	kWh/yr	$ 0.15	$ 709	7088	kWh/yr	$ 0.15	$ 1,063
Total Power Cost				$ 101,000				$ 151,000
Chemical Consumption								
Alum Dosage	2	$/yr	$ 84,589	$ 169,178	3	$/yr	$ 84,589	$ 253,767
Polyer Dosage	2	$/yr	$ 84,589	$ 169,178	3	$/yr	$ 84,589	$ 253,767
Total Chemical Cost				$ 339,000				$ 508,000
Total Operational Costs				$ 440,000				$ 659,000

MAINTENANCE AND REPAIR COST	Phase 2				Phase 3			
	Units	Unit Cost	Cost	Yearly Cost	Units	Unit Cost	Cost	Yearly Cost
SYSTEM								
Maintenance and Repair	1	$ 101,320	$ 101,320	$ 101,320	1	$ 118,640	$ 118,640	$ 118,640
Total Maintenance and Repair Cost				$ 102,000				$ 119,000
Total Cost				$ 542,000				$ 778,000

NPV Calculation	Total	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052
CAPITAL COSTS																														
Equipment	$ 21,711,120						$ 18,541,560							$ 3,169,560																
Construction Costs	$ 42,596,910						$ 10,516,644	$ 14,022,192	$ 10,516,644					$ 2,262,429	$ 3,016,572	$ 2,262,429														
Maintenance and Repair Cost	$ 1,428,000									$ 102,000	$ 102,000	$ 102,000	$ 102,000	$ 102,000	$ 102,000	$ 102,000	$ 119,000	$ 119,000	$ 119,000	$ 119,000	$ 119,000	$ 119,000	$ 119,000	$ 119,000	$ 119,000	$ 119,000	$ 119,000	$ 119,000	$ 119,000	$ 119,000
Total Capital Cost in 2024 Dollars	$ 65,736,030	$ -	$ -	$ -	$ -	$ -	$ 29,058,204	$ 14,022,192	$ 10,516,644	$ 102,000	$ 102,000	$ 102,000	$ 102,000	$ 5,533,989	$ 3,118,572	$ 2,364,429	$ 119,000	$ 119,000	$ 119,000	$ 119,000	$ 119,000	$ 119,000	$ 119,000	$ 119,000	$ 119,000	$ 119,000	$ 119,000	$ 119,000	$ 119,000	$ 119,000
Capital Costs Total NPV	$ 57,560,000	$ -	$ -	$ -	$ -	$ -	$ 26,394,194	$ 12,494,056	$ 9,192,056	$ 87,455	$ 85,789	$ 84,155	$ 82,552	$ 4,393,528	$ 2,428,728	$ 1,806,331	$ 89,180	$ 87,481	$ 85,815	$ 84,180	$ 82,577	$ 81,004	$ 79,461	$ 77,947	$ 76,463	$ 75,006	$ 73,578	$ 72,176	$ 70,801	$ 69,453
OPERATIONAL COSTS																														
Power Consumption Cost	$ 1,613,000									$ 101,000	$ 101,000	$ 101,000	$ 101,000	$ 101,000	$ 101,000	$ 101,000	$ 151,000	$ 151,000	$ 151,000	$ 151,000	$ 151,000	$ 151,000	$ 151,000	$ 151,000	$ 151,000	$ 151,000	$ 151,000	$ 151,000	$ 151,000	$ 151,000
Chemical Consumption Cost	$ 5,421,000									$ 339,000	$ 339,000	$ 339,000	$ 339,000	$ 339,000	$ 339,000	$ 339,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000
Total Operational Cost in 2024 Dollars	$ 7,034,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 440,000	$ 440,000	$ 440,000	$ 440,000	$ 440,000	$ 440,000	$ 440,000	$ 659,000	$ 659,000	$ 659,000	$ 659,000	$ 659,000	$ 659,000	$ 659,000	$ 659,000	$ 659,000	$ 659,000	$ 659,000	$ 659,000	$ 659,000	$ 659,000
Operational Costs Total NPV	$ 5,321,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 377,256	$ 370,070	$ 363,021	$ 356,106	$ 349,323	$ 342,670	$ 336,143	$ 493,861	$ 484,454	$ 475,226	$ 466,174	$ 457,295	$ 448,584	$ 440,040	$ 431,658	$ 423,436	$ 415,370	$ 407,459	$ 399,698	$ 392,084	$ 384,616
Current Year Sub-total	$ 72,770,030	$ -	$ -	$ -	$ -	$ -	$ 29,058,204	$ 14,022,192	$ 10,516,644	$ 542,000	$ 542,000	$ 542,000	$ 542,000	$ 5,973,989	$ 3,558,572	$ 2,804,429	$ 778,000	$ 778,000	$ 778,000	$ 778,000	$ 778,000	$ 778,000	$ 778,000	$ 778,000	$ 778,000	$ 778,000	$ 778,000	$ 778,000	$ 778,000	$ 778,000
Inflation Adjusted	$ 92,061,897	$ -	$ -	$ -	$ -	$ -	$ 33,686,423	$ 16,743,231	$ 12,934,146	$ 686,589	$ 707,187	$ 728,403	$ 750,255	$ 8,517,480	$ 5,225,883	$ 4,241,950	$ 1,212,099	$ 1,248,462	$ 1,285,915	$ 1,324,493	$ 1,364,228	$ 1,405,155	$ 1,447,309	$ 1,490,728	$ 1,535,450	$ 1,581,514	$ 1,628,959	$ 1,677,828	$ 1,728,163	$ 1,780,008
NPV	**$ 66,769,000**	$ -	$ -	$ -	$ -	$ -	$ 26,394,194	$ 12,494,056	$ 9,192,056	$ 464,711	$ 455,859	$ 447,176	$ 438,658	$ 4,742,851	$ 2,771,397	$ 2,142,473	$ 583,040	$ 571,935	$ 561,041	$ 550,354	$ 539,871	$ 529,588	$ 519,501	$ 509,605	$ 499,899	$ 490,377	$ 481,036	$ 471,874	$ 462,886	$ 454,069

HANOVER CLASS EA: PHASE 2 & 3
WWTP TECHNOLOGY EVALUATION
LIFE CYCLE ANALYSIS

AINLEY: 122059
Moving Bed Biofilm Reactor

Economic Factors	
Discount Rate (Interest):	5%
Inflation Rate	3%
General Requirements	20%
Contractors Profit	8%
Contingency	40%
Engineering Fees	15%
Year to Begin Phase 2 Construction	2029
Estimated Phase 2 Construction Complete	2031
Year to Begin Phase 3 Construction	2036
Estimated Phase 3 Construction Complete	2038

CAPITAL COST	Phase 2					Phase 3				
	Units	Unit Cost	Cost	Installation	Total	Units	Unit Cost	Cost	Installation	Total
EQUIPMENT										
Moving Bed Biofilm Reactor (MBBR) System										
MBBR Reactor Corarse Bubbles Aeration Media Retention Sieves Process Air Blower Instrumentation	2	$ 860,000	$ 1,720,000	60%	$ 2,752,000	1	$ 860,000	$ 860,000	60%	$ 1,376,000
Dissolved Air Flotation (DAF) System Coagulation Tanks Flocculation Tanks Prefabricated DAF Units White Water Pump Skids Combined Filter/Air Separator Instrumentation Chemical Dosing Emulsion Polymer Activation and Dosing System Coagulant Dosing Skid	2	$ 946,000	$ 1,892,000	60%	$ 3,027,200	1	$ 946,000	$ 946,000	60%	$ 1,513,600
Discfilter Discfilter Units Chemical Cleaning Trolley	2	$ 258,000	$ 516,000	60%	$ 825,600	1	$ 258,000	$ 258,000	60%	$ 412,800
Controls	2	$ 86,000	$ 172,000	60%	$ 275,200	1	$ 86,000	$ 86,000	60%	$ 137,600
Total Equipment Cost					$ 6,880,000					$ 3,440,000
CONSTRUCTION										
Site Work				20%	$ 3,438,520				20%	$ 811,860
Yard Piping				20%	$ 3,438,520				20%	$ 811,860
MBBR Tank	2	$ 436,000	$ 872,000	10%	$ 959,200	1	$ 436,000	$ 436,000	10%	$ 479,600
Coagulant Tank	2	$ 19,000	$ 38,000	10%	$ 41,800	1	$ 19,000	$ 19,000	10%	$ 20,900
Flocculation Tank	2	$ 19,000	$ 38,000	10%	$ 41,800	1	$ 19,000	$ 19,000	10%	$ 20,900
DAF Tank	2	$ 89,000	$ 178,000	10%	$ 195,800	1	$ 89,000	$ 89,000	10%	$ 97,900
DAF Building	1	$ 3,744,000	$ 3,744,000		$ 3,744,000	0	$ 3,744,000	$ -		$ -
Technical Building	1	$ 2,600,000	$ 2,600,000		$ 2,600,000	0	$ 2,600,000	$ -		$ -
Tertiary & UV Building	1	$ 2,730,000	$ 2,730,000		$ 2,730,000	0	$ 2,730,000	$ -		$ -
Total Construction Cost					$ 17,190,000					$ 2,244,000
General Requirements including Mobilization and Demobilization, Insurance and Bonding, etc. (20%)					$ 4,814,000					$ 1,136,800
Contractors Profit (8%)					$ 1,925,600					$ 454,720
Contingency (40%)					$ 9,628,000					$ 2,273,600
Engineering Fees (15%)					$ 3,610,500					$ 852,600
Total Capital Cost					$ 44,049,000					$ 10,402,000

OPERATIONAL COST	Phase 2				Phase 3			
	Rating	Units	Unit Cost	Yearly Cost	Rating	Units	Unit Cost	Yearly Cost
SYSTEM								
MBBR								
Process Blower	390	kWh/d	$ 0.15	$ 21,353	585	kWh/d	$ 0.15	$ 32,029
Scour Blower	50	kWh/d	$ 0.15	$ 2,738	75	kWh/d	$ 0.15	$ 4,106
Dutty Mixer	500	kWh/d	$ 0.15	$ 27,375	750	kWh/d	$ 0.15	$ 41,063
Total Power Cost				$ 52,000				$ 78,000
Chemical Consumption								
Alum Dosage	2	$/yr	$ 84,589	$ 169,178	3	$/yr	$ 84,589	$ 253,767
Polyer Dosage	2	$/yr	$ 84,589	$ 169,178	3	$/yr	$ 84,589	$ 253,767
Total Chemical Cost				$ 339,000				$ 508,000
Total Operational Costs				$ 391,000				$ 586,000

MAINTENANCE AND REPAIR COST	Phase 2				Phase 3			
	Units	Unit Cost	Cost	Yearly Cost	Units	Unit Cost	Cost	Yearly Cost
SYSTEM								
Maintenance and Repair	1	$ 68,800	$ 68,800	$ 68,800	1	$ 103,200	$ 103,200	$ 103,200
Total Maintenance and Repair Cost				$ 69,000				$ 104,000
Total Cost				$ 460,000				$ 690,000

NPV Calculation	Total	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052
CAPITAL COSTS																														
Equipment	$ 18,885,600						$ 12,590,400							$ 6,295,200																
Construction Costs	$ 35,564,220						$ 9,437,310	$ 12,583,080	$ 9,437,310					$ 1,231,956	$ 1,642,608	$ 1,231,956														
Maintenance and Repair Cost	$ 1,107,000									$ 69,000	$ 69,000	$ 69,000	$ 69,000	$ 69,000	$ 69,000	$ 69,000	$ 104,000	$ 104,000	$ 104,000	$ 104,000	$ 104,000	$ 104,000	$ 104,000	$ 104,000	$ 104,000	$ 104,000	$ 104,000	$ 104,000	$ 104,000	$ 104,000
Total Capital Cost in 2024 Dollars	$ 55,556,820	$ -	$ -	$ -	$ -	$ -	$ 22,027,710	$ 12,583,080	$ 9,437,310	$ 69,000	$ 69,000	$ 69,000	$ 69,000	$ 7,596,156	$ 1,711,608	$ 1,300,956	$ 104,000	$ 104,000	$ 104,000	$ 104,000	$ 104,000	$ 104,000	$ 104,000	$ 104,000	$ 104,000	$ 104,000	$ 104,000	$ 104,000	$ 104,000	$ 104,000
Capital Costs Total NPV	$ 48,503,000	$ -	$ -	$ -	$ -	$ -	$ 20,008,244	$ 11,211,779	$ 8,248,666	$ 59,161	$ 58,034	$ 56,928	$ 55,844	$ 6,030,717	$ 1,332,991	$ 993,879	$ 77,939	$ 76,454	$ 74,998	$ 73,569	$ 72,168	$ 70,793	$ 69,445	$ 68,122	$ 66,824	$ 65,552	$ 64,303	$ 63,078	$ 61,877	$ 60,698
OPERATIONAL COSTS																														
Power Consumption Cost	$ 832,000									$ 52,000	$ 52,000	$ 52,000	$ 52,000	$ 52,000	$ 52,000	$ 52,000	$ 78,000	$ 78,000	$ 78,000	$ 78,000	$ 78,000	$ 78,000	$ 78,000	$ 78,000	$ 78,000	$ 78,000	$ 78,000	$ 78,000	$ 78,000	$ 78,000
Chemical Consumption Cost	$ 5,421,000									$ 339,000	$ 339,000	$ 339,000	$ 339,000	$ 339,000	$ 339,000	$ 339,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000	$ 508,000
Total Operational Cost in 2024 Dollars	$ 6,253,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 391,000	$ 391,000	$ 391,000	$ 391,000	$ 391,000	$ 391,000	$ 391,000	$ 586,000	$ 586,000	$ 586,000	$ 586,000	$ 586,000	$ 586,000	$ 586,000	$ 586,000	$ 586,000	$ 586,000	$ 586,000	$ 586,000	$ 586,000	$ 586,000
Operational Costs Total NPV	$ 4,730,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 335,243	$ 328,858	$ 322,594	$ 316,449	$ 310,422	$ 304,509	$ 298,709	$ 439,154	$ 430,789	$ 422,583	$ 414,534	$ 406,638	$ 398,893	$ 391,295	$ 383,842	$ 376,530	$ 369,358	$ 362,323	$ 355,421	$ 348,652	$ 342,011
Current Year Sub-total	$ 61,809,820	$ -	$ -	$ -	$ -	$ -	$ 22,027,710	$ 12,583,080	$ 9,437,310	$ 460,000	$ 460,000	$ 460,000	$ 460,000	$ 7,987,156	$ 2,102,608	$ 1,691,956	$ 690,000	$ 690,000	$ 690,000	$ 690,000	$ 690,000	$ 690,000	$ 690,000	$ 690,000	$ 690,000	$ 690,000	$ 690,000	$ 690,000	$ 690,000	$ 690,000
Inflation Adjusted	$ 78,593,854	$ -	$ -	$ -	$ -	$ -	$ 25,536,153	$ 15,024,856	$ 11,606,701	$ 582,714	$ 600,196	$ 618,202	$ 636,748	$ 11,387,775	$ 3,087,751	$ 2,559,235	$ 1,074,998	$ 1,107,247	$ 1,140,465	$ 1,174,679	$ 1,209,919	$ 1,246,217	$ 1,283,603	$ 1,322,111	$ 1,361,775	$ 1,402,628	$ 1,444,707	$ 1,488,048	$ 1,532,689	$ 1,578,670
NPV	**$ 56,681,000**	$ -	$ -	$ -	$ -	$ -	$ 20,008,244	$ 11,211,779	$ 8,248,666	$ 394,404	$ 386,891	$ 379,522	$ 372,293	$ 6,341,139	$ 1,637,500	$ 1,292,588	$ 517,092	$ 507,243	$ 497,581	$ 488,103	$ 478,806	$ 469,686	$ 460,740	$ 451,964	$ 443,355	$ 434,910	$ 426,626	$ 418,500	$ 410,528	$ 402,709

Appendix F

Life Cycle Cost Evaluation of Tertiary Treatment

HANOVER CLASS EA: PHASE 2 & 3
WWTP TECHNOLOGY EVALUATION
LIFE CYCLE ANALYSIS

AINLEY: 122059
DISC FILTERS

Economic Factors	
Discount Rate (Interest):	5%
Inflation Rate	3%
General Requirements	20%
Contractors Profit	8%
Contingency	40%
Engineering Fees	15%
Year to Begin Phase 2 Construction	2029
Estimated Phase 2 Construction Complete	2031

CAPITAL COST	Phase 2				
	Units	Unit Cost	Cost	Installation	Total
EQUIPMENT					
Disc Filter Package					
Tanks/ Basins					
Centertubes					
Media					
Drive Systems	1	$ 1,864,000	$ 1,864,000	60%	$ 2,982,400
Backwash Systems/ Pumps					
Valves					
Instrumentation and Control					
Total Equipment Cost					$ 2,983,000
CONSTRUCTION					
Site Work				20%	$ 1,220,600
Yard Piping				20%	$ 1,220,600
Disc Filter Building	1	$ 3,120,000	$ 3,120,000		$ 3,120,000
Electrical and Instrumentation					
Total Construction Cost					$ 5,562,000
General Requirements including Mobilization and Demobilization, Insurance and Bonding, etc. (20%)					$ 1,709,000
Contractors Profit (8%)					$ 683,600
Contingency (40%)					$ 3,418,000
Engineering Fees (15%)					$ 1,281,750
Total Capital Cost					$ 15,638,000

OPERATIONAL COST	Phase 2			
	Rating/ Number	Units	Unit Cost	Yearly Cost
SYSTEM				
Power Consumption				
Backwash/ Solids Waste Pump	10267	kWh/y	$ 0.15	$ 1,540
Disk Drive Motor	1680	kWh/y	$ 0.15	$ 252
Power Control Panel	9800	kWh/y	$ 0.15	$ 1,470
Total Power Cost				$ 4,000
Chemical Consumption				
Ferric Sulfate	490	kg/d	$ 0.5	$ 89,425
Total Chemical Cost				$ 90,000
Total Operational Cost				$ 94,000

MAINTENANCE AND REPAIR COST	Phase 2			
	Units	Unit Cost	Cost	Yearly Cost
SYSTEM				
Maintenance and Repair	1	$ 29,830	$ 29,830	$ 29,830
Total Maintenance and Repair Cost				$ 30,000
Total Cost				$ 124,000

NPV Calculation	Total	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052
CAPITAL COSTS																														
Equipment	$ 5,458,890						$ 5,458,890																							
Construction Costs	$ 11,196,306						$ 3,053,538	$ 4,071,384	$ 4,071,384																					
Maintenance and Repair Cost	$ 630,000									$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000
Total Capital Cost in 2024 Dollars	$ 17,285,196	$ -	$ -	$ -	$ -	$ -	$ 8,512,428	$ 4,071,384	$ 4,071,384	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000
Capital Costs Total NPV	$ 15,367,000	$ -	$ -	$ -	$ -	$ -	$ 7,732,022	$ 3,627,685	$ 3,558,587	$ 25,722	$ 25,232	$ 24,751	$ 24,280	$ 23,818	$ 23,364	$ 22,919	$ 22,482	$ 22,054	$ 21,634	$ 21,222	$ 20,818	$ 20,421	$ 20,032	$ 19,651	$ 19,276	$ 18,909	$ 18,549	$ 18,196	$ 17,849	$ 17,509
OPERATIONAL COSTS																														
Power Consumption Cost	$ 84,000									$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000	$ 4,000
Chemical Consumption Cost	$ 1,890,000									$ 90,000	$ 90,000	$ 90,000	$ 90,000	$ 90,000	$ 90,000	$ 90,000	$ 90,000	$ 90,000	$ 90,000	$ 90,000	$ 90,000	$ 90,000	$ 90,000	$ 90,000	$ 90,000	$ 90,000	$ 90,000	$ 90,000	$ 90,000	$ 90,000
Total Operational Cost in 2024 Dollars	$ 1,974,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 94,000	$ 94,000	$ 94,000	$ 94,000	$ 94,000	$ 94,000	$ 94,000	$ 94,000	$ 94,000	$ 94,000	$ 94,000	$ 94,000	$ 94,000	$ 94,000	$ 94,000	$ 94,000	$ 94,000	$ 94,000	$ 94,000	$ 94,000	$ 94,000
Operational Costs Total NPV	$ 1,406,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 80,596	$ 79,060	$ 77,555	$ 76,077	$ 74,628	$ 73,207	$ 71,812	$ 70,444	$ 69,103	$ 67,786	$ 66,495	$ 65,229	$ 63,986	$ 62,767	$ 61,572	$ 60,399	$ 59,249	$ 58,120	$ 57,013	$ 55,927	$ 54,862
Current Year Sub-total	$ 19,259,196	$ -	$ -	$ -	$ -	$ -	$ 8,512,428	$ 4,071,384	$ 4,071,384	$ 124,000	$ 124,000	$ 124,000	$ 124,000	$ 124,000	$ 124,000	$ 124,000	$ 124,000	$ 124,000	$ 124,000	$ 124,000	$ 124,000	$ 124,000	$ 124,000	$ 124,000	$ 124,000	$ 124,000	$ 124,000	$ 124,000	$ 124,000	$ 124,000
Inflation Adjusted	$ 24,241,459	$ -	$ -	$ -	$ -	$ -	$ 9,868,237	$ 4,861,445	$ 5,007,289	$ 157,079	$ 161,792	$ 166,646	$ 171,645	$ 176,794	$ 182,098	$ 187,561	$ 193,188	$ 198,984	$ 204,953	$ 211,102	$ 217,435	$ 223,958	$ 230,677	$ 237,597	$ 244,725	$ 252,066	$ 259,628	$ 267,417	$ 275,440	$ 283,703
NPV	**$ 16,773,000**	$ -	$ -	$ -	$ -	$ -	$ 7,732,022	$ 3,627,685	$ 3,558,587	$ 106,318	$ 104,292	$ 102,306	$ 100,357	$ 98,446	$ 96,571	$ 94,731	$ 92,927	$ 91,157	$ 89,420	$ 87,717	$ 86,046	$ 84,407	$ 82,800	$ 81,222	$ 79,675	$ 78,158	$ 76,669	$ 75,209	$ 73,776	$ 72,371

HANOVER CLASS EA: PHASE 2 & 3
WWTP TECHNOLOGY EVALUATION
LIFE CYCLE ANALYSIS

AINLEY: 122059
HIGH-RATE CLARIFIER

Economic Factors	
Discount Rate (Interest):	5%
Inflation Rate	3%
General Requirements	20%
Contractors Profit	8%
Contingency	40%
Engineering Fees	15%
Year to Begin Phase 2 Construction	2029
Estimated Phase 2 Construction Complete	2031

CAPITAL COST	Phase 2				
	Units	Unit Cost	Cost	Installation	Total
EQUIPMENT					
High-rate Clarification Package					
Turbo model					
Coagulant dosing skid with pumps					
Polymer dosing skid with pumps	2	$ 1,837,500	$ 3,675,000	60%	$ 5,880,000
Process valves and piping					
Instrumentation and control					
Total Equipment Cost					$ 5,880,000
CONSTRUCTION					
Site Work				20%	$ 1,800,000
Yard Piping				20%	$ 1,800,000
Tertiary Treatment Building	1	$ 3,120,000	$ 3,120,000		$ 3,120,000
Electrical and Instrumentation					
Total Construction Cost					$ 6,720,000
General Requirements including Mobilization and Demobilization, Insurance and Bonding, etc. (20%)					$ 630,000
Contractors Profit (8%)					$ 378,000
Contingency (40%)					$ 2,520,000
Engineering Fees (15%)					$ 1,008,000
Total Capital Cost					$ 17,136,000

OPERATIONAL COST	Phase 2			
	Rating/ Number	Units	Unit Cost	Yearly Cost
SYSTEM				
Power Consumption				
Coagulation Mixer	69	kWh/d	$ 0.15	$ 3,796
Flocculation Mixer	176	kWh/d	$ 0.15	$ 9,609
Scraper Drive	28	kWh/d	$ 0.15	$ 1,542
Recirculation Pumps	171	kWh/d	$ 0.15	$ 9,371
Total Power Cost				$ 25,000
Chemical Consumption				
Ferric Sulfate	455	kg/d	$ 0.5	$ 83,038
Polymer	13	kg/d	$ 8	$ 37,960
Microsand	26	kg/d	$ 0.6	$ 5,694
Total Chemical Cost				$ 127,000
Total Operational Cost				$ 152,000

MAINTENANCE AND REPAIR COST	Phase 2			
	Units	Unit Cost	Cost	Yearly Cost
SYSTEM				
Maintenance and Repair	1	$ 58,800	$ 58,800	$ 58,800
Total Maintenance and Repair Cost				$ 59,000
Total Cost				$ 211,000

NPV Calculation	Total	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052
CAPITAL COSTS																														
Equipment	$ 10,760,400						$ 10,760,400																							
Construction Costs	$ 13,527,360						$ 3,689,280	$ 4,919,040	$ 4,919,040																					
Maintenance and Repair Cost	$ 1,239,000									$ 59,000	$ 59,000	$ 59,000	$ 59,000	$ 59,000	$ 59,000	$ 59,000	$ 59,000	$ 59,000	$ 59,000	$ 59,000	$ 59,000	$ 59,000	$ 59,000	$ 59,000	$ 59,000	$ 59,000	$ 59,000	$ 59,000	$ 59,000	$ 59,000
Total Capital Cost in 2024 Dollars	$ 25,526,760	$ -	$ -	$ -	$ -	$ -	$ 14,449,680	$ 4,919,040	$ 4,919,040	$ 59,000	$ 59,000	$ 59,000	$ 59,000	$ 59,000	$ 59,000	$ 59,000	$ 59,000	$ 59,000	$ 59,000	$ 59,000	$ 59,000	$ 59,000	$ 59,000	$ 59,000	$ 59,000	$ 59,000	$ 59,000	$ 59,000	$ 59,000	$ 59,000
Capital Costs Total NPV	$ 22,690,000	$ -	$ -	$ -	$ -	$ -	$ 13,124,956	$ 4,382,964	$ 4,299,479	$ 50,587	$ 49,623	$ 48,678	$ 47,751	$ 46,841	$ 45,949	$ 45,074	$ 44,215	$ 43,373	$ 42,547	$ 41,736	$ 40,941	$ 40,162	$ 39,397	$ 38,646	$ 37,910	$ 37,188	$ 36,480	$ 35,785	$ 35,103	$ 34,435
OPERATIONAL COSTS																														
Power Consumption Cost	$ 525,000									$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000
Chemical Consumption Cost	$ 2,667,000									$ 127,000	$ 127,000	$ 127,000	$ 127,000	$ 127,000	$ 127,000	$ 127,000	$ 127,000	$ 127,000	$ 127,000	$ 127,000	$ 127,000	$ 127,000	$ 127,000	$ 127,000	$ 127,000	$ 127,000	$ 127,000	$ 127,000	$ 127,000	$ 127,000
Total Operational Cost in 2024 Dollars	$ 3,192,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 152,000	$ 152,000	$ 152,000	$ 152,000	$ 152,000	$ 152,000	$ 152,000	$ 152,000	$ 152,000	$ 152,000	$ 152,000	$ 152,000	$ 152,000	$ 152,000	$ 152,000	$ 152,000	$ 152,000	$ 152,000	$ 152,000	$ 152,000	$ 152,000
Operational Costs Total NPV	$ 2,274,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 130,325	$ 127,842	$ 125,407	$ 123,019	$ 120,675	$ 118,377	$ 116,122	$ 113,910	$ 111,740	$ 109,612	$ 107,524	$ 105,476	$ 103,467	$ 101,496	$ 99,563	$ 97,667	$ 95,806	$ 93,981	$ 92,191	$ 90,435	$ 88,713
Current Year Sub-total	$ 28,718,760	$ -	$ -	$ -	$ -	$ -	$ 14,449,680	$ 4,919,040	$ 4,919,040	$ 211,000	$ 211,000	$ 211,000	$ 211,000	$ 211,000	$ 211,000	$ 211,000	$ 211,000	$ 211,000	$ 211,000	$ 211,000	$ 211,000	$ 211,000	$ 211,000	$ 211,000	$ 211,000	$ 211,000	$ 211,000	$ 211,000	$ 211,000	$ 211,000
Inflation Adjusted	$ 36,339,424	$ -	$ -	$ -	$ -	$ -	$ 16,751,139	$ 5,873,591	$ 6,049,799	$ 267,288	$ 275,307	$ 283,566	$ 292,073	$ 300,836	$ 309,861	$ 319,156	$ 328,731	$ 338,593	$ 348,751	$ 359,213	$ 369,990	$ 381,089	$ 392,522	$ 404,298	$ 416,427	$ 428,920	$ 441,787	$ 455,041	$ 468,692	$ 482,753
NPV	**$ 24,964,000**	$ -	$ -	$ -	$ -	$ -	$ 13,124,956	$ 4,382,964	$ 4,299,479	$ 180,911	$ 177,465	$ 174,085	$ 170,769	$ 167,516	$ 164,326	$ 161,196	$ 158,125	$ 155,113	$ 152,159	$ 149,261	$ 146,418	$ 143,629	$ 140,893	$ 138,209	$ 135,577	$ 132,994	$ 130,461	$ 127,976	$ 125,538	$ 123,147

Appendix G

Life Cycle Cost Evaluation of Disinfection

HANOVER CLASS EA: PHASE 2 & 3
WWTP TECHNOLOGY EVALUATION
LIFE CYCLE ANALYSIS

AINLEY: 122059
UV DISINFECTION

Economic Factors	
Discount Rate (Interest):	5%
Inflation Rate	3%
General Requirements	20%
Contractors Profit	8%
Contingency	40%
Engineering Fees	15%
Year to Begin Phase 2 Construction	2029
Estimated Phase 2 Construction Complete	2031
Year to Begin Phase 3 Construction	2036
Estimated Phase 3 Construction Complete	2038

CAPITAL COST	Phase 2					Phase 3				
	Units	Unit Cost	Cost	Installation	Total	Units	Unit Cost	Cost	Installation	Total
EQUIPMENT										
Trojan UV3000Plus bank										
banks	4					4				
modules per bank	3					1				
lamps per module	8					8				
UV panels	1	$ 440,000	$ 440,000	60%	$ 704,000		$ 15,000	$ 60,000	60%	$ 96,000
level controller (ALC)	2									
Davit Crane	1									
Standard Spareparts/ Safety Equipment	1									
Total Equipment Cost					$ 704,000					$ 96,000
CONSTRUCTION										
Site Work				20%	$ 157,520				20%	$ 19,200
Yard Piping				20%	$ 157,520				20%	$ 19,200
UV Channels	2	$ 38,000	$ 76,000	10%	$ 83,600					$ -
Electrical and Instrumentation									15%	$ 20,160
Total Construciton Cost					$ 399,000					$ 59,000
General Requirements including Mobilization and Demobilization, Insurance and Bonding, etc. (20%)					$ 220,600					$ 31,000
Contractors Profit (8%)					$ 88,240					$ 12,400
Contingency (40%)					$ 441,200					$ 62,000
Engineering Fees (15%)					$ 165,450					$ 23,250
Total Capital Cost					$ 2,019,000					$ 284,000

OPERATIONAL COST	Phase 2				Phase 3			
	Rating/ Number	Units	Unit Cost	Yearly Cost	Rating/ Number	Units	Unit Cost	Yearly Cost
SYSTEM								
Power Consumption								
Overall Power Consumption	859	kWh/d	$ 0.15	$ 47,041	1289	kWh/d	$ 0.15	$ 70,584
Total Power Cost				$ 48,000				$ 71,000
Total Operational Cost				$ 48,000				$ 71,000

MAINTENANCE AND REPAIR COST	Phase 2				Phase 3			
	Units	Unit Cost	Cost	Yearly Cost	Units	Unit Cost	Cost	Yearly Cost
SYSTEM								
Lamp (1/1.5 year)	96	$ 475	$ 45,600	$ 30,400	144	$ 475	$ 68,400	$ 45,600
Total Maintenance and Repair Cost				$ 31,000				$ 46,000
Total Cost				$ 79,000				$ 117,000

NPV Calculation	Total	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052
CAPITAL COSTS																														
Equipment Cost	$ 1,464,000						$ 1,288,320							$ 175,680																
Construction Cost	$ 838,140						$ 292,068	$ 219,051	$ 219,051					$ 32,391	$ 43,188	$ 32,391														
Maintenance and Repair Cost	$ 861,000									$ 31,000	$ 31,000	$ 31,000	$ 31,000	$ 31,000	$ 31,000	$ 31,000	$ 46,000	$ 46,000	$ 46,000	$ 46,000	$ 46,000	$ 46,000	$ 46,000	$ 46,000	$ 46,000	$ 46,000	$ 46,000	$ 46,000	$ 46,000	$ 46,000
Total Capital Cost in 2024 Dollars	$ 3,163,140	$ -	$ -	$ -	$ -	$ -	$ 1,580,388	$ 219,051	$ 219,051	$ 31,000	$ 31,000	$ 31,000	$ 31,000	$ 239,071	$ 74,188	$ 63,391	$ 46,000	$ 46,000	$ 46,000	$ 46,000	$ 46,000	$ 46,000	$ 46,000	$ 46,000	$ 46,000	$ 46,000	$ 46,000	$ 46,000	$ 46,000	$ 46,000
Capital Costs Total NPV	$ 2,649,000	$ -	$ -	$ -	$ -	$ -	$ 1,435,501	$ 195,179	$ 191,461	$ 26,579	$ 26,073	$ 25,576	$ 25,089	$ 189,803	$ 57,777	$ 48,428	$ 34,473	$ 33,816	$ 33,172	$ 32,540	$ 31,920	$ 31,312	$ 30,716	$ 30,131	$ 29,557	$ 28,994	$ 28,442	$ 27,900	$ 27,369	$ 26,847
OPERATIONAL COSTS																														
Power Consumption Cost	$ 1,330,000									$ 48,000	$ 48,000	$ 48,000	$ 48,000	$ 48,000	$ 48,000	$ 48,000	$ 71,000	$ 71,000	$ 71,000	$ 71,000	$ 71,000	$ 71,000	$ 71,000	$ 71,000	$ 71,000	$ 71,000	$ 71,000	$ 71,000	$ 71,000	$ 71,000
Total Operational Cost in 2024 Dollars	$ 1,330,000	$ -	$ -	$ -	$ -	$ -	$ -		$ -	$ 48,000	$ 48,000	$ 48,000	$ 48,000	$ 48,000	$ 48,000	$ 48,000	$ 71,000	$ 71,000	$ 71,000	$ 71,000	$ 71,000	$ 71,000	$ 71,000	$ 71,000	$ 71,000	$ 71,000	$ 71,000	$ 71,000	$ 71,000	$ 71,000
Operational Costs Total NPV	$ 932,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 41,155	$ 40,371	$ 39,602	$ 38,848	$ 38,108	$ 37,382	$ 36,670	$ 53,208	$ 52,195	$ 51,200	$ 50,225	$ 49,268	$ 48,330	$ 47,409	$ 46,506	$ 45,621	$ 44,752	$ 43,899	$ 43,063	$ 42,243	$ 41,438
Current Year Sub-total	$ 4,493,140	$ -	$ -	$ -	$ -	$ -	$ 1,580,388	$ 219,051	$ 219,051	$ 79,000	$ 79,000	$ 79,000	$ 79,000	$ 287,071	$ 122,188	$ 111,391	$ 117,000	$ 117,000	$ 117,000	$ 117,000	$ 117,000	$ 117,000	$ 117,000	$ 117,000	$ 117,000	$ 117,000	$ 117,000	$ 117,000	$ 117,000	$ 117,000
Inflation Adjusted	$ 6,653,495	$ -	$ -	$ -	$ -	$ -	$ 1,832,103	$ 261,558	$ 269,405	$ 100,075	$ 103,077	$ 106,169	$ 109,354	$ 409,295	$ 179,437	$ 168,489	$ 182,282	$ 187,751	$ 193,383	$ 199,185	$ 205,160	$ 211,315	$ 217,654	$ 224,184	$ 230,910	$ 237,837	$ 244,972	$ 252,321	$ 259,891	$ 267,688
NPV	**$ 3,581,000**	$ -	$ -	$ -	$ -	$ -	$ 1,435,501	$ 195,179	$ 191,461	$ 67,735	$ 66,444	$ 65,179	$ 63,937	$ 227,911	$ 95,159	$ 85,098	$ 87,681	$ 86,011	$ 84,372	$ 82,765	$ 81,189	$ 79,642	$ 78,125	$ 76,637	$ 75,178	$ 73,746	$ 72,341	$ 70,963	$ 69,611	$ 68,285

Appendix H

Life Cycle Cost Evaluation of On-site Sludge Stabilization

HANOVER CLASS EA: PHASE 2 & 3
WWTP TECHNOLOGY EVALUATION
LIFE CYCLE ANALYSIS

AINLEY: 122059
ANAEROBIC DIGESTION SYSTEM

Economic Factors	
Discount Rate (Interest):	5%
Inflation Rate	3%
General Requirements	20%
Contractors Profit	8%
Contingency	40%
Engineering Fees	15%
Year to Begin Phase 2 Construction	2029
Estimated Phase 2 Construction Complete	2031
Year to Begin Phase 3 Construction	2036
Estimated Phase 3 Construction Complete	2038

CAPITAL COST	Phase 2					Phase 3				
	Units	Unit Cost	Cost	Installation	Total	Units	Unit Cost	Cost	Installation	Total
EQUIPMENT										
Anaerobic Digestion										
Mixing Equipment	3	$ 131,250	$ 393,750	60%	$ 630,000	1	$ 131,250	$ 131,250	60%	$ 210,000
Polymer System	3	$ 70,000	$ 210,000	60%	$ 336,000	1	$ 70,000	$ 70,000	60%	$ 112,000
Pumps										
Thickener Feed Pump										
Digester Feed Pump	3	$ 52,500	$ 157,500	60%	$ 252,000	1	$ 52,500	$ 52,500	60%	$ 84,000
Sludge Recirculation Pump										
Sludge Mixing Pump										
Biosolids Transfer Pump										
Heat Exchanger	1	$ 140,000	$ 140,000	60%	$ 224,000	0	$ 140,000	$ -	60%	$ -
Waste Gas Burner & Safety Equipment	1	$ 308,000	$ 308,000	60%	$ 492,800	0	$ 308,000	$ -	60%	$ -
Total Equipment Cost					$ 1,935,000					$ 406,000
CONSTRUCTION										
Site Work				20%	$ 2,156,360				20%	$ 322,000
Yard Piping				20%	$ 2,156,360				20%	$ 322,000
Anaerobic Digester	2	$ (446,000)	$ (892,000)	10%	$ (981,200)	0	$ (446,000)	$ -	10%	$ -
Control Building	1	$ 5,967,000	$ 5,967,000		$ 5,967,000	0	$ 4,030,000	$ -		$ -
Thickening Building	1	$ 3,861,000	$ 3,861,000		$ 3,861,000	0	$ 3,868,000	$ -		$ -
Biosolids Storage Building	0	$ 1,204,000	$ -		$ -	1	$ 1,204,000	$ 1,204,000		$ 1,204,000
Total Construction Cost					$ 13,160,000					$ 1,848,000
General Requirements including Mobilization and Demobilization, Insurance and Bonding, etc. (20%)					$ 3,019,000					$ 450,800
Contractors Profit (8%)					$ 1,207,600					$ 180,320
Contingency (40%)					$ 6,038,000					$ 901,600
Engineering Fees (15%)					$ 2,264,250					$ 338,100
Total Equipment Cost					$ 27,624,000					$ 16,966,000

OPERATIONAL COST	Phase 2				Phase 3			
	Rating/ Number	Units	Unit Cost	Yearly Cost	Rating/ Number	Units	Unit Cost	Yearly Cost
SYSTEM								
Power Consumption								
WAS Holding Tank & Pump Room	331	kWh/d	$ 0.15	$ 18,109	441	kWh/d	$ 0.15	$ 24,145
Thickening Building	87	kWh/d	$ 0.15	$ 4,761	116	kWh/d	$ 0.15	$ 6,348
Waste Gas Burner	16	kWh/d	$ 0.15	$ 862	21	kWh/d	$ 0.15	$ 1,150
Digester Control Building	2363	kWh/d	$ 0.15	$ 129,347	3150	kWh/d	$ 0.15	$ 172,463
Total Power Cost				$ 154,000				$ 205,000
Chemical Consumption								
Polymer	50	kg/d	$ 8.00	$ 144,540	66	kg/d	$ 8.00	$ 192,720
Total Chemical Cost				$ 145,000				$ 193,000
Total Operational Costs				$ 299,000				$ 398,000

MAINTENANCE AND REPAIR COST	Phase 2				Phase 3			
	Units	Unit Cost	Cost	Yearly Cost	Units	Unit Cost	Cost	Yearly Cost
SYSTEM								
Maintenance and Repair	1	$ 19,350	$ 19,350	$ 19,350	1	$ 23,410	$ 23,410	$ 23,410
Total Maintenance and Repair Cost				$ 20,000				$ 24,000
Total Cost				$ 319,000				$ 422,000

NPV Calculation	Total	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052
CAPITAL COSTS																														
Equipment	$ 4,284,030						$ 3,541,050							$ 742,980																
Construction Costs	$ 27,464,640						$ 7,224,840.0	$ 9,633,120	$ 7,224,840					$ 1,014,552	$ 1,352,736	$ 1,014,552														
Maintenance and Repair Cost	$ 476,000									$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 24,000	$ 24,000	$ 24,000	$ 24,000	$ 24,000	$ 24,000	$ 24,000	$ 24,000	$ 24,000	$ 24,000	$ 24,000	$ 24,000	$ 24,000	$ 24,000	$ 24,000
Total Capital Cost in 2024 Dollars	$ 32,224,670	$ -	$ -	$ -	$ -	$ -	$ 10,765,890	$ 9,633,120	$ 7,224,840	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 1,777,532	$ 1,372,736	$ 1,034,552	$ 24,000	$ 24,000	$ 24,000	$ 24,000	$ 24,000	$ 24,000	$ 24,000	$ 24,000	$ 24,000	$ 24,000	$ 24,000	$ 24,000	$ 24,000	$ 24,000
Capital Costs Total NPV	$ 28,238,000	$ -	$ -	$ -	$ -	$ -	$ 9,778,890	$ 8,583,305	$ 6,314,860	$ 17,148	$ 16,821	$ 16,501	$ 16,187	$ 1,411,213	$ 1,069,080	$ 790,357	$ 17,986	$ 17,643	$ 17,307	$ 16,978	$ 16,654	$ 16,337	$ 16,026	$ 15,720	$ 15,421	$ 15,127	$ 14,839	$ 14,557	$ 14,279	$ 14,007
OPERATIONAL COSTS																														
Power Consumption Cost	$ 3,948,000									$ 154,000	$ 154,000	$ 154,000	$ 154,000	$ 154,000	$ 154,000	$ 154,000	$ 205,000	$ 205,000	$ 205,000	$ 205,000	$ 205,000	$ 205,000	$ 205,000	$ 205,000	$ 205,000	$ 205,000	$ 205,000	$ 205,000	$ 205,000	$ 205,000	$ 205,000
Chemical Consumption Cost	$ 3,717,000									$ 145,000	$ 145,000	$ 145,000	$ 145,000	$ 145,000	$ 145,000	$ 145,000	$ 193,000	$ 193,000	$ 193,000	$ 193,000	$ 193,000	$ 193,000	$ 193,000	$ 193,000	$ 193,000	$ 193,000	$ 193,000	$ 193,000	$ 193,000	$ 193,000	$ 193,000
Total Operational Cost in 2024 Dollars	$ 7,665,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 299,000	$ 299,000	$ 299,000	$ 299,000	$ 299,000	$ 299,000	$ 299,000	$ 398,000	$ 398,000	$ 398,000	$ 398,000	$ 398,000	$ 398,000	$ 398,000	$ 398,000	$ 398,000	$ 398,000	$ 398,000	$ 398,000	$ 398,000	$ 398,000	$ 398,000
Operational Costs Total NPV	$ 5,392,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 256,363	$ 251,479	$ 246,689	$ 241,991	$ 237,381	$ 232,860	$ 228,424	$ 298,265	$ 292,584	$ 287,011	$ 281,544	$ 276,181	$ 270,920	$ 265,760	$ 260,698	$ 255,732	$ 250,861	$ 246,083	$ 241,395	$ 236,797	$ 232,287
Current Year Sub-total	$ 39,889,670	$ -	$ -	$ -	$ -	$ -	$ 10,765,890	$ 9,633,120	$ 7,224,840	$ 319,000	$ 319,000	$ 319,000	$ 319,000	$ 2,076,532	$ 1,671,736	$ 1,333,552	$ 422,000	$ 422,000	$ 422,000	$ 422,000	$ 422,000	$ 422,000	$ 422,000	$ 422,000	$ 422,000	$ 422,000	$ 422,000	$ 422,000	$ 422,000	$ 422,000
Inflation Adjusted	$ 53,225,679	$ -	$ -	$ -	$ -	$ -	$ 12,480,617	$ 11,502,449	$ 8,885,642	$ 404,100	$ 416,223	$ 428,709	$ 441,571	$ 2,960,638	$ 2,455,001	$ 2,017,117	$ 657,462	$ 677,186	$ 697,502	$ 718,427	$ 739,980	$ 762,179	$ 785,044	$ 808,596	$ 832,854	$ 857,839	$ 883,574	$ 910,082	$ 937,384	$ 965,505
NPV	**$ 33,629,000**	$ -	$ -	$ -	$ -	$ -	$ 9,778,890	$ 8,583,305	$ 6,314,860	$ 273,511	$ 268,301	$ 263,190	$ 258,177	$ 1,648,594	$ 1,301,939	$ 1,018,781	$ 316,251	$ 310,227	$ 304,318	$ 298,521	$ 292,835	$ 287,257	$ 281,786	$ 276,418	$ 271,153	$ 265,988	$ 260,922	$ 255,952	$ 251,077	$ 246,294

HANOVER CLASS EA: PHASE 3
WPCP TECHNOLOGY EVALUATION
LIFE CYCLE ANALYSIS

AINLEY: 122059
AEROBIC DIGESTION SYSTEM

Economic Factors	
Discount Rate (Interest):	5%
Inflation Rate	3%
General Requirements	20%
Contractors Profit	8%
Contingency	40%
Engineering Fees	15%
Year to Begin Phase 2 Construction	2029
Estimated Phase 2 Construction Complete	2031
Year to Begin Phase 3 Construction	2036
Estimated Phase 3 Construction Complete	2038

CAPITAL COST	Phase 2					Phase 3				
	Units	Unit Cost	Cost	Installation	Total	Units	Unit Cost	Cost	Installation	Total
EQUIPMENT										
Aerobic Digester										
Diffusers and Aeration Piping	3	$ 300,000	$ 900,000	60%	$ 1,440,000	1	$ 300,000	$ 300,000	60%	$ 480,000
Blowers	3	$ 450,000	$ 1,350,000	60%	$ 2,160,000	1	$ 450,000	$ 450,000	60%	$ 720,000
Biosolids Transfer and Truck Loading Pumps	3	$ 150,000	$ 450,000	60%	$ 720,000	1	$ 150,000	$ 150,000	60%	$ 240,000
Odour Control System										
Dry Media Adsorption System	1	$ 180,000	$ 180,000	60%	$ 288,000	0	$ 180,000	$ -	60%	$ -
Biosolids Storage	1	$ 830,000	$ 830,000	60%	$ 1,328,000	0	$ 830,000	$ -	60%	$ -
Total Equipment Cost					$ 5,936,000					$ 1,440,000
CONSTRUCTION										
Site Work				20%	$ 2,750,600				20%	$ 274,580
Yard Piping				20%	$ 2,750,600				20%	$ 274,580
Aerobic Digesters & Thickening Tanks	1	$ 2,320,000	$ 2,320,000	10%	$ 2,552,000	1	$ 984,000	$ 984,000	10%	$ 1,082,400
Biosolids Storage Building	0	$ (1,045,000)	$ -	10%	$ -	1	$ (1,045,000)	$ (1,045,000)	10%	$ (1,149,500)
Technical Building	1	$ 5,265,000	$ 5,265,000		$ 5,265,000	0	$ 5,265,000	$ -		$ -
Total Construction Cost					$ 13,319,000					$ 483,000
General Requirements including Mobilization and Demobilization, Insurance and Bonding, etc. (20%)					$ 3,851,000					$ 384,600
Contractors Profit (8%)					$ 1,540,400					$ 153,840
Contingency (40%)					$ 7,702,000					$ 769,200
Engineering Fees (15%)					$ 2,888,250					$ 288,450
Total Capital Cost					$ 35,237,000					$ 20,852,000

OPERATIONAL COST	Phase 2				Phase 3			
	Rating/ Number	Units	Unit Cost	Yearly Cost	Rating/ Number	Units	Unit Cost	Yearly Cost
SYSTEM								
Power Consumption								
Digester Aeration	4644	kWh/d	$ 0.15	$ 260,000	6192	kWh/d	$ 0.15	$ 340,000
Blowers	72	kWh/d	$ 0.15	$ 4,000	96	kWh/d	$ 0.15	$ 6,000
Biosolids Transfer and Truck Loading Pumps	72	kWh/d	$ 0.15	$ 4,000	96	kWh/d	$ 0.15	$ 6,000
Total Power Cost				$ 268,000				$ 352,000
Chemical Consumption								
Polymer	50	kg/d	$ 8.00	$ 144,540	66	kg/d	$ 8.00	$ 192,720
Total Chemical Cost				$ 145,000				$ 193,000
Total Operational Costs				$ 413,000				$ 545,000

MAINTENANCE AND REPAIR COST	Phase 2				Phase 3			
	Units	Unit Cost	Cost	Yearly Cost	Units	Unit Cost	Cost	Yearly Cost
SYSTEM								
Maintenance and Repair	1	$ 59,360	$ 59,360	$ 59,360	1	$ 73,760	$ 73,760	$ 73,760
Total Maintenance and Repair Cost				$ 60,000				$ 74,000
Total Cost				$ 473,000				$ 619,000

NPV Calculation	Total	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052
CAPITAL COSTS																														
Equipment	$ 27,008,970						$ 24,373,770							$ 2,635,200																
Construction Costs	$ 25,257,660						$7,312,131.0	$ 9,749,508	$ 7,312,131					$ 265,167	$ 353,556	$ 265,167														
Maintenance and Repair Cost	$ 1,456,000									$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 74,000	$ 74,000	$ 74,000	$ 74,000	$ 74,000	$ 74,000	$ 74,000	$ 74,000	$ 74,000	$ 74,000	$ 74,000	$ 74,000	$ 74,000	$ 74,000
Total Capital Cost in 2024 Dollars	$ 53,722,630	$ -	$ -	$ -	$ -	$ -	$ 31,685,901	$ 9,749,508	$ 7,312,131	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 2,960,367	$ 413,556	$ 325,167	$ 74,000	$ 74,000	$ 74,000	$ 74,000	$ 74,000	$ 74,000	$ 74,000	$ 74,000	$ 74,000	$ 74,000	$ 74,000	$ 74,000	$ 74,000	$ 74,000
Capital Costs Total NPV	$ 47,668,000	$ -	$ -	$ -	$ -	$ -	$ 28,780,987	$ 8,687,009	$ 6,391,156	$ 51,444	$ 50,464	$ 49,503	$ 48,560	$ 2,350,286	$ 322,075	$ 248,415	$ 55,456	$ 54,400	$ 53,364	$ 52,347	$ 51,350	$ 50,372	$ 49,413	$ 48,471	$ 47,548	$ 46,643	$ 45,754	$ 44,883	$ 44,028	$ 43,189
OPERATIONAL COSTS																														
Power Consumption Cost	$ 6,804,000									$ 268,000	$ 268,000	$ 268,000	$ 268,000	$ 268,000	$ 268,000	$ 268,000	$ 352,000	$ 352,000	$ 352,000	$ 352,000	$ 352,000	$ 352,000	$ 352,000	$ 352,000	$ 352,000	$ 352,000	$ 352,000	$ 352,000	$ 352,000	$ 352,000
Chemical Consumption Cost	$ 3,717,000									$ 145,000	$ 145,000	$ 145,000	$ 145,000	$ 145,000	$ 145,000	$ 145,000	$ 193,000	$ 193,000	$ 193,000	$ 193,000	$ 193,000	$ 193,000	$ 193,000	$ 193,000	$ 193,000	$ 193,000	$ 193,000	$ 193,000	$ 193,000	$ 193,000
Total Operational Cost in 2024 Dollars	$ 10,521,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 413,000	$ 413,000	$ 413,000	$ 413,000	$ 413,000	$ 413,000	$ 413,000	$ 545,000	$ 545,000	$ 545,000	$ 545,000	$ 545,000	$ 545,000	$ 545,000	$ 545,000	$ 545,000	$ 545,000	$ 545,000	$ 545,000	$ 545,000	$ 545,000
Operational Costs Total NPV	$ 7,403,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 354,106	$ 347,361	$ 340,745	$ 334,254	$ 327,888	$ 321,642	$ 315,516	$ 408,428	$ 400,648	$ 393,017	$ 385,531	$ 378,187	$ 370,984	$ 363,918	$ 356,986	$ 350,186	$ 343,516	$ 336,973	$ 330,554	$ 324,258	$ 318,082
Current Year Sub-total	$ 64,243,630	$ -	$ -	$ -	$ -	$ -	$ 31,685,901	$ 9,749,508	$ 7,312,131	$ 473,000	$ 473,000	$ 473,000	$ 473,000	$ 3,373,367	$ 826,556	$ 738,167	$ 619,000	$ 619,000	$ 619,000	$ 619,000	$ 619,000	$ 619,000	$ 619,000	$ 619,000	$ 619,000	$ 619,000	$ 619,000	$ 619,000	$ 619,000	$ 619,000
Inflation Adjusted	$ 83,491,544	$ -	$ -	$ -	$ -	$ -	$ 36,732,644	$ 11,641,422	$ 8,992,999	$ 599,182	$ 617,158	$ 635,672	$ 654,743	$ 4,809,615	$ 1,213,825	$ 1,116,544	$ 964,382	$ 993,313	$1,023,113	$1,053,806	$1,085,420	$1,117,983	$1,151,522	$1,186,068	$1,221,650	$1,258,300	$1,296,049	$1,334,930	$1,374,978	$1,416,227
NPV	**$ 55,070,000**	$ -	$ -	$ -	$ -	$ -	$ 28,780,987	$ 8,687,009	$ 6,391,156	$ 405,550	$ 397,825	$ 390,248	$ 382,814	$ 2,678,173	$ 643,718	$ 563,931	$ 463,884	$ 455,048	$ 446,381	$ 437,878	$ 429,538	$ 421,356	$ 413,330	$ 405,457	$ 397,734	$ 390,158	$ 382,727	$ 375,437	$ 368,286	$ 361,271

Appendix I

Secondary Treatment Technology Alternatives Evaluation Matrix

Hanover WWTP Class EA
Alternative Design Concepts for Secondary Treatment
Ainley Project: 122059

EVALUATION MATRIX FOR SHORT LISTED SECONDARY TREATMENT ALTERNATIVES

PRIMARY CRITERIA		SECONDARY CRITERIA		ABSOLUTE WEIGHT (WT)	SHORT LISTED ALTERNATIVES								COMMENTS
					Alternative 1 CAS		Alternative 2 AGS		Alternative 3 MABR		Alternative 4 MBBR		
CRITERIA	WEIGHT	CRITERIA	WEIGHT		SCORE	WT SCORE	SCORE	WT SCORE	SCORE	WT SCORE	SCORE	WT SCORE	
Social/Culture	15%	Aesthetic Impacts (plant appearance)	10	1.5	3	0.9	2	0.6	2	0.6	4	1.2	Aesthetic impacts would be related to the size of each technology. MBBR would have the least visual impact since it has the smallest tanks, followed by CAS and MABR. The footprint required for AGS would have the most visual impacts.
		Traffic (during construction and operation)	30	4.5	3	2.7	3	2.7	3	2.7	3	2.7	MBBR would have the least construction traffic due to smallest tankage (concrete trucks) and equipment required for each tank/process followed by CAS, AGS and MABR. CAS would have slightly higher operation traffic due to chemical deliveries, followed by MABR. AGS and MBBR cosumes the least amount of chemical.
		Noise Impacts (during operation)	20	3	3	1.8	3	1.8	3	1.8	3	1.8	Noise impacts would be limited to effects on worker health and safety and be due largely to mechanical equipment like blowers, pumps and mixers. CAS and MABR produces moderate noise as it involves continuous aeration and mixing in open tanks. AGS and MBBR have similar noise levels similar. AGS system tend to produce relatively lower noise levels, because it often involves less continuous mixing and aeration, resulting in quieter operation.
		Odour Impacts (during operation)	40	6	4	4.8	4	4.8	4	4.8	4	4.8	A higher potential for fugitive odours exist where there are open tanks. All alternatives involve open tanks or basins that are exposed to the environment during different phases of the treatment cycle.
Technical	30%	Ability to Meet Regulatory Objectives	25	7.5	5	7.5	5	7.5	5	7.5	5	7.5	All alternatives are considered to have the same ability to meet regulatory objectives as they are all capable of meeting the effluent limit required for Paris.
		Technology/Process Robustness	25	7.5	5	7.5	5	7.5	5	7.5	5	7.5	CAS process is a well-established and flexible technology with the capability for upgrades or modifications. It can accommodate various tank arrangements to meet different treatment requirements. AGS process is relatively sensitive to operational fluctuations, especially during its early stages of development. Sudden changes in influent characteristics or operational parameters can disrupt the stability of the granules. However, once the granules mature and the system stabilizes, it can exhibit reasonable robustness. The granular is able to regrow and protect the internal bacteria from toxicity. MABR process is an energy-effcient with simultaneous nitrification and denitrification in a compact design. Additionally, with aeration, it improves the oxygen transfer efficiency significantly. MBBR process demonstrates excellent resilience to variations in wastewater flow and pollutant load. It can handle sudden increases in organic or hydraulic loads without compromising treatment performance. All alternatives are able to meet the treatment requirements.
		Ease of Expansion and Phasing to Buildout	10	3	3	1.8	3	1.8	3	1.8	4	2.4	MBBR has the smallest tanks and requires the least footprint, followed by CAS and MABR. The footprint required for AGS would require slightly larger footprint the difference is negligible.
		Energy Requirements	10	3	3	1.8	4	2.4	4	2.4	4	2.4	The power consumption of MABR, MBBR and AGS are quite similar, which is slightly higher than CAS.
		Operation & Maintenance Requirements (simplicity, operator skill level/quantity)	10	3	4	2.4	3	1.8	4	2.4	3	1.8	CAS and MABR processes have the similiar maintenance requirements as MABR also requires CAS during the whole process. As the existing plant process is CAS, CAS and MABR are considered to have the least operational difficulty. AGS process can be moderately complex to operate and maintain, particularly during the initial stages of reactor start-up and granule development. Operators need a good understanding of granule formation and control. Occasional cleaning and adjustments is required to maintain granule integrity. MBBR systems are relatively easy to maintain. The biofilm carries are self-cleaning, minimizing the need for frequenmt maintenance and cleaning procedures, which reduces downtime and operational disruptions.
		Site Requirements (plant footprint)	20	6	4	4.8	3	3.6	4	4.8	5	6	The footprint of AGS is the largest. CAS and MABR are similar and slightly smaller than AGS. MBBR process has the most compact footprint.
Environmental	30%	Climate Change Impacts / Greenhouse Gas Generation	10	3	4	2.4	4	2.4	4	2.4	4	2.4	The power consumption of MABR, MBBR and AGS are quite similar, which is slightly higher than CAS. The difference is negligible when considering climate change impacts.
		Natural Environment Vegetation and Flora Impacts	10	3	4	2.4	4	2.4	4	2.4	4	2.4	All alternatives would have similar natural environment vegetation and flora impacts.
		Natural Environment Woodland Impacts	15	4.5	4	3.6	4	3.6	4	3.6	4	3.6	All alternatives would have similar natural environment woodland impacts.
		Natural Environment Wildlife Impacts	15	4.5	4	3.6	4	3.6	4	3.6	4	3.6	All alternatives would have similar natural environment wildlife impacts.
		Natural Environment Fisheries and Aquatic Impacts	15	4.5	4	3.6	4	3.6	4	3.6	4	3.6	All alternatives would have similar natural environment fisheries and aquatic impacts.
		Natural Environment Species at Risk Impacts	15	4.5	4	3.6	4	3.6	4	3.6	4	3.6	All alternatives would have similar natural environment species at risk impacts.
		Archaeological Impacts	10	3	5	3	5	3	5	3	5	3	The study area is considered clear of archaeological concern.
		Stormwater Impacts	10	3	5	3	5	3	5	3	5	3	All alternatives are designed based on peak flows and maximum month concentrations.
Economic	25%	Capital Cost	30	7.5	5	7.5	3	4.5	4	6	4	6	Refer to NPV spreadsheets.
		Operation and Maintenance Costs	40	10	5	10	3	6	3	6	4	8	Refer to NPV spreadsheets.
		Net Present Value	30	7.5	5	7.5	2	3	4	6	3	4.5	Refer to NPV spreadsheets.
		TOTAL SCORE	100		86.2		73.2		79.5		81.8		

Appendix J

Tertiary Treatment Technology Alternatives Evaluation Matrix

Hanover WWTP Class EA
Alternative Design Concepts for Tertiary Treatment
Ainley Project: 122059

EVALUATION MATRIX FOR SHORT LISTED TERTIARY TREATMENT ALTERNATIVES

PRIMARY CRITERIA		SECONDARY CRITERIA		ABSOLUTE WEIGHT (WT)	SHORT LISTED ALTERNATIVES				COMMENTS
					Alternative 1 Disc Filter		Alternative 2 High-rate Clarifier		
CRITERIA	WEIGHT	CRITERIA	WEIGHT		SCORE	WT SCORE	SCORE	WT SCORE	
Social/Culture	15%	Aesthetic Impacts (plant appearance)	10	1.5	3	0.9	4	1.2	Aesthetic impacts would be related to the size of each technology. The footprint of disc filter is slightly larger than high-rate clarifier.
		Traffic (during construction and operation)	30	4.5	4	3.6	3	2.7	Both alternatives would have similar construction traffic requirements to for delivering construction materials (concrete trucks) and equipment. However, high-rate clarifier would have the higher traffic requirements for delivering chemicals.
		Noise Impacts (during operation)	20	3	4	2.4	4	2.4	No Significant noises expected during normal operation.
		Odour Impacts (during operation)	40	6	4	4.8	4	4.8	No significant odours expected during normal operation.
Technical	30%	Ability to Meet Regulatory Objectives	25	7.5	5	7.5	5	7.5	Both alternatives are considered to have the same ability to meet regulatory objectives as they are all capable of meeting the effluent limit required for Paris.
		Technology/Process Robustness	25	7.5	4	6	4	6	Both alternatives can be configured for dual-use application for tertiary and wet weather operation.
		Ease of Expansion and Phasing to Buildout	10	3	4	2.4	4	2.4	Both alternatives would be built to accommodate the 2052 projected flows.
		Energy Requirements	10	3	5	3	4	2.4	High-rate clarifier has higher energy requirements than disc filter.
		Operation & Maintenance Requirements (simplicity, operator skill level/quantity)	10	3	4	2.4	4	2.4	Disc filter is equipped with internal washing system and long-lasting media. Routine maintenance on motor, pumps and valves are required for both alternatives.
		Site Requirements (plant footprint)	20	6	3	3.6	4	4.8	The footprint of disc filter is slightly larger than high-rate clarifier.
Environmental	30%	Climate Change Impacts / Greenhouse Gas Generation	10	3	4	2.4	2	1.2	High-rate clarifier consumes more energy, which would have the larger impact on climate change factors. Disc filter has less energy consumption requirements.
		Natural Environment Vegetation and Flora Impacts	10	3	4	2.4	4	2.4	Both alternatives would have similar natural environment vegetation and flora impacts.
		Natural Environment Woodland Impacts	15	4.5	4	3.6	4	3.6	Both alternatives would have similar natural environment woodland impacts.
		Natural Environment Wildlife Impacts	15	4.5	4	3.6	4	3.6	Both alternatives would have similar natural environment wildlife impacts.
		Natural Environment Fisheries and Aquatic Impacts	15	4.5	4	3.6	4	3.6	Both alternatives would have similar natural environment fisheries and aquatic impacts.
		Natural Environment Species at Risk Impacts	15	4.5	4	3.6	4	3.6	Both alternatives would have similar natural environment species at risk impacts.
		Archaeological Impacts	10	3	5	3	5	3	The study area is considered clear of archaeological concern.
		Stormwater Impacts	10	3	5	3	5	3	Both alternatives are designed based on peak flows.
Economic	25%	Capital Cost	30	7.5	4	6	3	4.5	Refer to NPV spreadsheets.
		Operation and Maintenance Costs	40	10	4	8	3	6	Refer to NPV spreadsheets.
		Net Present Value	30	7.5	4	6	3	4.5	Refer to NPV spreadsheets.
		TOTAL SCORE		100		81.8		75.6	

Appendix K

On-site Sludge Stabilization Technology Alternatives Evaluation Matrix

Hanover WWTP Class EA
Alternative Design Concepts for Sludge Treatment
Ainley Project: 122059

EVALUATION MATRIX FOR SHORT LISTED ON-SITE SLUDGE STABILIZATION TREATMENT ALTERNATIVES

PRIMARY CRITERIA		SECONDARY CRITERIA		ABSOLUTE WEIGHT (WT)	SHORT LISTED ALTERNATIVES				COMMENTS
					Alternative 1 Anaerobic Digestion		Alternative 2 Aerobic Digestion		
CRITERIA	WEIGHT	CRITERIA	WEIGHT		SCORE	WT SCORE	SCORE	WT SCORE	
Social/Culture	15%	Aesthetic Impacts (plant appearance)	10	1.5	4	1.2	3	0.9	The aerobic system has higher aesthetic impact because of larger above ground facilities needed.
		Traffic (during construction and operation)	30	4.5	3	2.7	3	2.7	The traffic required is similar for both alternatives.
		Noise Impacts (during operation)	20	3	3	1.8	3	1.8	Anaerobic has slightly smaller footprint than aerobic digestion and likely lower noise emissions.
		Odour Impacts (during operation)	40	6	3	3.6	3	3.6	Similar odour impacts.
Technical	30%	Ability for Beneficial Reuse	25	7.5	4	6	3	4.5	Anaerobic digeste sludge is more benefiial because of the its higher organic matter content and ability to improve soil structure and fertility over time
		Technology/Process Robustness	25	7.5	4	6	4	6	Similar tranditional sludge treatment technologies.
		Ease of Expansion and Phasing to Buildout	10	3	4	2.4	4	2.4	The aerobic digestion process would be easier to expand since it has less equipment.
		Energy Requirements	10	3	4	2.4	3	1.8	The anaerobic digestion process requires slightly less energy than the aerobic process due to smaller tanks required.
		Operation & Maintenance Requirements (simplicity, operator skill level/quantity)	10	3	4	2.4	3	1.8	The existing site is implementing anaerobic digestion. Therefore, anaerobic digestion would be more familiar by the operators.
		Site Requirements (plant footprint)	20	6	4	4.8	3	3.6	The aerobic process requires more land.
Environmental	30%	Climate Change Impacts / Greenhouse Gas Generation	10	3	4	2.4	4	2.4	Aerobic produces less biogas compare to anaerobic digestion, which means less impact on climate change.
		Natural Environment Vegetation and Flora Impacts	10	3	4	2.4	4	2.4	Both alternatives would have similar natural environment vegetation and flora impacts.
		Natural Environment Woodland Impacts	15	4.5	4	3.6	4	3.6	Both alternatives would have similar natural environment woodland impacts.
		Natural Environment Wildlife Impacts	15	4.5	4	3.6	4	3.6	Both alternatives would have similar natural environment wildlife impacts.
		Natural Environment Fisheries and Aquatic Impacts	15	4.5	4	3.6	4	3.6	Both alternatives would have similar natural environment fisheries and aquatic impacts.
		Natural Environment Species at Risk Impacts	15	4.5	4	3.6	4	3.6	Both alternatives would have similar natural environment species at risk impacts.
		Archaeological Impacts	10	3	5	3	5	3	The study area is considered clear of archaeological concern.
		Waste Generation	10	3	3	1.8	3	1.8	Waste generation would be similar for the two systems.
Economic	25%	Capital Cost	30	7.5	4	6	3	4.5	Refer to NPV spreadsheets.
		Operation and Maintenance Costs	40	10	4	8	3	6	Refer to NPV spreadsheets.
		Net Present Value	30	7.5	4	6	3	4.5	Refer to NPV spreadsheets.
			TOTAL SCORE	100		77.3		68.1	

Appendix J
Consultation Records

List of Content

1. Notice of Study Commencement
2. Notice of PIC#1
3. PIC#1 Display Boards
4. Notice of PIC#2
5. PIC#2 Display Boards
6. Notice of Completion
7. Consultation Records with Agencies
8. Consultation Records with First Nations
9. Summary of Comments Received

Notice of Study Commencement

Town of Hanover
Class Environmental Assessment
Wastewater Treatment Plant Upgrades
Notice of Study Commencement

The Study

The Town of Hanover (Hanover) Wastewater Treatment Plant (HWWTP), located at 718 7th Avenue, was originally constructed in 1934 and since then has undergone major expansions in 1964 and 1981 and serves a population of 7,967 people. A Municipal Servicing Needs Assessment was completed in 2021 which identified that 80%-85% capacity of HWWTP has been reached, triggering the initiation of the Class Environmental Assessment (EA) process to plan for the management of wastewater flows in the Town as development proceeds. The assessment reviewed 474 hectares of net developable land area beyond the current municipal boundary that has the potential to be developed. Upgrades of the HWWTP are needed to service the potential growth beyond the current municipal boundary. A Leachate Management Review for Hanover/Walkerton Landfill Site was also completed in 2021 to address the long-term implementation and operation issues. The preferred solution is to construct a leachate pumping station and forcemain to connect to HWWTP, which will increase the wastewater flow received by HWWTP.



This Class EA study will evaluate various design alternatives and advanced treatment technologies to effectively treat the future wastewater flows from Hanover and Hanover/Walkerton Landfill Site. Through the EA process a preferred alternative will be selected to increase the capacity to accommodate existing flows, allow for existing non-serviced areas to be serviced and allow future growth of Hanover over the next 30 years. This Notice initiates the beginning of the Class EA process.

The Process

Hanover has retained Ainley Group to complete and document a Schedule C Class EA in accordance with the Municipal Class Environmental Assessment Document, October 2000, as amended in 2015.

How to Get Involved

Public consultation is a key component of the Class EA process. Additional information will be made available through Public Information Centres (PIC's), newspaper advertisements, and notices posted to the Town's website, at key stages of the EA process. Advance notice will be provided to allow all interested parties an opportunity to comment. If you would like to be placed on the mailing list to receive all future notices relating to this Class EA, please send your contact information to either of the following members of the study team:

Ron Cooper,
Director of Public Works
Town of Hanover
341 10th Street
Hanover, ON N4N 1P5
Tel. (519)364-2780 x1229
rcooper@hanover.ca

Jatin Singh, P.Eng., PMP.
Senior Project Manager
Ainley Group
195 County Court Boulevard
Brampton, ON L6W 3W8
Tel. (647) 975-3885
jatin.singh@ainleygroup.com

Any input received during this process will be maintained on file for use during the project and may be included in project documentation. Information collected will be used in accordance with the Freedom of Information and Protection of Privacy Act. With the exception of personal information, all comments will become part of the public record.

This notice was issued on October 6, 2022.

Hanover police seeking public assistance

On Sept. 28 at approximately 11:20 p.m., the Hanover Police Service attempted to stop a dark-coloured racing style motorcycle on 10th Street in Hanover after it was observed by an officer driving aggressively and "popping wheelies."

Police initiated a traffic stop, however, the motorcyclist failed to stop and accelerated away at a high rate of speed eastbound on Grey County Road 4 into the Municipality of West Grey. A police pursuit was not initiated for public safety reasons.

Within minutes, police were called to the scene of a fail to remain collision involving this same motorcycle just east of Hanover on County Road 4.

Police determined the driver lost control because of excessive speed and slid a few hundred metres on the paved portion of the roadway before coming to rest.

The male driver, who indicated to a witness that he was not injured, was able to restart the motorcycle after several attempts and took off immediately after the crash, again at a high rate of speed, back towards Hanover.

Police investigators have seized several parts from the motorcycle at the scene, along with a single running shoe that belonged to the driver.

The Hanover Police Service is requesting the public's assistance in identifying this male driver who may have injuries consistent with sliding on pavement known as "road rash."

The motorcycle will have damage to the right side consistent with sliding and scraping on pavement.

Anyone with information that can help with this investigation is encouraged to contact the Hanover Police Service at 519-364-2411 or Crime Stoppers of Grey Bruce at 1-800-222-TIPS (8477) or by leaving a secure web tip at www.crimestoppersgb.ca.

OPP BRIEFS

Stolen vehicles

On Sept. 17 at 11:12 a.m., the South Bruce Ontario Provincial Police (OPP) received a theft report from a residence along Concession 4 in Carrick Township. Sometime between 6 p.m. on Sept. 16 and 10 a.m. on Sept. 17, a red GMC Sierra pickup truck was taken. The vehicle has no licence plates on it and the serial number is on file with police.

On Sept. 25 at 9:32 a.m., the South Bruce OPP received a theft report from a residence along Side Road 10 south in Brant Township. Sometime between 9 p.m. on Sept. 24 and 9 a.m. on Sept. 25, a beige Jeep Patriot was taken. The vehicle has no licence plates on it and the serial number is on file with police.

The South Bruce OPP is requesting anyone with information to call 1-888-310-1122. Should you wish to remain anonymous, call Crime Stoppers at 1-800-222-8477 (TIPS) or submit a secure web tip at www.cstip.ca, where you may be eligible to receive a cash reward of up to $2,000.

Hanover
Ontario, Canada

TOWN OF HANOVER
CLASS ENVIRONMENTAL ASSESSMENT
WASTEWATER TREATMENT PLANT UPGRADES
NOTICE OF STUDY COMMENCEMENT

The Study
The Town of Hanover (Hanover) Wastewater Treatment Plant (HWWTP), located at 718 7th Avenue, was originally constructed in 1934 and since then has undergone major expansions in 1964 and 1981 and serves a population of 7,967 people. A Municipal Servicing Needs Assessment was completed in 2021 which identified that 80%-85% capacity of HWWTP has been reached, triggering the initiation of the Class Environmental Assessment (EA) process to plan for the management of wastewater flows in the Town as development proceeds. The assessment reviewed 474 hectares of net developable land area beyond the current municipal boundary that has the potential to be developed.
Upgrades of the HWWTP are needed to service the potential growth beyond the current municipal boundary. A Leachate Management Review for Hanover/Walkerton Landfill Site was also completed in 2021 to address the long-term implementation and operation issues. The preferred solution is to construct a leachate pumping station and forcemain to connect to HWWTP, which will increase the wastewater flow received by HWWTP.

This Class EA study will evaluate various design alternatives and advanced treatment technologies to effectively treat the future wastewater flows from Hanover and Hanover/Walkerton Landfill Site. Through the EA process a preferred alternative will be selected to increase the capacity to accommodate existing flows, allow for existing non-serviced areas to be serviced and allow future growth of Hanover over the next 30 years. This Notice initiates the beginning of the Class EA process.



The Process
Hanover has retained Ainley Group to complete and document a Schedule C Class EA in accordance with the Municipal Class Environmental Assessment Document, October 2000, as amended in 2015.

How to Get Involved
Public consultation is a key component of the Class EA process. Additional information will be made available through Public Information Centres (PIC's), newspaper advertisements, and notices posted to the Town's website, at key stages of the EA process. Advance notice will be provided to allow all interested parties an opportunity to comment. If you would like to be placed on the mailing list to receive all future notices relating to this Class EA, please send your contact information to either of the following members of the study team:

Ron Cooper,
Director of Public Works
Town of Hanover
341 10th Street
Hanover, ON N4N 1P5
Tel: (519)364-2780 x1229
Email: rcooper@hanover.ca

Jatin Singh, P.Eng., PMP.
Senior Project Manager
Ainley Group
195 County Court Boulevard
Brampton, ON L6W 3W8
Tel: (647) 975-3885
Email: jatin.singh@ainleygroup.com

Any input received during this process will be maintained on file for use during the project and may be included in project documentation. Information collected will be used in accordance with the Freedom of Information and Protection of Privacy Act. With the exception of personal information, all comments will become part of the public record.

This notice was issued on October 6, 2022.

Criminal Code regarding the alcohol and possessing a weapon. The man was later released with an upcoming court date in Walkerton. His driver's licence was suspended for 90 days and the vehicle was impounded.

Bail violations

On Sept. 14, Hanover police received information that a 52-year-old Orangeville man had been breaching the terms of his release. The man was facing numerous Criminal Code offences in the local area and was bound by strict bail conditions. One condition of that bail was that the man was to report to a bail supervision program. The man failed to complete this obligation. On Sept. 15, the man was located by Hanover police and arrested without incident. He was charged with failure to comply and held in custody pending a bail hearing in Walkerton.

Break and enter

Hanover police continue to investigate a commercial break and enter that occurred in the 700 block of 10th Street. The entry occurred during the overnight hours of Sept. 14. Hanover police are asking members of the public to contact them should they observe any suspicious persons in and around residential/commercial properties day or night. If anyone has information about this occurrence they are asked to contact the Hanover Police Service or Crime Stoppers at 1-800-222-TIPS (8477) or by submitting a secure web tip.

Hanover
Ontario, Canada

TOWN OF HANOVER
CLASS ENVIRONMENTAL ASSESSMENT
WASTEWATER TREATMENT PLANT UPGRADES
NOTICE OF STUDY COMMENCEMENT

The Study

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Upgrades of the HWWTP are needed to service the potential growth beyond the current municipal boundary. A Leachate Management Review for Hanover/Walkerton Landfill Site was also completed in 2021 to address the long-term implementation and operation issues. The preferred solution is to construct a leachate pumping station and forcemain to connect to HWWTP, which will increase the wastewater flow received by HWWTP.



This Class EA study will evaluate various design alternatives and advanced treatment technologies to effectively treat the future wastewater flows from Hanover and Hanover/Walkerton Landfill Site. Through the EA process a preferred alternative will be selected to increase the capacity to accommodate existing flows, allow for existing non-serviced areas to be serviced and allow future growth of Hanover over the next 30 years. This Notice initiates the beginning of the Class EA process.

The Process

Hanover has retained Ainley Group to complete and document a Schedule C Class EA in accordance with the Municipal Class Environmental Assessment Document, October 2000, as amended in 2015.

How to Get Involved

Public consultation is a key component of the Class EA process. Additional information will be made available through Public Information Centres (PIC's), newspaper advertisements, and notices posted to the Town's website, at key stages of the EA process. Advance notice will be provided to allow all interested parties an opportunity to comment. If you would like to be placed on the mailing list to receive all future notices relating to this Class EA, please send your contact information to either of the following members of the study team:

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This notice was issued on October 6, 2022.

Notice of PIC#1

Town of Hanover
Schedule 'C' Class Environmental Assessment
Wastewater Treatment Plant Upgrades
Notice of Public Information Centre #1

Project Background

In 2021, a Municipal Servicing Needs Assessment was completed, which identified that the Hanover Wastewater Treatment Plant (HWWTP) has reached 80%-85% capacity. This triggered the initiation of the Schedule 'C' Municipal Class Environmental Assessment (Class EA) project to plan for the management of wastewater flows in the Town as development proceeds. Upgrades or expansions of the HWWTP are needed to ensure sufficient wastewater treatment capacity for existing residents and businesses in urban areas. Additionally, it is necessary to accommodate future growth, including the developable land area beyond the municipal boundary. This Class EA will determine the preferred design alternative to increase the treatment capacity of the HWWTP.



Public Information Centre

Public consultation is a key component of this study and will assist in ensuring that members of the community and stakeholders have an opportunity to learn about the Class EA and provide input and feedback.

The purpose of the Public Information Centre #1 (PIC#1) is for the community to review the study background, existing conditions, problems and opportunities, preliminary alternative solutions, and next steps in the study.

A virtual pre-recorded PIC presentation will be available to view as of Thursday, May 2nd, 2024 at https://www.hanover.ca/wastewater-treatment-plant-upgrades-class-ea. Print copy of the PIC material can be reviewed in-person at the Town's office during regular business hours. Comments relating to the PIC#1 will be incorporated into the final report.

How to Get Involved

Public input is encouraged throughout this process and will be given consideration during the planning and design of this project. Comments on the information presented will be received until Friday, June 7th, 2024 and may also be submitted in advance. To submit comments or obtain additional information, please contact either of the study team members listed below.

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Director of Public Works
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341 10th Street
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This notice was issued on May 2nd, 2024.

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** Short Term Savings rate – Limited time **

Rates are as of April 26th, 2024 and are subject to change

Public Notices

Hanover
Ontario, Canada

Town of Hanover
Schedule 'C' Class Environmental Assessment
Wastewater Treatment Plant Upgrades
Notice of Public Information Centre #1



Project Background In 2021, a Municipal Servicing Needs Assessment was completed, which identified that the Hanover Wastewater Treatment Plant (HWWTP) has reached 80%-85% capacity. This triggered the initiationof the Schedule 'C' Municipal Class Environmental Assessment (Class EA) project to plan for the management of wastewater flows in the Town as development proceeds. Upgrades or expansions of the HWWTP are needed to ensure sufficient wastewater treatment capacity for existing residents and businesses in urban areas. Additionally, it is necessary to accommodate future growth. This Class EA will determine the preferred design alternative to increase the treatment capacity of the HWWTP.

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This notice was issued on May 2nd, 2024.

CLASSIFINDS!

PIC#1 Display Boards

WELCOME

Public Information Centre #1

Town of Hanover

Hanover Wastewater Treatment Plant Upgrades

Hanover
Ontario, Canada

Schedule C Class Environmental Assessment

Ainley GROUP CONSULTING ENGINEERS PLANNERS

Class Environmental Assessment (EA) Process

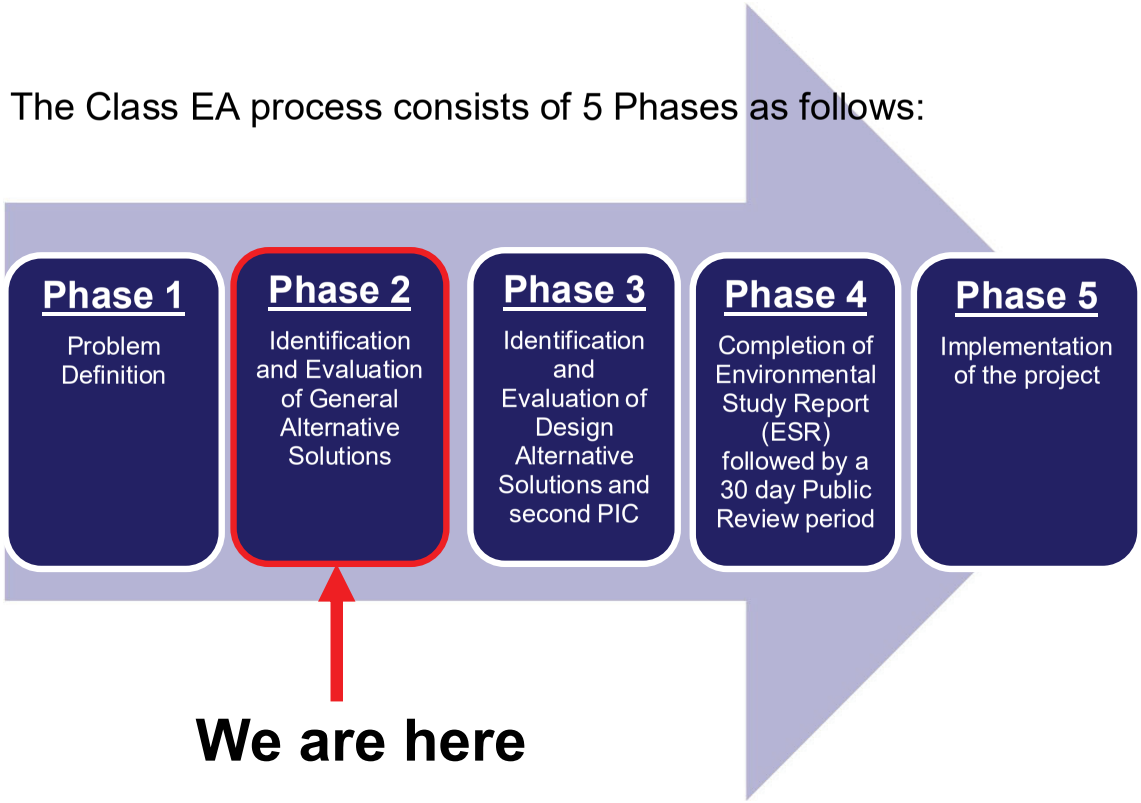
Key Principles of Class EA

- Consultation with affected parties early and throughout the process.
- Consideration of a reasonable range of alternatives.
- Consideration of effects on all aspects of the environment.
- Systematic evaluation of alternatives.
- Documentation & traceability.

Purpose of this Public Information Centre

- Review and update the problem statement (Phase 1) and evaluation of General Alternative Solutions (Phase 2);
- Confirm and present the preferred General Alternative Solution.

The Class EA process consists of 5 Phases as follows:



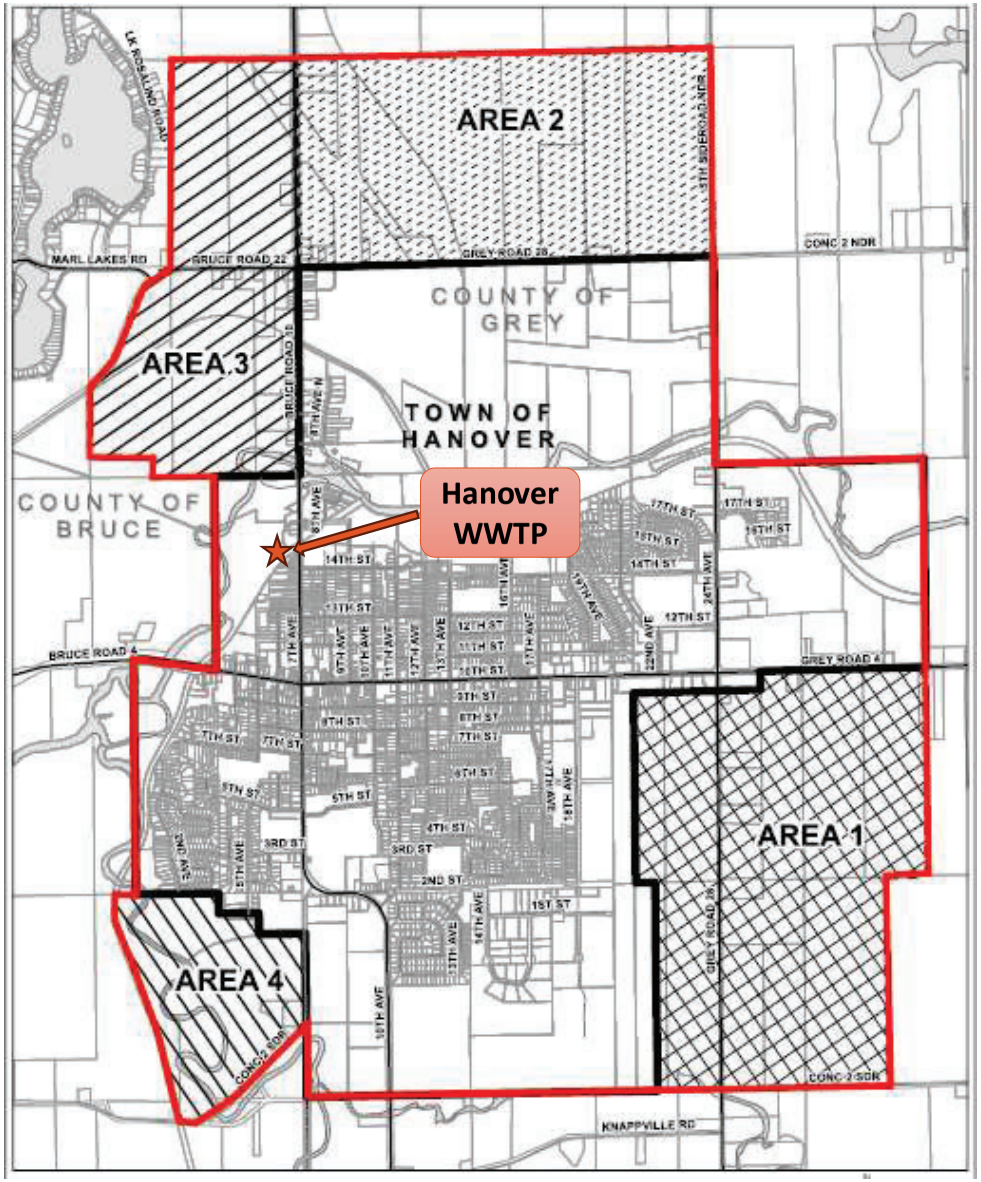
Problem/Opportunity Statement

Based on updated evaluation of the existing WWTP performance, condition and capacity, as well as existing and future wastewater flows from the service area, the Problem/Opportunity Statement is updated to include that:

- The historical Average Daily Flow (ADF) in the recent 6 years (2017-2022) has reached nearly 85% of plant's current rated capacity, resulting insufficient capacity to service future growth within the Town.
- The rate of development in Town of Hanover has accelerated and wastewater treatment capacity is essential to facilitating growth of the community.
- Additionally, there exists high Inflow and Infiltration (I&I) contribution to the plant.
- An additional wastewater treatment ADF capacity of 7,429m^3/d is needed to accommodate the projected 2052 growth.

Study Area

- The Study Area includes:
  - The current Town of Hanover urban area,
  - Two areas (area 1 and 2) in Grey County,
  - Two areas (area 3 and 4) in Bruce County.



Existing HWWTP Process Layout

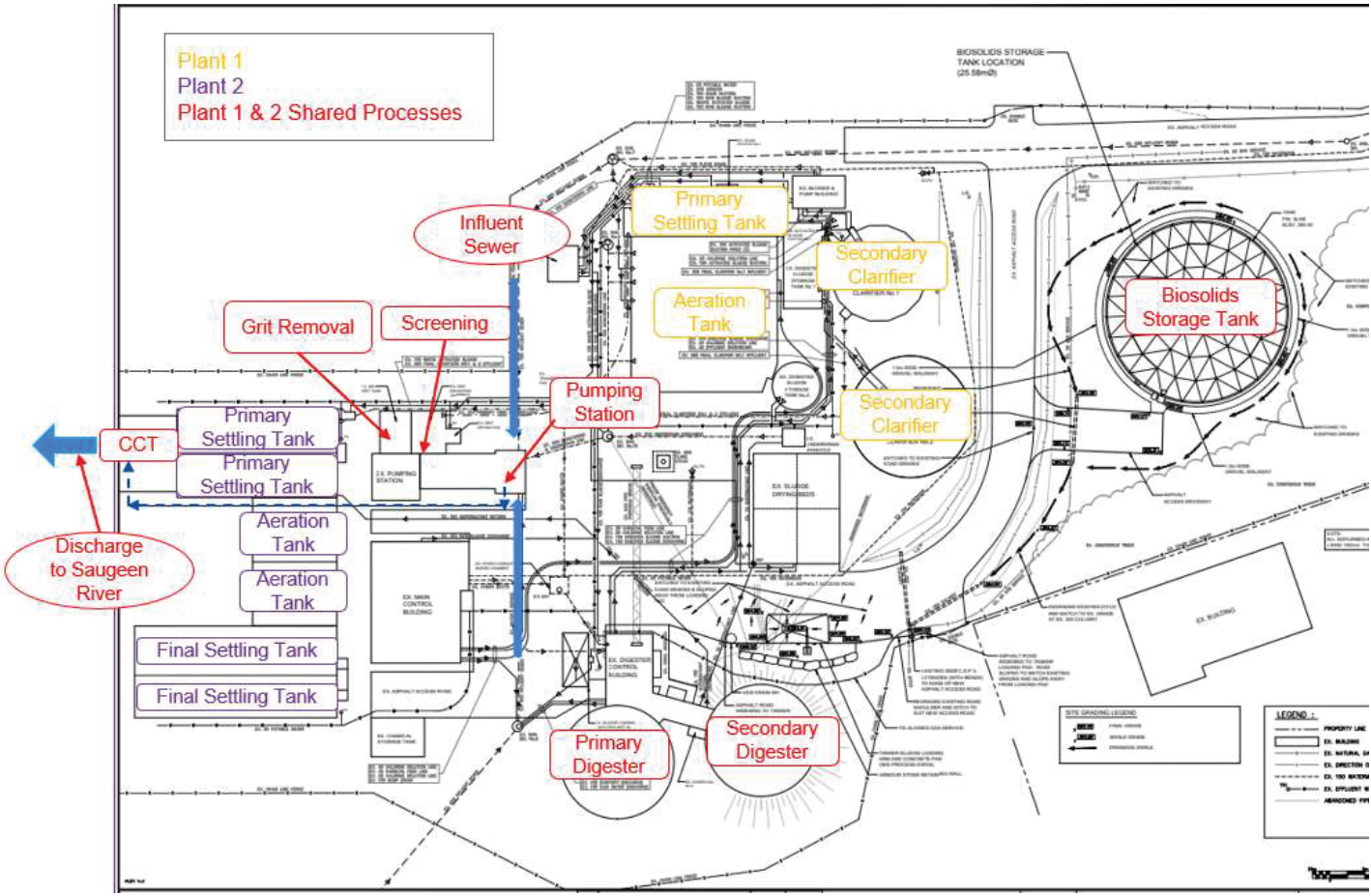
Existing Treatment Process Description

The collected sewage within the Town of Hanover is transferred to the HWWTP via two influent sewers (1 from north & 1 from south). The HWWTP was originally built in 1934, and has undergone 2 major expansions in 1960's and 1980's.

The following major systems are used in the plant:

- Screening – Mechanical screen and manual screen
- Aerated Grit Removal
- Primary Sedimentation
- Aeration – Coarse bubble aeration in Plant 1; mechanical aeration in Plant 2
- Secondary Sedimentation – Sludge collector mechanism
- Chlorine Contact Tank
- Solids Digestion – Anaerobic Digester
- Biosolids Storage and Disposal – Liquid Biosolids Storage Tank

Treated effluent is discharged to Saugeen River through an outfall after Chlorination.



Existing HWWTP Treatment Processes

Treatment Process		Basis of Design	Capacity (m^3/d)	
			Plant 1	Plant 2
Preliminary Treatment	Sewage Pumping Station	Peak Instantaneous Flow	19,613	
	Screening	Peak Instantaneous Flow	9,072	
	Grit Removal	Peak Hourly Flow	19,608	
	Primary Clarifiers	Peak Daily Flow	9,800	9,800
Secondary Treatment	Aeration	Average Daily BOD_5 Loading	866 m^3	884 m^3
	Secondary Clarifiers	Peak Hourly Flow	3,816	9,816
Disinfection	Chlorine Contact Tank	Peak Hourly Flow	19,608	
Sludge Management	Anaerobic Digesters	Maximum Monthly Mass Loading and Flow Rate	1,327 m^3	
	Biosolids Storage (incl. secondary digester)	Maximum Monthly Mass Loading and Flow Rate	6,679 m^3	

- The HWWTP operated under an Environmental Compliance Approval (ECA) issued by the Ministry of Environment, Conservation and Parks (MECP) that outlines strict requirements that the plant must meet.
- The HWWTP's rated Average Day Flow (ADF) capacity stated in ECA is 6,360 m^3/d.

Existing HWWTP Wastewater Flows

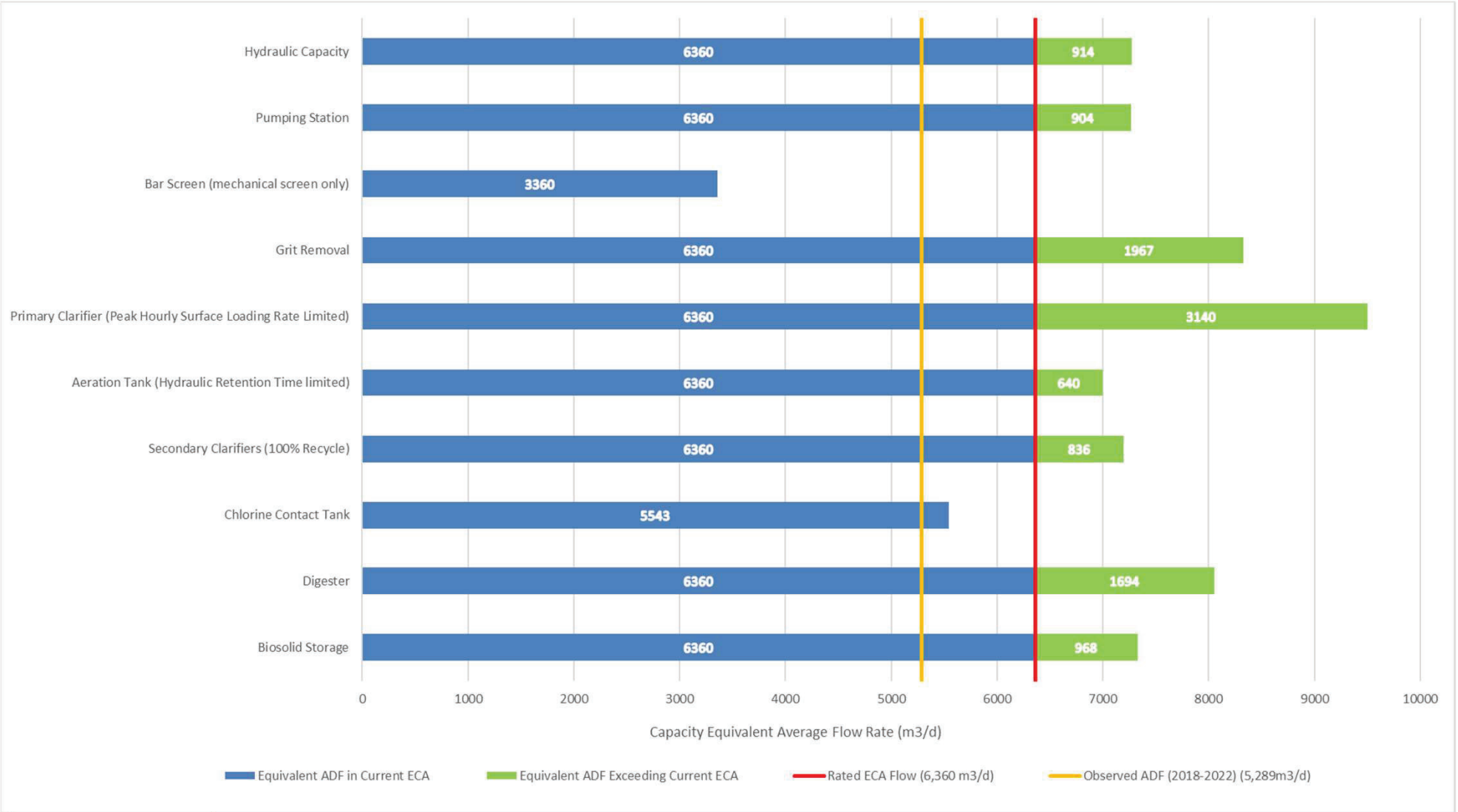
As part of this Class Environmental Assessment, historical wastewater flow assessment and future flow projection was conducted for the Hanover Wastewater Treatment Plant (HWWTP).

- ADF to the HWWTP is relatively constant.
- The historical ADF in the recent 6 years was 5,374.7 m^3/d, representing nearly 85% of plant's ECA Rated ADF capacity.
- The Town of Hanover has engaged in efforts to reduce inflow and infiltration (I&I).

Year	Average Day Flow (m^3/d)	Peak Day Flow (m^3/d)
2017	5,802.7	10,578.0
2018	5,619.0	17,541.0
2019	5,296.6	11,375.0
2020	5,055.6	11,962.0
2021	5,185.9	13,963.0
2022	5,288.7	10,294.0
Average	**5,374.7**	**12,618.8**

Plant Capacity Assessment

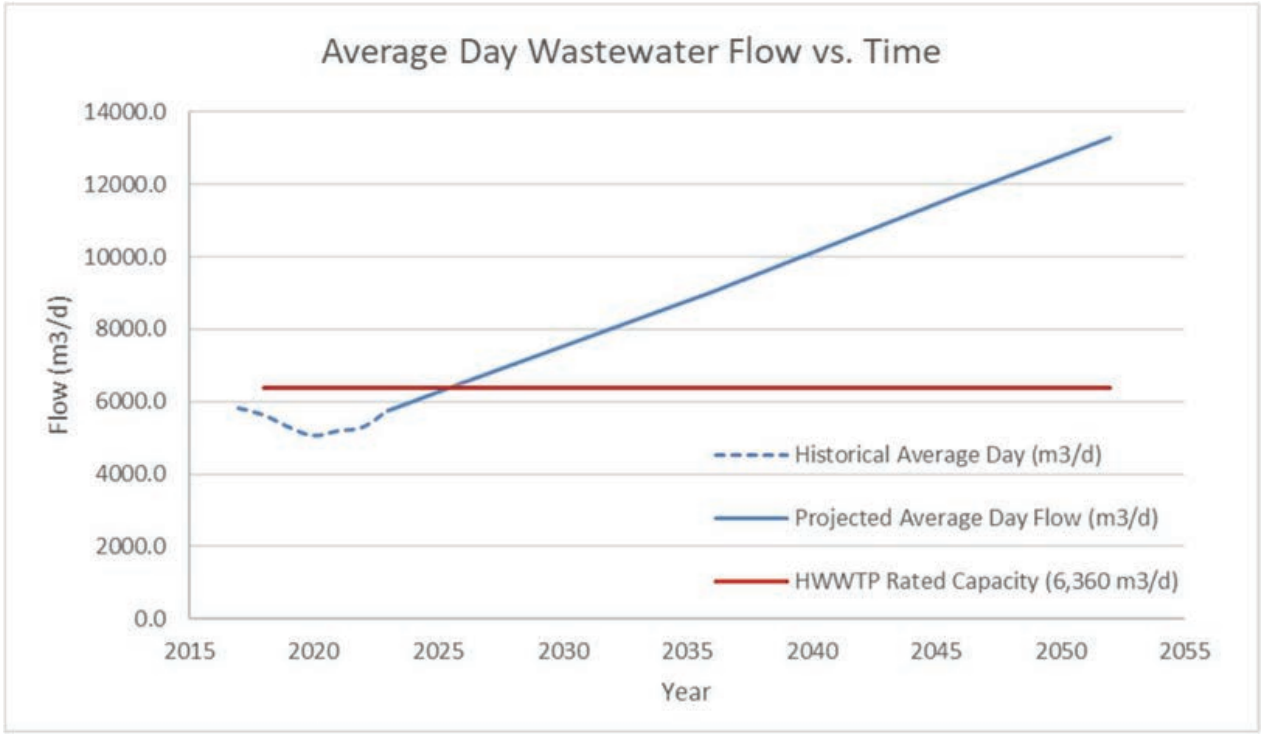
The unit process capacity was assessed to have a better understanding of the maximum treatment capacity within the existing processes.



Population and Flow Projections

As part of this Class Environmental Assessment, future population and flow projections were conducted for the Hanover Wastewater Treatment Plant (HWWTP).

- Development has been projected to proceed at a pace of 137 persons and 59 new jobs each year based on Official Plan Amendment #11. This leads to a total population growth of 4,242 and 1,824 new jobs by the year 2052.
- The 30-year projected growth (until 2052) will require a total treatment capacity (ADF) of 13,789 m^3/d.



Existing ECA Effluent Criteria

- ECA Effluent Concentration **Objectives & Limits**

Effluent Parameter	Averaging Calculator	Concentration Objectives (mg/L)	Concentration Limits (mg/L)
$CBOD_5$	Monthly Average Effluent Concentration	15.0	25.0
Total Suspended Solids	Monthly Average Effluent Concentration	15.0	25.0
Total Phosphorus	Monthly Average Effluent Concentration	0.8	1
E.coli	Monthly Geometric Mean Density	150 CFU/100 mL (May 15 – Sep 15)	200 CFU/100 mL (May 15 – Sep 15)
pH	Single Sample Result	6.5 – 8.5 inclusive	6.0 – 9.0 inclusive

- ECA Effluent Loading **Limits**

Effluent Parameter	Averaging Calculator	Loading Limits (kg/d)
$CBOD_5$	Monthly Average Daily Effluent Loading	159.0
Total Suspended Solids	Monthly Average Daily Effluent Loading	159.0
Total Phosphorus	Monthly Average Daily Effluent Loading	6.4



Effluent Concentration vs. ECA Requirements

Parameter	Max Month*	ECA Objective	ECA Limit
CBOD5 (mg/L)	**6.2**	15.0	25.0
TSS (mg/L)	**10.2**	15.0	25.0
TP (mg/L)	**0.4**	0.8	1.0
E.coli (CFU/100mL)	**60.6**	150	200
pH	**8.2**	6.5 – 8.0	6.0 – 9.5

*Average of maximum concentration in each year

- The historical (2018-2022) average effluent concentrations have been tested, with 86% below the $CBOD^5$ limits, 78% below the TSS limits, 77% below the TP limits, and 86% below the E.coli limits.
- pH is within the ECA limit range.

Long-Listed General Alternatives 1-4

Alternatives	Ability of Alternative to Address Problem/Opportunity Statement	Carried Forward?
Alternative 1 – Do Nothing	No changes from the existing conditions. Inconsistent with the Grey County and the Town of Hanover Official Plans. This alternative will not solve the problem, as it does not facilitate development. As such this is not a viable solution to address the problem/opportunity statement.	✖
Alternative 2 – Limit the Growth	Contrary to the provisions outlined in the Official Plans of Grey County and the Town of Hanover, this approach lacks compatibility with the Town's development needs. As such this is not a viable solution to address the problem/opportunity statement.	✖
Alternative 3 – I&I Reduction	The outcome of I&I reduction aimed at decreasing the overall wastewater flow to the HWWTP is uncertain. The impact may not be substantial enough to significantly decrease the overall flow. Additionally, the process is time-consuming and might not effectively address the treatment requirements in the near future. However, this alternative could be deemed a partial contribution to reducing the wastewater flow. As such this alternative is not a complete solution to address the problem/opportunity statement, however could be implemented in conjunction with the preferred alternative.	✖
Alternative 4 – Optimize Plant Operation	Implement measures to optimize and enhance the performance of the current unit processes within the HWWTP with the objective of expanding its capacity to treat larger volumes of wastewater flow. This alternative is not a complete solution to address the problem/opportunity statement, however could be implemented in conjunction with the preferred alternative.	✖



Long-Listed General Alternatives 5-9

Alternatives	Ability of Alternative to Address Problem/Opportunity Statement	Carried Forward?
Alternative 5 – Rebuild the HWWTP	Demolish the existing plant and construct a new WWTP at the same location. Wastewater treatment during the demolition process cannot be guaranteed to satisfy the treatment needs. As such this is not a viable solution to address the problem/opportunity statement.	✗
Alternative 6 – Expand and Upgrade the Existing WWTP	Expansion of the plant on the existing site will require additional land area. The availability of the land within the existing site footprint is constrained by floodplain and the Saugeen river, but expansion is feasible. As such this alternative provides a viable solution to address the problem/opportunity statement.	✓
Alternative 7 – Direct Future Wastewater Flows to Another Nearby WWTP	The feasibility of this alternative relies on the presence of a nearby WWTP capable of accommodating the wastewater flow from the Town of Hanover. Implementing this approach would require the transportation of wastewater over a considerable distance, and would require a willing recipient. This alternative presents significant challenges in terms of practical implementation. As such this is not a viable solution to address the problem/opportunity statement.	✗
Alternative 8 – Build a New WWTP at a Different Location	The certainty of acquiring suitable land for a new WWTP is not guaranteed. In addition, there are challenges and inefficiencies related to the diversion of existing sewers between two treatment locations and/or fully redirecting the existing collection system to a new location, however greenfield development is less costly than building within a constrained site. As such this alternative provides a viable solution to address the problem/opportunity statement.	✓
Alternative 9 – De-centralized WWTP	This alternative would involve the construction of an additional, or several additional WWTP to service new development. Current development plans do not account for on site wastewater treatment. This solution would require buy-in from all new developers and would likely deter development. In addition, long term operation of several wastewater treatment facilities would be onerous and costly. As such this is not a viable solution to address the problem/opportunity statement.	✗

Evaluation of Alternative Solutions

EVALUATION CRITERIA	ALT 6	ALT 8
Complexity	◕	◔
Compatibility with Current Policies and Regulations	◕	◔
Impacts to Property Owners	◕	◑
Impacts to Adjacent Business/Commercial Properties	◑	◑
Capital Costs	◕	◔
Addresses the Problem and Opportunity Statement	●	◕
Total Score	**19**	**12**

Note: A higher score indicates a more preferable option.

○ - Negative Impact
◔ - Some Negative Impact
◑ - Neutral
◕ - Some Positive Impact
● - Positive Impact

Alternative 6 – Expand and Upgrade the Existing WWTP is our preferred solution.

Conceptual Expansion Area of Preliminary Preferred Alternative

- The conceptual expansion area is situated on the southern side of the plant.
- This area is regulated by the Saugeen River Conservation Authority (SVCA). SVCA confirms that it is within the floodplain, and a portion of the area will be designated as a wetland.



Studies

As part of the Schedule C Class EA, several studies are anticipated be required in order to comply with Municipal Class Environmental Assessment process:

- **Assimilative Capacity Study (ACS):** A receiving water assessment to determine effluent criteria for point-source dischargers.
- **Archaeological Assessment:** Evaluate archaeological potential.
- **Cultural Heritage Assessment:** Evaluate the potential for built heritage resources and cultural heritage landscapes.
- **Natural Heritage Assessment / Environmental Inventory Study (EIS):** A desktop-level environmental screening and a baseline natural features assessment.
- **Floodplain Study:** Determine the current extent of flooding on the site.

Proposed Schedule for Completion of Class EA

- Comments on the PIC#1 material will be received by the Town's Project Team until June 7th, 2024.
- Upon completion of developing alternative design concepts for preferred solution, there will be a PIC#2.
- Following the review of all comments and issuance of the responses, where necessary, the Environment Study Report (ESR) will be prepared to document the Class EA process and will be made available for a mandatory 30-Day public review period.
- A Notice of Study Completion will be issued that will identify the final Preferred Solution along with initiating the start of the mandatory 30-Day public review period. Online links to the ESR document will be made available for simplification of access to the study materials.
- At the conclusion of the 30-Day public review period and assuming there are no Requests for a Section 16 Order, the Class EA process is considered complete and the project can then move forward to detailed design and construction.

Your Comment are Important to us

- Following this presentation we invite you to submit any comments by completing the Comment Sheet. Comment Sheets may be provided to either of the following members of the Project Team by June 7th, 2024:

Ron Cooper
Director of Public Works
Town of Hanover
341 10th Street
Hanover, ON N4N 1P5
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Notice of PIC#2

Town of Hanover
Schedule 'C' Class Environmental Assessment
Wastewater Treatment Plant Upgrades
Notice of Public Information Centre #2

Project Background
The Town of Hanover is undertaking a Municipal Class Environmental Assessment (Class EA) to identify the preferred design alternative for wastewater servicing of existing urban residents and businesses, as well as to accommodate future growth. A Municipal Servicing Needs Assessment completed in 2021 identified that the Hanover Wastewater Treatment Plant (HWWTP) had reached 80%–85% of its capacity.

Process
This Class EA is following the planning and design process for Schedule 'C' projects as described in the Municipal Class Environmental Assessment Document (October 2000 as amended in 2007, 2011, 2015 & 2023), published by the Municipal Engineers Association.

Public Information Centre

Public consultation is a key component of this study and will assist in ensuring that members of the community and stakeholders have an opportunity to learn about the Class EA and provide input and feedback.

The purpose of the Public Information Centre #2 (PIC#2) is for the community to learn about and give comment on a number of technical studies that have been completed. The focus of the studies include: archaeological and cultural heritage assessment, population and wastewater flow projection, existing plant condition, treatment technology alternative evaluation, and a preliminary cost analysis.

A virtual pre-recorded PIC presentation will be available to view as of Thursday, April 24th, 2025 at https://www.hanover.ca/wastewater-treatment-plant-upgrades-class-ea. Print copy of the PIC material can be reviewed in-person at the Town's office during regular business hours. Comments relating to the PIC#2 will be incorporated into the final report.

How to Get Involved
Public input is encouraged throughout this process and will be given consideration during the planning and design of this project. Comments on the information presented will be received until Thursday, May 8th, 2025 and may also be submitted in advance. To submit comments or obtain additional information, please contact either of the study team members listed below.

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This notice was issued on April 3rd, 2025.

Classifieds

To place an ad: | **Email** classifieds@postmedia.com | **Phone** 1-877-750-3054

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Public Notices

Hanover

Town of Hanover
Schedule 'C' Class Environmental Assessment
Wastewater Treatment Plant Upgrades
Notice of Public Information Centre #2

Project Background
The Town of Hanover is undertaking a Municipal Class Environmental Assessment (Class EA) to identify the preferred design alternative for wastewater servicing of existing urban residents and businesses, as well as to accommodate future growth. A Municipal Servicing Needs Assessment completed in 2021 identified that the Hanover Wastewater Treatment Plant (HWWTP) had reached 80%–85% of its capacity.

Process
This Class EA is following the planning and design process for Schedule 'C' projects as described in the Municipal Class Environmental Assessment Document (October 2000 as amended in 2007, 2011, 2015 & 2023), published by the Municipal Engineers Association.

Public Information Centre
Public consultation is a key component of this study and will assist in ensuring that members of the community and stakeholders have an opportunity to learn about the Class EA and provide input and feedback.

The purpose of the Public Information Centre #2 (PIC#2) is for the community to learn about and give comment on a number of technical studies that have been completed. The focus of the studies include: archaeological and cultural heritage assessment, population and wastewater flow projection, existing plant condition, treatment technology alternative evaluation, and a preliminary cost analysis.

A virtual pre-recorded PIC presentation will be available to view as of Thursday, April 24th, 2025 at https://www.hanover.ca/wastewater-treatment-plant-upgrades-class-ea. Print copy of the PIC material can be reviewed in-person at the Town's office during regular business hours. Comments relating to the PIC#2 will be incorporated into the final report.

How to Get Involved
Public input is encouraged throughout this process and will be given consideration during the planning and design of this project. Comments on the information presented will be received until Thursday, May 8th, 2025 and may also be submitted in advance. To submit comments or obtain additional information, please contact either of the study team members listed below.

Ron Cooper,
Director of Public Works
Town of Hanover
341 10th Street
Hanover, ON N4N 1P5
Tel. (519) 364-2780 x1229
rcooper@hanover.ca

Jatin Singh, P.Eng., PMP
Senior Project Manager
Ainley Group
6299 Airport Rd #205
Mississauga, ON L4V 1N3
Tel. (647) 975-3885
jatin.singh@ainleygroup.com

Any input received during this process will be maintained on file for use during the project and may be included in project documentation. Information collected will be used in accordance with the Freedom of Information and Protection of Privacy Act. With the exception of personal information, all comments will become part of the public record.

This notice was issued on April 3rd, 2025.

PIC#2 Display Boards

WELCOME

Public Information Centre #2

Town of Hanover

Wastewater Treatment Plant Upgrades

Hanover
Ontario, Canada

Schedule C Class Environmental Assessment

Ainley GROUP CONSULTING ENGINEERS PLANNERS

Class Environmental Assessment (EA) Process

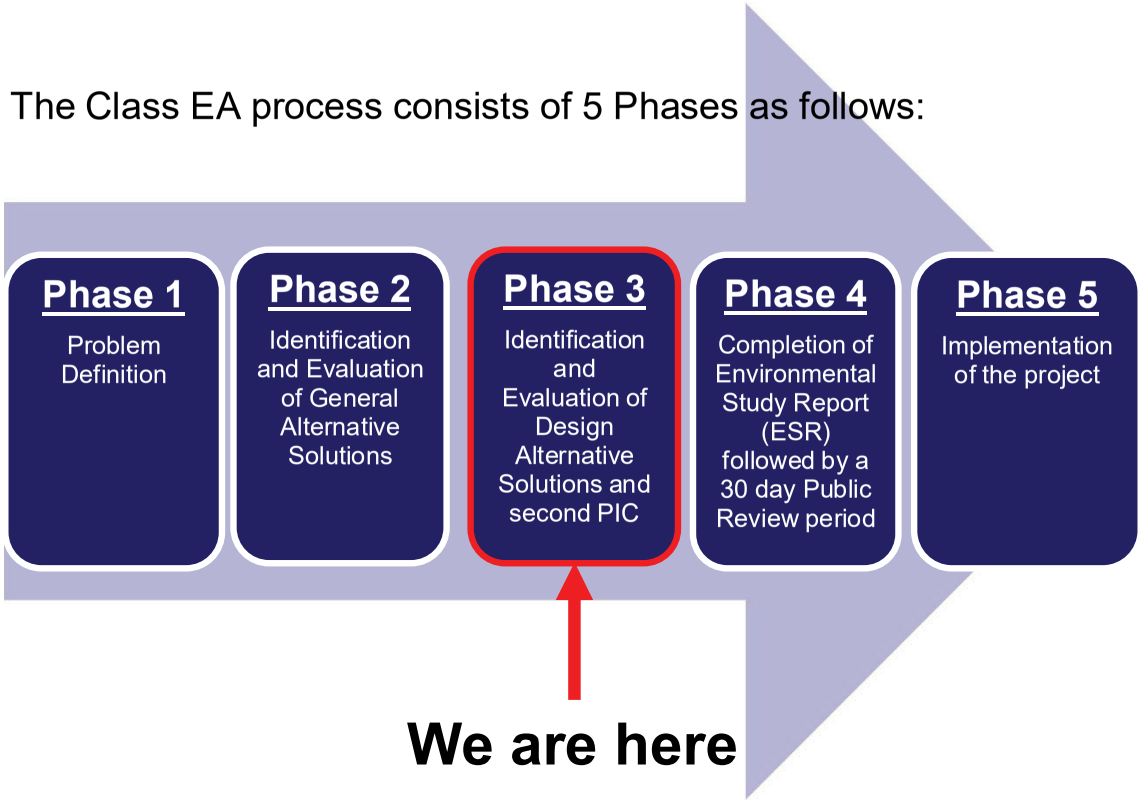
Key Principles of Class EA

- Consultation with affected parties early and throughout the process.
- Consideration of a reasonable range of alternatives.
- Consideration of effects on all aspects of the environment.
- Systematic evaluation of alternatives.
- Documentation & traceability.

Purpose of this Public Information Centre (PIC)

- Identification and evaluation of Design Alternative Solutions (Phase 3);
- Confirm and present the preferred Design Alternative Solution.

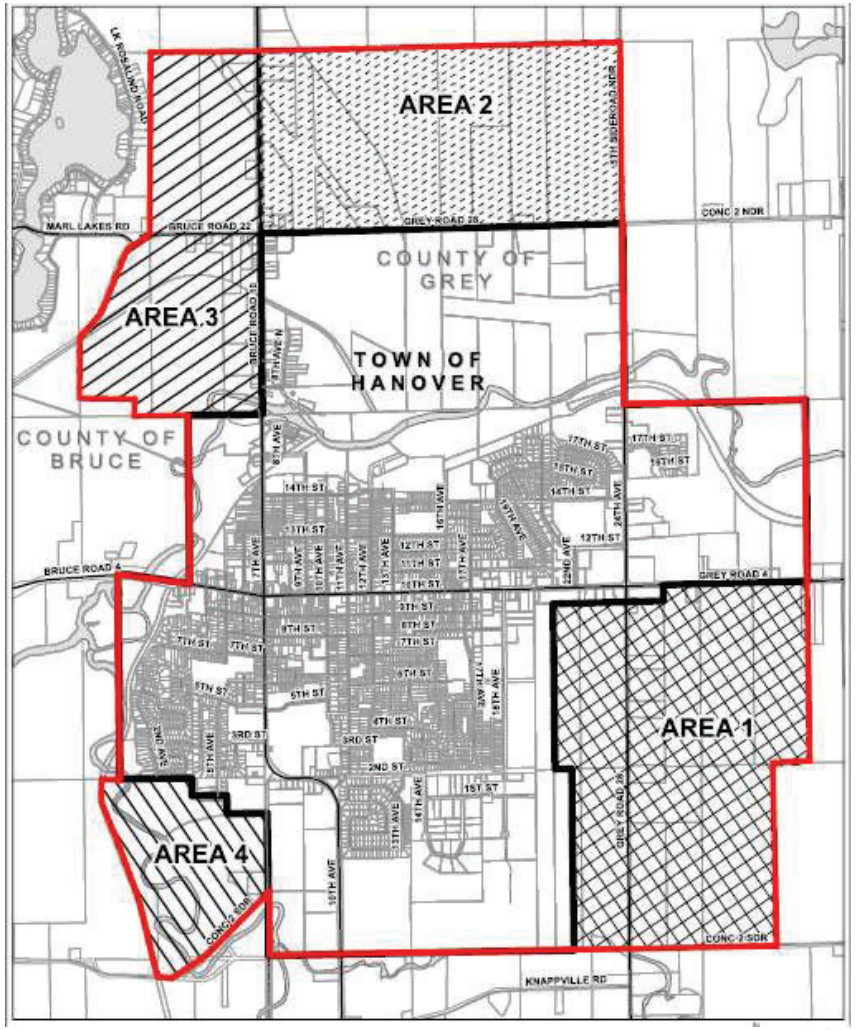
The Class EA process consists of 5 Phases as follows:



Review of PIC#1 and Study Area

In 2024, the Town has completed the PIC#1 to identify the Problem/Opportunity Statement and evaluate General Alternative Solutions.

- The historical Average Daily Flow (ADF) has reached nearly 85% of plant's current rated capacity, resulting insufficient capacity to service future growth within the Town.
- A projected wastewater treatment ADF capacity of 13,789m^3/d is needed to accommodate the projected 2052 growth.
- The Study Area includes:
  - The current Town of Hanover urban area,
  - Two areas (area 1 and 2) in Grey County,
  - Two areas (area 3 and 4) in Bruce County.



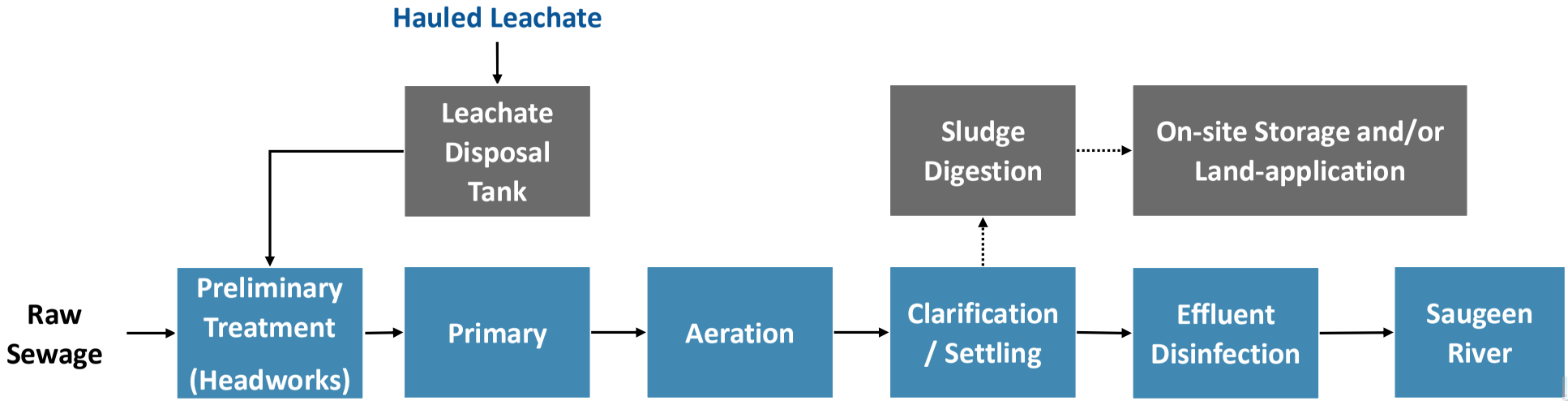
Preferred General Alternative in PIC#1

- In PIC#1, the general alternative of "Expand and Upgrade the Existing WWTP" is the preferred solution
- The proposed expansion area is situated on the southern side of the plant.

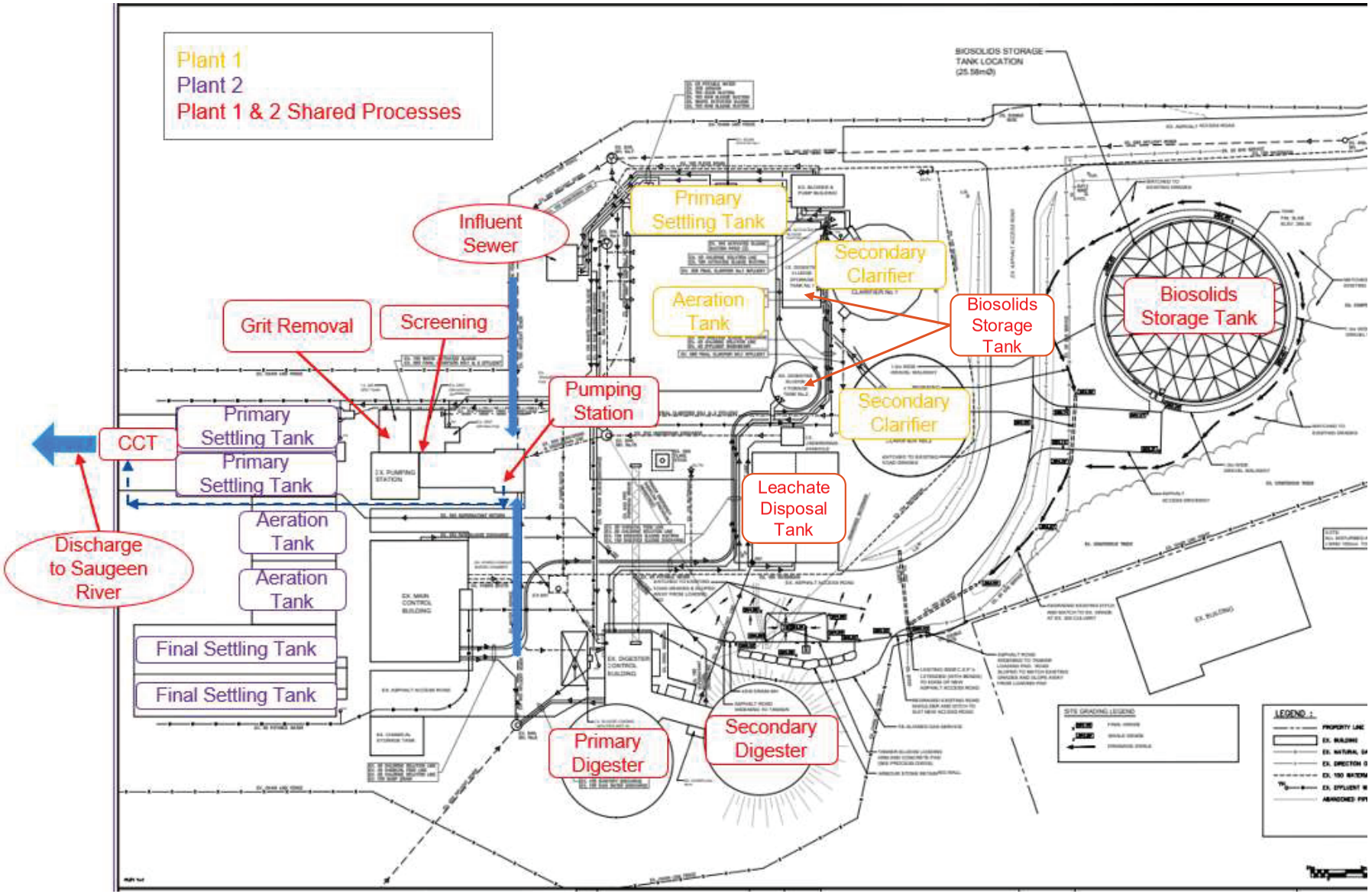


Existing Hanover Wastewater Treatment Plant (HWWTP)

Process	Brief Description and Treatment Steps
Preliminary and Primary	Remove screenings, grit and settleable solids.
Aeration	Provide oxygen to bacteria for treating and stabilizing the wastewater.
Clarification / Settling	Remove solids from aeration step.
Sludge Digestion	Stabilise waste organic solids.
Effluent Disinfection	Remove harmful pathogens from effluent.



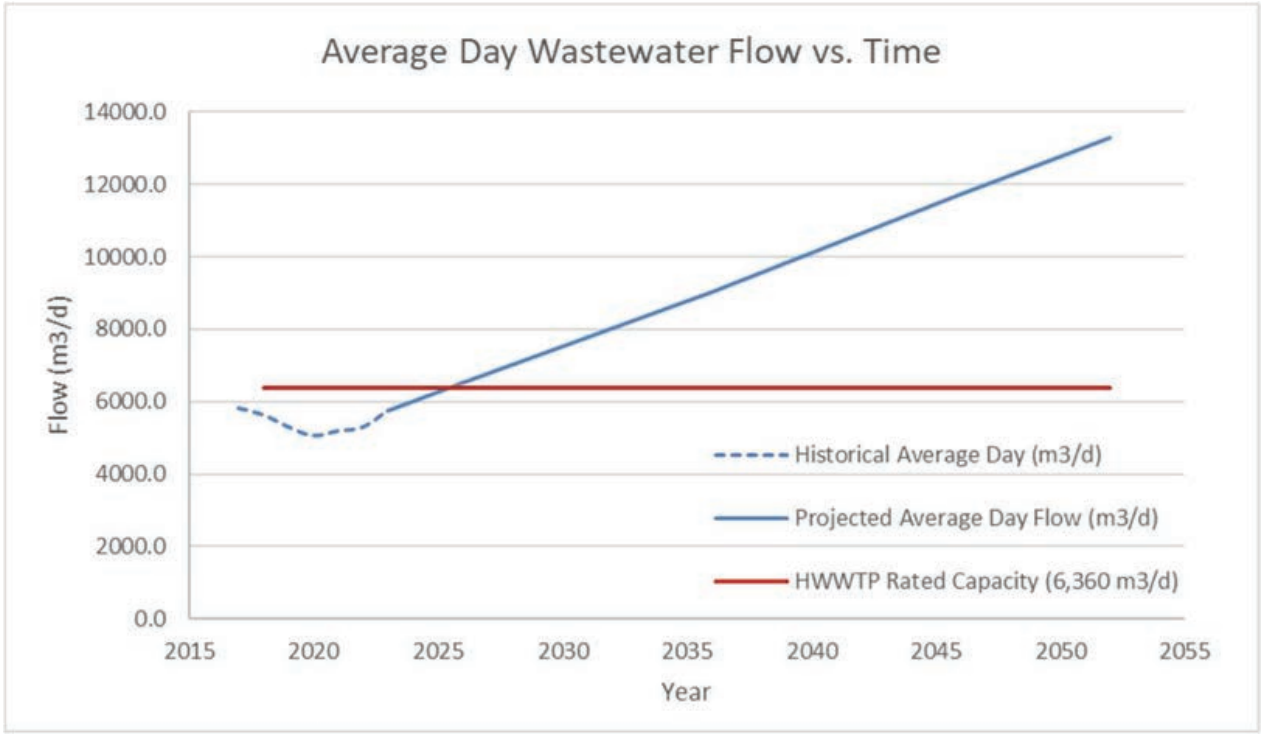
Existing Hanover Wastewater Treatment Plant (HWWTP)



Population and Flow Projections

As part of this Class Environmental Assessment, future population and flow projections were conducted for the Hanover Wastewater Treatment Plant (HWWTP).

- Development has been projected to proceed at a pace of 137 persons and 59 new jobs each year based on Official Plan Amendment #11. This leads to a total population growth of 4,242 and 1,824 new jobs by the year 2052.
- The 30-year projected growth (until 2052) will require a total treatment capacity (ADF) of 13,789 m^3/d.



Upgrade and Expansion Plan

The existing plant cannot accommodate the 2052 flow projections, and its current rated capacity will soon be reached. Therefore, it is recommended that planning for additional HWWTP capacity begin immediately after the Class EA identifies the preferred design solutions.

To reduce construction and maintenance costs while meeting treatment requirements, the upgrade and expansion plan will be carried out in three phases.

- Phase 1: Conduct plant-wide Stress Test to confirm plant can handle 7,000 m^3/d with both Plant 1 and Plant 2 operational. This phase is already underway.
- Phase 2: Construct a new facility to increase the treatment capacity to 10,500 m^3/d with Plant 1 decommissioned.
  - Plant 2 Capacity of 3,500 m^3/d
  - New Plant Capacity of 7,000 m^3/d
- Phase 3: Expand the new plant to bring the treatment capacity to 13,789 m^3/d.

Background Studies and Reports Completed

Background studies were undertaken during this Class EA to support the evaluation of alternative design solutions, identify potential impacts and mitigation measures, and to support the evaluation process.

The studies and the summary of their findings include:

- **Assimilative Capacity Study (ACS):** A receiving water assessment was conducted in consultation with MECP to determine effluent criteria for point-source dischargers with stricter effluent objectives and compliance limits proposed for the upgraded and expanded plant.
- **Archaeological Assessment:** The results of the Stage 1 and Stage 2 Archaeological Assessment indicate that the study area is considered clear of further archaeological concern.
- **Cultural Heritage Assessment:** Construction activities and staging should be suitably planned and undertaken to avoid impacts to identified Built Heritage Resources (B.H.R.s) and Cultural Heritage Landscapes (C.H.L.s).
- **Natural Heritage Assessment / Environmental Inventory Study (EIS):** The report documents existing ecological conditions, evaluates potential impacts of four WWTP secondary treatment alternatives, and outlines mitigation measures and permitting requirements to support the Town of Hanover's proposed plant expansion.
- **Floodplain Study:** Based on the findings of this study, the proposed expansion area is located within the floodplain extent; however, it can be filled without negatively impacting floodplain depths or extents.

Wastewater Treatment Processes

An overview of the processes within a modern wastewater treatment plant are identified below:

Process	Brief Description and Treatment Focus
Preliminary / Primary Treatment	Removal of screenings and grit and removal of settleable solids by gravity
Secondary Treatment	Oxidize organics and ammonia and partly remove nitrogen and phosphorus
Tertiary Treatment	Further removal of phosphorus and suspended solids to meet the effluent criteria
Disinfection	Inactivation of pathogenic organisms
Biosolids Management	Process to thicken, stabilize and dewater the liquid sludge for reuse
Aeration of Treated Effluent	Process to elevate the dissolved oxygen levels in the treated effluent

Screening criteria for identifying appropriate treatment technologies for expansion and upgrades:

- Regulatory Compliance: Ability to meet current and anticipated future regulations;
- Proven Reliability: Demonstrated track record of consistently meeting or exceeding treatment objectives;
- Ease of Expansion: Ability of the system to easily expand to meet the Hanover WWTP full build-out capacity, and feasibility of the system footprint to fit into the available site;
- Operation and Maintenance: The simplicity of operation and maintenance and level of staffing required;
- Cost: Have benefits/value in-line with the anticipated capital costs and operation and maintenance costs.

Detailed Evaluation of Treatment Technologies

Rating	Social/Cultural	Technical	Natural	Economic
Most Preferred (4-5)	Low Impact	High Technical Merit	Low Impact	Low Cost
Moderately to Highly Preferred (3-4)	Low to Moderate Impact	Moderate to High Technical Merit	Low to Moderate Impact	Low to Moderate Cost
Moderately Preferred (2-3)	Moderate Impact	Moderate Technical Merit	Moderate Impact	Moderate Cost
Less Preferred (1-2)	Moderate to High Impact	Low to Moderate Technical Merit	Moderate to High Impact	Moderate to High Cost
Least Preferred (0-1)	High Impact	Low Technical Merit	High Impact	High Cost

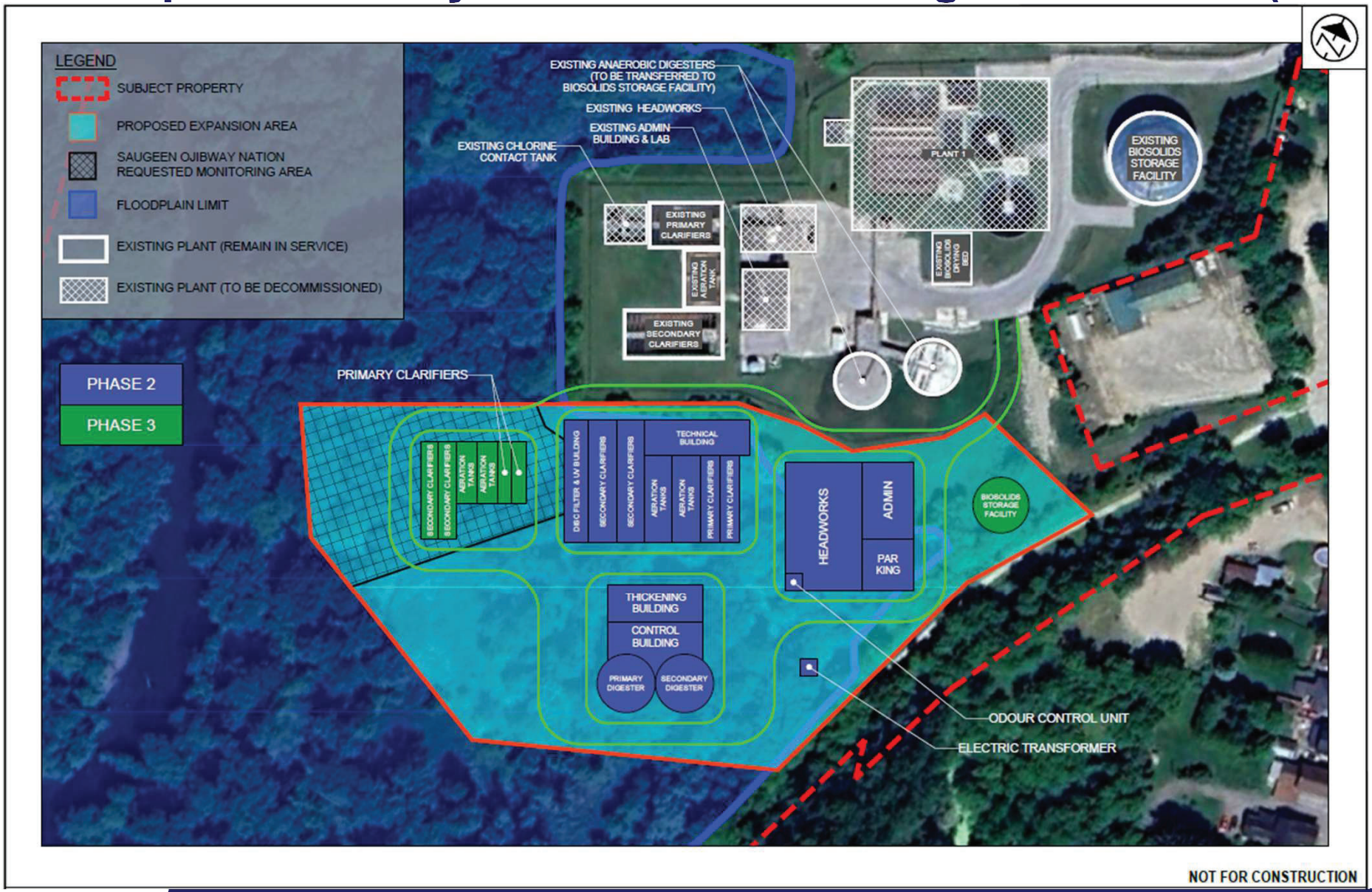
- Each of the treatment technologies were evaluated based on their potential impacts on the environment (Social/Cultural, Technical, Natural, and Economic), with “Low Impact” as the most preferable result and “High Impact” as the least preferable result.
- The scoring system used and implemented for detailed evaluation is defined below. The treatment technology with lower environmental impacts will be scored higher in the evaluation.
- The technology with higher overall scoring in each of the wastewater treatment processes will be selected as the preferred potential design solutions.

Summary of Detailed Evaluation

Treatment Process		Treatment Technologies	Results
Liquid Treatment	Preliminary Treatment	Headworks: Facility where wastewater enters a wastewater treatment plant, may consist of bar racks or bar screens, shredders or grinders and a pumping station.	✓ Preferred
	Secondary Treatment	Conventional Activated Sludge (CAS): Consists of preliminary treatment, primary treatment, aeration, and secondary clarification.	✓ Preferred
		Aerobic Granular Sludge Reactor (AGS): Use aerobic granular biomass for biological nutrient removal.	× Not Preferred
		Membrane Bioreactor (MABR): Use fixed-membrane biological treatment with gas transfer through specially designed membranes.	× Not Preferred
		Moving Bed Biofilm Reactor (MBBR): Use specialized plastic media to facilitate the biofilm process.	× Not Preferred
	Tertiary Treatment	Disc Filter: Remove suspended solids by passing wastewater through disc filter media.	✓ Preferred
		High-rate Clarifier: Remove suspended solids from wastewater by sedimentation at high water linear velocity.	× Not Preferred
	Disinfection	UV Radiation: Use high-intensity ultra-violet lamps to inactivate pathogens.	✓ Preferred
Solids Treatment	On-site Sludge Stabilization	Mesophilic Anaerobic Digestion: Treats organic waste in an oxygen-free environment at moderate temperatures.	✓ Preferred
		Aerobic Digestion: Degrade the organic sludge solids in the presence of oxygen.	× Not Preferred

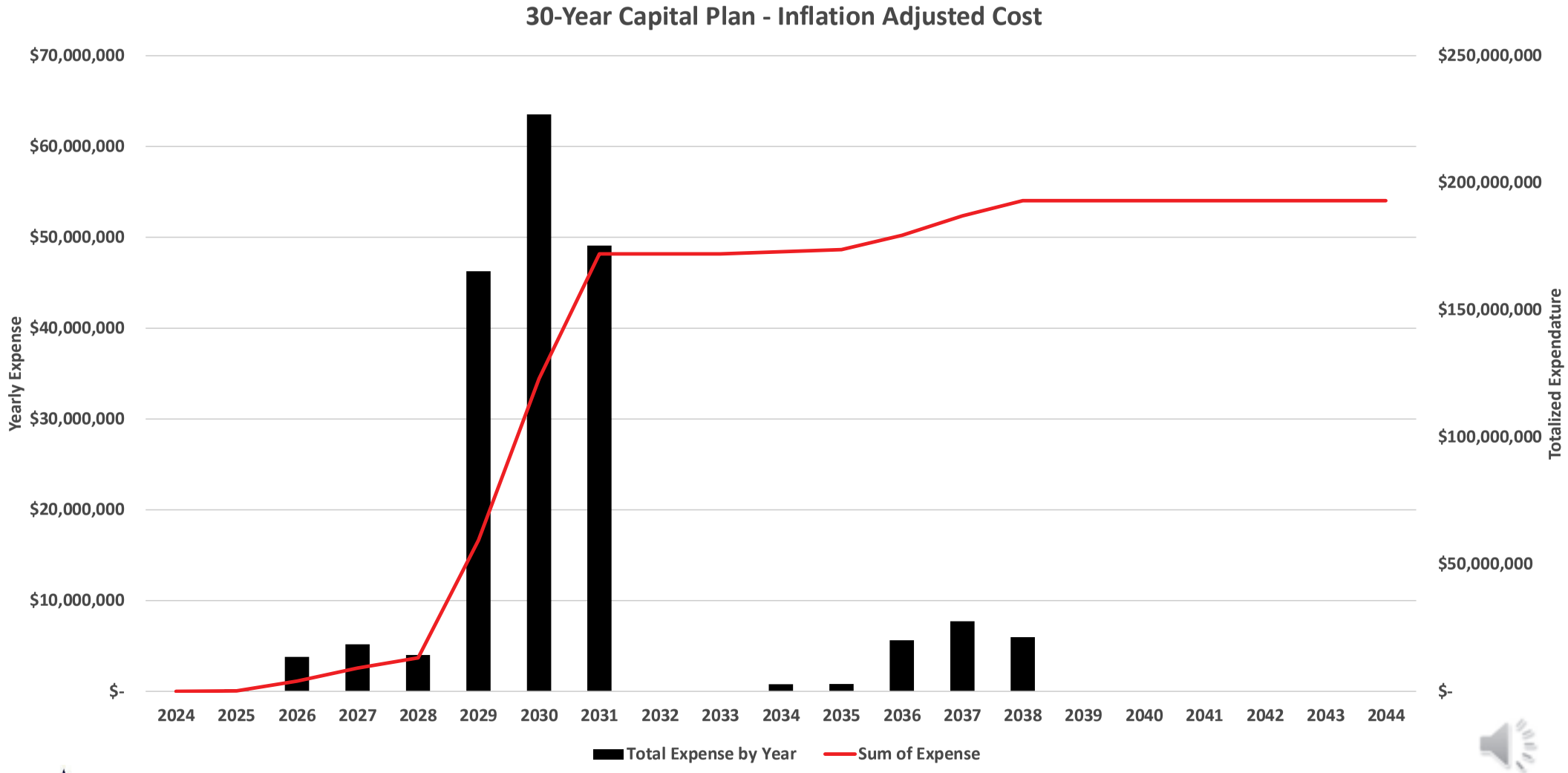


Conceptual Site Layout – Preferred Design Alternative (CAS)



Capital Plan – Inflation Adjusted Cost

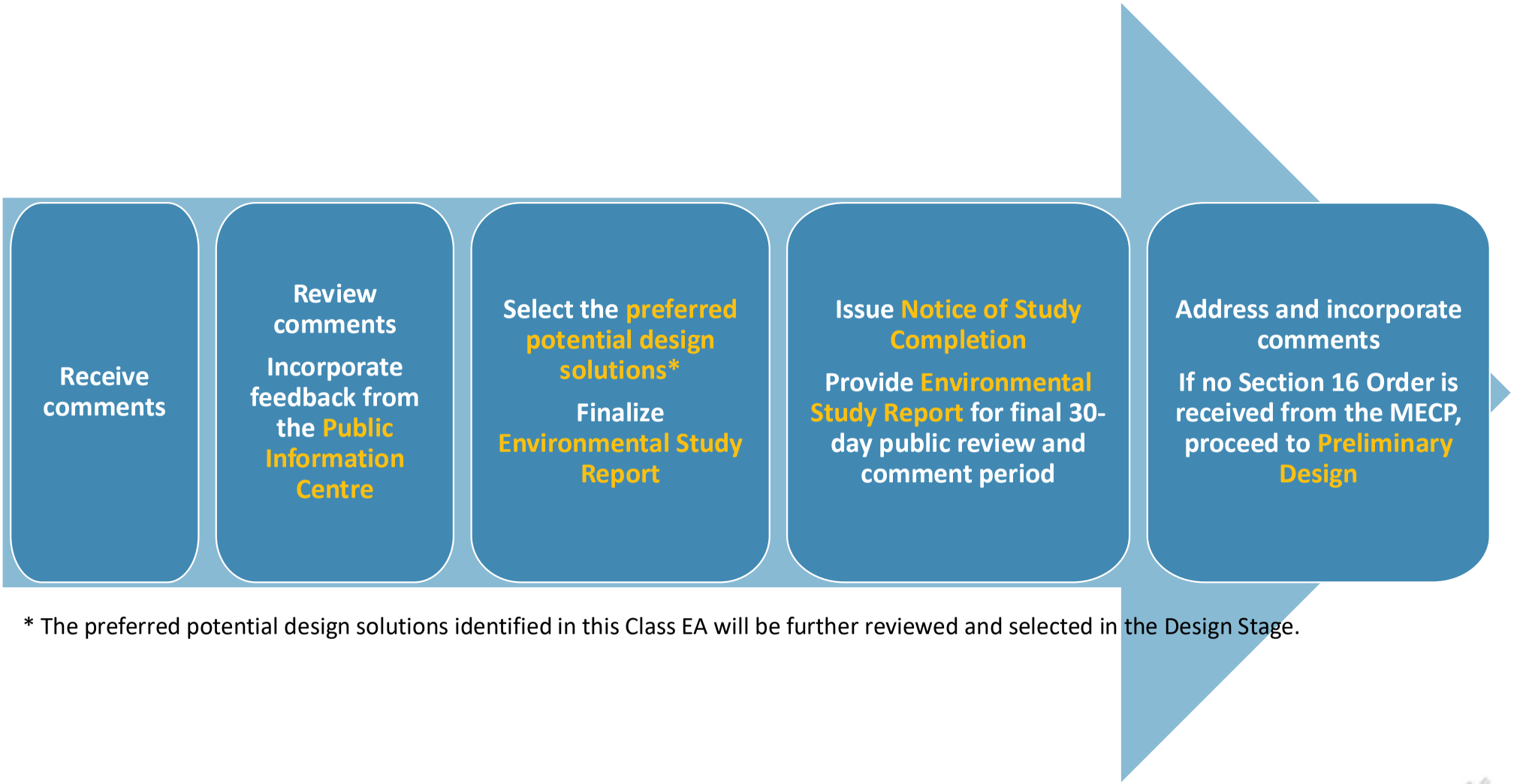
Phase 1 Duration	Phase 2 Design	Phase 2 Construction		Phase 3 Design	Phase 3 Construction	
2024-2025	2026-2028	2029-2031		2034-2035	2036-2038	



Mitigation Measures and Monitoring Program

Category	Mitigation Measures	Monitoring Program
Social/Cultural Environment	• Traffic Management Plan: Develop and implement a Traffic Management Plan to minimize disruption caused by construction vehicles; • Aesthetic Impacts Mitigation: Establish a visual barrier between the Hanover Community Trail and proposed works with berm and/or tree stand.	• Traffic Monitoring: Monitor traffic flow, congestion and incidents near the construction site to ensure effective implementation of the Traffic Management Plan.
Technical Environment	• Odour and Air Emission Control: Evaluate and implement best management practices for the mitigation of odour and air emissions; • Noise Control: House the noise sources in noise-attenuating structure to shield the environment and residents from the noise.	• Community Feedback: Assess noise levels, dust complaints, and overall community sentiment during construction and operation.
Natural Environment	• Environmental Management Plan: Complete an Environmental Management Plan to identify the impact to existing trees; • Aquatic Habitat Preservation: Implement exclusion and erosion control measures near water bodies; • Stormwater Management: Develop a Stormwater Management Plan and construct flood barrier for flood protection; • Climate Change Adaptation: Utilize rating system targeting at reducing energy usage and meeting climate change targets to improve energy efficiency and reduce GHG emissions.	• Water Quality Monitoring: Keep records of total phosphorus, nitrogen levels, suspended solids, and biochemical oxygen demand parameters; • Stormwater Monitoring: Constant monitoring during wet weather conditions;
Economic Environment	• Grants and Funding: Explore potential grants or funding opportunities to offset capital and operational costs.	• Cost Analysis: Track operational costs related to energy, chemical usage, and sludge management to assess budget compliance and identify potential savings.

Next Steps



* The preferred potential design solutions identified in this Class EA will be further reviewed and selected in the Design Stage.

Your Comment are Important to us

- Following this presentation, we invite you to submit any comments by completing the Comment Sheet. Comment Sheets may be provided to either of the following members of the Project Team by May 8th, 2025:

Ron Cooper
Director of Public Works
Town of Hanover
341 10th Street
Hanover, ON N4N 1P5
(519) 364-2780 ext. 1229
rcooper@hanover.ca

Jatin Singh, PMP, P. Eng.
Project Manager
Ainley Group
6299 Airport Rd.
Mississauga, ON L4V 1N3
(647) 975-3885
jatin.singh@ainleygroup.com



Notice of Completion

Town of Hanover
Schedule 'C' Class Environmental Assessment
Wastewater Treatment Plant Upgrades
Notice of Completion

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Process
This Class EA is following the planning and design process for Schedule 'C' projects as described in the Municipal Class Environmental Assessment Document (October 2000 as amended in 2007, 2011, 2015 & 2023), published by the Municipal Engineers Association.

Recommendation
The recommendation from this Class EA is to expand the existing wastewater treatment plant onto the land adjacent to the current facility using a phased approach. The proposed upgrades will include the construction of a new headworks building, primary treatment, secondary treatment, tertiary treatment, UV disinfection, anaerobic biosolids treatment, and additional biosolids storage.

The study process and recommendations are documented in the Environmental Study Report. The report will be available on the Town's website for a 30-day public review period beginning on November 27, 2025, at:
https://www.hanover.ca/wastewater-treatment-plant-upgrades-class-ea.

Feedback
Consultation is vital to the success of a Class EA Study and the Town wants to ensure that anyone interested has the opportunity to be involved and provide input. Interested persons may provide written comments to our project team by December 29, 2025. All comments and concerns should be sent directly to either one of the following contacts:

Andrew Wilken,
Director of Development & Infrastructure
Town of Hanover
341 10th Street
Hanover, ON N4N 1P5
Tel. (519) 364-2780 x1280
awilken@hanover.ca

Jatin Singh, P.Eng., PMP.
Senior Project Manager
Ainley Group
6299 Airport Rd #205
Mississauga, ON L4V 1N3
Tel. (647) 975-3885
jatin.singh@ainleygroup.com

In addition, a request may be made to the Ministry of the Environment, Conservation and Parks for an order requiring a higher level of study (that is, requiring and individual/comprehensive EA approval before being able to proceed), or that conditions be imposed (that is, requires further studies), only on the grounds that the requested order may prevent, mitigate, or remedy adverse impacts on constitutionally protected inherent and treaty rights of a First Nation or Indigenous community.

Requests on other grounds will not be considered. Requests should include the requester's contact information and full name.

Requests should specify what kind of order is being requested (request for additional conditions or a request for an additional/comprehensive EA) on the grounds specified previously, and any information in support of the statements in the request.
The request should be sent in writing or by email to both of the following contacts:

Minister of the Environment, Conservation and Parks
Ministry of the Environment, Conservation and Parks
77 Bay Street, 5th Floor
Toronto, ON, M7A 2J3
minister.mecp@ontario.ca

Director, Environmental Assessment Branch
Ministry of the Environment, Conservation and Parks
135 St. Clair Avenue West, 1st Floor
Toronto, ON, M4V 1P5
EABDirector@ontario.ca

Requests should be also sent to the project contacts listed above by mail or by email.

Please visit the ministry's website for more information on requests for orders under section 16 of the *Environmental Assessment Act* at:
https://www.ontario.ca/page/class-environmental-assessments-section-16-order

All personal information included in your request - such as name, address, telephone number, and property location - is collected, under the authority of section 30 of the Environmental Assessment Act and is collected and maintained for the purpose of creating a record that is available to the general public. As this information is collected for the purpose of a public record, the protection of personal information provided in the *Freedom of Information and Protection of Privacy Act* (FIPPA) does not apply (s.37). Personal information you submit may become part of a public record that is available to the general public unless you request that your personal information remain confidential.

This notice was issued on November 13, 2025.

Public Notices

Hanover

Town of Hanover
Schedule 'C' Class Environmental Assessment
Wastewater Treatment Plant Upgrades
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Director, Environmental Assessment Branch
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This notice was issued on November 13, 2025

CLASSIFINDS!

Classifieds

To place an ad: Email classifieds@postmedia.com | Phone 1-877-750-5651

Public Notices

West Grey Hanover

Notice of Joint Public Meeting
Municipal Boundary Restructuring Proposal
(Municipal Act, Sections 172 and 173)

Take notice that the Corporation of the Town of Hanover (Hanover) and the Municipality of West Grey (West Grey) are working together to build communities for the future and grow prosperity in the region.

The municipalities are considering the expansion of the Hanover boundary to encompass the following lots in West Grey in their entirety.

Lots 1 to 10, Concession 3 NDR, Part lots 11 to 13, Concession 2 NDR, Part lots 16 to19, Concession 1 NDR, Part lots 8 to 11, Concession 1 SDR, Lots 12 to 17, Concession1 SDR and Lots 9 to 17, Concession 2 SDR, Geographic Township of Bentinck.

The proposed 'mutual prosperity lands' highlighted in purple are the lands that are being considered for transfer from West Grey to Hanover in exchange for financial compensation from Hanover to West Grey.



Public Meeting Details:

Date: Wednesday, November 19, 2025 Time: 6:30 p.m. (formal presentation, followed by comment period) Location: Elmwood Community Centre (38 Concession Rd 10, Elmwood) and virtually through Zoom (registration required) To participate in the meeting virtually through Zoom, email communications@grey.ca before 12:00 p.m. noon on Tuesday, November 18.

The meeting will also be streamed virtually on the Grey County YouTube Channel and through www.grey.ca/live-stream. A full recording will be made available following the meeting.

No decisions will be made at the public meeting. The public meeting is an opportunity to learn more about the proposed boundary adjustment and for the public to provide comments and feedback. All interested parties are invited to attend in person or electronically.

Public Comments/Record

Any person may participate in the public meeting and/or make written or oral submissions. All submissions will form part of the public record.

Oral and written comments will be considered at the public meeting. Written comments may be submitted electronically through an online webform at www.grey.ca/boundarycomments.

Written comments can be submitted by mail to:

Tara Warder
Clerk County of Grey
595 9th Avenue East
Owen Sound, ON N4K 3E3

Anyone wishing to comment on the mutual prosperity boundary adjustment is invited to submit comments no later than November 26, 2025. To ensure that your comments are clearly understood and received prior to Hanover and West Grey deciding, you are strongly encouraged to submit written comments prior to the public meeting even if you intend to attend the public meeting.

Personal information is collected under the authority of the Municipal Act. The information collected will be used to complete the restructuring process and will form part of the public record. Questions about this collection should be addressed to Tara Warder, Grey County Clerk, at tara.warder@grey.ca or 1-519-370-2340.

More Information

Information about the mutual prosperity boundary adjustment can be found on the two municipal websites, www.hanover.ca and www.westgrey.com. More information is also available by contacting the offices listed at the bottom of this notice.

Contacts

Jamie Eckenswiller
Clerk
Municipality of West Grey
402813 Grey Road 4
Durham, ON N0G 1R0
clerk@westgrey.com
519-369-2200 ext.229
www.westgrey.com

Vicki McDonald
Clerk
Corporation of the Town of Hanover
341 10th Street
Hanover, ON N4N 1P5
vmcdonald@hanover.ca
519-364-2780 ext.1231
www.hanover.ca

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HANOVER MISSIONARY CHURCH

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All Welcome!
Church - Sunday @ 9:30 am

Youtube/hmccommunications
Adventure Land @ 9:30 am for grades JK - 6 gr
Preschool & Nursery Available

www.hanovermissionary.com

628 11th Street
519-364-1823
office@hanovermissionary.com

SEVENTH DAY ADVENTIST
Church

Sabbath Saturday

Church Services in person, Sabbath School at 10, services at 11, at the Mennonite Church

Hear us one Bluewater Radio (BWR) 91.3 8-10 a.m. on Sunday Morning

226-930-1202
hanover23.adventistchurchconnect.org
hanoveradventist@bmts.com

Obituaries

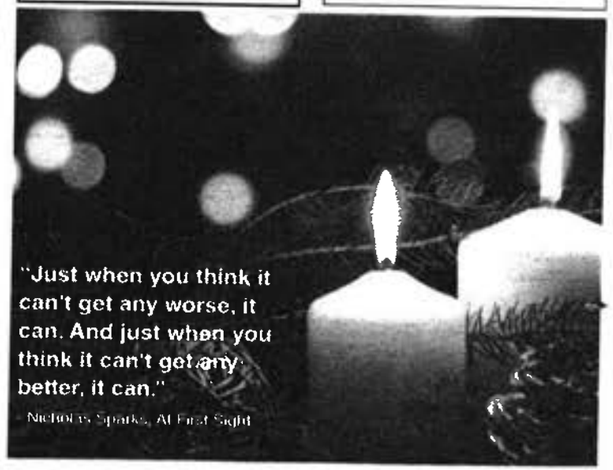
Obituaries



COLE, Ruth

Ruth Eleanor Cole (nee Lemon), of Durham, passed away at Rockwood Terrace, Durham on Saturday, November 1, 2025 in her 97th year. Beloved wife of the late Richard "Dick" Cole. Loving mother of John Cole and his wife Cathy, and Jim Cole and his wife Jeanette. Dear grandmother of Sam Revoy and his wife Jenny, Tim Cole and his wife Julie, Jennifer Cole, Nicky and her husband Frank Dusome, and Andrea Cole; great-grandmother of 9, and great-great-grandmother of 4. Predeceased by her brothers John "Jack" Lemon, and Keith Lemon, her sister Helen Goddard, and her good friend Warden Thompson.

Cremation has taken place. A celebration of Ruth's life will be held at the Durham Legion, 271 Bruce Street North, on Saturday, January 17, 2026 from 1- 4 p.m., with memories being shared at 2 p.m. Interment of cremated remains at Durham Cemetery. As an expression of sympathy, memorial donations to the Royal Canadian Legion Branch 308 would be appreciated. Arrangements entrusted to the McCulloch-Watson Funeral Home, Durham.



Classifieds

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Public Notices

NOTICE OF INTENDED DECLARATION

Pursuant to section 176 of Ontario Regulation 30/11
made under the Funeral, Burial and Cremation Services Act, 2002

Re: Burial site at 101 10th Street, Town of Hanover, Geographic Township of Brant, Grey Country, Province of Ontario

Take Notice that on December 2, 2024, the discovery of a burial site was reported to the Registrar of Burial Sites under the Funeral, Burial, and Cremation Services Act, 2002 (Act), when human remains were discovered during construction on the subject property. The archaeological investigation identified the remains of one individual who had been interred on the property.

The Registrar hereby gives notice of the intention to declare the discovered site a Burial Ground under section 98 of the Act and invites representatives of the persons whose remains are interred in the burial ground to contact the Registrar within 30 days of the date of this notice.
Under the Act "Cemetery" means land set aside with the apparent intention of interring in it, in accordance with cultural affinities, human remains and containing remains identified as those of persons who were not one of the aboriginal peoples of Canada; and
"representative," in the case of a "burial ground," means (i) a descendant of the interred person, or (ii) if there is no known surviving descendant, a representative of the religious denomination with which the interred person was affiliated as evidenced by the place of interment.

If the site is declared a "burial ground" persons who meet the definition of "representative" and agree to be representatives will be entitled to receive notice of the burial ground declaration, and once served with that notice, will need to negotiate a site disposition agreement with the landowner, in accordance with the Act and its regulations. If no persons agree to be identified as a representative of the persons whose remains are interred, the landowner will not be required under the Act to negotiate how the human remains from the burial ground are to be dealt with when ensuring their final disposition in a cemetery.

Dated at Toronto, this 28th day of November, 2025.
Ian Hember, Registrar of Burial Sites
Funeral, Burial, and Cremation Services Act, 2002
Ministry of Public and Business Service Delivery
56 Wellesley Street West, 16th Floor
Toronto Ontario M7A 0C1
Phone: 416-212-7499 Email: lbcsaregistrar@ontario.ca

Public Notices

Hanover
Ontario, Canada

Town of Hanover
Schedule 'C' Class Environmental Assessment
Wastewater Treatment Plant Upgrades
Notice of Completion

Project Background
The Town of Hanover is undertaking a Municipal Class Environmental Assessment (Class EA) to identify the preferred design alternative for wastewater servicing of existing urban residents and businesses, as well as to accommodate future growth. A Municipal Servicing Needs Assessment completed in 2021 identified that the Hanover Wastewater Treatment Plant (HWWTP) had reached 80%–85% of its capacity.

Process
This Class EA is following the planning and design process for Schedule 'C' projects as described in the Municipal Class Environmental Assessment Document (October 2000 as amended in 2007, 2011, 2015 & 2023), published by the Municipal Engineers Association.

Recommendation
The recommendation from this Class EA is to expand the existing wastewater treatment plant onto the land adjacent to the current facility using a phased approach. The proposed upgrades will include the construction of a new headworks building, primary treatment, secondary treatment, tertiary treatment, UV disinfection, anaerobic biosolids treatment, and additional biosolids storage.

The study process and recommendations are documented in the Environmental Study Report. The report is now available on the Town's website for a 30-day public review period beginning on November 27, 2025, at: https://www.hanover.ca/wastewater-treatment-plant-upgrades-class-ea.

Feedback
Consultation is vital to the success of a Class EA Study and the Town wants to ensure that anyone interested has the opportunity to be involved and provide input. Interested persons may provide written comments to our project team by December 29, 2025. All comments and concerns should be sent directly to either one of the following contacts:

Andrew Wilken,
Director of Development & Infrastructure
Town of Hanover
341 10th Street
Hanover, ON N4N 1P5
Tel: (519) 364-2780 x1280
awilken@hanover.ca

Jatin Singh, P.Eng., PMP
Senior Project Manager
Ainley Group
6299 Airport Rd #205
Mississauga, ON L4V 1N3
Tel: (647) 975-3885
jatin.singh@ainleygroup.com

In addition, a request may be made to the Ministry of the Environment, Conservation and Parks for an order requiring a higher level of study (that is, requiring and individual/comprehensive EA approval before being able to proceed), or that conditions be imposed (that is, requires further studies), only on the grounds that the requested order may prevent, mitigate, or remedy adverse impacts on constitutionally protected inherent and treaty rights of a First Nation or Indigenous community. Requests on other grounds will not be considered. Requests should include the requester's contact information and full name.

Requests should specify what kind of order is being requested (request for additional conditions or a request for an additional/comprehensive EA) on the grounds specified previously, and any information in support of the statements in the request.

The request should be sent in writing or by email to both of the following contacts.

Minister of the Environment, Conservation and Parks
Ministry of the Environment, Conservation and Parks
77 Bay Street, 5th Floor
Toronto, ON, M7A 2J3
minister.mecp@ontario.ca

Director, Environmental Assessment Branch
Ministry of the Environment, Conservation and Parks
135 St. Clair Avenue West, 1st Floor
Toronto, ON, M4V 1P5
EABDirector@ontario.ca

Requests should be also sent to the project contacts listed above by mail or by email.

Please visit the ministry's website for more information on requests for orders under section 16 of the Environmental Assessment Act at: https://www.ontario.ca/page/class-environmental-assessments-section-16-order

All personal information included in your request - such as name, address, telephone number, and property location - is collected, under the authority of section 30 of the Environmental Assessment Act and is collected and maintained for the purpose of creating a record that is available to the general public. As this information is collected for the purpose of a public record, the protection of personal information provided in the Freedom of Information and Protection of Privacy Act (FIPPA) does not apply (s.37). Personal information you submit may become part of a public record that is available to the general public unless you request that your personal information remain confidential.

This notice was originally issued on November 13, 2025.

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Other

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To Know Christ & Make Him Known

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Youtube/hmccommunications
Adventure Land @ 9:30 am for grades JK - 6 gr
Preschool & Nursery Available

www.hanovermissionary.com

628 11th Street
519-364-1823
office@hanovermissionary.com

SEVENTH-DAY ADVENTIST CHURCH

Sabbath Saturday

Church Services in person,
Sabbath School at 10,
services at 11, at the
Mennonite Church

Hear us one Bluewater Radio (BWR) 91.3
8-10 a.m. on Sunday Morning

226-930-1202
hanover23.adventistchurchconnect.org
hanoveradventist@bmts.com



Consultation Records with Agencies

Beth Wang

From: Beth Wang
Sent: October 6, 2022 3:50 PM
Cc: Ron Cooper; Jatin Singh; Lanting Xie
Subject: Town of Hanover, Hanover Wastewater Treatment Plant Class EA - Notice of Study Commencement
Attachments: Town of Hanover - HWWTP Class EA - Notice of Study Commencement.pdf

Bcc: ec.enviroinfo.ec@canada.ca; brianne.kucharski@dfo-mpo.gc.ca; Zsolt.Katzirz@ontario.ca; eanotification.swregion@ontario.ca; Rob.Wrigley@ontario.ca; Paul.Heeney@ontario.ca; Mark.Badali1@ontario.ca; Hugh.Geurts@ontario.ca; ian.mitchell@ontario.ca; eanotification.swregion@ontario.ca; crystal.lafrance@ontario.ca; mark.smith@ontario.ca; John.S.Ritchie@ontario.ca; karla.barboza@ontario.ca; chris.mahood@heritagetrust.on.ca; Ken.mott@ontario.ca; midhurstinfo@ontario.ca; Aldo.Ingraldi@ontario.ca; charlotte.caza@ontario.ca; Carolyn.hamilton@ontario.ca; John.turvey@ontario.ca; minister.omafra@ontario.ca; Robert.greene@ontario.ca; CAU-UCA@aadnc-aandc.gc.ca; m.plewes@greysauble.on.ca; e.downing@svca.on.ca; m.stansfield@svca.on.ca; Michelle.Knieriem@ontario.ca; aadnc.infopubs.aandc@canada.ca; enviropermissions@ontario.ca; inquiry@hanover.ca; kevin.mcnab@grey.ca; Pat.hoy@grey.ca; scott.taylor@grey.ca; matt.marck@grey.ca; info@brucecounty.on.ca; A.Barton@publichealthgreybruce.on.ca; info@hanoverchamber.ca; communications@bwdsb.on.ca; tracy-lynn_atkinson@bwdsb.on.ca; bruce_grey@bgcdsb.org; robyn_garvey@bgcdsb.org; colin.bonnell@bell.ca; bcecomms@bce.ca; bcyr@rci.rogers.com; subdivision@HydroOne.com; Gail.Best@enbridge.com; jeff.brolese@brucetelecom.com

Hello,

The Town of Hanover recently completed a Municipal Servicing Needs Assessment in 2021 which identified that the current capacity of the Hanover Wastewater Treatment Plant (HWWTP) is insufficient to meet the needs of planned future growth. The Town of Hanover is undertaking a Municipal Class Environmental Assessment process to evaluate ways to upgrade the HWWTP.

Please refer to the attached copy of the Notice of Study Commencement for further details regarding the project. Further correspondence regarding this project will follow in the coming months.

Regards,

Beth Wang, EIT
Engineering Intern

www.ainleygroup.com
Tel: (905) 452-5172 Ext. 221
Cell: (289) 541-8086

CAUTION: *The information contained in and/or attached to this transmission is solely for the use of the intended recipient. Any copying, distribution or use by others, without the express written consent of the Ainley Group, is strictly prohibited. The recipient is responsible for confirming the accuracy and completeness of the information with the originator. Please advise the sender if you believe this message has been received by you in error.*

From:	Harvey, Joseph (MCM)
To:	rcooper@hanover.ca
Cc:	Jatin Singh; Beth Wang
Subject:	FW: File 0017769: Town of Hanover, Hanover Wastewater Treatment Plant Class EA - Notice of Study Commencement
Date:	November 1, 2022 5:07:25 PM
Attachments:	image001.jpg Town of Hanover - HWWTP Class EA - Notice of Study Commencement.pdf 2020-11-01_HanoverWasteWater-MCM-Ltr.pdf

Ron Cooper,

Please find attached comments on the above referenced undertaking,

Please note that the responsibility for administration of the *Ontario Heritage Act* and matters related to cultural heritage recently transferred from the Ministry of Tourism, Culture and Sport (MTCS) to the Ministry of Citizenship and Multiculturalism (MCM). Individual staff roles and contact information remain unchanged. Please continue to send any notices, report and/or documentation to both Karla Barboza and Joseph Harvey.

Please do not hesitate to contact me with any questions or concerns,

Joseph Harvey | Heritage Planner
Inclusion and Heritage Division | Heritage Branch | Heritage Planning Unit
Ministry of Citizenship and Multiculturalism
613.242.3743
Joseph.Harvey@ontario.ca

From: Beth Wang <beth.wang@ainleygroup.com>
Sent: October-06-22 3:50 PM
Cc: Ron Cooper <rcooper@hanover.ca>; Jatin Singh <jatin.singh@ainleygroup.com>; Lanting Xie <lanting.xie@ainleygroup.com>
Subject: Town of Hanover, Hanover Wastewater Treatment Plant Class EA - Notice of Study Commencement

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Hello,

The Town of Hanover recently completed a Municipal Servicing Needs Assessment in 2021 which identified that the current capacity of the Hanover Wastewater Treatment Plant (HWWTP) is insufficient to meet the needs of planned future growth. The Town of Hanover is undertaking a Municipal Class Environmental Assessment process to evaluate ways to upgrade the HWWTP.

Please refer to the attached copy of the Notice of Study Commencement for further details regarding the project. Further correspondence regarding this project will follow in the coming months.

Regards,

Beth Wang, EIT
Engineering Intern
image003
www.ainleygroup.com
Tel: (905) 452-5172 Ext. 221
Cell: (289) 541-8086

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Ministry of Citizenship and Multiculturalism

Heritage Branch
400 University Ave.
5th Floor
Toronto ON M7A 2E7
Tel.: 613.242.3743

Ministère des Affaires civiques et du Multiculturalisme

Direction du patrimoine
400, av. University
5th étage
Toronto ON M7A 2E7
Tél.: 613.242.3743

Ontario

November 1, 2022 EMAIL ONLY

Ron Cooper,
Director of Public Works
Town of Hanover
341 10th Street
Hanover, ON N4N 1P5
rcooper@hanover.ca

MCM File	**:**	**0017769**
Proponent	**:**	**Town of Hanover**
Subject	**:**	**Municipal Class Environmental Assessment -Schedule C - Notice of Study Commencement**
Project	**:**	**Wastewater Treatment Plant Upgrades**
Location	**:**	**Town of Hanover**

Dear Ron Cooper:

Thank you for providing us with the Notice of Commencement for the above-referenced project.

Please note that the responsibility for administration of the *Ontario Heritage Act* and matters related to cultural heritage recently transferred from the Ministry of Tourism, Culture and Sport (MTCS) to the Ministry of Citizenship and Multiculturalism (MCM). Individual staff roles and contact information remain unchanged. Please continue to send any notices, report and/or documentation to both Karla Barboza and Joseph Harvey.

MCM's interest in this Environmental Assessment (EA) project relates to its mandate of conserving Ontario's cultural heritage, which includes:

- archaeological resources, including land and marine;
- built heritage resources, including bridges and monuments; and
- cultural heritage landscapes.

Under the EA process, the proponent is required to determine a project's potential impact on known (previously recognized) and potential cultural heritage resources.

Project Summary
This Class EA study will evaluate various design alternatives and advanced treatment technologies to effectively treat the future wastewater flows from Hanover and Hanover/Walkerton Landfill Site. Hanover has retained Ainley Group to complete and document a Schedule C Class EA in accordance with the Municipal Class Environmental Assessment Document, October 2000, as amended in 2015.

Identifying Cultural Heritage Resources
While some cultural heritage resources may have already been formally identified, others may be identified through screening and evaluation.

Archaeological Resources
This EA project may impact archaeological resources and should be screened using the MTCS *Criteria for Evaluating Archaeological Potential* to determine if an archaeological assessment is needed. MCM archaeological sites data are available at *archaeology@ontario.ca*.

If the EA project area exhibits archaeological potential, then an archaeological assessment (AA) shall be undertaken by an archaeologist licenced under the *Ontario Heritage Act (OHA)*, who is responsible for submitting the report directly to MCM for review.

Built Heritage Resources and Cultural Heritage Landscapes
The MTCS *Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes* should be completed to help determine whether this EA project may impact built heritage resources and/or cultural heritage landscapes.

If there is potential for built heritage resources and/or cultural heritage landscapes on the property or within the project area, a Cultural Heritage Evaluation Report (CHER) should be undertaken by a qualified person to determine the cultural heritage value or interest of the property (or project area). If the property (or project area) is determined to be of cultural heritage value or interest and alterations or development is proposed, MCM recommends that a Heritage Impact Assessment (HIA), prepared by a qualified consultant, be completed to assess potential project impacts. Please send the HIA to MCM for review and comment and make it available to local organizations or individuals who have expressed interest in review.

Community input should be sought to identify locally recognized and potential cultural heritage resources. Sources include, but are not limited to, municipal heritage committees, historical societies and other local heritage organizations.

Cultural heritage resources are often of critical importance to Indigenous communities. Indigenous communities may have knowledge that can contribute to the identification of cultural heritage resources, and we suggest that any engagement with Indigenous communities includes a discussion about known or potential cultural heritage resources that are of value to them.

Environmental Assessment Reporting
All technical cultural heritage studies and their recommendations are to be addressed and incorporated into EA projects. Please advise MCM whether any technical cultural heritage studies will be completed for this EA project, and provide them to MCM before issuing a Notice of Completion or commencing any work on the site. If screening has identified no known or potential cultural heritage resources, or no impacts to these resources, please include the completed checklists and supporting documentation in the EA report or file.

Thank you for consulting MCM on this project and please continue to do so throughout the EA process. If you have any questions or require clarification, please do not hesitate to contact me.

Sincerely,

Joseph Harvey
Heritage Planner
joseph.harvey@Ontario.ca

Copied to: Jatin Singh, Senior Project Manager, Ainley Group
Beth Wang, Engineering Intern, Ainley Group

It is the sole responsibility of proponents to ensure that any information and documentation submitted as part of their EA report or file is accurate. The Ministry of Citizenship and Multiculturalism (MCM) makes no representation or warranty as to the completeness, accuracy or quality of the any checklists, reports or supporting documentation submitted as part of the EA process, and in no way shall MCM be liable for any harm, damages, costs, expenses, losses, claims or actions that may result if any checklists, reports or supporting documents are discovered to be inaccurate, incomplete, misleading or fraudulent.

Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48(1) of the *Ontario Heritage Act*. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out an archaeological assessment, in compliance with Section 48(1) of the *Ontario Heritage Act*.

The *Funeral, Burial and Cremation Services Act, 2002, S.O. 2002, c.33* requires that any person discovering human remains must cease all activities immediately and notify the police or coroner. If the coroner does not suspect foul play in the disposition of the remains, in accordance with *Ontario Regulation 30/11* the coroner shall notify the Registrar, Ontario Ministry of Public and Business Service Delivery, which administers provisions of that Act related to burial sites. In situations where human remains are associated with archaeological resources, the Ministry of Citizenship and Multiculturalism should also be notified (at archaeology@ontario.ca) to ensure that the archaeological site is not subject to unlicensed alterations which would be a contravention of the *Ontario Heritage Act*.

From:	Ron Cooper
To:	Beth Wang; Jatin Singh; Simon Glass; Chief Operator
Subject:	FW: EXTERNAL: SVCA Comments - Municipal Class Environmental Assessment (Leachate Pumping Station) - Town of Hanover
Date:	October 18, 2022 2:30:17 PM
Attachments:	image002.jpg 2022_10_18_HANO_HWWTP_ClassEA_SVCAComments.pdf

Beth:

Attached are comments received from SVCA.

Ron Cooper
Director of Public Works
Town of Hanover
341 10th St. Hanover ON N4N 1P5
t 519.364.2780 x1229 | f 519.364.6456
e rcooper@hanover.ca | hanover.ca

This communication is confidential and may contain information protected by privacy legislation. Unauthorized use is strictly prohibited. If you have received this communication in error, please notify sender immediately by telephone.

From: Michael Cook <m.cook@svca.on.ca>
Sent: Tuesday, October 18, 2022 12:32 PM
To: Ron Cooper <rcooper@hanover.ca>
Cc: Vicki McDonald <vmcdonald@hanover.ca>; Sue Paterson <spaterson@hanover.ca>; jatin.singh@ainleygroup.com
Subject: EXTERNAL: SVCA Comments - Municipal Class Environmental Assessment (Leachate Pumping Station) - Town of Hanover

THIS MESSAGE IS FROM AN EXTERNAL SOURCE. PLEASE DO NOT OPEN ATTACHMENTS OR CLICK LINKS UNLESS YOU KNOW THE CONTENT IS SAFE.

Dear Mr. Cooper,

RE: Notice of Study Commencement
Municipal Class Environmental Assessment
Hanover Wastewater Treatment Plant Upgrades - Leachate Pumping Station

It is the understanding of Saugeen Valley Conservation Authority (SVCA) staff the Town of Hanover is undertaking a Municipal Class Environmental Assessment for the construction of a leachate pumping station and force main to connect to the Hanover Wastewater Treatment Plant (HWWTP), which will increase the wastewater flow received by HWWTP. SVCA staff have not received details on the proposed plans to date and as such our comments are based upon a review of our files, resource mapping, and SVCA's Environmental Planning and Regulations Policies Manual, amended October 16, 2018. Please see the attached letter for additional information. If you have any questions, please feel free to contact me.

Thank you,

Michael J. Cook
Environmental Planning Technician, Environmental Planning and Regulations Department
Saugeen Valley Conservation Authority
1078 Bruce Rd 12, Formosa, ON N0G 1W0
www.svca.on.ca
Cell (519) 377-3406
m.cook@svca.on.ca

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1078 Bruce Road 12 | P.O. Box 150 | Formosa ON
Canada | N0G 1W0 | 519-364-1255
www.saugeenconservation.ca
publicinfo@svca.on.ca

SENT ELECTRONICALLY ONLY (rcooper@hanover.ca)

October 18, 2022

Town of Hanover
341 10th Street
Hanover, ON N4N 1P5

ATTENTION: Ron Cooper, Director of Public Works, Town of Hanover

Dear Mr. Cooper,

RE: Notice of Study Commencement
Municipal Class Environmental Assessment
Hanover Wastewater Treatment Plant Upgrades - Leachate Pumping Station

It is the understanding of Saugeen Valley Conservation Authority (SVCA) staff the Town of Hanover is undertaking a Municipal Class Environmental Assessment for the construction of a leachate pumping station and force main to connect to the Hanover Wastewater Treatment Plant (HWWTP), which will increase the wastewater flow received by HWWTP. SVCA staff have not received details on the proposed plans to date and as such our comments are based upon a review of our files, resource mapping, and SVCA's Environmental Planning and Regulations Policies Manual, amended October 16, 2018.

Limitation of Comments

At the onset, please be advised that SVCA staff comments pertain only to matters relating to proposed development as described above. Furthermore, these comments represent the position of SVCA staff based on information currently available and policies and guidelines in affect at this time. Should development not proceed for some time on the property, SVCA staff cannot guarantee that our comments will remain unchanged indefinitely.

Drinking Water Source Protection

The subject property appears to SVCA staff to not be located within an area that is subject to the local Drinking Water Source Protection Plan. To confirm, please contact Risk Management Official Carl Seider at c.seider@greysauble.on.ca.

Site Description

The subject property is an irregular-shaped parcel located east of the Saugeen River and is located inside the north-west boundary of the Town of Hanover. The property features the Town OF Hanovers'

Wastewater Treatment Plant, Immediately East of the Walkerton landfill site. There are woodlands and wetlands within the river valley located west of the HWWTP.

SVCA Regulation

A significant portion of the property is subject to the SVCA's Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation (Ontario Regulation 169/06, as amended). This Regulation is in accordance with Section 28 of the Conservation Authorities Act R.S.O, 1990, Chap. C. 27. This Regulation requires that a person obtain the written permission of the SVCA prior to any "development or alteration" within a Regulated Area.

> "Development" as defined under the *Conservation Authorities Act means:*
>
> *a) the construction, reconstruction, erection or placing of a building or structure of any kind;*
> *b) any change to a building or structure that would have the effect of altering the use or potential use of the building or structure, increasing the size of the building or structure or increasing the number of dwelling units in the building or structure;*
> *c) site grading; or,*
> *d) the temporary or permanent placing, dumping or removal of any material, originating on the site or elsewhere*.
>
> And;
>
> "Alteration" as per Section 5 of Ontario Regulation 169/06 generally includes the straightening, diverting or interference in any way with a river, creek, stream or watercourse, or the changing or interfering in any way with a wetland.

To determine the SVCA "Approximate Regulated Area" on the property, please refer to the attached map. Should you require assistance, please contact our office directly. For this property, the Regulated Area includes the watercourse, wetlands, regional storm floodplain, and river valley, plus adjacent lands to these features as prescribed in the Regulation.

SVCA Permission for Development or Alteration

The floodplain on the subject property is managed as a one-zone floodplain. In general, SVCA's policies do not support development and site alteration within the one-zone floodplain nor within the boundaries of a wetland. Development may be permitted within the river valley (outside the regulatory floodplain and erosion hazard), within adjacent lands to a wetland, and alteration to a watercourse may be permitted; subject to SVCA's policies, and if in the opinion of SVCA staff the proposed will not impact the control of flooding, erosion, pollution, or the conservation of land. However, without specific details on the proposed, SVCA staff cannot advise if the proposed would be permitted within SVCA's Regulated Area. SVCA staff encourage all development and site alteration to be located outside these regulated areas where feasible. Development and alteration proposed within SVCA's Regulated Area will require a permit under O. Regulation 169/06.

Right to Hearing

Please be advised that the owner(s) of a property may apply for a development or alteration proposal to the SVCA at any time. An Application must be complete as determined by the SVCA for it to be considered. The completeness of an Application is determined by SVCA staff, or an administrative review can be requested by the applicant to the SVCA's General Manager/Secretary Treasurer. In the event that the administrative review by the SVCA's General Manager/Secretary Treasurer determines an Application is not complete, the applicant can request an administrative review by the Authority. Applications to recognize works that have already occurred are not eligible for administrative reviews.

In accordance with Section 28 (12) of the Conservation Authorities Act, permission required under Ontario Regulation 169/06, as amended, shall not be refused or granted subject to conditions unless the person requesting the permission has been given the opportunity for a hearing (by request) before the Authority or, in the case of the SVCA, before the Authority's Executive Committee. Should you receive an SVCA permit, approved by staff, with conditions of approval and object to one or more of the conditions, you will have the option to attend a hearing before the SVCA Executive Committee. Should you submit a complete Application for which staff is not prepared to issue a permit, you will have the option to attend a hearing scheduled before the SVCA Executive Committee.

After holding a hearing under Section 28 (12), the SVCA Executive Committee shall,
(a) refuse the permission; or
(b) grant the permission, with or without conditions.

After the hearing, if the Executive Committee refuses permission, or grants permission subject to conditions, the person who requested permission shall be given written reasons for the decision. If the person is refused permission or objects to conditions imposed on the permission, the person may appeal to the Ontario Lands Tribunal within 30 days of receiving the reasons for the refusal.

Zoning and Official Plan / Natural Heritage

Administration and final interpretation of the Zoning By-law and Official Plan are the responsibility of the Municipality and/or County. We recommend you contact the Municipality and/or County to confirm the zoning status and/or designation for the property, and for all other items relating to the Zoning By-law and Official Plan.

As the provincial commenting agency for matters relating to Natural Hazards (Environmental Protection / Environmental Hazard / Hazard / etc. zones and/or designations) in association with applications made under the Planning Act, the SVCA is required to provide comments and assistance to the Municipality and/or County and its residents for zoning and Official Plan matters in this regard.

The SVCA also provides recommendations pertaining to Natural Heritage in accordance with the Plan Review Agreements currently in effect with our member municipalities, and as a watershed agency associated with Planning Act applications. Therefore, if a planning application (proposed Zoning By-law amendment, application for minor variance, application for consent, site plan approval, Draft Plan of Subdivision, Draft Plan of Condominium, etc.) is required in association with your proposal, the SVCA will be involved in that process as a review agency and the SVCA's comments to that process will be

forwarded to the Municipality and/or County at that time. SVCA comments regarding Zoning and Official Plan matters are not included within this correspondence.

However, for information purposes, SVCA staff have screened the property for natural heritage features, and we advise the following features are located on or adjacent to the subject property:

1. Significant Woodlands
2. Fish habitat
3. Potentially Significant Wildlife Habitat
4. Potentially Habitat of Endangered Species and Threatened Species
5. Aquatic Species at Risk
6. Wetlands

SVCA staff recommend that the Municipality, via the EA process, review the above-mentioned natural heritage features and have consideration for the applicable natural heritage policies of the province, county, and the Town when considering options for the project.

Conclusion

Specific development proposals are required to be submitted and reviewed by SVCA staff on an individual basis. Permission from the SVCA will be required for development and/or alteration within SVCA's Regulated Area. SVCA staff has provided comments based on the information that is currently available, and there is no guarantee that these comments will remain unchanged indefinitely.

We trust you find this information helpful. We request an opportunity to review the draft EA when applicable. Should questions arise, please do not hesitate to contact this office.

Sincerely,

Michael Cook

Michael Cook
Environmental Planning Technician
Saugeen Conservation

MC/

cc: Sue Paterson, SVCA Member (via email)
Vicki McDonald, Clerk, Town of Hanover (via email)
Jatin Singh, P.Eng., PMP. Ainley Group, Senior Project Manager (via email)

Beth Wang

From: Beth Wang
Sent: May 2, 2024 11:27 AM
Cc: Ron Cooper; Jatin Singh
Subject: Town of Hanover, Hanover Wastewater Treatment Plant Class EA - Notice of Public Information Centre #1
Attachments: Town of Hanover - HWWTP Class EA-Notice of Public Information Centre#1.pdf

Bcc: 'ec.enviroinfo.ec@canada.ca'; 'info@dfo-mpo.gc.ca'; 'brianne.kucharski@dfo-mpo.gc.ca'; 'Zsolt.Katzirz@ontario.ca'; 'eanotification.swregion@ontario.ca'; Macki, Monika (MECP); 'Ritchie, John (He/Him) (MECP)'; 'karla.barboza@ontario.ca'; 'joseph.harvey@Ontario.ca'; 'SR.Planning@ontario.ca'; 'Aldo.Ingraldi@ontario.ca'; 'Jane.Parnell@Ontario.ca'; 'Michelle.Knieriem@ontario.ca'; 'Carolyn.hamilton@ontario.ca'; 'John.turvey@ontario.ca'; 'minister.omafra@ontario.ca'; 'Robert.greene@ontario.ca'; 'allison.berman@sac-isc.gc.ca'; 'infopubs@sac-isc.gc.ca'; 'm.plewes@greysauble.on.ca'; 'e.downing@svca.on.ca'; 'c.malo@svca.on.ca'; Michael Oberle; 'aadnc.infopubs.aandc@canada.ca'; 'enviropermissions@ontario.ca'; 'inquiry@hanover.ca'; 'kevin.mcnab@grey.ca'; 'Pat.hoy@grey.ca'; 'scott.taylor@grey.ca'; 'matt.marck@grey.ca'; 'info@brucecounty.on.ca'; 'cldodds@brucecounty.on.ca'; 'jvandorp@brucecounty.on.ca'; 'A.Barton@publichealthgreybruce.on.ca'; 'info@hanoverchamber.ca'; 'info@bwdsb.on.ca'; 'tracy-lynn_atkinson@bwdsb.on.ca'; 'bruce_grey@bgcdsb.org'; 'robyn_garvey@bgcdsb.org'; 'rmercey@exceldor.com'; 'kwilliams@exceldor.com'; 'colin.bonnell@bell.ca'; 'bcecomms@bce.ca'; 'bcyr@rci.rogers.com'; 'subdivision@HydroOne.com'; 'Gail.Best@enbridge.com'; 'jeff.brolese@brucetelecom.com'; 'btocheri09@gmail.com'

Hello,

The Town of Hanover has retained the services of Ainley Group to undertake a Schedule C Municipal Class Environmental Assessment (Class EA) to evaluate options to service future wastewater flows in the Town of Hanover.

Please refer to the attached copy of the Notice of Public Information Centre #1 on how to view presentation material and the timeline for providing comments/questions.

Regards,

Beth Wang, EIT
Engineering Intern

www.ainleygroup.com
Tel: (905) 452-5172 Ext. 321
Cell: (289) 541-8086

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Beth Wang

From: Beth Wang
Sent: May 2, 2024 11:55 AM
Cc: Ron Cooper; Jatin Singh
Subject: Town of Hanover, Hanover Wastewater Treatment Plant Class EA - Notice of Public Information Centre #1
Attachments: Town of Hanover - HWWTP Class EA-Notice of Public Information Centre#1.pdf

Bcc: david.plaunt@brucetelecom.com; isdept@brucetelecom.com

Hello,

The Town of Hanover has retained the services of Ainley Group to undertake a Schedule C Municipal Class Environmental Assessment (Class EA) to evaluate options to service future wastewater flows in the Town of Hanover.

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From: Kennedy, Adam (MNRF)
To: rcooper@hanover.ca; Jatin Singh
Cc: Beth Wang; Kennedy, Adam (MNRF)
Subject: 2024-05-03-MNRFcomments-HanoverWastewaterPlant- ClassEA
Date: May 3, 2024 9:08:24 AM
Attachments: image002.png
image003.jpg
Town of Hanover - HWWTP Class EA-Notice of Public Information Centre#1.pdf
2024-05-03-MNRF Comments-HanoverWastewaterUpgrades-NoC.pdf

You don't often get email from adam.kennedy@ontario.ca. Learn why this is important

Hi Ron and Jatin,

Please find attached Ministry of Natural Resources and Forestry (MNRF) comments per the Class EA for the Town of Hanover Wastewater Treatment Plant upgrades circulated May 2, 2024.

If you have any questions please let me know.

Regards,
Adam

Adam Kennedy
Regional Planner | LUPSI
Southern Region | ROD
Ontario Ministry of Natural Resources and Forestry | Ontario Public Service
Adam.Kennedy@Ontario.ca | (705) 761-3374

Taking pride in strengthening Ontario, its places and its people

---

From: Beth Wang <beth.wang@ainleygroup.com>
Sent: May 2, 2024 11:27 AM
Cc: Ron Cooper <rcooper@hanover.ca>; Jatin Singh <jatin.singh@ainleygroup.com>
Subject: Town of Hanover, Hanover Wastewater Treatment Plant Class EA - Notice of Public Information Centre #1

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Hello,

The Town of Hanover has retained the services of Ainley Group to undertake a Schedule C Municipal Class Environmental Assessment (Class EA) to evaluate options to service future wastewater flows in the Town of Hanover.

Please refer to the attached copy of the Notice of Public Information Centre #1 on how to view presentation material and the timeline for providing comments/questions.

Regards,

Beth Wang, EIT
Engineering Intern
image003
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Cell: (289) 541-8086

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Ministry of Natural Resources and Forestry

Land Use Planning and Strategic Issues Section
Southern Region

Regional Operations Division
300 Water Street
Peterborough, ON K9J 3C7
Tel.: 705 761-4839

Ministère des Richesses naturelles et des Forêts

Section de l'aménagement du territoire et desquestions stratégiques
Région du Sud

Division des opérations régionales300, rue Water
Peterborough (ON) K9J 3C7
Tél. : 705 761-4839

Ontario

May 3, 2024

To Ron Cooper and Jatin Singh,

SUBJECT: Town of Hanover – Notice of PIC#1 – Schedule "C" Class Environmental Assessment - Wastewater Treatment Plant Upgrades

The Ministry of Natural Resources and Forestry (MNRF) received the Notice of Study Commencement on May 2, 2024. Thank you for circulating this to our office. Please note that we have not competed a screening of natural heritage or other resource values for the project at this time. This response, however, does provide information to guide you in identifying and assessing natural features and resources as required by applicable policies and legislation, as well as engaging with the Ministry for advice as needed.

Please also note that it is the proponent's responsibility to be aware of, and comply with, all relevant federal or provincial legislation, municipal by-laws or other agency approvals.

Natural Heritage

MNRF's natural heritage and natural resources GIS data layers can be obtained through the Ministry's GeoHub website. You may also view natural heritage information online (e.g., Provincially Significant Wetlands, ANSI's, woodlands, etc.) using the Make a Map: Natural Heritage Areas tool.

We recommend that you use the above-noted sources of information during the review of your project proposal.

Natural Hazards

A series of natural hazard technical guides developed by MNRF are available to support municipalities and conservation authorities implement the natural hazard policies in the Provincial Policy Statement (PPS). For example, standards to address flood risks and the potential impacts and costs from riverine flooding are addressed in the *Technical Guide River and Stream Systems: Flooding Hazard Limit (2002)*. We recommend that you consider these technical guides as you assess specific improvement projects that can be undertaken to reduce the risk of flooding.

Fish and Wildlife Conservation Act

Please note, that should the project require:

- The relocation of fish outside of the work area, a Licence to Collect Fish for Scientific Purposes under the *Fish and Wildlife Conservation Act* will be required.
- The relocation of wildlife outside of the work area (including amphibians, reptiles, and small mammals), a Wildlife Collector's Authorization under the *Fish and Wildlife Conservation Act* will be required.

Public Lands Act & Lakes and Rivers Improvement Act

Some projects may be subject to the provisions of the *Public Lands Act* or *Lakes and River Improvement Act*. Please review the information on MNRF's web pages provided below regarding when an approval is, or is not, required.

The *Lakes and Rivers Improvement Act* (LRIA) provides the MNRF with the legislative authority to govern the design, construction, operation, maintenance and safety of dams in Ontario. For information regarding when a MNRF approval may be required and how the LRIA is administered by the Ministry visit Lakes and Rivers Improvement Act administrative guide | ontario.ca

The use of public land and shore lands are regulated under the *Public Lands Act*. A work permit must be obtained from MNRF to undertake certain activities on public land and shore lands. To occupy Crown land in Ontario, you must receive prior approval/authorization from the MNRF. Visit Natural Resources Information Portal for information on when a permit or approval is required and how to submit an application.

Oil, Gas and Salt Resources

Any oil, gas or salt wells in the project area are regulated by the *Oil, Gas and Salt Resources Act*, and the supporting regulations and operating standards.

To help determine the presence of petroleum wells within the proposed project area, basic mapping information can be found through the GeoHub portal or the Ontario Oil, Gas and Salt Resources Library (www.ogsrlibrary.com). Please reference the 'Definitions and Terminology Guide' listed in the publications section on the library website to better understand the well and resource information available.

The Ontario Petroleum Institute (OPI) is an industry association that can assist with retaining the services of a consultant who can provide information about the potential resources located below the property.

If any unanticipated petroleum wells or associated works are encountered during the project, the proponent shall cease work immediately and contact MNRF's Petroleum Operations Section (POS) to further understand the proponent's obligations under the *Oil, Gas and Salt Resources Act*. The POS may be contacted at POSRecords@ontario.ca or 519-873-4634. In the event of a spill, the proponent shall report it to the Spills Action Centre at 416-325-3000, 1-800-268-6060 (toll free), or 1-855-889-5775 (TTY).

After reviewing the information provided, if you have not identified any of MNRF's interests stated above, there is no need to circulate any subsequent notices to our office. If you have

identified any of MNRF's interests and/or may require permit(s) or further technical advice, please direct your specific questions to the undersigned.

If you have any questions or concerns, please feel free to contact me.

Best Regards,

Adam Kennedy

Adam Kennedy
Regional Planner
Land Use Planning and Strategic Issues Section (LUPSI)
Southern Region
Ministry of Natural Resources and Forestry

(705) 761-3374
Adam.Kennedy@Ontario.ca

From:	Harvey, Joseph (MCM)
To:	Beth Wang
Cc:	Ron Cooper; Jatin Singh
Subject:	RE: File 0017769: Town of Hanover, Hanover Wastewater Treatment Plant Class EA - Notice of Public Information Centre #1
Date:	July 22, 2024 11:50:48 AM
Attachments:	image002.png image003.jpg image004.png 2024-07-22_HanoverWW-CHR-MCM-Comments.pdf

---

Hi Beth,

Please find attached our comments on the Cultural Heritage Report prepared in support of the above referenced undertaking.

Please do not hesitate to contact me with any questions or concerns.

Regards,

Joseph Harvey
Heritage Planner | Heritage Branch | Citizenship Inclusion and Heritage Division
Ministry of Citizenship and Multiculturalism | Ontario Public Service
613.242.3743 | Joseph.Harvey@ontario.ca

From: Beth Wang <beth.wang@ainleygroup.com>
Sent: Tuesday, June 25, 2024 2:06 PM
To: Harvey, Joseph (MCM) <Joseph.Harvey@ontario.ca>
Cc: Ron Cooper <rcooper@hanover.ca>; Jatin Singh <jatin.singh@ainleygroup.com>
Subject: RE: File 0017769: Town of Hanover, Hanover Wastewater Treatment Plant Class EA - Notice of Public Information Centre #1

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Good afternoon Joseph,

Hope all is well!

The Project Information Form (PIF) number for Stage 1 Archaeological Assessment is P094-0366-2023, and the PIF number for Stage 2 Archaeological Assessment is P383-0422-2023. Additionally, we conducted a cultural heritage study, and the study report is available for your review (as attached).

Please let us know if you have any questions or comments.

Regards,

Beth Wang, EIT
Engineering Intern

image003

www.ainleygroup.com
Tel: (905) 452-5172 Ext. 321
Cell: (289) 541-8086

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From: Harvey, Joseph (MCM) <Joseph.Harvey@ontario.ca>
Sent: May 27, 2024 2:10 PM
To: Beth Wang <beth.wang@ainleygroup.com>
Cc: Ron Cooper <rcooper@hanover.ca>; Jatin Singh <jatin.singh@ainleygroup.com>
Subject: FW: File 0017769: Town of Hanover, Hanover Wastewater Treatment Plant Class EA - Notice of Public Information Centre #1

Some people who received this message don't often get email from joseph.harvey@ontario.ca. Learn why this is important

Beth Wang,

Thanks for providing us with the attached notice.

To assist us in tracking archaeological assessment reports, please provide us with the Project Information Form (PIF) number(s) of any archaeological assessments being prepared for this project.

Please let us know if the project has been screened for impacts to known (previously recognized) or potential built heritage resources and cultural heritage landscapes. The Ministry's *Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes* should be completed to help determine whether this EA project may impact known or potential built heritage resources and/or cultural heritage landscapes.

If there is potential for built heritage resources and/or cultural heritage landscapes on the property or within the project area, a Cultural Heritage Evaluation Report (CHER) should be undertaken by a qualified person to determine the cultural heritage value or interest of the property (or project area). If the property (or project area) is determined to be of cultural heritage value or interest and alterations or development is proposed, MCM recommends that a Heritage Impact Assessment (HIA), prepared by a qualified consultant, be completed to assess potential project impacts. Please send the HIA to MCM and the Town of Hanover for review and comment and make it available to local organizations or individuals who have expressed interest in review.

Thanks,

Joseph Harvey
Heritage Planner | Heritage Branch | Citizenship Inclusion and Heritage Division
Ministry of Citizenship and Multiculturalism | Ontario Public Service
613.242.3743 | Joseph.Harvey@ontario.ca

From: Beth Wang <beth.wang@ainleygroup.com>
Sent: May 2, 2024 11:27 AM
Cc: Ron Cooper <rcooper@hanover.ca>; Jatin Singh <jatin.singh@ainleygroup.com>
Subject: Town of Hanover, Hanover Wastewater Treatment Plant Class EA - Notice of Public Information Centre #1

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Hello,

The Town of Hanover has retained the services of Ainley Group to undertake a Schedule C Municipal Class Environmental Assessment (Class EA) to evaluate options to service future wastewater flows in the Town of Hanover.

Please refer to the attached copy of the Notice of Public Information Centre #1 on how to view presentation material and the timeline for providing comments/questions.

Regards,

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Engineering Intern
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Ministry of Citizenship and Multiculturalism

Heritage Planning Unit
Heritage Branch
Citizenship, Inclusion and Heritage Division
5th Flr, 400 University Ave
Tel.: 613.242.3743

Ministère des Affaires civiques et du Multiculturalisme

Unité de la planification relative au patrimoine
Direction du patrimoine
Division des affaires civiques, de l'inclusion et du patrimoine
Tél.: 613.242.3743

July 22, 2024 EMAIL ONLY

Beth Wang, EIT
Engineering Intern
Ainley Group
beth.wang@ainleygroup.com

MCM File	**:**	**0017769**
Proponent	**:**	**Town of Hanover**
Subject	**:**	**Municipal Class Environmental Assessment (EA) – Schedule C – Cultural Heritage Report**
Project	**:**	**Wastewater Treatment Plant Upgrades**
Location	**:**	**Town of Hanover**

Dear Beth Wang:

Thank you for providing the Ministry of Citizenship and Multiculturalism (MCM) with a copy of the document: *Cultural Heritage Report: Existing Conditions and Preliminary Impact Assessment Hanover Wastewater Treatment Plant Municipal Class Environmental Assessment* (dated September 2023, prepared by ASI) which was prepared in support of the above-referenced project.

MCM's interest in this project relates to its mandate of conserving Ontario's cultural heritage.

Under the EA process, the proponent is required to determine a project's potential impact on known (previously recognized) and potential cultural heritage resources.

Project Summary
This Class EA study will evaluate various design alternatives and advanced treatment technologies to effectively treat the future wastewater flows from Hanover and Hanover/Walkerton Landfill Site. Hanover has retained Ainley Group to complete and document a Schedule C Class EA in accordance with the Municipal Class Environmental Assessment Document, October 2000, as amended in 2015.

Comments

We have reviewed the above referenced Cultural Heritage Report and find that it is consistent with the requirements, guidance and standards of the Municipal Class EA and MCM's best practices.

MCM recommends that this Cultural Heritage Report is included as an appendix in any EA report for public review and should be made available to local heritage organizations or any individuals who express an interest throughout the EA process.

Thank you for making the Cultural Heritage Report available for our review. If you have any questions or require clarification, please do not hesitate to contact me.

Sincerely,

Joseph Harvey
Heritage Planner
joseph.harvey@Ontario.ca

Copied to: Jatin Singh, Senior Project Manager, Ainley Group
Ron Cooper, Director of Public Works, Town of Hanover

It is the sole responsibility of proponents to ensure that any information and documentation submitted as part of their EA report or file is accurate. The Ministry of Citizenship and Multiculturalism (MCM) makes no representation or warranty as to the completeness, accuracy or quality of the any checklists, reports or supporting documentation submitted as part of the EA process, and in no way shall MCM be liable for any harm, damages, costs, expenses, losses, claims or actions that may result if any checklists, reports or supporting documents are discovered to be inaccurate, incomplete, misleading or fraudulent.

Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48(1) of the *Ontario Heritage Act*. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out an archaeological assessment, in compliance with Section 48(1) of the *Ontario Heritage Act*.

The *Funeral, Burial and Cremation Services Act, 2002, S.O. 2002, c.33* requires that any person discovering human remains must cease all activities immediately and notify the police or coroner. If the coroner does not suspect foul play in the disposition of the remains, in accordance with *Ontario Regulation 30/11* the coroner shall notify the Registrar, Ontario Ministry of Public and Business Service Delivery, which administers provisions of that Act related to burial sites. In situations where human remains are associated with archaeological resources, the Ministry of Citizenship and Multiculturalism should also be notified (at archaeology@ontario.ca) to ensure that the archaeological site is not subject to unlicensed alterations which would be a contravention of the *Ontario Heritage Act*.

From: planning@grey.ca
To: Beth Wang
Subject: County comments for Natural Environment Report - Wastewater Treatment Plant
Date: June 4, 2024 9:00:30 AM

County comments for Natural Environment Report - Wastewater Treatment Plant

Hello Beth Wang,

County Planning Ecology staff have reviewed the Natural Environment Report and have a comment stating,

Natural Heritage

The property contains and/or is adjacent to significant woodlands, significant wildlife habitat, potential habitat for threatened and/or endangered species, other wetlands, and fish habitat. It is Grey County staffs understanding that the proposed development will be located within and/or adjacent to the features. It is Grey County Staffs understanding that subsequent drafts of this NER/EIS is warranted and anticipated through the MCEA process. This evaluation will include a description of the preferred design, additional studies, general mitigations to develop at detailed design, and outline the expected permitting requirements.

Stormwater Management

It is Grey County Staffs understanding stormwater management infrastructure is not needed for the proposal. If needed, a stormwater management report and plan must be prepared which demonstrates an acceptable level of outlet water quality as per the standards within the Stormwater Management Planning and Design Manual (MECP, 2003). A sediment and erosion control plan will be required at minimum, and an impact assessment of the thermal regime of the cool-cold water fishery is needed. We recommend the consultant contact this office to determine a Terms of Reference for the report.

Source Water Protection

It is Grey County Staffs understanding that the property does not contain protection areas that are subject to policies of the Source Water Protection Act. The property does lie within an area designated as having potential influence on highly vulnerable aquifers, as such, low-impact development and infrastructure is recommended.

Provided County Planning Ecology staffs' comments are addressed; County Planning staff have no concerns with the Natural Environment Report.

Please note, a paper copy will not be provided unless requested.

Let us know if you have any questions.

Best regards,

Derek McMurdie

From: Michael Oberle
To: Beth Wang
Cc: Ron Cooper; Jatin Singh
Subject: RE: Town of Hanover, Hanover Wastewater Treatment Plant Class EA - Notice of Public Information Centre #1
Date: May 8, 2024 10:57:05 AM
Attachments: image001.jpg

Good morning Beth Wang,

This email is further to the email of below regarding the above refenced proposal.
Thank you for including the Saugeen Valley Conservation Authority (SVCA) in your circulation. The SVCA does not have any specific comment to provide at this time, and the SVCA looks forward to working together with our municipal partners, where required, as this proposal progresses.
I trust that the above is helpful at this time. Any questions, please do not hesitate to ask.
Kind regards,
Mike

Michael Oberle
Environmental Planning Coordinator
Cell: 519-373-4175
1078 Bruce Road 12, PO Box 150, Formosa, ON N0G 1W0
m.oberle@svca.on.ca
www.saugeenconservation.ca

From: Beth Wang <beth.wang@ainleygroup.com>
Sent: Thursday, May 2, 2024 11:27 AM
Cc: Ron Cooper <rcooper@hanover.ca>; Jatin Singh <jatin.singh@ainleygroup.com>
Subject: Town of Hanover, Hanover Wastewater Treatment Plant Class EA - Notice of Public Information Centre #1

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Hello,

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Please refer to the attached copy of the Notice of Public Information Centre #1 on how to view presentation material and the timeline for providing comments/questions.

Regards,

Beth Wang, EIT
Engineering Intern

image003

www.ainleygroup.com
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Cell: (289) 541-8086

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From:	Beth Wang
Cc:	Ron Cooper; Jatin Singh
Bcc:	ec.enviroinfo.ec@canada.ca; info@dfo-mpo.gc.ca; Zsolt.Katzirz@ontario.ca; EA Notices to SWRegion (MECP); Macki, Monika (MECP); karla.barboza@ontario.ca; Harvey, Joseph (MCM); SR.Planning@ontario.ca; Aldo.Ingraldi@ontario.ca; Jane.Parnell@Ontario.ca; Carolyn.hamilton@ontario.ca; John.turvey@ontario.ca; minister.omafra@ontario.ca; infopubs@sac-isc.gc.ca; m.plewes@greysauble.on.ca; e.downing@svca.on.ca; c.malo@svca.on.ca; Michael Oberle; aadnc.infopubs.aandc@canada.ca; enviropermissions@ontario.ca; inquiry@hanover.ca; kevin.mcnab@grey.ca; Pat.hoy@grey.ca; scott.taylor@grey.ca; info@brucecounty.on.ca; cldodds@brucecounty.on.ca; jvandorp@brucecounty.on.ca; A.Barton@publichealthgreybruce.on.ca; info@hanoverchamber.ca; info@bwdsb.on.ca; tracy-lynn_atkinson@bwdsb.on.ca; bruce_grey@bgcdsb.org; robyn_garvey@bgcdsb.org; rmercey@exceldor.com; kwilliams@exceldor.com; colin.bonnell@bell.ca; bcyr@rci.rogers.com; subdivision@HydroOne.com; Gail.Best@enbridge.com; david.plaunt@brucetelecom.com; isdept@brucetelecom.com; btocheri09@gmail.com
Subject:	Town of Hanover, Hanover Wastewater Treatment Plant Class EA - Notice of Public Information Centre #2
Date:	April 3, 2025 3:48:00 PM
Attachments:	Town of Hanover - HWWTP Class EA - Notice of Public Information Centre#2.pdf

Good afternoon,

The Town of Hanover has retained the services of Ainley Group to undertake a Schedule C Municipal Class Environmental Assessment (Class EA) to evaluate options to service future wastewater flows in the Town of Hanover.

Please refer to the attached copy of the Notice of Public Information Centre #2 on how to view presentation material and the timeline for providing comments/questions.

Regards,

Beth Wang, EIT
Engineering Intern

Tel: (905) 452-5172, Ext. 321
Cell: (289) 541-8086
Email: beth.wang@ainleygroup.com

WWW.AINLEYGROUP.COM

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From:	Kennedy, Adam (MNR)
To:	rcooper@hanover.ca
Cc:	Kennedy, Adam (MNR); Jatin Singh; Beth Wang
Subject:	2025-04-30-MNRcomments-HanoverWastewaterTreatmentPlant-PIC2
Date:	April 30, 2025 10:33:00 AM
Attachments:	image001.jpg image002.png Town of Hanover - HWWTP Class EA - Notice of Public Information Centre#2.pdf MNR Southern Region Information Package – For External Proponent Environmental Assessments_Ver2.pdf

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Dean Ron Cooper,

The Ministry of Natural Resources (MNR) received the Notice of PIC 2 for the Town of Hanover - Schedule 'C' Class Environmental Assessment - Wastewater Treatment Plant Upgrades, on April 3, 2025. Thank you for circulating this to our office.

MNR has prepared the attached **MNR Southern Region Information Package – For External Proponent Environmental Assessments** (Package) to help project proponents understand MNR's role as a commenting agency and interests related to environmental assessment within the Ministry's mandate. The Package also provides information on the Ministry's regulatory authority to issue authorizations, permits, licenses and/or approvals.

The information provided is subject to change from time to time and it is the proponent's responsibility to ensure the information used to support project planning and compliance with *Environmental Assessment Act* requirements is current and accurate. It is the proponent's responsibility to be aware of, and comply with, all relevant federal or provincial legislation, municipal by-laws and/or other agency approvals.

Of particular note, please review the section on "Special Policy Areas" found on p.8, and MNR's "Regulatory Authority" found in Appendix A. MNR suggests reviewing the remaining sections as well. If the project requires a potential approval from the MNR please contact the ministry well in advance of finalizing the project to discuss the process and application requirements.

If you have any questions or require clarification per the comments above please let me know.

Regards,
Adam

Adam Kennedy
Regional Planner | LUPSI
Southern Region | ROD
Ontario Ministry of Natural Resources | Ontario Public Service
Adam.Kennedy@Ontario.ca | (705) 761-3374

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Please note: As part of providing accessible customer service, if you have any accommodation needs, require communication supports, or alternate formats please let me know.

From: Beth Wang <beth.wang@ainleygroup.com>
Sent: Thursday, April 3, 2025 3:48 PM
Cc: Ron Cooper <rcooper@hanover.ca>; Jatin Singh <jatin.singh@ainleygroup.com>
Subject: Town of Hanover, Hanover Wastewater Treatment Plant Class EA - Notice of Public Information Centre #2

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Good afternoon,

The Town of Hanover has retained the services of Ainley Group to undertake a Schedule C Municipal Class Environmental Assessment (Class EA) to evaluate options to service future wastewater flows in the Town of Hanover.

Please refer to the attached copy of the Notice of Public Information Centre #2 on how to view presentation material and the timeline for providing comments/questions.

Regards,

Beth Wang, EIT
Engineering Intern

Tel: (905) 452-5172, Ext. 321
Cell: (289) 541-8086
Email: beth.wang@ainleygroup.com

WWW.AINLEYGROUP.COM

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MNR SOUTHERN REGION INFORMATION PACKAGE – FOR EXTERNAL PROPONENT ENVIRONMENTAL ASSESSMENTS

MNR – SOUTHERN REGION – LUPSI

October 2024

How to Use This Information Package

Environmental Assessment (EA) is a planning and decision-making process used to promote environmentally responsible decision-making. In Ontario, this process is defined and is required pursuant to the *Environmental Assessment Act (EAA)*. The Ministry of Environment, Conservation and Parks (MECP) administers the *EAA*.

The Ministry of Natural Resources (MNR) may be asked by a proponent of a project subject to an EA or Class EA to participate as a commenting agency to ensure provincial interests within MNR's mandate are considered by the proponent in the project planning process.

Use of this Information Package "Package" is intended to help project proponents understand MNR's:

- role as a commenting agency and interests related to environmental assessment within the Ministry's mandate (refer Sections 1 through 8 of this document)
- regulatory authority to issue authorizations, permits, licenses and/or approvals (refer Appendix A – MNR Regulatory Role)

The information provided by MNR and the sources listed in this Package should not be considered exhaustive nor a substitute for consultation with other agencies, site visits and appropriate field studies. The information provided is subject to change from time to time and it is the proponent's responsibility to ensure the information used to support project planning and compliance with *EAA* requirements is current and accurate.

If no MNR interests are identified based on the information contained in this Package there is no need to further circulate MNR as a commenting agency when undertaking consultation and review under the applicable EA process. MNR Southern Region (via sr.planning@ontario.ca) may be contacted if there are any questions about the content of this Package or if specific technical information is required.

This Package is intended for use within MNR's Southern Region (SR) regional boundary only. To view the MNR SR regional boundary please see Ministry of Natural Resources and Forestry work centres | ontario.ca.

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1. MNR Mandate

MNR has a mandate to protect Ontario's biodiversity while promoting economic opportunities in the resource sector and supporting outdoor recreation opportunities by:

- Sustainably managing Ontario's fish and wildlife resources.
- Leading the management of Ontario's public (also referred to as Crown) lands, including the beds of navigable waters, oil, gas, salt and aggregate resources, and access to Crown land for renewable energy projects.
- Ensuring the sustainable management of Ontario's Crown forests.
- Protecting people, property and communities from forest fires, floods, and droughts.
- Developing and applying geographic information to help manage the province's natural resources.

MNR's regulatory role is triggered when a project proponent seeks an approval under legislation administered by the Ministry. Information on the Ministry's regulatory role under applicable legislation can be found in Appendix A.

2. MNR Role as Commenting Agency

MNR's role as a commenting agency on projects subject to *EAA* requirements is to:

- Assist and enable project proponents to access relevant technical and scientific information within the scope of MNR's mandate.
- Provide legislative / regulatory / policy information and direction regarding interests within MNR's mandate.
- Support the identification and consideration of the potential effects of a project on matters within MNR's mandate.
- Identify where the project proponent may need to seek MNR approvals regarding the project.

3. Provincial Planning Policies

Provincial plans together with the *Provincial Policy Statement, 2024* (PPS) issued under section 3(1) of the *Planning Act,* provide policy direction on matters of provincial interest related to land use planning and development in Ontario. The PPS and provincial plans contain policies specific to infrastructure projects.

A summary of matters related to MNR's mandate within specific infrastructure-related provincial planning policies can be found below. Please note, this is not an exhaustive list of provincial policies that may apply to a project and other MNR mandated interests may be applicable. It is the project proponent's responsibility to review the provincial plans and PPS,

which may be amended from time to time, to determine policies applicable to the proposed project.

Provincial Plan Mapping

Mapping of provincial plan boundaries and natural heritage areas as defined in individual provincial plans is available to view or download through Make A Map: Natural Heritage Areas or Ontario GeoHub (GeoHub) - Natural Heritage System Area.

Greenbelt Plan, 2017

Section 4.2.1.2 of the Greenbelt Plan contains policies which are designed to direct infrastructure away from, or where not possible, to minimize the impacts on the Natural Heritage and Water Resource Systems. It requires that new or expanding infrastructure "shall avoid *key natural heritage features, key hydrologic features or key hydrologic areas* unless need has been demonstrated and it has been established that there is no other reasonable alternative."

Niagara Escarpment Plan (NEP), 2017

The NEP is administered by the Niagara Escarpment Commission, the government agency mandated to develop, interpret, and apply NEP policies that maintain and enhance the Niagara Escarpment's unique environmental and landscape features. In addition to Make A Map: Natural Heritage Areas, mapping of NEP Escarpment Natural Areas and Escarpment Protection Areas may be obtained from your local municipality or the Niagara Escarpment Commission.

Oak Ridges Moraine Conservation Plan (ORMCP), 2017

Section 41 of the ORMCP contains policies specific to the development of new or the upgrading/extension of existing infrastructure. This policy direction includes where development shall not be permitted unless specified criteria have been satisfied (including where applicable that there is no other reasonable alternative) and establishes required documentation to support infrastructure projects. Specific conditions apply to proposed infrastructure development within a natural core area and infrastructure crossings of key natural heritage features.

Lake Simcoe Protection Plan (LSPP), 2009

Policy 6.23-DP of the LSPP directs that development or site alteration in relation to infrastructure shall not be permitted within a key natural heritage feature, a key hydrologic feature or within a related vegetation protection zone unless the need for the project has been demonstrated through an Environmental Assessment or other similar environmental approval and it has been demonstrated there is no reasonable alternative. Some exceptions may apply.

4. Fish, Wildlife and Natural Heritage

MNR's natural heritage and natural resources geospatial data layers can be accessed through the ministry's GeoHub and Natural Resources Data Access Requests | Ontario GeoHub. Please note, these Geospatial Ontario (formerly known as Land Information Ontario) GIS data layers available from MNR and the sources listed and linked on this webpage should not be considered as a substitute for site visits and appropriate field surveys. Generally, information available from MNR can be regarded as a starting point from which to conduct further field studies, if needed. While this data represents MNR's best available current information, it is important to note that a lack of information for a site does not mean that additional features and values are not present. There are many areas where MNR does not currently have information. On-site assessments can better verify site conditions, identify natural features and values and confirm presence of species at risk and/or their habitats.

The information below provides an overview of MNR's mandated interests in natural heritage to consider within the project study area. A detailed list of provincial technical guidance material used to identify significant natural heritage features in different landscapes can be found in Appendix B.

Fisheries

All permanent and intermittent watercourses and waterbodies have potential to contain fish habitat or contribute to fisheries resources. MNR is responsible for administering and enforcing the Ontario Fishery Regulations under the *Fisheries Act*.

When agency approvals are required for a proposed project, it is the responsibility of the authorizing regulatory agency to set any in-water work timing windows in their authorizations. These timing windows may be based on the MNR's In-water Work Timing Window Guidelines.

Areas of Natural and Scientific Interest

The study area should be screened for the presence of Areas of Natural and Scientific Interest (ANSI). ANSIs are lands and waters containing features that are important for natural heritage protection, scientific study, and education. ANSIs are identified and confirmed by MNR based on their representation of Ontario's significant geological and natural heritage features and are categorized as either Earth Science or Life Science.

Wetlands

Study areas that contain unevaluated or unmapped wet features should be investigated for the presence of wetlands. Wetlands are lands that are seasonally or permanently covered by shallow water, as well as lands where the water table is close to the surface. Wetlands may

vary in their significance, and the four major types of wetlands are swamps, marshes, bogs, and fens.

As of January 1, 2023, MNR no longer reviews and confirms wetland evaluations. MNR's role with respect to wetland evaluation includes providing the provincial framework under which wetlands in Ontario are evaluated for significance (OWES), and uploading digital wetland boundary mapping and wetland status into the Geospatial Ontario database.

Significant Wildlife Habitat

Study areas which may contain significant wildlife habitat should be investigated for its presence or absence. Significant wildlife habitat may include features such as: seasonal concentration areas for wildlife species (e.g., snake hibernaculum), rare vegetation communities (e.g., tallgrass prairie), specialized habitats of wildlife (e.g., turtle nesting and over-wintering areas), habitats of species of conservation concern (e.g., Special Concern species as identified on the Species at Risk in Ontario list) and animal movement corridors (e.g., amphibian movement corridors). Provincially tracked species data (generalized to Natural Heritage Information Centre 1 km screening grid) can be viewed in Natural Heritage Make a Map. Detailed geospatial data may be obtained through GeoHub via a data sharing agreement.

Please note, relying on online mapping tools only may not accurately reflect the presence or absence of significant wildlife habitat within the project study area. Surveys or additional site level assessment are often required to confirm presence or absence of natural heritage features and values.

Significant Woodlands

Project study areas that contain wooded areas should be investigated for the presence of significant woodlands. Significant woodlands are areas that are ecologically important in terms of features such as species composition, age of trees and stand history; functionally important due to their contribution to the broader landscape; or economically important. Local planning authorities are responsible for identifying significant woodlands in accordance with criteria established by MNR.

Significant Valleylands

Project study areas that occur in a valley or other landform depression that has water for some period of the year should be investigated for the presence of significant valleylands. The identification of valleyland significance is the responsibility of the local planning authority. MNR recommends criteria for determination of valleyland significance.

5. Natural Hazards

In Ontario, development is generally directed away from areas impacted by natural hazards to prevent risks from inappropriate development on and around these lands and to ensure that the risks to public health and safety are minimized. Keeping people and property out of harm's way is a cost-effective, socially responsible, and proactive approach to addressing natural hazards. Various policies and programs direct people and development outside of natural hazard areas.

Responsibility for natural hazard management and implementation of programs and policies for most natural hazards has been delegated to municipalities and Conservation Authorities (CA) where they exist. MNR supports implementation of natural hazard policies by local municipalities and CAs by providing a series of natural hazard technical guidelines (see Appendix B).

Hazardous Lands (flooding, erosion and dynamic beach hazards)

The project location should be reviewed for the presence of hazardous lands. These may include lands subject to flooding and/or erosion and dynamic beaches. These lands become hazardous when people and property locate in these areas. The local municipality and CA should be contacted for further guidance where required.

Special Policy Areas

Some localized areas of the province may be subject to an approved Special Policy Area (SPA), as defined by the PPS. If the study area is located within or adjacent to a SPA, special consideration for any impacts to the flood plain and site-specific SPA policies may be necessary. Any proposed change or modification to the official plan policies, land use designations or boundaries applying to SPA lands, requires joint approval by the Ministers of the Ministry of Municipal Affairs and Housing (MMAH) and MNR.

Local official plans may be reviewed to identify the presence of SPAs within the study area. MNR may have additional information regarding SPAs which can be made available upon request.

Where applicable, information should be identified at the EA stage regarding any expected changes to the floodplain or potential modifications to the SPA subject to provincial approval.

Hazardous Sites (unstable soils and bedrock)

The project location should be reviewed for the presence of hazardous sites. These may include unstable soils (sensitive marine clays [leda], organic soils) or unstable bedrock (karst topography). General information and mapping tools available to assist in identifying the

potential presence of hazardous sites (e.g., karst and organic soils) include, but are not limited to:

- GeologyOntario (gov.on.ca) is maintained by the Ministry of Mines and provides access to all Ontario Geological Survey maps, reports and digital datasets.
- Wetland mapping
- Soil information and mapping maintained by the Ministry of Agriculture, Food and Rural Affairs is available at Soil Survey Complex (GeoON) or AgMaps

Hazardous Forest Types for Wildland Fire

Project study areas containing wooded areas should be screened for the presence of hazardous forest types for wildland fire. Data to identify potential areas that meet this definition can be found in GeoHub - Potential Hazardous Forest Types for Wildland Fire. Note that this data layer is based on forest type data at a coarse scale. Complete assessment of risk and determination of appropriate mitigation measures can only be done with confidence on a site-specific basis.

6. Oil, Gas and Salt Resources

Oil, gas or salt wells are regulated under the *Oil, Gas and Salt Resources Act*, and the supporting regulations and operating standards.

To help determine the presence of petroleum wells within the proposed project area, basic mapping information can be found through the GeoHub portal or the Ontario Oil, Gas and Salt Resources Library (www.ogsrlibrary.com). The 'Definitions and Terminology Guide' listed in the publications section on the library website may provide a better understanding of the well and resource information available.

The Ontario Petroleum Institute (OPI) is an industry association that can assist with retaining the services of a consultant who can provide information about the potential resources located below the property.

If any unanticipated petroleum wells or associated works are encountered during a project, the proponent should cease work immediately and contact MNR's Petroleum Operations Section (POS) to further understand the proponent's obligations under the *Oil, Gas and Salt Resources Act*. The POS may be contacted at POSRecords@ontario.ca or 519-873-4634. In the event of a spill, the project proponent should report it to the Spills Action Centre at 416-325-3000, 1-800-268-6060 (toll free), or 1-855-889-5775 (TTY).

7. Mineral Aggregate Resources

Mineral aggregate resources are usually sand, gravel, clay, earth and bedrock. They are used to make roads, subway tunnels, homes and other structures. Mineral aggregate resources are a non-renewable resource that exist in fixed locations.

MNR has an interest in protecting mineral aggregate resources from incompatible development so they may continue to be available for future extraction. Data to map known deposits of mineral aggregate resources is available from Geology Ontario at GeologyOntario (gov.on.ca).

Project proponents should consider mineral aggregate resources by screening for existing aggregate operations at Find Pits and Quarries | ontario.ca, and consider any potential to preclude or hinder operations and the use of aggregate resource deposits through incompatible development.

8. Crown Lands, Lakes, Rivers and Forests

MNR manages public lands including the beds of most lakes and rivers. Some activities on shore lands (both public and private) are also managed by the MNR.

Public land boundaries (mapping is representative only) and applicable Crown land use policies can be viewed at Crown Land Use Policy Atlas | ontario.ca. Provincial parks and conservation reserves are managed by MECP under the *Provincial Parks and Conservation Reserves Act*.

MNR manages the health of Crown forests so they may continue to provide ecological, economic, and social benefits. Most of Ontario's Crown forests are managed by forest companies under 20-year Sustainable Forest Licences. These companies are responsible for working with government and others to prepare and implement a forest management plan for their licence area, monitoring compliance with the plan and renewing the forest after harvesting trees.

9. Conclusion

The list of interests within MNR's mandate described in this document is not exhaustive. For additional information on legislation and programs the ministry administers see Ministry of Natural Resources | ontario.ca.

If you have identified any MNR interests in your project planning and require additional information, please direct your specific questions to the designated Regional Planner for the project, or to SR.planning@ontario.ca.

Appendix A – MNR Regulatory Role

MNR's regulatory role is triggered when a project proponent seeks an approval under legislation administered by the Ministry. This Appendix provides information about some of the more commonly applicable approvals issued by MNR. Please note, MNR may not be able to confirm the requirement for an approval until a detailed project and site plan have been provided to the Ministry.

A proposal for an MNR approval may engage the ministry's duty to consult Indigenous peoples.

Where MNR is considering an application, the ministry must also ensure its own obligations under the *EAA* are satisfied prior to a final decision. Where an approval would dispose of rights to Crown Resources for a project that has already completed *EAA* requirements under another process, MNR will require written documentation from the applicant setting out how *EAA* requirements for the project have been met prior to MNR issuing any requested approval.

Fish and Wildlife Conservation Act

The *Fish and Wildlife Conservation Act, 1997* regulates the relocation of fish and wildlife. Accordingly, should a project require:

- The relocation of fish outside of the work area, a Licence to Collect Fish for Scientific Purposes will be required.
- The relocation of wildlife outside of the work area (including amphibians, reptiles, and small mammals), will require a Wildlife Collector's Authorization.
- The destruction, taking or possession of any nests or eggs of species not protected by the *Migratory Birds Convention Act (*MBCA*)* or excluded under section 7(2) of the FWCA may also require a Wildlife Collector's Authorization.

To learn more about the management of Fish and Wildlife in Ontario, or to apply for permits or licenses, please visit the Natural Resources Information Portal.

Aggregate Resources Act

The *Aggregate Resources Act* (ARA) is the primary legislative framework for regulating aggregate resource extraction in Ontario. The MNR administers the *ARA* and issues licenses, permits and approves amendments to existing approvals. Information on existing pits and quarries and when an aggregate permit or license may be required can be accessed from MNR's Aggregates Section or GeoHub – Additional Resources

Lakes and Rivers Improvement Act

The *Lakes and Rivers Improvement Act* (LRIA) provides the MNR with regulatory authority over the design, construction, operation, maintenance and safety of dams in Ontario. For

information regarding when a MNR approval may be required and how the LRIA is administered by the Ministry visit Lakes and Rivers Improvement Act administrative guide | ontario.ca

Public Lands Act

The use of public land and shore lands are regulated under the *Public Lands Act*. A work permit must be obtained from MNR to undertake certain activities on public land and shore lands. To occupy public lands in Ontario, you must receive prior approval from MNR unless the use is permitted by regulation. Visit Natural Resources Information Portal for information on when a permit or approval is required and how to submit an application.

Crown Forest Sustainability Act

Any activities that involve a proposal to cut Crown forest resources (e.g., trees on Crown land) may require approval under the *Crown Forest Sustainability Act, 1994.*

Appendix B – Technical Guides

The following technical guides are the province's best available information to support identification of significant natural heritage features in different landscapes:

- Natural Heritage Reference Manual (2010)
- Greenbelt Technical Paper (2005)
- Oak Ridges Moraine Technical Paper 1 (Natural Heritage Features)
- Oak Ridges Moraine Technical Paper 2 (Significant Wildlife Habitat)
- Oak Ridges Moraine Technical Paper 7 (Significant Woodlands)
- Lake Simcoe Protection Plan Technical Paper
- Ontario Wetland Evaluation System (OWES)
- Significant Wildlife Habitat Technical Guide
    - Ecoregion Criterion Schedules for the identification of Significant Wildlife Habitat
        - Ecoregion 5E
        - Ecoregion 6E
        - Ecoregion 7E
    - Significant Wildlife Habitat Mitigation Support Tool (MiST)

Other supporting information may be found at Ontario GeoHub or Natural Resources Data Access Requests | Ontario GeoHub.

The following technical guides are the province's best available information to support implementation of MNR's interest in natural hazards (contact MNR to request pdf copies):

- Understanding Natural Hazards (2001)
- Special Policy Areas Procedures (2009)
- Technical Guide – River & Stream Systems: Flooding Hazard Limit (2002)
- Technical Guide – River & Stream Systems: Erosion Hazard Limit (2002)
- Great Lakes-St. Lawrence River Shorelines: Flooding, Erosion and Dynamic Beaches (2001)
- Technical Guide for Large Inland Lakes Shorelines: Flooding, Erosion and Dynamic Beaches (1996)
- Hazardous Sites Technical Guide (1996)
- Technical Bulletin: Flooding Hazards: Data Survey and Mapping Specifications (2023)
- Wildland Fire Risk Assessment and Mitigation Reference Manual (2017)

The following technical guide is the province's best available information supporting implementation of MNR's mandated interest in mineral aggregate resources (contact MNR to request pdf copy):

- Non-renewable Resources Training Manual (1997)

Beth Wang

From: Michael Oberle <m.oberle@SVCA.ON.CA>
Sent: May 8, 2024 10:57 AM
To: Beth Wang
Cc: Ron Cooper; Jatin Singh
Subject: RE: Town of Hanover, Hanover Wastewater Treatment Plant Class EA - Notice of Public Information Centre #1

Good morning Beth Wang,

This email is further to the email of below regarding the above refenced proposal.
Thank you for including the Saugeen Valley Conservation Authority (SVCA) in your circulation.

The SVCA does not have any specific comment to provide at this time, and the SVCA looks forward to working together with our municipal partners, where required, as this proposal progresses.

I trust that the above is helpful at this time. Any questions, please do not hesitate to ask.

Kind regards,
Mike
Michael Oberle
Environmental Planning Coordinator
Cell: 519-373-4175
1078 Bruce Road 12, PO Box 150, Formosa, ON N0G 1W0
m.oberle@svca.on.ca
www.saugeenconservation.ca

From: Beth Wang <beth.wang@ainleygroup.com>
Sent: Thursday, May 2, 2024 11:27 AM
Cc: Ron Cooper <rcooper@hanover.ca>; Jatin Singh <jatin.singh@ainleygroup.com>
Subject: Town of Hanover, Hanover Wastewater Treatment Plant Class EA - Notice of Public Information Centre #1

[CAUTION]: This email originated from outside of the organization. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Hello,

The Town of Hanover has retained the services of Ainley Group to undertake a Schedule C Municipal Class Environmental Assessment (Class EA) to evaluate options to service future wastewater flows in the Town of Hanover.

Please refer to the attached copy of the Notice of Public Information Centre #1 on how to view presentation material and the timeline for providing comments/questions.

Regards,

Beth Wang, EIT
Engineering Intern

www.ainleygroup.com
Tel: (905) 452-5172 Ext. 321
Cell: (289) 541-8086

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Beth Wang

From: Brandi Walter <b.walter@svca.on.ca>
Sent: June 6, 2025 3:57 PM
To: Jatin Singh; Andrew Wilken
Cc: Clayton Capes
Subject: RE: Town of Hanover Schedule 'C' Class Environmental Assessment WWTP Upgrades
Attachments: 20250506_Hanover_WWTP_EA_SVCA_Comments.pdf

Hi Jatin / Andrew;

SVCA is satisfied with Clayton Capes response to our questions regarding the Flood Study. We have no further concerns relating to the floodplain delineation.

As discussed, a SVCA permit will be required to undertake the development within the floodplain. At that time, we will require engineered drawings that demonstrate the fill required for floodproofing be designed to withstand the velocities experienced during the Hurricane Hazel Flood Event. I recommend that SVCA permit application be submitted well in advance of the proposed start date for construction to address any technical issues that may arise.

Now that the floodplain issue has been addressed, I would like to draw your attention again to the remainder of SVCA's comments relating to development in the wetlands, and potential watercourse alterations (related to sewer outfall) in the attached correspondence provided to you on May 6, 2025.

Relating to wetland interference, I will expand on our comments here. SVCA's wetland policies do not support development in wetlands. Any application that proposes to remove a wetland by developing on it must be approved by SVCA's board of directors. As indicated in the correspondence, to complete your SVCA application to develop in the wetland, we will require that a professional hydrologist/hydrogeologist undertake a hydrologic/hydrogeologic study to identify the existing hydrologic function of the wetland and the impacts the proposed would have on the control of flooding and erosion. Any proposed work that would have an impact on the control of flooding and erosion and / or where there would be an impact to public health and safety or to property damage could not be approved by SVCA.

Please refer to the attached comments for more direction relating to watercourse interference relating to proposed upgrades to the outlet.

Thank you for your cooperation in this matter. Feel free to contact me with any questions. I look forward to further discussing this project with you.

Kind Regards,

Brandi Walter
Environmental Planning Coordinator
Saugeen Valley Conservation Authority
1078 Bruce Rd. 12, PO Box 150, Formosa ON N0G 1W0

519-364-1255 ext. 236
b.walter@svca.on.ca
www.saugeenconservation.ca

From: Clayton Capes <clayton@capesengineering.com>
Sent: June 2, 2025 2:20 PM
To: Brandi Walter <b.walter@svca.on.ca>
Cc: Jatin Singh <jatin.singh@ainleygroup.com>; Andrew Wilken <awilken@hanover.ca>; Ron Cooper <rcooper@hanover.ca>
Subject: RE: Town of Hanover Schedule 'C' Class Environmental Assessment WWTP Upgrades

[CAUTION]: This email originated from outside of the organization. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Sorry, you want a drawing showing where a 2 cm flood increase occurs?

I already provided the proposed condition HEC RAS results and sections in Appendix E of the report...there are only three x-sects that have a 2 cm change 1152.1, 960.11 and 859.53...several others have a 1 cm change.

I would reiterate that NONE of those should be any kind of a significant change in the floodplain...it is more likely just noise in the model.

Clayton Capes, MSc., P.Eng
President
Direct Cell: 705-994-4818

CAPES Engineering Ltd.
New Head Office Address

511 9th Street E
Owen Sound, ON
N4K 1P4
www.capesengineering.com

From: Brandi Walter <b.walter@svca.on.ca>
Sent: June 2, 2025 12:50 PM
To: Clayton Capes <clayton@capesengineering.com>
Cc: Jatin Singh <jatin.singh@ainleygroup.com>; Andrew Wilken <awilken@hanover.ca>; Ron Cooper <rcooper@hanover.ca>
Subject: RE: Town of Hanover Schedule 'C' Class Environmental Assessment WWTP Upgrades

Good afternoon Clayton,

Thank you for your responses below. Can you provide us with an illustration where the increase in flood elevations will be experienced from existing flood elevations?

Kind Regards,

Brandi Walter
Environmental Planning Coordinator
Saugeen Valley Conservation Authority
1078 Bruce Rd. 12, PO Box 150, Formosa ON N0G 1W0
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From: Clayton Capes <clayton@capesengineering.com>
Sent: May 21, 2025 7:47 PM
To: Brandi Walter <b.walter@svca.on.ca>
Cc: Jatin Singh <jatin.singh@ainleygroup.com>; Andrew Wilken <awilken@hanover.ca>; Ron Cooper <rcooper@hanover.ca>
Subject: RE: Town of Hanover Schedule 'C' Class Environmental Assessment WWTP Upgrades

[CAUTION]: This email originated from outside of the organization. Do not click on links or open attachments unless you recognize the sender and know the content is safe.

Hi Brandi,

Responses are below in red.

Clayton Capes, MSc., P.Eng
President

CAPES Engineering Ltd.
(Temporary New Address)
495404 Grey Rd. 2
Ravenna, ON
N0H 2E0
705-994-4818
www.capesengineering.com

From: Brandi Walter <b.walter@svca.on.ca>
Sent: May 21, 2025 3:50 PM
To: Clayton Capes <clayton@capesengineering.com>
Cc: Jatin Singh <jatin.singh@ainleygroup.com>; Andrew Wilken <awilken@hanover.ca>; Ron Cooper <rcooper@hanover.ca>
Subject: RE: Town of Hanover Schedule 'C' Class Environmental Assessment WWTP Upgrades

Hi Clayton,

Thank you for your response. We appreciate your review of the Hanover Floodplain Study. We acknowledge that the report is old. However, as staff, we use the best information available to us. Below is the link to the missing maps indicated in the report. Also attached for your reference is an email provided to Ainley Group in 2023 that includes a SVCA GIS map and .shp files in relation to the subject location. Perhaps this will also help your review.

Hanover_Knappville_FloodplainMapping_NoDate.pdf

Following up from your email, I kindly ask that you address the questions and comments below to continue review of this file;

1. Please verify whether there is any information in the 1977 report and mapping that can be used to better inform your existing model.

   In my opinion, no. The 1977 report is useless.

2. If your answer to no. 1 above is no, please explain why your report more accurately depicts existing conditions (e.g. better methods, top info, flow data, etc.)

   The Greenland report from 2009 generates peak flows which are 32 years more current, including using updated mapping information, soils, land use and technology to delineate the catchments and generate peak flows. The SVCA has already accepted the Greenland report and its methodologies in determining the peak flow for the River. I have previously submitted multiple flood studies to the SVCA using the same methodology for determining the peak flows for the study area. The method has previously been discussed and accepted by the SVCA.
   The 1977 study utilizes HEC2 to generate flood levels while my study uses HEC-RAS. The USACE specifically developed HEC RAS to improve on the computation capabilities of HEC2. If you wish to read up on all the differences here is a link https://knowledge.civilgeo.com/computational-differences-between-hec-ras-and-hec-2/

Bottom line is no one has used HEC2 since the mid 1990's when HEC RAS came out. So my report uses current (as of 2024) topographic information calibrated to within a couple of cm, up to date flow information and modern software modelling. My report is fundamentally more accurate than the 1977 information.

3. What accounts for the significant discrepancy in flood elevations at the site between the two reports.

   Refer to the link I provided in response 2. The HEC RAS results are going to be different than HEC 2 no matter what, it is just better software. The mapping from 1977 is based on 1 m contours with 0.5 m "auxillary contours" in flat areas. The topographic information we used is based on 0.1 m contour LiDAR information and was calibrated using on site GPS accurate to 2 cm vertically. I believe the most significant difference between HEC2 and HEC RAS is that HEC2 can only handle 100 points on a cross section and calculates the flood way differently than HEC RAS, so it is a FAR less accurate methodology to determine flood elevations.

4. In accordance with my comments under the One-Zone policies section of the attached letter, item number 4) still needs to be addressed. The floodway must be identified to safely locate the development outside of the floodway, which would address item no. 2).

   SVCA Policy allows for the placement of infrastructure within the one-zone floodway. I discuss this on Page 11 of my report, but will repeat it here. SVCA Policy 4.7.1-2 (One-Zone -Permitted) development includes public infrastructure like this WWTP expansion subject to an EA process and that we have demonstrated no impact to the flooding, erosion, pollution or the conservation of land. I demonstrated there was no negative impact to the flooding in my report already.

   The "floodway" as you are referencing it in the letter you provided is for a Two-Zone approach (See page 50 of Section 3.6.1 of the SVCA Manual) not a One-Zone approach (See page 49 of Section 3.6.1 of SVCA Manual) . This is a one-zone area and as such the floodway is the entire width of the flooded area. We have already identified the floodway in our report by identifying the flood limits. The proposed expansion of the WWTP is within the floodway in a one zone concept, but as per Policy 4.7.1.2 the development does NOT need to be outside the floodway as we have already demonstrated no flood impact. There is no alternative area that would allow the expansion to be outside of the floodway.

   The floodway in this case is 480 m wide and the flooding depth is 2.2 m deep. The filling of the area proposed for the WWTP only changes the floodplain depth by 2 cm which is insignificant and can be considered a computational or rounding error in the model.

Thank you for your attention to this matter, I look forward to your response.

Have a great day.

Kind Regards,

Brandi Walter
Environmental Planning Coordinator
Saugeen Valley Conservation Authority
1078 Bruce Rd. 12, PO Box 150, Formosa ON N0G 1W0
519-364-1255 ext. 236
b.walter@svca.on.ca
www.saugeenconservation.ca

From: Clayton Capes <clayton@capesengineering.com>
Sent: May 20, 2025 12:23 PM
To: Brandi Walter <b.walter@svca.on.ca>; Jatin Singh <jatin.singh@ainleygroup.com>
Cc: Andrew Wilken <awilken@hanover.ca>; Beth Wang <beth.wang@ainleygroup.com>; Ron Cooper <rcooper@hanover.ca>; Matt Armstrong <m.armstrong@svca.on.ca>
Subject: RE: Town of Hanover Schedule 'C' Class Environmental Assessment WWTP Upgrades

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Sorry correction from below...Regional is Hazel not Timmins so the rainfall used in the 1977 report does match the Hazel distribution. All other comments stand. Apologies for the confusion.

Clayton Capes, MSc., P.Eng
President

CAPES Engineering Ltd.
(Temporary New Address)
495404 Grey Rd. 2
Ravenna, ON
N0H 2E0
705-994-4818
www.capesengineering.com

From: Clayton Capes
Sent: May 20, 2025 12:13 PM
To: Brandi Walter <b.walter@svca.on.ca>; Jatin Singh <jatin.singh@ainleygroup.com>
Cc: Andrew Wilken <awilken@hanover.ca>; Beth Wang <beth.wang@ainleygroup.com>; Ron Cooper

<rcooper@hanover.ca>; Matt Armstrong <m.armstrong@svca.on.ca>
Subject: RE: Town of Hanover Schedule 'C' Class Environmental Assessment WWTP Upgrades

Hi Brandi,

I have had a look at the report you provided and note the following:

1. The report is now 48 years old
2. The report indicates that the flows were determined by an empirical method as small scale mapping was unavailable. They note that "further calibration" of the method was out of their scope and due to the lack of large storms and runoff events
3. There are general descriptions of the runoff flow nodes but no Figure that shows the location for the flow points listed in Table 3.7 Hard to make an accurate comparison based on the information provided.
4. The report was completed using imperial units with unknown input information using 50 year old methodology and technology.
5. Only 93 cross sections were used for the entire study area and there is no figures provided (to us) of where these sections are located.
6. The provided report is missing the 17 floodplain maps listed in Section 7.1
7. The Regional Storm information provided in Table 2.1 does not match the Timmins Storm. I am unclear where that "Regional Storm" data came from but it is not current.

I would also question why the SVCA would refer back to this 1977 report when the Greenland Consulting 2009 report for the Walkerton Floodline Mapping completed on behalf of the SVCA exists and includes hydrologic information for the same general study area? The Greenland report indicates :

> The SVCA's existing floodline mapping for the watercourse systems within the geographic Town of Walkerton, including Silver Creek, the Saugeen River, and an unnamed tributary hereafter referred to as the Easterly Tributary, is based on hydrologic analysis from the mid 1970's. However, the Walkerton urban landscape has undergone changes since that time. In addition, increased development pressures within the watersheds of the Saugeen Conservation have also raised concerns about safety and the impact of damages relating to floods. Essential to watershed health are "defendable" floodline maps to delineate floodway and flood fringe zones.

The Greenland study generates new flood flows for the Saugeen and makes no mention of the earlier 1977 report.

I don't believe that the 1977 report is at all valid after almost 50 years. Is the SVCA saying that the 1977 flood mapping is still "defendable" in the delineation of the floodway?

My report relies instead on the 2009 Greenland flow information for the basis of the calculated flows AND I have already demonstrated that there is no impact to the floodplain with the proposed filling of the small area of floodplain to accommodate the expansion of the WWTP.

I would hope that this settles the current discussion surrounding this, but please let me know if you need additional information here.

Clayton Capes, MSc., P.Eng
President

CAPES Engineering Ltd.
(Temporary New Address)
495404 Grey Rd. 2
Ravenna, ON
N0H 2E0
705-994-4818
www.capesengineering.com

From: Brandi Walter <b.walter@svca.on.ca>
Sent: May 20, 2025 11:13 AM
To: Jatin Singh <jatin.singh@ainleygroup.com>
Cc: Andrew Wilken <awilken@hanover.ca>; Beth Wang <beth.wang@ainleygroup.com>; Ron Cooper <rcooper@hanover.ca>; Clayton Capes <clayton@capesengineering.com>; Matt Armstrong <m.armstrong@svca.on.ca>
Subject: RE: Town of Hanover Schedule 'C' Class Environmental Assessment WWTP Upgrades

Hi Jatin,

See email below.

It appears the file was too large for inboxes, so I have provided a link to SVCA's Hanover Floodplain Study below.

Hanover Knappville FloodPlain Mapping Technical Index_1977.pdf

Please let me know if there are any issues with the shared link. The link will expire on May 23, 2025.

Kind Regards,

Brandi Walter
Environmental Planning Coordinator
Saugeen Valley Conservation Authority
1078 Bruce Rd. 12, PO Box 150, Formosa ON N0G 1W0
519-364-1255 ext. 236
b.walter@svca.on.ca
www.saugeenconservation.ca

From: Brandi Walter
Sent: May 20, 2025 10:06 AM
To: Jatin Singh <jatin.singh@ainleygroup.com>
Cc: Andrew Wilken <awilken@hanover.ca>; Beth Wang <beth.wang@ainleygroup.com>; Ron Cooper <rcooper@hanover.ca>; Clayton Capes <clayton@capesengineering.com>; Matt Armstrong <m.armstrong@svca.on.ca>
Subject: RE: Town of Hanover Schedule 'C' Class Environmental Assessment WWTP Upgrades

Hi Jatin,

Thank you for this. I will have a look and update my comments, if applicable.

Attached is a copy of SVCA's floodplain study for Hanover. As noted, it is older. However, the information should still be applicable. I have copied Clayton on this email for this information. Once Clayton has reviewed the report, he could update the floodplain study for the HWTTP where appropriate.

Please have Clayton contact me if he has any comments or questions.

Have a great day.

Kind Regards,

Brandi Walter
Environmental Planning Coordinator
Saugeen Valley Conservation Authority
1078 Bruce Rd. 12, PO Box 150, Formosa ON N0G 1W0
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b.walter@svca.on.ca
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From: Jatin Singh <jatin.singh@ainleygroup.com>
Sent: May 15, 2025 9:04 PM
To: Brandi Walter <b.walter@svca.on.ca>
Cc: Andrew Wilken <awilken@hanover.ca>; Beth Wang <beth.wang@ainleygroup.com>; Ron Cooper <rcooper@hanover.ca>
Subject: RE: Town of Hanover Schedule 'C' Class Environmental Assessment WWTP Upgrades

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Hi Brandi: As discussed in the call, please see attached Natural Environment Report. Also attached is the correspondence with Michael Oberle.

Regard

Jatin Singh, M.A.Sc., P.Eng.,PMP
Wastewater Treatment Group Lead

Tel: (905) 452-5172 Ext. 311
Cell: (647) 975-3885
Email: jatin.singh@ainleygroup.com

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From: Brandi Walter <b.walter@svca.on.ca>
Sent: May 7, 2025 10:26 AM
To: Jatin Singh <jatin.singh@ainleygroup.com>
Cc: Sue Paterson (890460) <spaterson@hanover.ca>; Ron Cooper <rcooper@hanover.ca>; Beth Wang <beth.wang@ainleygroup.com>; Matt Armstrong <m.armstrong@svca.on.ca>; Mike Oberle <m.oberle@SVCA.ON.CA>
Subject: RE: Town of Hanover Schedule 'C' Class Environmental Assessment WWTP Upgrades

Good morning Jatin,

SVCA staff would be happy to meet with the Town to discuss our comments.

It was my understanding that public input was required prior to May 8th, 2025 as indicated on the recent "Notice of Public Information Centre #2."

As for the Flood Plain Study submission, I apologize for the delayed response. As you may be aware, I was on secondment from SVCA during that time-period and I only returned to my current position in January 2025. Hopefully, we can clarify any miscommunication relating to SVCA's role in this EA process during our upcoming meeting.

Regarding meeting dates/times: SVCA staff can be available for a virtual meeting between 1:30 – 3:30 p.m. on May 12th, or between 2:00 – 3:30 p.m. on May 14th.

I look to hearing from you.

Kind Regards,

Brandi Walter
Environmental Planning Coordinator
Saugeen Valley Conservation Authority
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519-364-1255 ext. 236
b.walter@svca.on.ca
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From: Jatin Singh <jatin.singh@ainleygroup.com>
Sent: May 6, 2025 6:29 PM
To: Brandi Walter <b.walter@svca.on.ca>
Cc: Sue Paterson (890460) <spaterson@hanover.ca>; Ron Cooper <rcooper@hanover.ca>; Beth Wang <beth.wang@ainleygroup.com>
Subject: RE: Town of Hanover Schedule 'C' Class Environmental Assessment WWTP Upgrades

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Hi Brandi,

Thank you for your comments.

We believe it would be helpful to schedule a Microsoft Teams call to review your feedback and discuss next steps.

As you know, the Flood Plain Study was submitted to SVCA on March 12, 2024. Receiving comments after a 14-month interval presents some challenges, particularly as we are working toward closing the Environmental Assessment.

Please let us know your availability for a Team meeting next week, and we'll be happy to coordinate a time that works for everyone.

Regards

Jatin Singh, M.A.Sc., P.Eng.,PMP
Wastewater Treatment Group Lead

Tel: (905) 452-5172 Ext. 311
Cell: (647) 975-3885
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From: Brandi Walter <b.walter@svca.on.ca>
Sent: May 6, 2025 4:45 PM
To: Ron Cooper <rcooper@hanover.ca>
Cc: Jatin Singh <jatin.singh@ainleygroup.com>; Sue Paterson (890460) <spaterson@hanover.ca>
Subject: Town of Hanover Schedule 'C' Class Environmental Assessment WWTP Upgrades

Dear Ron,

Please find attached, SVCA's comments relating to the Class 'C' EA for the Hanover, WWTP expansion.

Feel free to contact me if you have any questions.

Kind Regards,

Brandi Walter
Environmental Planning Coordinator
Saugeen Valley Conservation Authority
1078 Bruce Rd. 12, PO Box 150, Formosa ON N0G 1W0
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publicinfo@svca.on.ca

SENT ELECTRONICALLY (rcooper@hanover.ca)
May 6, 2025

Town of Hanover
341 10th Street
Hanover, ON N4N 1P5

ATTENTION: Ron Cooper, Director of Public Works

Dear Ron Cooper;

RE: Schedule 'C' Class Environmental Assessment
Wastewater Treatment Plan Upgrades
Notice of Public Information Centre #2
Town of Hanover

The above-noted application has been received by the Saugeen Valley Conservation Authority (SVCA) in accordance with the Mandatory Programs and Services Regulation (Ontario Regulation 686/21) made under the *Conservation Authorities Act* (CA Act). SVCA staff have reviewed the proposal for consistency with SVCA's policies (https://www.saugeenconservation.ca/en/permits-and-planning/resources/Environmental-Regulations/January-2019-Consolidated-Manual_Interim.pdf) made in conformance with the CA Act, O. Regulation 41/24, and associated provincial guidelines.

It is SVCA staff's understanding the Town of Hanover is undertaking a Municipal Class Environmental Assessment (Class EA) to identify the preferred design alternative for wastewater servicing of existing urban residents and businesses, as well as to accommodate future growth. A Municipal Servicing Needs Assessment completed in 2021 identified that the Hanover Wastewater Treatment Plant (HWWTP) had reached 80%–85% of its capacity.

Recommendation

Currently, SVCA staff do not find the proposed expansion of the HWWTP into the regulatory floodplain and adjacent wetlands acceptable.

For SVCA staff to find the proposed development acceptable, the final EA report must demonstrate there is no feasible location for the expansion outside of the regulatory floodplain and wetland boundaries. If it is demonstrated there is no feasible location outside these features, the conditions

outlined in the comments below must be met [to SVCA's staff's satisfaction] for staff to issue a permit for the development.

Site Characteristics

The subject property and study area feature lands within SVCA's Regulated Area associated with a one-zone floodplain, a watercourse, and wetlands. Organic soil may be present within the wetlands and are also hazardous lands regulated by the SVCA. Based on our review of resource mapping and topographic information provided in the Floodplain Report, the existing HWWTP property would be subject to flooding under a regional storm event. The preferred expansion sites would encroach within the floodplain and wetlands.

Documents Reviewed by Staff

Staff have received and reviewed the following document provided to SVCA:

1) Floodplain Report, Capes Engineering, March 6, 2024.

Floodplain Report Review

SVCA staff have reviewed the above-noted floodplain report, and we offer the following comments:

- The report indicates the "extent or depth of the floodplain from the Saugeen River has not previously been identified in the regulation mapping." This statement is incorrect because SVCA has engineered floodplain mapping for the Hanover area. This information would have been provided to the Town's engineer upon request. Should this information have been provided, we would have requested that existing floodplain elevations and study information be used to assess the impact of the proposed development on the floodplain and adjacent properties.
- The floodplain elevations determined through the Capes study, around the existing and preferred sites, are not consistent with SVCA's floodplain mapping. The Capes floodplain elevations are approximately 2.4 metres below SVCA's floodplain elevations.
- SVCA's floodplain elevations are established using Canadian Geodetic Vertical Datum (CGVD 2013). Please ensure the report refers to this standard.
- The Capes report concludes that the fill required for expansion of the proposed WWTP would not impact flood elevations significantly but would need to be confirmed. SVCA staff are not satisfied with this conclusion because the appropriate SVCA flood study information was not used for the analysis.
- The Capes report states that "current SVCA policy allows for the development of Municipal infrastructure within flooded areas provided no negative impact can be demonstrated." SVCA staff provide comments on SVCA's policies in the section below.

Conservation Authorities Act and Ontario Regulation 41/24

Within SVCA's regulated areas and in accordance with the CA Act and O. Regulation 41/24, a permit from the SVCA is required to change or interfere with watercourses or wetlands and for development activities in or adjacent to hazardous lands, wetlands, river or stream valleys, Great Lakes, and inland lake shorelines. When reviewing an application, SVCA staff must assess the proposal for impacts to

the control of flooding, erosion, dynamic beaches, or unstable soil or bedrock, and ensure the activity will not create conditions or circumstances that, in the event of a natural hazard, might jeopardize the health or safety of persons or result in the damage or destruction of property. Provided staff are satisfied the proposal is consistent with SVCA's policies, designed to mitigate these risks, and where policies allow a permit can be issued.

As indicated, the regulated features on the property are the one-zone floodplain, a watercourse, and wetlands. SVCA's policies for development activities proposed within SVCA regulated areas are expected to be updated after May 15, 2025. Given that the proposed development is not to be constructed for some time, we have provided a summary of SVCA's policies that will affect the development post May 15, 2025.

Specific Policies

In general, for SVCA to issue a permit for the proposed development it must be demonstrated that:

1) the control of flooding, erosion, unstable soil, or bedrock is not negatively affected,
2) the activity will not create conditions or circumstances that, in the event of a natural hazard, might jeopardize the health or safety of persons or result in the damage or destruction of property: and that,
3) the development cannot be located outside of the hazards and wetlands.

Here are the requirements for addressing the above conditions for each natural hazard. Where the hazards overlap, all requirements must be addressed:

One-Zone Floodplain Policies

1) Rationale for why the development cannot be located outside the floodplain,
2) The development must be located in an area of least (and acceptable) risk,
3) The development must be protected from the flood hazard through the incorporation of appropriate passive dry floodproofing measures, that will not negatively impact flooding on adjacent properties (i.e. would not increase floodplain elevations and flows),
4) A revised floodplain study must be submitted to SVCA to show the development can be located outside the hydraulic floodway.
    - The floodway is the inner portion of the flood plain where flood depths and velocities are higher and faster flowing than those experienced in the outer portion of the overall flood plain. The hydraulic floodway represents the area required for the safe passage of flood flow and/or that area where flood depths and/or velocities are considered to be such that they pose a significant threat to life and/or property damage,
5) Upon request, SVCA will provide a copy of our flood study for the Hanover-Knappville area to consider in a revised report; and,
6) The floodplain study or other engineered study must demonstrate that any fill required to floodproof the new infrastructure will be protected from erosion or failure under regulatory flood conditions.

Wetland Policies

1) Rationale for why the development cannot be located outside the wetlands; and,
2) A hydrologic study must demonstrate there will be no impact on the hydrologic functions of the wetland, or the impacts are deemed acceptable by SVCA.

For proposed development within 30 metres of the wetland boundary:

1) A hydrologic study must demonstrate there will be no impact on the hydrologic functions of the wetland, or the impacts are deemed acceptable by SVCA.

Hazardous Lands – Unstable Soil Policies

If organic soils are found to be present within and/or adjacent to the wetlands, a geotechnical assessment would be required to make recommendations for mitigating the impact to development from the unstable soils.

Watercourse Interference

Interference or alterations to the adjacent watercourse (Saugeen River) may be required for associated outlet works. This public infrastructure may be permitted if it is demonstrated through technical studies that the interference on the hydrologic functions of the watercourse is acceptable to the SVCA.

SVCA Permit

In accordance with SVCA's policies made under the CA Act and O. Regulation 41/24, a permit for the proposed development is required prior to carrying out the work. SVCA must be satisfied that there is no feasible location outside of the one-zone floodplain, wetland boundary and organic soils for the development. If it is demonstrated there is no feasible alternative location, the conditions outlined in the policy sections above must be demonstrated to SVCA's staff's satisfaction for SVCA staff to issue a permit.

SVCA staff should be contacted by the Town's Engineer for SVCA's existing floodplain study information and mapping to update their Floodplain Report. We should also be contacted to discuss terms of reference for other SVCA required technical studies (i.e. hydrologic study for wetlands and watercourse interference.)

Drinking Water Source Protection

The subject property appears to SVCA staff to not be located within an area that is subject to the local Drinking Water Source Protection Plan. To confirm, please contact the Risk Management Official (RMO) at rmo@greysauble.on.ca.

Summary

SVCA staff have reviewed the proposal for consistency with SVCA's policies made in conformance with the Conservation Authorities Act, O. Regulation 41/24, and associated provincial guidelines.

SVCA staff require the submission of supplemental information to continue reviewing the proposed HWWTP expansion into the regulatory floodplain, wetland, and organic soils (if present). SVCA staff

will work with you to ensure the supplemental information and permit application meet the requirements for a complete application.

Please keep the SVCA informed on the process of this EA. We would be pleased to be included in future discussions or technical meetings for the proposed project. Should you have any questions, or require this information in an accessible format, please contact the undersigned [b.walter@svca.on.ca].

Sincerely,

Brandi Walter
Environmental Planning Coordinator
Saugeen Conservation
BW/

cc: Jatin Singh, P. Eng, PMP, Ainsley Group (via email)
Sue Paterson, SVCA Member (via email)

From:	Beth Wang
Cc:	"Andrew Wilken"; Jatin Singh
Bcc:	"ec.enviroinfo.ec@canada.ca"; "info@dfo-mpo.gc.ca"; "Zsolt.Katzirz@ontario.ca"; "EA Notices to SWRegion (MECP)"; "Macki, Monika (MECP)"; "karla.barboza@ontario.ca"; "Harvey, Joseph (MCM)"; "SR.Planning@ontario.ca"; "Aldo.Ingraldi@ontario.ca"; "Jane.Parnell@Ontario.ca"; "Carolyn.hamilton@ontario.ca"; "John.turvey@ontario.ca"; "minister.omafra@ontario.ca"; "infopubs@sac-isc.gc.ca"; "m.plewes@greysauble.on.ca"; "e.downing@svca.on.ca"; "Brandi Walter"; "Michael Oberle"; "aadnc.infopubs.aandc@canada.ca"; "enviropermissions@ontario.ca"; "kevin.mcnab@grey.ca"; "Pat.hoy@grey.ca"; "scott.taylor@grey.ca"; "info@brucecounty.on.ca"; "cldodds@brucecounty.on.ca"; "jvandorp@brucecounty.on.ca"; "A.Barton@publichealthgreybruce.on.ca"; "info@bwdsb.on.ca"; "tracy-lynn_atkinson@bwdsb.on.ca"; "bruce_grey@bgcdsb.org"; "robyn_garvey@bgcdsb.org"; "rmercey@exceldor.com"; "kwilliams@exceldor.com"; "colin.bonnell@bell.ca"; "bcyr@rci.rogers.com"; "subdivision@HydroOne.com"; "Gail.Best@enbridge.com"; "david.plaunt@brucetelecom.com"; "isdept@brucetelecom.com"; "btocheri09@gmail.com"; "info@brocktonupdate.ca"; "gsenior771@gmail.com"; "Mmcdonald@phmilling.com"; "swalden@hanover.ca"
Subject:	Town of Hanover, Hanover Wastewater Treatment Plant Class EA - Notice of Completion
Date:	November 13, 2025 3:28:00 PM
Attachments:	Hanover WWTP Class EA-Notice of Completion.pdf

Good afternoon,

The Town of Hanover has retained Ainley Group to conduct a Schedule C Municipal Class Environmental Assessment (Class EA) for the upgrade and expansion of the Hanover Wastewater Treatment Plant.

Please find attached important information regarding the **completion of the Class EA** and details on how to access the Environmental Study Report (ESR).
The ESR will be available for review through the link provided in the notice on **November 27, 2025**, and comments on this Class EA may be submitted until **December 29, 2025**.

Should you have any questions or require further information, please do not hesitate to reach out.

Regards,

Beth Wang, EIT
Engineering Intern

Tel: (905) 452-5172, Ext. 321
Cell: (289) 541-8086
Email: beth.wang@ainleygroup.com

WWW.AINLEYGROUP.COM

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From: Antwi-Nsiah, Amanda (MCM)
To: Jatin Singh
Cc: Barboza, Karla (She/Her) (MCM); Andrew Wilken; EA Notices to SWRegion (MECP); Macki, Monika (MECP); Beth Wang
Subject: MCM Response - Town of Hanover, Hanover Wastewater Treatment Plant Class EA - Notice of Completion [MCM File: 0017769]
Date: December 17, 2025 11:50:34 AM
Attachments: image002.png
image003.jpg
2025-12-17 HanoverWWTP_Upgrades_ESR_MCM Comments.pdf
2025-11-13 HanoverWWTP_NofCompletion.pdf

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Hello Jatin Singh,

Thank you for sending the Notice of Completion for the above-referenced project to the Ministry of Citizenship and Multiculturalism (MCM). Please find attached MCM's comments on the Environmental Study Report (ESR).

If you have any questions, please do not hesitate to contact me.

Best regards,

Amanda Antwi-Nsiah
Heritage Planner | Heritage Operations Branch | Citizenship, Inclusion and Heritage Division
Ministry of Citizenship and Multiculturalism | Ontario Public Service
437-212-5945 | Amanda.Antwi-Nsiah@ontario.ca

Taking pride in strengthening Ontario, its places and its people

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From: Beth Wang <beth.wang@ainleygroup.com>
Sent: November 27, 2025 12:25 PM
Cc: Andrew Wilken <awilken@hanover.ca>; Jatin Singh <jatin.singh@ainleygroup.com>
Subject: Town of Hanover, Hanover Wastewater Treatment Plant Class EA - Notice of Completion

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Good afternoon,

Please find attached important information regarding the **completion of the Schedule C Municipal Class Environmental Assessment (Class EA)** for the upgrade and expansion of the Hanover Wastewater Treatment Plant, and details on how to access the Environmental Study Report (ESR).

The ESR is now **available** for review through the link provided in the notice, and comments on this Class EA may be submitted until **December 29, 2025**.

Should you have any questions or require further information, please do not hesitate to reach out.

Regards,

Beth Wang, EIT
Engineering Intern
Tel: (905) 452-5172, Ext. 321
Cell: (289) 541-8086
Email: beth.wang@ainleygroup.com

WWW.AINLEYGROUP.COM

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From: Beth Wang
Sent: November 13, 2025 3:29 PM
Cc: 'Andrew Wilken' <awilken@hanover.ca>; Jatin Singh <jatin.singh@ainleygroup.com>
Subject: Town of Hanover, Hanover Wastewater Treatment Plant Class EA - Notice of Completion

Good afternoon,

The Town of Hanover has retained Ainley Group to conduct a Schedule C Municipal Class Environmental Assessment (Class EA) for the upgrade and expansion of the Hanover Wastewater Treatment Plant.

Please find attached important information regarding the **completion of the Class EA** and details on how to access the Environmental Study Report (ESR).
The ESR will be available for review through the link provided in the notice on **November 27, 2025**, and comments on this Class EA may be submitted until **December 29, 2025**.

Should you have any questions or require further information, please do not hesitate to reach out.

Regards,

Beth Wang, EIT
Engineering Intern
Tel: (905) 452-5172, Ext. 321
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Ministry of Citizenship and Multiculturalism

Heritage Planning Unit
Heritage Operations Branch
Citizenship, Inclusion and Heritage Division
5th Flr, 400 University Ave
Toronto, ON M5G 1S7
Tel.: 437-212-5945

Ministère des Affaires civiques et du Multiculturalisme

Planification relative au patrimoine
Opérations relatives au patrimoine
Division des affaires civiques, de l'inclusion et du patrimoine
5e étage, 400, av. University
Toronto, ON M5G 1S7
Tél.: 437-212-5945

Ontario

December 17, 2025 EMAIL ONLY

Jatin Singh, P.Eng., PMP
Senior Project Manager
Ainley Group
6299 Airport Rd #205
Mississauga, ON L4V 1N3
jatin.singh@ainleygroup.com

MCM File	**:**	**0017769**
Proponent	**:**	**Town of Hanover**
Subject	**:**	**Municipal Class Environmental Assessment – Schedule C – Notice of Completion**
Project	**:**	**Wastewater Treatment Plant Upgrades**
Location	**:**	**Town of Hanover, Grey County**

Dear Jatin Singh:

Thank you for providing the Ministry of Citizenship and Multiculturalism (MCM) with the Notice of Completion for the above-referenced project and for making the Environmental Study Report (ESR) available for our review.

MCM's interest in this Environmental Assessment (EA) project relates to its mandate of conserving Ontario's cultural heritage.

Project Summary
The Town of Hanover has completed a Municipal Class Environmental Assessment (Class EA) to identify the preferred design alternative for wastewater servicing of existing urban residents and businesses, as well as to accommodate future growth. A Municipal Servicing Needs Assessment completed in 2021 identified that the Hanover Wastewater Treatment Plant (HWWTP) had reached 80%–85% of its capacity.

This Class EA is following the planning and design process for Schedule 'C' projects as described in the Municipal Class Environmental Assessment Document (October 2000 as amended in 2007, 2011, 2015 & 2023), published by the Municipal Engineers Association.

Comments

We have reviewed the *Town of Hanover Wastewater Treatment Plant (WWTP) Upgrades Environmental Study Report* (prepared by Ainley Group, dated November 2025) and find that due diligence has been undertaken in preparing the Environmental Study Report by undertaking:

- a Stage 1 and 2 archaeological assessment (AA, under Project Information Form numbers P094-0366-2023 and P383-0422-2023). The associated reports have been entered into the Ontario Public Register of Archaeological Reports. The Stage 2 AA did not recommend further archaeological assessment. However, it did recommend construction monitoring by a licensed archeologist.
- a Cultural Heritage Report: Existing Conditions and Preliminary Impacts (revised, dated June 2024 and prepared by Archaeological Services Inc.), which identified 7 potential built heritage resources (BHRs) and 3 potential cultural heritage landscapes (CHLs). No known BHRs or known CHLs were identified. No direct impacts to the identified BHRs and CHLs are anticipated as a result of the proposed project. The Cultural Heritage Report recommended mitigation measures during construction including suitable planning, no-go zones with fencing, issuing instructions to construction crews to avoid identified BHRs and CHLs, a baseline vibration assessment where necessary, and contacting a qualified heritage consultant if the study area is expanded.

Thank you for consulting MCM on this project. If you have any questions or require clarification, please do not hesitate to contact me.

Sincerely,

Amanda Antwi-Nsiah
Heritage Planner
Amanda.Antwi-Nsiah@ontario.ca

Copied to: Andrew Wilken, Director of Development & Infrastructure, Town of Hanover
EA notices to Southwest region, MECP
Monika Macki, Environmental Resource Planner and Environmental Assessment Coordinator, MECP
Karla Barboza, Team Lead, Heritage Planning Unit, MCM
Beth Wang, Ainley Group

It is the sole responsibility of proponents to ensure that any information and documentation submitted as part of their EA report or file is accurate. The Ministry of Citizenship and Multiculturalism (MCM) makes no representation or warranty as to the completeness, accuracy or quality of the any checklists, reports or supporting documentation submitted as part of the EA process, and in no way shall MCM be liable for any harm, damages, costs, expenses, losses, claims or actions that may result if any checklists, reports or supporting documents are discovered to be inaccurate, incomplete, misleading or fraudulent.

Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48(1) of the *Ontario Heritage Act*. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out an archaeological assessment, in compliance with Section 48(1) of the *Ontario Heritage Act*.

The *Funeral, Burial and Cremation Services Act, 2002, S.O. 2002, c.33* requires that any person discovering human remains must cease all activities immediately and notify the police or coroner. If the coroner does not suspect foul play in the disposition of the remains, in accordance with *Ontario Regulation 30/11* the coroner shall notify the Registrar, Ontario Ministry of Public and Business Service Delivery, which administers provisions of that Act related to burial sites. In situations where human remains are associated with archaeological resources, the Ministry of Citizenship and Multiculturalism should also be notified (at archaeology@ontario.ca) to ensure that the archaeological site is not subject to unlicensed alterations which would be a contravention of the *Ontario Heritage Act*.

From:	Jatin Singh
To:	Beth Wang
Subject:	FW: Notice of Completion - HWWTP ESR - SVCA Comments
Date:	December 23, 2025 10:46:40 AM
Attachments:	image001.png 20251222_NoticeOfCompletion_HWWTP_EA_SVCAComments.pdf RE Town of Hanover Schedule C Class Environmental Assessment WWTP Upgrades.msg 20250506_Hanover_WWTP_EA_SVCA_Comments.pdf SVCA Map - Town of Hanover.pdf

---

Beth: Please file these comments is our folder

Jatin

From: Brandi Walter <b.walter@svca.on.ca>
Sent: December 22, 2025 4:45 PM
To: Andrew Wilken <awilken@hanover.ca>
Cc: Jatin Singh <jatin.singh@ainleygroup.com>
Subject: Notice of Completion - HWWTP ESR - SVCA Comments

Good Afternoon,

Please find attached, SVCA's comments on the draft ESR for the HWWTP EA.

Feel free to contact me if you have any questions.

Kind Regards,

Brandi Walter
Environmental Planning Coordinator
Saugeen Valley Conservation Authority
1078 Bruce Rd. 12, PO Box 150, Formosa ON N0G 1W0
519-364-1255 ext. 236
b.walter@svca.on.ca
www.saugeenconservation.ca



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1078 Bruce Road 12 | P.O. Box 150 | Formosa ON
Canada | N0G 1W0 | 519-364-1255
www.saugeenconservation.ca
publicinfo@svca.on.ca

SENT ELECTRONICALLY (awilken@hanover.ca)
December 22, 2025

Town of Hanover
341 10th Street
Hanover, ON N4N 1P5

ATTENTION: Andrew Wilken, Director of Development and Infrastructure

Dear Andrew Wilken,

RE: Town of Hanover
Schedule 'C' Class Environmental Assessment
Wastewater Treatment Plant Upgrades
Notice of Completion – Environmental Study Report

Thank you for the opportunity to review the Environmental Study Report (ESR) that was undertaken as part of the Class EA process for the above-noted project. Saugeen Valley Conservation Authority (SVCA) staff have reviewed the proposed WWTP upgrade in accordance with the Mandatory Programs and Services Regulation (O. Regulation 686/21) made under the *Conservation Authorities Act* (CA Act). We have also reviewed the project with regard to SVCA's Environmental Planning and Regulation Policies made in conformance with the CA Act, O. Regulation 41/24, and associated provincial guidelines.

SVCA provided the attached correspondence dated May 6, 2025 related to the Notice of Public Information Centre #2. Since that time, SVCA has consulted on the Floodplain Assessment with CAPES Engineering, and we have no further concerns with that assessment. Following our review of the Floodplain Assessment, SVCA staff provided the attached email to the Town of Hanover and Ainley Group relating to the remainder of our concerns for the project and outlying issues detailed in the May 6, 2025 letter. We have reviewed the ESR with regard to our stated concerns and we offer the following comments:

1) **Preferred Alternative – Expansion of the existing Hanover Wastewater Treatment Plant (HWWTP):** The preferred approach would be to expand the existing facility by filling and constructing within the floodplain of the Saugeen River and would encroach onto existing wetlands as shown on the attached map. Outlet infrastructure would also interfere with

the Saugeen River watercourse. All of the above proposed development activities would require a permit from the SVCA as indicated in previous correspondence.

2) **Phasing Plan:** Phase 2 of the proposed alternative would occur in 2029 - 2031. SVCA should be contacted well in advance of the proposed start date to consult on SVCA's requirements for a complete application for SVCA permit. SVCA's complete application requirements would include but not be limited to the technical studies indicated in the attached correspondence. Additional studies and plans may be required based on the final proposed plan at that time.
3) **Impacts, Mitigation Measures and Monitoring Program:** This section does not address the hydrologic impacts of filling in the existing wetland for plant expansion. Furthermore, it is concluded in the report that the Saugeen River is not directly affected by the construction given proposed mitigation measures for erosion and sediment control. However, additional technical studies required by SVCA staff have not been completed to sufficiently assess the environmental impacts and proposed mitigation. For example, SVCA has advised in previous correspondence that a hydrologic/hydrogeologic study will be required to address the hydrologic function of the wetland, prior to SVCA approving the proposed development in SVCA's regulated area. If it is determined via study that filling in the wetlands will have a hydrologic impact to the Saugeen River, then the aforementioned conclusion may be misleading. SVCA staff recommends this section of the draft ESR be revised to address the above; it should be noted that the conclusions and proposed mitigation measures related to the natural environment will be re-evaluated once the aforementioned reports are completed.
4) **Permits and Approvals:** This section of the report summarizes the approvals required for various agencies prior to completing the work. SVCA staff concurs that SVCA's permit application should be submitted in advance of the proposed construction start date. However, the ESR should be amended to include our requirement for the technical studies mentioned above and it should be noted that SVCA be contacted to consult on the Terms of References for the studies. Additional studies/drawings may be required depending on the final proposed project.
5) **Section 3.1, Provincial Policy Statement (2024)**: It is SVCA staff's opinion that this section is not complete and should be updated to include policy direction for natural hazards as per Chapter 5 of the PPS. It is SVCA's opinion that the flooding hazard may be the most significant constraint affecting the project and should be mentioned in the report.
6) **Studies - Natural Environment Assessment:** It is SVCA staff's opinion Palmer's Natural Environment Report does not adequately address the impact of filling in the existing wetland, which would occur for the proposed plant expansion; specifically, the hydrologic impact. An addendum to the Palmer Report should be undertaken once the aforementioned hydrologic/hydrogeologic impact study has been completed and the ESR should be amended to indicate as such.
7) **Studies - Floodplain Assessment:** As noted, SVCA staff is satisfied with the Capes Floodplain Assessment. Staff agree that this study would need to be revised should the proposed expansion increase in size or configuration. As indicated above, the Floodplain Assessment would also require an addendum to address the impact of flood flow

velocities on the proposed development, including recommendations for mitigation. We recommend this section of the ESR be updated as such.

8) **Studies – SVCA Recommended:** SVCA staff notes, the studies required by the SVCA and the purpose for those studies are not listed in the draft ESR. We recommend the report be amended to indicate the additional studies outlined in SVCA correspondence (i.e. hydrologic/hydrogeologic study for wetland/watercourse interference, SVCA's requirements for further geotechnical study to address unstable organic soils; and updated flood study to address flood flow velocity impacts on the development).

SVCA staff have reviewed the proposal for consistency with SVCA's policies made in conformance with the CA Act, O. Regulation 41/24, and associated provincial guidelines. We recommend the ESR be amended in accordance with our comments outlined above.

Please keep the SVCA informed on the process of this EA. We would be pleased to be included in future discussions or technical meetings for the proposed project. Should you have any questions, please contact the undersigned at b.walter@svca.on.ca.

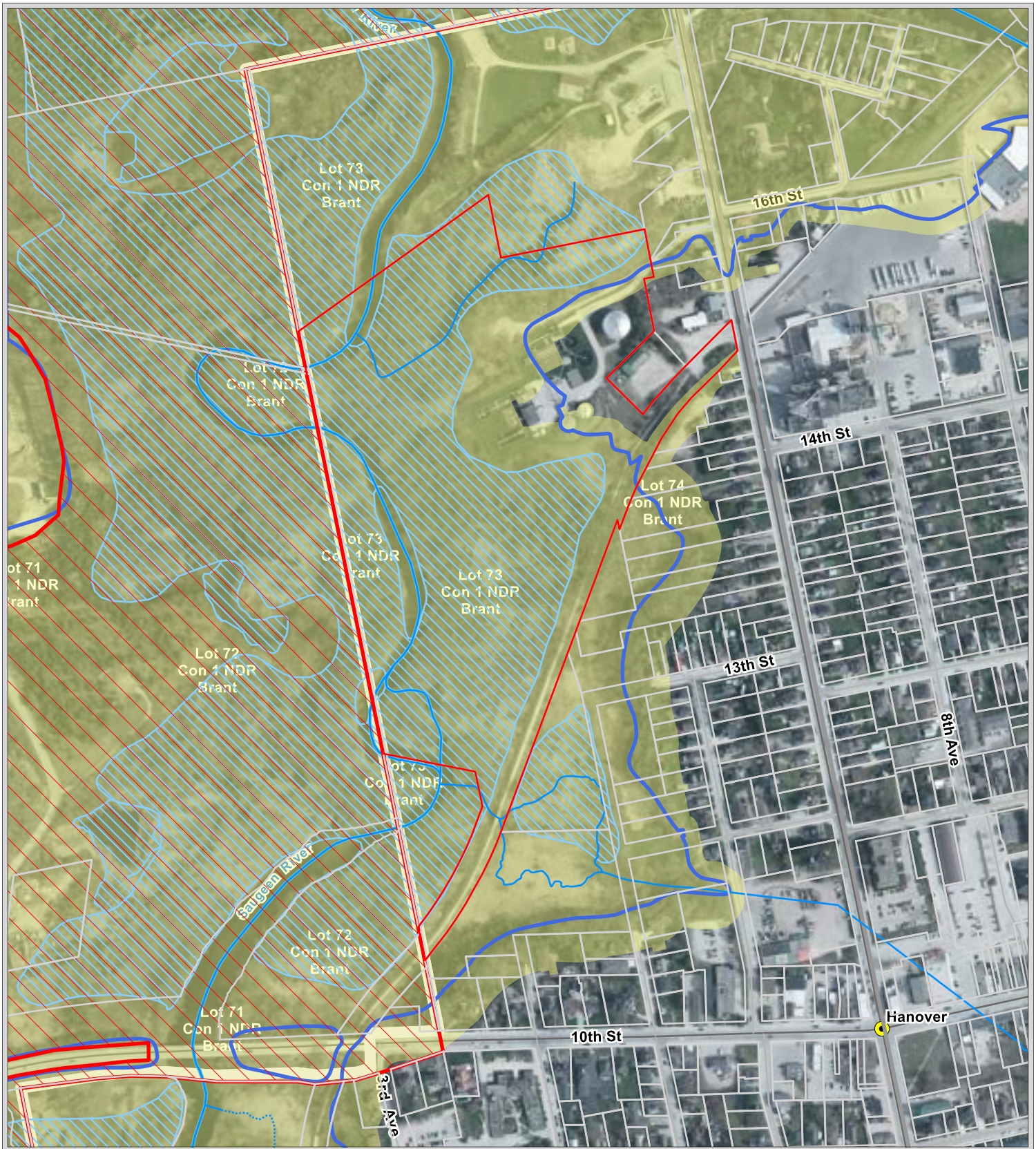
Sincerely,

Brandi Walter
Environmental Planning Coordinator
Saugeen Conservation
BW/

Encl: SVCA May 6, 2025 letter, SVCA June 6, 2025 email, SVCA map

cc: Jatin Singh, Senior Project Manager, Ainley Group (via email)

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The included mapping has been compiled from various sources and is for information purposes only. Saugeen Valley Conservation Authority (SVCA) is not responsible for, and cannot guarantee, the accuracy of all the information contained within the map.

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This mapping contains products of the South Western Ontario Orthophotography Project 2020 (SWOOP2020). These images were taken in 2020 at 16cm resolution by Mapcon Mapping Ltd. They are the property of Saugeen Valley Conservation Authority ©2023.

September 20, 2023

N

UTM Zone 17N, NAD 83

1:5000

Legend

- Watercourse
- Regulatory Flood Line
- Unevaluated Wetland
- Hazard Lands
- SVCA Regulated Area

Town of Hanover
718 7th Avenue
Pt Lots 73 and 74, Con 1 NDR
Plan 771
Roll No. 422903000210900
Town of Hanover

Additionally, activities undertaken outside of a habitat area may adversely impact the species' habitat through indirect effects. For example:

- any activity occurring outside the area surrounding a hibernaculum (e.g., beyond 200 m) that results in physical damage to the underground feature
- significant alteration of natural features outside an area delineated as maternity habitat (e.g., beyond 1000 m from the roost) that changes conditions within the area such that it is no longer suitable as maternity habitat

5. Example of habitat delineation for a hypothetical activity

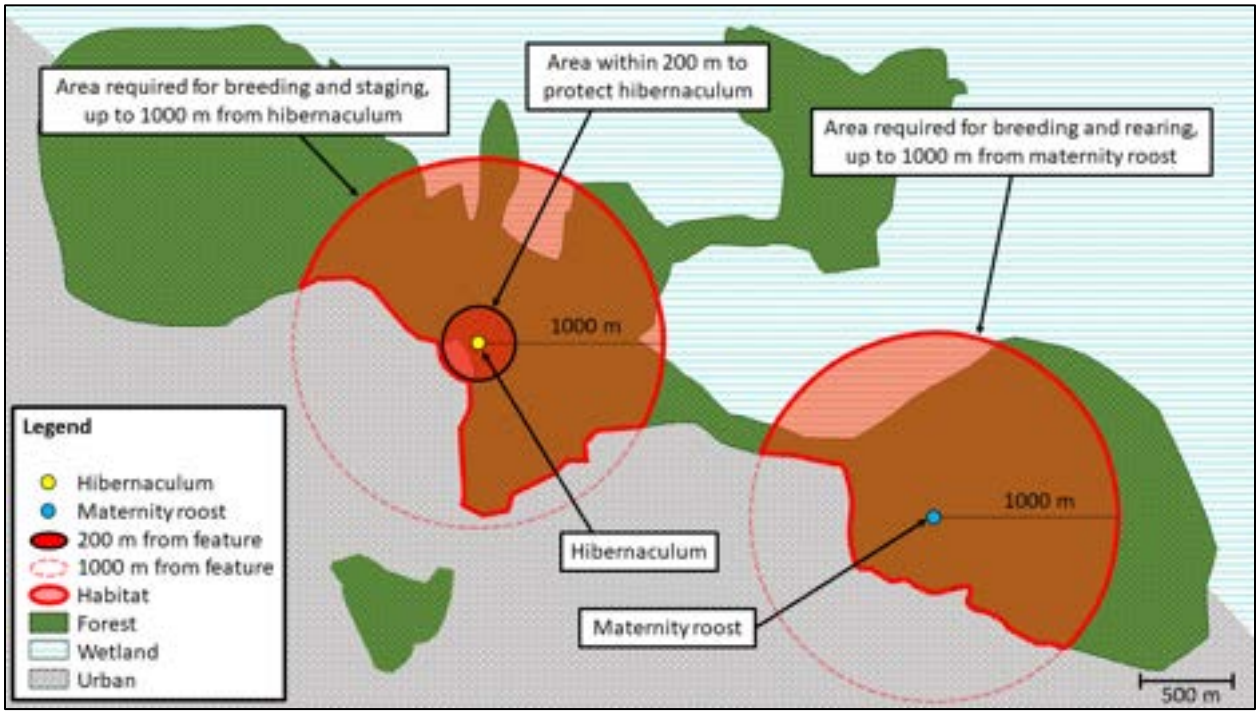


Figure 1. Sample application of habitat delineation for a bat species, using a hypothetical example with a hibernaculum and maternity roost site within a single forested area.

From: Macki, Monika (MECP)
To: Beth Wang; Ron Cooper
Cc: Andrew Wilken; Jatin Singh
Subject: RE: Town of Hanover, Hanover Wastewater Treatment Plant Class EA - Notice of Completion
Date: February 6, 2026 2:08:15 PM
Attachments: 1 - Bats - Preliminary Habitat Summary_Aug8 clean.docx
MECP PRU Comments - ESR - Town of Hanover MCEA Sch C Hanover WWTP.pdf

---

HI Beth,

Thank you for your patience and the opportunity to review the Town of Hanover's WWTP EA.

Please find attached MECP comments.

I look forward to your response.

Thank you,

Monika Macki
Environmental Resource Planner/Environmental Assessment Coordinator
Environmental Assessment Branch
Ministry of the Environment, Conservation and Parks
monika.macki@ontario.ca

From: Beth Wang <beth.wang@ainleygroup.com>
Sent: Friday, February 6, 2026 9:04 AM
To: Macki, Monika (MECP) <Monika.MacKi@ontario.ca>
Cc: Andrew Wilken <awilken@hanover.ca>; Jatin Singh <jatin.singh@ainleygroup.com>
Subject: RE: Town of Hanover, Hanover Wastewater Treatment Plant Class EA - Notice of Completion

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Good morning Monika,

Hope all is well!

I wanted to follow up again to see when we might expect to receive MECP's comments regarding the ESR for the Hanover WWTP Class EA.
Could you please advise?

Regards,

Beth Wang, EIT
Engineering Intern

Tel: (905) 452-5172, Ext. 321
Cell: (289) 541-8086
Email: beth.wang@ainleygroup.com

WWW.AINLEYGROUP.COM

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From: Macki, Monika (MECP) <Monika.MacKi@ontario.ca>
Sent: January 19, 2026 11:01 AM
To: Beth Wang <beth.wang@ainleygroup.com>
Cc: Andrew Wilken <awilken@hanover.ca>; Jatin Singh <jatin.singh@ainleygroup.com>
Subject: RE: Town of Hanover, Hanover Wastewater Treatment Plant Class EA - Notice of Completion

Hi Beth, and happy new year!

Thanks for following up. There are a few technical reviewers for this project working on their reviews, I am hoping within the next couple of weeks we'll have the comment sheet ready.

Apologies for the wait and thank you for your understanding.

Monika Macki
Environmental Resource Planner/Environmental Assessment Coordinator
Environmental Assessment Branch
Ministry of the Environment, Conservation and Parks
monika.macki@ontario.ca

From: Beth Wang <beth.wang@ainleygroup.com>
Sent: Friday, January 16, 2026 2:52 PM
To: Macki, Monika (MECP) <Monika.MacKi@ontario.ca>
Cc: Andrew Wilken <awilken@hanover.ca>; Jatin Singh <jatin.singh@ainleygroup.com>
Subject: RE: Town of Hanover, Hanover Wastewater Treatment Plant Class EA - Notice of Completion

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Good afternoon Monika,

Hope all is well!

I wanted to follow up regarding any comments we may receive from the MECP on the ESR for the Hanover WWTP Class EA.
Could you please advise on the anticipated timeline for when we might expect to receive them?

Regards,

Beth Wang, EIT
Engineering Intern

Tel: (905) 452-5172, Ext. 321
Cell: (289) 541-8086
Email: beth.wang@ainleygroup.com

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From: Macki, Monika (MECP) <Monika.MacKi@ontario.ca>
Sent: December 12, 2025 10:38 AM
To: Beth Wang <beth.wang@ainleygroup.com>
Cc: Andrew Wilken <awilken@hanover.ca>; Jatin Singh <jatin.singh@ainleygroup.com>
Subject: RE: Town of Hanover, Hanover Wastewater Treatment Plant Class EA - Notice of Completion

Hi Beth,

Thanks for providing MECP the notice of completion and ESR for the Hanover WWTP project.

We cannot reach the December 29 date, we will try to get back with our comments by mid-January.

Thank you very much for your understanding,

Monika Macki
Environmental Resource Planner/Environmental Assessment Coordinator
Environmental Assessment Branch
Ministry of the Environment, Conservation and Parks
monika.macki@ontario.ca

From: Beth Wang <beth.wang@ainleygroup.com>
Sent: Thursday, November 27, 2025 12:25 PM
Cc: Andrew Wilken <awilken@hanover.ca>; Jatin Singh <jatin.singh@ainleygroup.com>
Subject: Town of Hanover, Hanover Wastewater Treatment Plant Class EA - Notice of Completion

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Good afternoon,

Please find attached important information regarding the **completion of the Schedule C Municipal Class Environmental Assessment (Class EA)** for the upgrade and expansion of the Hanover Wastewater Treatment Plant, and details on how to access the Environmental Study Report (ESR).

The ESR is now **available** for review through the link provided in the notice, and comments on this Class EA may be submitted until **December 29, 2025**.

Should you have any questions or require further information, please do not hesitate to reach out.

Regards,

Beth Wang, EIT
Engineering Intern

Tel: (905) 452-5172, Ext. 321
Cell: (289) 541-8086
Email: beth.wang@ainleygroup.com

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From: Beth Wang
Sent: November 13, 2025 3:29 PM

Cc: 'Andrew Wilken' <awilken@hanover.ca>; Jatin Singh <jatin.singh@ainleygroup.com>
Subject: Town of Hanover, Hanover Wastewater Treatment Plant Class EA - Notice of Completion

Good afternoon,

The Town of Hanover has retained Ainley Group to conduct a Schedule C Municipal Class Environmental Assessment (Class EA) for the upgrade and expansion of the Hanover Wastewater Treatment Plant.

Please find attached important information regarding the **completion of the Class EA** and details on how to access the Environmental Study Report (ESR).
The ESR will be available for review through the link provided in the notice on **November 27, 2025**, and comments on this Class EA may be submitted until **December 29, 2025**.

Should you have any questions or require further information, please do not hesitate to reach out.

Regards,

Beth Wang, EIT
Engineering Intern

Tel: (905) 452-5172, Ext. 321
Cell: (289) 541-8086
Email: beth.wang@ainleygroup.com

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Ministry of the Environment, Conservation and Parks

Environmental Assessment Branch

1st Floor
135 St. Clair Avenue W
Toronto ON M4V 1P5
Tel.: 416 314-8001
Fax.: 416 314-8452

Ministère de l'Environnement, de la Protection de la nature et des Parcs

Direction des évaluations environnementales

Rez-de-chaussée
135, avenue St. Clair Ouest
Toronto ON M4V 1P5
Tél. : 416 314-8001
Téléc. : 416 314-8452

Via E-mail Only

February 6, 2026

Andrew Wilken
Director of Development and Infrastructure
Town of Hanover
awilken@hanover.ca

Re: Town of Hanover Wastewater Treatment Plant Upgrades
Town of Hanover
Municipal Class Environmental Assessment – Schedule C
Project Review Unit Comments –Environmental Study Report

Dear Andrew,

This letter is in response to the Notice of Completion provided for the above noted Class Environmental Assessment (EA) project. The Ministry of the Environment, Conservation and Parks (ministry) provides the following comments for your consideration.

General

1) The appendix document displays the first page as PDF p. 72. Are there 72 pages prior the Appendix A's page that are not being displayed?



2) The appendix document copies the title page for appendices A-D on PDF p. 580. These appendices seem to already be posted earlier in the document.

3) On PDF p. 129 is the title page for Appendix C Capacity Assessment and Optimization Study. However, on PDF p. 58 it says that it is Appendix B.

Air Quality and Odour

4) The MECP expects that the report contain at minimum, a qualitative air assessment, which should includes:

    a. A discussion of local air quality including existing activities/sources that significantly impact local air quality and how the project may impact existing conditions;
    b. A discussion of the nearby sensitive receptors and the project's potential air quality impacts on present and future sensitive receptors;
    c. A discussion of local air quality impacts that could arise from this project during both construction and operation; and

Species at Risk

5) Acoustic surveys should be considered to confirm the presence (or absence) of species listed in the study screening report.

6) The ESR notes the presence of 6 species of SAR bats, with tree removal likely required for the project. A permit for destruction of species at risk bat habitat would be required should tree removal occur. Please see attached interim habitat guidance.

7) There are also observations of Hungerford's crawling water beetle (endangered) within the Saugeen River next to the proposed expansion. This species is sensitive to changes in water quality and streamflow – depending on where the discharge for the WWTP currently is and/or where the discharge for the expansion is proposed, there could be negative impacts to this species and their habitat.

8) The Protect Ontario by Unleashing our Economy Act, 2025 (Bill 5) received Royal Assent on June 5, 2025, and as a result, the Endangered Species Act, 2007 (ESA) has been immediately amended and will be in effect until such time as the Species Conservation Act (SCA) is proclaimed. The amendments to the ESA are outlined in the Environmental Registry proposal posting. A decision posting reflecting the passing of Bill 5 can be found here.

   The amended ESA and proposed SCA legislation can be found below:
   Endangered Species Act, 2007, S.O. 2007, c. 6 | ontario.ca
   Species Conservation Act, 2025, S.O. 2025, c. 4, Sched. 10 | ontario.ca

9) The Species Conservation Act (SCA) is proposed to be proclaimed in 2026 and will replace the Endangered Species Act (ESA):
   a. Species at risk listed as special concern under the ESA are not proposed to be protected under the SCA
   b. Additionally, migratory bird species and aquatic species that are listed under SARA are not proposed to be protected under the SCA

Surface Water

10) The expansion is proposed to take place in an area regulated by the Saugeen Valley Conservation Authority. The Ministry will require that all Conservation Authority approvals are in place prior to ECA approval.

11) The monitoring program in the ESR (page 47) indicates monthly water quality monitoring of the effluent and downstream during operational phases. It is proposed to monitor for Total Phosphorus, Nitrogen, TSS and BOD_5.

    This should also include pH, temperature, E. coli, Total Ammonia Nitrogen and Total Residual Chlorine (if UV is not selected for disinfection). If there are other waste streams with specific contaminants of concern, these should also be included in the monitoring program.

12) An assimilative capacity study was prepared and reviewed by the Ministry with discussion regarding final effluent limits and objectives. Proposed limits/objectives are presented on page 17 (Table 12) of the ESR. The numbers in Table 12 are not in line with the Ministry's comments on the ACS.

    During the review of the assimilative capacity study, the Region recommended the following edits in red below:

Table 12 – Proposed Effluent Objectives and Limits for 13,789 m3/d Effluent Parameter	**Proposed Effluent Objectives**	**Proposed Effluent Limit**
CBOD5	9.0 mg/L	11.5 mg/L
TSS	9.0 mg/L	11.5 mg/L
TAN		
~~Spring (Mar - May)~~	~~7.2 mg/L~~	~~9.0 mg/L~~
Summer (Jun - Sep)	2.0 mg/L	4.0 mg/L
~~Fall (Oct - Nov)~~	~~5.6 mg/L~~	~~7.0 mg/L~~
Winter (Oct - May)	4 mg/L	6.0 mg/L
TP	0.2 mg/L	0.25 mg/L
E. coli [1]	80 CFU/ 100 ml	100 CFU/ 100 ml
pH [2]	6.5 - 8.5	6.0 - 9.5
TRC [3]	Non-Detect	0.02

a) TAN objectives and limits presented above were developed based on an assessment of the assimilative capacity of the Saugeen River in the vicinity of the outfall. Final TAN objectives and limits for an upgraded and expanded HWWTP may be more stringent, depending on the liquid treatment train technology(ies) ultimately selected.

b) TRC objective and limit would only apply if the upgraded and expanded HWWTP utilizes chlorination / de-chlorination for disinfection.

Thank you for circulating this Report for the ministry's consideration. Please document the receipt of this Project Review Unit Comments letter in the final report. We look forward to receiving a written response from the Town of Hanover to address our comments provided above.

Should you or any members of your project team have any questions regarding the material above, please contact me at monika.macki@ontario.ca.

Sincerely,

Monika Macki

Monika Macki
Environmental Resource Planner / EA Coordinator
Environmental Assessment Program Support, Environmental Assessment Branch
Ontario Ministry of the Environment, Conservation and Parks

AINLEY & ASSOCIATES LIMITED
6299 Airport Road, Suite 205, Mississauga, ON L4V 1N3
Tel: (905) 452-5172 • www.ainleygroup.com

VIA EMAIL

July 7, 2026

File No. 122059

Monika Macki
Environmental Resource Planner/Environmental Assessment Coordinator
Environmental Assessment Branch
Ministry of the Environment, Conservation and Parks
monika.macki@ontario.ca

Re: **Town of Hanover**
Wastewater Treatment Plant Upgrades
Schedule C Municipal Class Environmental Assessment
Response to Comment Received

Dear Monika,

On behalf of Town of Hanover, we are responding to your comment letter dated February 6, 2026 (attached) regarding the Town of Hanover Wastewater Treatment Plant Upgrades Schedule C Class Environmental Assessment.

Please find enclosed the response to the comments provided. The response document outlines the clarification, revisions, and commitments associated with each comment, as applicable.

The Town appreciates the Ministry's review and consideration of the Environmental Study Report. The receipt of the Project Review Unit comments letter and the Town's response will be documented in the final Environmental Study Report.

If you have additional questions or require further assistance with this matter, please feel free to contact the undersigned.

Yours truly,

AINLEY & ASSOCIATES LIMITED



Jatin Singh, P. Eng., PMP
Project Manager
905-452-5172 ext. 311
jatin.singh@ainleygroup.com

cc: Andrew Wilken – Town of Hanover (By Email)

MECP Comment #1:

1) The appendix document displays the first page as PDF p. 72. Are there 72 pages prior the Appendix A's page that are not being displayed?

Response: The PDF page issue has been corrected.

MECP Comment #2:

2) The appendix document copies the title page for appendices A-D on PDF p. 580. These appendices seem to already be posted earlier in the document.

Response: The duplicate title pages were associated with appendices to the Technology Alternatives Memorandum, which had been included earlier in the ESR. To avoid duplication and potential confusion, these title pages have been removed from the final report.

MECP Comment #3:

3) On PDF p. 129 is the title page for Appendix C Capacity Assessment and Optimization Study. However, on PDF p. 58 it says that it is Appendix B.

Response: We understand that the comment refers to PDF page 458 or 581, rather than PDF page 58. The referenced title page is included within the Technology Alternatives Memorandum, an interim technical memorandum prepared during the EA process. Within that memorandum, the Capacity Assessment and Optimization Study is identified as Appendix B; it is not identified as Appendix B to the ESR.

As several supporting technical memoranda were prepared throughout the EA process, certain reports and appendices were appended more than once. In some cases, only the title page was retained to avoid reproducing the full report multiple times. To eliminate potential confusion, all duplicate appendix material has been removed from the final ESR.

MECP Comment #4:

4) The MECP expects that the report contain at minimum, a qualitative air assessment, which should includes:

a. A discussion of local air quality including existing activities/sources that significantly impact local air quality and how the project may impact existing conditions;

b. A discussion of the nearby sensitive receptors and the project's potential air quality impacts on present and future sensitive receptors;

c. A discussion of local air quality impacts that could arise from this project during both construction and operation;

Response: A preliminary air quality and odour assessment section has been added to the final ESR. This section addresses existing local air quality conditions and sources, nearby sensitive receptors, and potential air quality and odour effects associated with both construction and operation of the proposed works.

Project-specific air quality and odour investigations will be completed during detailed design to inform the final design, mitigation measures, and applicable approval requirements.

MECP Comment #5:

5) Acoustic surveys should be considered to confirm the presence (or absence) of species listed in the study screening report.

6) The ESR notes the presence of 6 species of SAR bats, with tree removal likely required for the project. A permit for destruction of species at risk bat habitat would be required should tree removal occur. Please see attached interim habitat guidance.

7) There are also observations of Hungerford's crawling water beetle (endangered) within the Saugeen River next to the proposed expansion. This species is sensitive to changes in water quality and streamflow - depending on where the discharge for the WWTP currently is and/or where the discharge for the expansion is proposed, there could be negative impacts to this species and their habitat.

8) The Protect Ontario by Unleashing our Economy Act, 2025 (Bill 5) received Royal Assent on June 5, 2025, and as a result, the Endangered Species Act, 2007 (ESA) has been immediately amended and will be in effect until such time as the Species Conservation Act (SCA) is proclaimed. The amendments to the ESA are outlined in the Environmental Registry proposal posting. A decision posting reflecting the passing of Bill 5 can be found here.

The amended ESA and proposed SCA legislation can be found below:

Endangered Species Act, 2007, S.O. 2007, c. 6 | ontario.ca

Species Conservation Act, 2025, S.O. 2025, c. 4, Sched. 10 | ontario.ca

9) The Species Conservation Act (SCA) is proposed to be proclaimed in 2026 and will replace the Endangered Species Act (ESA):

a. Species at risk listed as special concern under the ESA are not proposed to be protected under the SCA

b. Additionally, migratory bird species and aquatic species that are listed under SARA are not proposed to be protected under the SCA

Response: The Natural Heritage Report has been revised in response to the above comments and is included as an appendix to the final ESR. The revised report addresses the consideration of acoustic surveys, potential effects on species at risk bats and Hungerford's crawling water beetle, and applicable species at risk legislation and regulatory requirements.

The report also identifies recommended follow-up investigations, mitigation measures, and permitting requirements, as applicable, to be addressed during subsequent project phases.

MECP Comment #6:

10) The expansion is proposed to take place in an area regulated by the Saugeen Valley Conservation Authority. The Ministry will require that all Conservation Authority approvals are in place prior to ECA approval.

Response: Noted. All required approvals from the Saugeen Valley Conservation Authority will be obtained during detailed design and prior to submission of the ECA application.

MECP Comment #7:

11) The monitoring program in the ESR (page 47) indicates monthly water quality monitoring of the effluent and downstream during operational phases. It is proposed to monitor for Total Phosphorus, Nitrogen, TSS and BOD5.

This should also include pH, temperature, E. coli, Total Ammonia Nitrogen and Total Residual Chlorine (if UV is not selected for disinfection). If there are other waste streams with specific contaminants of concern, these should also be included in the monitoring program.

Response: Updated in the final ESR as per the Ministry's comments.

MECP Comment #8:

12) An assimilative capacity study was prepared and reviewed by the Ministry with discussion regarding final effluent limits and objectives. Proposed limits/objectives are presented on page 17 (Table 12) of the ESR. The numbers in Table 12 are not in line with the Ministry's comments on the ACS.

During the review of the assimilative capacity study, the Region recommended the following edits in red below:

Table 12 – Proposed Effluent Objectives and Limits for 13,789 m3/d Effluent Parameter	Proposed Effluent Objectives	Proposed Effluent Limit
CBOD5	9.0 mg/L	11.5 mg/L
TSS	9.0 mg/L	11.5 mg/L
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E. coli [1]	80 CFU/ 100 ml	100 CFU/ 100 ml
pH [2]	6.5 - 8.5	6.0 - 9.5
TRC [3]	Non-Detect	0.02

a) TAN objectives and limits presented above were developed based on an assessment of the assimilative capacity of the Saugeen River in the vicinity of the outfall. Final TAN objectives and limits for an upgraded and expanded HWWTP may be more stringent, depending on the liquid treatment train technology(ies) ultimately selected.

b) TRC objective and limit would only apply if the upgraded and expanded HWWTP utilizes chlorination / de-chlorination for disinfection.

Response: Table 12 in the ESR has been revised to reflect the effluent objectives and limits identified through the Ministry's review of the Assimilative Capacity Study. The corresponding revisions have also been incorporated into the Assimilative Capacity Study report. The MECP has indicated acceptance of a summer TAN limit of 4.0 mg/L. However, based on the recommendations of the ACS, a more stringent summer TAN limit of 2.7 mg/L is recommended. Final effluent objectives and limits will be confirmed through detailed design and the ECA process, considering the selected treatment technology.

Preliminary Technical Habitat Summary for Bats
August 2025

1. Applicability

This preliminary technical information applies to endangered and threatened bat species that are listed on the Species at Risk in Ontario List (O. Reg. 230/08) under the *Endangered Species Act, 2007* (ESA) as amended on June 5, 2025.

The applicable part of the new definition of habitat, under the amended ESA, for bats is clause (a) – i.e., a dwelling place such as a den, nest or other similar place that is occupied or habitually occupied by one or more members of a species for the purposes of breeding, rearing, staging, wintering or hibernating, and the area immediately around a dwelling place that is essential for these purposes.

There are 8 species of bats living in Ontario, 7 of which are listed as endangered. “Resident Bats” include Eastern Small-footed Myotis, Little Brown Myotis, Northern Myotis and Tri-colored Bat, regional migrants which live in Ontario year-round and spend winters hibernating. “Migratory Bats” include Hoary Bat, Eastern Red Bat and Silver-haired Bat, long-distance migrants which typically spend winters outside of Ontario, although individuals have been observed overwintering in the Great Lakes area.

This information is not and should not be taken as legal advice and does not constitute official ministry policy or requirements. You should consult a lawyer on questions about the application or interpretation of the laws of Ontario as they relate to the matters covered by this information.

2. Brief description of habitat

The information below can be used to support client-led decisions about whether an area may reasonably be considered habitat under the new definition. This information is a preliminary technical interpretation and is based on best available information at this time. It may change or be updated in the future, as additional information becomes available or as future policy guidance is developed.

This information is general in nature. Delineation of protected habitat will generally need to be undertaken on a case-by-case basis, taking into account context-specific factors such as species-specific biology and habitat needs and local conditions.

When assessing areas of potential habitat, best available information suggests that:

Hibernating and swarming habitat *(for Resident Bats)* generally includes:

- as a dwelling place, the entire natural feature or anthropogenic structure (e.g., cave, crevice, mine, tunnel), including all entry points and extent of underground chambers, occupied for wintering (hibernation) and breeding (swarming) (hereafter, “hibernaculum”)

- all area immediately within a 200 m radius of the hibernaculum
- the portion of the area required by the species for the purposes of breeding in the fall and staging in the spring, up to a 1000 m radius from the hibernaculum

Maternity roosting habitat *(for Resident and Migratory Bats)* generally includes:

- as a dwelling place, the natural roost feature (e.g., tree, snag, rock) or entire anthropogenic structure (e.g., entire bridge, barn, or rock pile) occupied for breeding (gestation, birth) and rearing pups (hereafter, “maternity roost”)
- the portion of the area required by the species for breeding and rearing pups, up to a 1000 m radius from the maternity roost

Migratory stopover habitat *(for Migratory Bats)* generally includes:

- as a dwelling place, the natural roost feature (e.g., tree) or anthropogenic structure (e.g., building) occupied for staging during migration
- the portion of the area required by the species for staging during migration, up to a 1000 m radius from the occupied feature or structure

Overwintering habitat *(for Migratory Bats)* generally includes:

- as a dwelling place, any habitat feature or structure (e.g., tree, leaf litter, natural cavity or building) occupied by a migratory bat for wintering
- all area immediately within a 25 m radius of the occupied feature or structure

3. Supporting rationale and considerations

- Bats exhibit high site fidelity to hibernacula, maternity roosting sites and migratory stopover areas in Ontario, habitually (seasonally) occupying these habitats year after year and over several generations.
- All area within 200 m of a hibernaculum, including its underground extent, is important to maintain the stability of the feature or structure, the climatic conditions required for hibernation, and the airspace used for swarming at its entrances.
- The portion of the area required for breeding and staging within 1000 m of a hibernaculum ensures that bats have the space and resources necessary to breed (via swarming) in the fall and supports overwintering as well as egg fertilization and gestation in the spring.
- The portion of the area required for breeding and rearing within 1000 m of a maternity roost is necessary to maintain the suitability of the roost for maternity conditions, support roost switching behaviour, and ensure the availability of resources essential for females to successfully rear young, including carrying, giving birth and nursing pups.
- The portion of the area required for staging within 1000 m of a roost occupied during migratory stopover is necessary to maintain the suitability of the site for

staging (e.g., microclimate, protection from predators) and to ensure the availability of resources essential for bats to successfully refuel during long-distance migration.

- The area within 25 m of occupied overwintering sites is needed to maintain the sites' function as habitat for wintering by providing concealment and maintaining microclimate.

4. Examples of activities in habitat

The following examples are for illustration purposes only.

Whether an activity is likely to damage or destroy the habitat of a protected species is contextual. It requires consideration of the activity details, the impacted habitat, and how the activity may affect a species' ability to carry on its life processes within that habitat. Activities that do not result in damage or destruction of habitat may result in killing or harming a species at risk or involve other actions (e.g., possession, transport) that require an ESA authorization. This includes activities that occur outside of habitat, as species protections generally apply wherever the species occurs.

Examples of activities that are unlikely to adversely impact bat habitat include:

- continuation of existing agricultural practices and planned management activities such as annual crop harvest (excluding tree clearing), mowing, and cattle grazing
- general use or improvement of an occupied or habitually occupied building or structure that does not impair its function as a habitat (e.g., painting the exterior of a building used as a maternity roost outside of the maternity period)
- ground-level yard work such as lawn care or gardening
- selective pruning or removal of individual trees not occupied for breeding, rearing, staging or wintering

Examples of activities that are likely to adversely impact bat habitat include:

- physically entering hibernacula at any time of the year, as it may facilitate transmission of disease (e.g., white-nose syndrome) to uninfected habitats
- any activity that temporarily or permanently impair the ecological function, physical integrity or suitable conditions of hibernacula (e.g., excavation altering groundwater flow)
- significant modifications to natural features or structures occupied as maternity roosts that temporarily or permanently impair or eliminate their function as habitat (e.g., removing or pruning an occupied tree or snag, renovating the roof of a habitually occupied barn)
- any activity that result in significant fragmentation or removal of habitat required for breeding, rearing or staging, such as forests, meadows, wetlands, ponds, riparian corridors, rock barrens and rock outcrops

Consultation Records with First Nations

Beth Wang

From: Tiffany Taylor <t.taylor@indigenousaware.com>
Sent: October 6, 2022 2:55 PM
To: chief.veronica@nawash.ca
Cc: Beth Wang; Jatin Singh; Lanting Xie
Subject: Project Notification Letter - Town of Hanover/Ainley Group
Attachments: Notification Letter Ainley Group EA Hanover - Nawash Unceded FN.pdf

Aaniin/Boozhoo,

My name is Tiffany Taylor, and I am the Indigenous Aware Coordinator at CIPS (Cambium Indigenous Professional Services).

CIPS has been retained by Ainley Group to assist with Indigenous Engagement/Consultation. Ainley Group will be conducting a Class C Environmental Assessment in the Town of Hanover Wastewater Treatment Plant Upgrades.

Please see attached notification letter which outlines the project details.

I look forward to working with your community.

Miigwetch,

Tiffany D. Taylor (she/her/kwe)
Indigenous Aware Coordinator
CIPS, Cambium Indigenous Professional Services

Email: t.taylor@indigenousaware.com
Phone: 705-400-6722 | Mobile: 705-917-1321

1109 Mississauga Street
Curve Lake First Nation, Ontario K0L 1R0
www.indigenousaware.com

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Beth Wang

From: Tiffany Taylor <t.taylor@indigenousaware.com>
Sent: October 6, 2022 2:59 PM
To: emily.martin@saugeenojibwaynation.ca
Cc: Beth Wang; Jatin Singh; Lanting Xie
Subject: Project Notification Letter - Town of Hanover/Ainley Group
Attachments: Notification Letter Ainley Group EA Hanover - SON Enviro. Office.pdf

Aaniin/Boozhoo Emily Martin,

My name is Tiffany Taylor, and I am the Indigenous Aware Coordinator at CIPS (Cambium Indigenous Professional Services).

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Please see attached notification letter which outlines the project details.

I look forward to working with your community.

Miigwetch,

Tiffany D. Taylor (she/her/kwe)
Indigenous Aware Coordinator
CIPS, Cambium Indigenous Professional Services

Email: t.taylor@indigenousaware.com
Phone: 705-400-6722 | Mobile: 705-917-1321

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Curve Lake First Nation, Ontario K0L 1R0
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Beth Wang

From: Tiffany Taylor <t.taylor@indigenousaware.com>
Sent: October 6, 2022 3:01 PM
To: peterc1908@hotmail.com
Cc: Beth Wang; Jatin Singh; Lanting Xie
Subject: Project Notification Letter - Town of Hanover/Ainley Group
Attachments: Notification Letter Ainley Group EA Hanover - Great Lakes Metis Council.pdf

Aaniin/Boozhoo Peter Coture,

My name is Tiffany Taylor, and I am the Indigenous Aware Coordinator at CIPS (Cambium Indigenous Professional Services).

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Please see attached notification letter which outlines the project details.

I look forward to working with your community.

Miigwetch,

Tiffany D. Taylor (she/her/kwe)
Indigenous Aware Coordinator
CIPS, Cambium Indigenous Professional Services

Email: t.taylor@indigenousaware.com
Phone: 705-400-6722 | Mobile: 705-917-1321

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Curve Lake First Nation, Ontario K0L 1R0
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Beth Wang

From: Tiffany Taylor <t.taylor@indigenousaware.com>
Sent: October 6, 2022 3:02 PM
To: Beth Wang; Jatin Singh; Lanting Xie
Subject: FW: Project Notification Letter - Town of Hanover/Ainley Group
Attachments: Notification Letter Ainley Group EA Hanover - Historic Saugeen Metis.pdf

Forgot to cc…see below and attached

Tiffany D. Taylor (she/her/kwe)
Indigenous Aware Coordinator
CIPS, Cambium Indigenous Professional Services

Email: t.taylor@indigenousaware.com
Phone: 705-400-6722 | Mobile: 705-917-1321

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www.indigenousaware.com

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From: Tiffany Taylor
Sent: October 6, 2022 3:00 PM
To: 'hsmlrcc@bmts.com' <hsmlrcc@bmts.com>
Subject: Project Notification Letter - Town of Hanover/Ainley Group

Aaniin/Boozhoo George Govier,

My name is Tiffany Taylor, and I am the Indigenous Aware Coordinator at CIPS (Cambium Indigenous Professional Services).

CIPS has been retained by Ainley Group to assist with Indigenous Engagement/Consultation. Ainley Group will be conducting a Class C Environmental Assessment in the Town of Hanover Wastewater Treatment Plant Upgrades.

Please see attached notification letter which outlines the project details.

I look forward to working with your community.

Miigwetch,

Tiffany D. Taylor (she/her/kwe)
Indigenous Aware Coordinator
CIPS, Cambium Indigenous Professional Services

Email: t.taylor@indigenousaware.com
Phone: 705-400-6722 | Mobile: 705-917-1321

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www.indigenousaware.com

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Beth Wang

From: Tiffany Taylor <t.taylor@indigenousaware.com>
Sent: October 6, 2022 2:57 PM
To: sfn@saugeen.org; lroote@saugeenfirstnation.ca
Cc: Beth Wang; Jatin Singh; Lanting Xie
Subject: Project Notification Letter - Town of Hanover/Ainley Group
Attachments: Notification Letter Ainley Group EA Hanover - Saugeen FN.pdf

Aaniin/Boozhoo Chief Conrad Ritchie,

My name is Tiffany Taylor, and I am the Indigenous Aware Coordinator at CIPS (Cambium Indigenous Professional Services).

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I look forward to working with your community.

Miigwetch,

Tiffany D. Taylor (she/her/kwe)
Indigenous Aware Coordinator
CIPS, Cambium Indigenous Professional Services

Email: t.taylor@indigenousaware.com
Phone: 705-400-6722 | Mobile: 705-917-1321

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Beth Wang

From: Tiffany Taylor <t.taylor@indigenousaware.com>
Sent: May 2, 2024 3:13 PM
To: Chief@nawash.ca; SON Archaeology; manager@saugeenojibwaynation.ca; associate.ri@saugeenojibwaynation.ca; peterc1908@hotmail.com; GLMC@metisnation.org; Coordinator LRC HSM
Cc: Beth Wang; Jatin Singh
Subject: FW: 122059-Hanover WWTP EA-Notice of PIC#1
Attachments: Hanover WWTP Class EA-Notice of Public Information Centre#1.pdf

Importance: High

Aaniin please see attached is the notice of PIC#1 for the Hanover WWTP EA.

The PIC will be available for review on Hanover official website on May 2, 2024 as well. The commenting deadline is June 7, 2024.

Please reach out if you have any questions or concerns.

Miigwech, Tiffany

Tiffany D. Taylor (she/her/kwe)
Indigenous Aware Coordinator
CIPS, Cambium Indigenous Professional Services

Email: t.taylor@indigenousaware.com
Phone: 705-400-6722 | Mobile: 705-917-1321

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www.indigenousaware.com

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Beth Wang

From: Tiffany Taylor <t.taylor@indigenousaware.com>
Sent: October 18, 2023 2:00 PM
To: Chief@nawash.ca
Cc: Beth Wang
Subject: FW: 122059-Hanover WWTP Class EA-Draft Stage 1 AA and Cultural Heritage Report
Attachments: 22EA-168 Stage 1 AA.pdf; 23CH-107 Hanover WWTP CHR_IA_29Sept2023.pdf

Apologies, I had the incorrect email. Please see below.

Miigwech,

Tiffany D. Taylor (she/her/kwe)
Indigenous Aware Coordinator
CIPS, Cambium Indigenous Professional Services

Email: t.taylor@indigenousaware.com
Phone: 705-400-6722 | Mobile: 705-917-1321

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Curve Lake First Nation, Ontario K0L 1R0
www.indigenousaware.com

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From: Tiffany Taylor
Sent: Wednesday, October 18, 2023 1:56 PM
To: chief.veronica@nawash.ca; sfn@saugeen.org; lroote@saugeenfirstnation.ca; emily.martin@saugeenojibwaynation.ca; Coordinator LRC HSM <hsmlrcc@bmts.com>; peterc1908@hotmail.com
Cc: Beth Wang <beth.wang@ainleygroup.com>; Ron Cooper <rcooper@hanover.ca>; Jatin Singh <jatin.singh@ainleygroup.com>
Subject: 122059-Hanover WWTP Class EA-Draft Stage 1 AA and Cultural Heritage Report

Aaniin,

Please see attached draft stage 1 archaeological report and cultural heritage report for the Hanover WWTP Class EA.

If you have any immediate questions or concerns, please let us know.

Miigwech,

Tiffany D. Taylor (she/her/kwe)
Indigenous Aware Coordinator
CIPS, Cambium Indigenous Professional Services

Email: t.taylor@indigenousaware.com
Phone: 705-400-6722 | Mobile: 705-917-1321

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Nijichaagominaanig **gaa-onji-bakewinidiyaang**

Beth Wang

From: Tiffany Taylor <t.taylor@indigenousaware.com>
Sent: December 8, 2023 1:30 PM
To: manager@saugeenojibwaynation.ca; SON Archaeology; Chief@nawash.ca; sfn@saugeen.org; lroote@saugeenfirstnation.ca; emily.martin@saugeenojibwaynation.ca; Coordinator LRC HSM; peterc1908@hotmail.com
Cc: Beth Wang
Subject: FW: 122059-Hanover WWTP Class EA-Draft Natural Environment Report
Attachments: DRAFT_Natural Environment Report_Dec 4, 2023.pdf

Importance: High

Aaniin,

Please find attached the Honover WWTP Class EA - draft natural environment report for your review and comment.

If you have any questions, concerns or comments, please let me know as soon as possible.

Miigwech,

Tiffany D. Taylor (she/her/kwe)
Indigenous Aware Coordinator
CIPS, Cambium Indigenous Professional Services

Email: t.taylor@indigenousaware.com
Phone: 705-400-6722 | Mobile: 705-917-1321

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Our Spirit is What Sets Us Apart
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From: Beth Wang <beth.wang@ainleygroup.com>
Sent: Friday, December 8, 2023 1:03 PM
To: Tiffany Taylor <t.taylor@indigenousaware.com>
Cc: Jatin Singh <jatin.singh@ainleygroup.com>; Ron Cooper <rcooper@hanover.ca>
Subject: 122059-Hanover WWTP Class EA-Draft Natural Environment Report
Importance: High

This message's attachments contains at least one web link. This is often used for phishing attempts. Please only interact with this attachment if you know its source and that the content is safe. If in doubt, confirm the legitimacy with the sender by phone.

Good afternoon Tiffany,

Hope all is well!

The draft natural environment report is enclosed. Would you kindly distribute it to indigenous communities for their review and feedback?

Regards,

Beth Wang, EIT
Engineering Intern



www.ainleygroup.com
Tel: (905) 452-5172 Ext. 321
Cell: (289) 541-8086

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From:	Tiffany Taylor
To:	Chief@nawash.ca; SON Archaeology; manager@saugeenojibwaynation.ca; associate.ri@saugeenojibwaynation.ca; peterc1908@hotmail.com; GLMC@metisnation.org; Coordinator LRC HSM
Cc:	Beth Wang; Jatin Singh
Subject:	FW: FOLLOW-UP: 122059-Hanover WWTP Class EA-Draft Stage 2 AA Report and Indigenous Engagement Supplementary Documentation
Date:	March 25, 2024 3:08:32 PM
Attachments:	image002.jpg image003.jpg image004.jpg image005.jpg image006.jpg image007.jpg image008.jpg image009.jpg 23EA276_HanoverWWTP_Stg2_8Mar_24.pdf 23EA276_HanoverWWTP_Stg2_IESD_12Mar_24.pdf
Importance:	High

Good afternoon, please see attached two report we received for Stage 2 Archaeological Assessment for the Hanover WWTP Class EA.

Please review and if you have any feedback, concerns or questions, please let us know.

Miigwech,

Tiffany D. Taylor (she/her/kwe)
Indigenous Aware Coordinator
CIPS, Cambium Indigenous Professional Services

Email: t.taylor@indigenousaware.com
Phone: 705-400-6722 | Mobile: 705-917-1321

1109 Mississauga Street
Curve Lake First Nation, Ontario K0L 1R0
www.indigenousaware.com

From:	Tiffany Taylor
To:	Chief@nawash.ca; SON Archaeology; manager@saugeenojibwaynation.ca; associate.ri@saugeenojibwaynation.ca; peterc1908@hotmail.com; GLMC@metisnation.org; Coordinator LRC HSM
Cc:	Beth Wang; Jatin Singh
Subject:	FW: 122059-Hanover WWTP EA-Final Cultural Heritage Report
Date:	July 23, 2024 3:37:18 PM
Attachments:	image001.jpg image002.jpg image003.jpg image004.jpg image005.jpg image006.jpg image008.jpg image010.jpg image011.jpg 22CH-107 Hanover WWTP CH Report_FINAL_28June2024.pdf
Importance:	High

Aaniin,

For your records, please find attached the final Cultural Heritage Report for the Hanover Wastewater Treatment Plant Municipal Class EA.

If you have any comments or concerns, please do not hesitate to contact me or the Ainley Group cc'd.

Miigwech and have a good afternoon, Tiffany

Tiffany D. Taylor (she/her/kwe)
Indigenous Aware Coordinator
CIPS, Cambium Indigenous Professional Services

Email: t.taylor@indigenousaware.com
Phone: 705-400-6722 | Mobile: 705-917-1321

1109 Mississauga Street
Curve Lake First Nation, Ontario K0L 1R0
www.indigenousaware.com

From: Beth Wang <beth.wang@ainleygroup.com>
Sent: Tuesday, July 23, 2024 3:03 PM
To: Tiffany Taylor <t.taylor@indigenousaware.com>
Cc: Jatin Singh <jatin.singh@ainleygroup.com>
Subject: 122059-Hanover WWTP EA-Final Cultural Heritage Report
Importance: High

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Good afternoon Tiffany,

Hope all is well!

Could you please distribute the final Cultural Heritage Report to First Nations for their records?

Regards,

Beth Wang, EIT
Engineering Intern
image003
www.ainleygroup.com
Tel: (905) 452-5172 Ext. 321
Cell: (289) 541-8086

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Beth Wang

From: Beth Wang
Sent: December 20, 2023 4:28 PM
To: Coordinator LRC HSM
Cc: Tiffany Taylor; Ron Cooper; Jatin Singh
Subject: Hanover WWTP Class EA Information Update to Historic Saugeen Métis
Attachments: Notification Letter Ainley Group EA Hanover - Historic Saugeen Metis.pdf; 22EA-168 Stage 1 AA.pdf; 23CH-107 Hanover WWTP CHR_IA_29Sept2023.pdf; DRAFT_Natural Environment Report_Dec 4, 2023.pdf

Good afternoon Georgia,

Hope all is well!

As we continue to progress with the Hanover Class Environmental Assessment (EA) project, I am writing to provide you information about the Class EA timeline and to seek your valued input.

The Hanover Wastewater Treatment Plant (HWWTP) is currently operating at 85% of rated capacity and uncommitted capacity reserves are limiting development. The purpose of this Class EA is to identify a general approach for the management of future wastewater flows, evaluate design alternatives and recommend a preferred alternative solution for the management of wastewater for the town through to 2052.

The following items have been issued to the Historic Saugeen Métis so far for this Class EA (also attached in this email):

1. Notice of Study Commencement on October 6, 2022
2. Draft Stage 1 Archaeological Assessment report and draft Cultural Heritage Report on October 18, 2023
3. Draft Natural Heritage Report on December 8, 2023

The draft stage 1 report indicates that stage 2 AA is required. We undertook the stage 2 field investigation on December 13, 2023. We anticipate the completion of the draft Stage 2 Archaeological Assessment report by March 2024 and will forward that to you when we have received it.

Looking ahead, we are planning to conduct Public Information Center #1 (PIC#1) early next year. This event presents an opportunity for the community, including interested first nation groups to engage with the project, ask questions, and provide feedback.

We value the input of HSM and welcome any feedback you may have so that concerns can be addressed early in the Class EA process.

Should you have any questions or require additional information, please feel free to contact us

Regards,

Beth Wang, EIT
Engineering Intern
Ainley
www.ainleygroup.com
Tel: (905) 452-5172 Ext. 321
Cell: (289) 541-8086

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From: Tiffany Taylor <t.taylor@indigenousaware.com>
Sent: December 13, 2023 1:11 PM
To: Coordinator LRC HSM <hsmlrcc@bmts.com>
Cc: Beth Wang <beth.wang@ainleygroup.com>
Subject: RE: 122059-Hanover WWTP Class EA-Draft Stage 1 AA and Cultural Heritage Report

Hi there!!

So glad I reached out.

In a separate email, I will forward all information that I have sent out regarding this project.

Also, cc'd is Beth from Ainley Group, who may have additional information.

Please let us know if you would like to e-meet to discuss or if you have any questions.

Thank you for the response 😊

Tiffany D. Taylor (she/her/kwe)
Indigenous Aware Coordinator
CIPS, Cambium Indigenous Professional Services

Email: t.taylor@indigenousaware.com
Phone: 705-400-6722 | Mobile: 705-917-1321

1109 Mississauga Street
Curve Lake First Nation, Ontario K0L 1R0
www.indigenousaware.com

Our Spirit is What Sets Us Apart
Nijichaagominaanig gaa-onji-bakewinidiyaang

From: Coordinator LRC HSM <hsmlrcc@bmts.com>
Sent: Wednesday, December 13, 2023 12:04 PM
To: Tiffany Taylor <t.taylor@indigenousaware.com>
Subject: Re: 122059-Hanover WWTP Class EA-Draft Stage 1 AA and Cultural Heritage Report

Hi Tiffany,

My sincere apologies - this is the correct email (hsmlrcc@bmts.com). I am new to this position and I think some of these emails from you may have gotten lost in the transition.

Thank you for the Cultural Heritage Report, Draft EIS, and Stage 1 Arch Report. Is there any initial circulation regarding proposal of the EA, including background information? HSM typically receives initial notice via email or letter from the municipality or consulting/engineering firm. We have no documentation of the project outside of the information from you. Some additional context of the overall project would be beneficial to catch up on these documents. I wonder if it is

possible we were missed on an initial circulation by accident. I will review the documents you have sent me and get back to you today with any comments we may have. Thanks so much for reaching out and following up.

Regards,

Georgia McLay

Coordinator, Lands, Waters & Consultation
Historic Saugeen Métis
204 High Street
Southampton, ON
saugeenmetis.com
519.483.4000

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> On Dec 13, 2023, at 11:01 AM, Tiffany Taylor <t.taylor@indigenousaware.com> wrote:
>
> Good morning,
>
> I have sent the below and am following up. I have not received a response. I may have the incorrect email as seen below.
>
> Could you review and let me know if you have any concerns or questions.
>
> With thanks,

<image002.jpg>

<image003.jpg><image004.jpg><image005.jpg>

Tiffany D. Taylor (she/her/kwe)
Indigenous Aware Coordinator
CIPS, Cambium Indigenous Professional Services

Email: t.taylor@indigenousaware.com
Phone: 705-400-6722 | Mobile: 705-917-1321

1109 Mississauga Street
Curve Lake First Nation, Ontario K0L 1R0
www.indigenousaware.com

<image001.jpg>

<image010.jpg>

From: Tiffany Taylor
Sent: Wednesday, October 18, 2023 1:56 PM
To: chief.veronica@nawash.ca; sfn@saugeen.org; lroote@saugeenfirstnation.ca; emily.martin@saugeenojibwaynation.ca; Coordinator LRC HSM <hsmlrcc@bmts.com>; peterc1908@hotmail.com
Cc: Beth Wang <beth.wang@ainleygroup.com>; Ron Cooper <rcooper@hanover.ca>; Jatin Singh <jatin.singh@ainleygroup.com>
Subject: 122059-Hanover WWTP Class EA-Draft Stage 1 AA and Cultural Heritage Report

Aaniin,

Please see attached draft stage 1 archaeological report and cultural heritage report for the Hanover WWTP Class EA.

If you have any immediate questions or concerns, please let us know.

Miigwech,

<image002.jpg>

<image003.jpg><image004.jpg><image005.jpg>

Tiffany D. Taylor (she/her/kwe)
Indigenous Aware Coordinator
CIPS, Cambium Indigenous Professional Services

Email: t.taylor@indigenousaware.com
Phone: 705-400-6722 | Mobile: 705-917-1321

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Curve Lake First Nation, Ontario K0L 1R0
www.indigenousaware.com

<image011.jpg>

<image010.jpg>

<22EA-168 Stage 1 AA.pdf><23CH-107 Hanover WWTP CHR_IA_29Sept2023.pdf>

Beth Wang

From: hsmlrcc@bmts.com
Sent: March 4, 2024 1:13 PM
To: Tiffany Taylor
Cc: Beth Wang
Subject: Re: FW: 122059-Hanover WWTP Class EA-Follow up with HSM
Attachments: image006.jpg; image008.jpg

Importance: High

You don't often get email from hsmlrcc@bmts.com. Learn why this is important

Good Afternoon,

Thanks for reaching out. I believe I replied on January 15, 2024 but missed you on my email, Beth. My sincere apologies. Thank you for your patience in this matter.

The Historic Saugeen Métis (HSM) Lands, Waters and Consultation Department has reviewed all relevant documents, including the Stage 1 Archaeological Assessment, Natural Environment Report and Draft Natural Heritage Report. HSM has no concerns and is satisfied with all documents as presented. As the Stage 2 Archaeological Assessment becomes available soon, HSM wishes to view this document, as you have indicated. Please keep us informed on all aspects as the project progresses.

Thank you for the opportunity to consult and be involved in the Hanover WWTP EA.

Regards,

Georgia McLay

Coordinator, Lands, Waters & Consultation
Historic Saugeen Métis
204 High Street
Southampton, ON
saugeenmetis.com
519.483.4000

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you have received this message in error, please reply to the sender by e-mail and delete or destroy all copies of this message.

On 2024-03-04 09:12, Tiffany Taylor wrote:

Aaniin!

Please see below email from Ainley Group, Beth Wang regarding the Hanover Waste Water project.

Please let us know if you have any comments or feedback.

Miigwech and have a good day,

Tiffany D. Taylor (she/her/kwe)

Indigenous Aware Coordinator

CIPS, Cambium Indigenous Professional Services

Email: t.taylor@indigenousaware.com

Phone: 705-400-6722 | Mobile: 705-917-1321

1109 Mississauga Street

Curve Lake First Nation, Ontario K0L 1R0

www.indigenousaware.com

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Nijichaagominaanig gaa-onji-bakewinidiyaang

From: Beth Wang <beth.wang@ainleygroup.com>
Sent: Tuesday, February 27, 2024 11:09 AM
To: Tiffany Taylor <t.taylor@indigenousaware.com>
Cc: Jatin Singh <jatin.singh@ainleygroup.com>
Subject: 122059-Hanover WWTP Class EA-Follow up with HSM
Importance: High

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Good morning Tiffany,

Hope all is well! I've recently returned from a vacation, which is why there has been a lapse in communication.

In the email sent to Historic Saugeen Métis on December 20, 2023 (as attached), we provided the notice of commencement and all three draft reports for review. However, we haven't heard back from them with any comments, despite their expressed interest in participating in the process.

Could you please follow up with a call to inquire about their opinion? Our subconsultant is awaiting their confirmation to submit the report to Ministry of Citizenship and Multiculturalism.

If you have any concerns, please let me know.

Regards,

Beth Wang, EIT

Engineering Intern

Ainley

www.ainleygroup.com

Tel: (905) 452-5172 Ext. 321

Cell: (289) 541-8086

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Beth Wang

From: Tiffany Taylor <t.taylor@indigenousaware.com>
Sent: July 25, 2024 3:56 PM
To: Coordinator LRC HSM
Cc: Beth Wang
Subject: RE: 122059-Hanover WWTP EA-Final Cultural Heritage Report

Hi there!

Glad you received it!

If you have any questions or concerns, please let us know.

Have a great rest of your day and enjoy the rest of your summer, Tiffany

Tiffany D. Taylor (she/her/kwe)
Indigenous Aware Coordinator
CIPS, Cambium Indigenous Professional Services

Email: t.taylor@indigenousaware.com
Phone: 705-400-6722 | Mobile: 705-917-1321

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Nijichaagominaanig gaa-onji-bakewinidiyaang

From: Coordinator LRC HSM <hsmlrcc@bmts.com>
Sent: Thursday, July 25, 2024 3:55 PM
To: Tiffany Taylor <t.taylor@indigenousaware.com>
Subject: Re: 122059-Hanover WWTP EA-Final Cultural Heritage Report
Importance: High

Hi Tiffany,

Thanks for providing the Cultural Heritage Report.

Regards,

Georgia Lumley

Coordinator, Lands, Waters & Consultation
Historic Saugeen Métis
204 High Street
Southampton, ON
saugeenmetis.com

519.483.4000

HISTORIC SAUGEEN MÉTIS

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On Jul 23, 2024, at 3:36 PM, Tiffany Taylor <t.taylor@indigenousaware.com> wrote:

Aaniin,

For your records, please find attached the final Cultural Heritage Report for the Hanover Wastewater Treatment Plant Municipal Class EA.

If you have any comments or concerns, please do not hesitate to contact me or the Ainley Group cc'd.

Miigwech and have a good afternoon, Tiffany

<image002.jpg>

<image003.jpg><image004.jpg><image005.jpg>

Tiffany D. Taylor (she/her/kwe)
Indigenous Aware Coordinator
CIPS, Cambium Indigenous Professional Services

Email: t.taylor@indigenousaware.com
Phone: 705-400-6722 | Mobile: 705-917-1321

1109 Mississauga Street
Curve Lake First Nation, Ontario K0L 1R0
www.indigenousaware.com

<image010.jpg>

<image011.jpg>

From: Beth Wang <beth.wang@ainleygroup.com>
Sent: Tuesday, July 23, 2024 3:03 PM
To: Tiffany Taylor <t.taylor@indigenousaware.com>
Cc: Jatin Singh <jatin.singh@ainleygroup.com>
Subject: 122059-Hanover WWTP EA-Final Cultural Heritage Report
Importance: High

This message's attachments contains at least one web link. This is often used for phishing attempts. Please only interact with this attachment if you know its source and that the content is safe. If in doubt, confirm the legitimacy with the sender by phone.

Good afternoon Tiffany,

Hope all is well!

Could you please distribute the final Cultural Heritage Report to First Nations for their records?

Regards,

Beth Wang, EIT
Engineering Intern
<image001.jpg>
www.ainleygroup.com
Tel: (905) 452-5172 Ext. 321
Cell: (289) 541-8086

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<22CH-107 Hanover WWTP CH Report_FINAL_28June2024.pdf>

Beth Wang

From: Tiffany Taylor <t.taylor@indigenousaware.com>
Sent: October 18, 2023 2:00 PM
To: Chief@nawash.ca
Cc: Beth Wang
Subject: FW: 122059-Hanover WWTP Class EA-Draft Stage 1 AA and Cultural Heritage Report
Attachments: 22EA-168 Stage 1 AA.pdf; 23CH-107 Hanover WWTP CHR_IA_29Sept2023.pdf

Apologies, I had the incorrect email. Please see below.

Miigwech,

Tiffany D. Taylor (she/her/kwe)
Indigenous Aware Coordinator
CIPS, Cambium Indigenous Professional Services

Email: t.taylor@indigenousaware.com
Phone: 705-400-6722 | Mobile: 705-917-1321

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www.indigenousaware.com

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From: Tiffany Taylor
Sent: Wednesday, October 18, 2023 1:56 PM
To: chief.veronica@nawash.ca; sfn@saugeen.org; lroote@saugeenfirstnation.ca; emily.martin@saugeenojibwaynation.ca; Coordinator LRC HSM <hsmlrcc@bmts.com>; peterc1908@hotmail.com
Cc: Beth Wang <beth.wang@ainleygroup.com>; Ron Cooper <rcooper@hanover.ca>; Jatin Singh <jatin.singh@ainleygroup.com>
Subject: 122059-Hanover WWTP Class EA-Draft Stage 1 AA and Cultural Heritage Report

Aaniin,

Please see attached draft stage 1 archaeological report and cultural heritage report for the Hanover WWTP Class EA.

If you have any immediate questions or concerns, please let us know.

Miigwech,

Tiffany D. Taylor (she/her/kwe)
Indigenous Aware Coordinator
CIPS, Cambium Indigenous Professional Services

Email: t.taylor@indigenousaware.com
Phone: 705-400-6722 | Mobile: 705-917-1321

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www.indigenousaware.com

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Nijichaagominaanig **gaa-onji-bakewinidiyaang**

Beth Wang

From: Karen Heisler <associate.ri@saugeenojibwaynation.ca>
Sent: December 15, 2023 9:03 AM
To: Beth Wang
Cc: Tiffany Taylor; Jatin Singh; Ron Cooper
Subject: Re: Hanover WWTP Class EA-Application Form

Good morning,

Thank you everyone for the clarification, we receive numerous notifications for municipal infrastructure projects from across the territory and given these are both from the same municipality we got our wires crossed. Just to summarize, yes we would be happy to meet with you to discuss. We are familiar with the Municipal Class EA process. It is important that we enter into a letter of agreement with the municipality that enables SON's participation in the review of the alternatives and peer review any studies that take place. Like many offices we will be closing the last week of December and first week of January, I do have availability next Wednesday and Thursday.

Regards,

Karen

On Thu, Dec 14, 2023 at 4:58 PM Beth Wang <beth.wang@ainleygroup.com> wrote:

> Good afternoon Karen,
>
> Hope all is well!
>
> Ainley is the contact for the Wastewater Treatment Plant EA Jatin Singh <jatin.singh@ainleygroup.com> is our project manager.
>
> The Landfill EA is managed by Cobide Engineering, and we have no communication with them. However, the Town should be able to provide you with these information.
>
> We can have a meeting to further discuss the WWTP EA next week if the Town is available then. I will confirm with them and get back to you ASAP.
>
> Regards,

Beth Wang, EIT

Engineering Intern



www.ainleygroup.com

Tel: (905) 452-5172 Ext. 321

Cell: (289) 541-8086

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From: Tiffany Taylor <t.taylor@indigenousaware.com>
Sent: December 13, 2023 1:18 PM
To: Karen Heisler <associate.ri@saugeenojibwaynation.ca>; Beth Wang <beth.wang@ainleygroup.com>
Subject: RE: Hanover WWTP Class EA-Application Form

Great! Thank you so very much for the clarification.

@Beth Wang Please see below and if you could provide contact for the 2 Hanover projects.

Miigwech,

Tiffany D. Taylor (she/her/kwe)

Indigenous Aware Coordinator

CIPS, Cambium Indigenous Professional Services

Email: t.taylor@indigenousaware.com

Phone: 705-400-6722 | Mobile: 705-917-1321

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Curve Lake First Nation, Ontario K0L 1R0

www.indigenousaware.com

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Nijichaagominaanig gaa-onji-bakewinidiyaang

From: Karen Heisler <associate.ri@saugeenojibwaynation.ca>
Sent: Wednesday, December 13, 2023 11:25 AM
To: Tiffany Taylor <t.taylor@indigenousaware.com>
Subject: Re: Hanover WWTP Class EA-Application Form

HI Tiffany,

The Saugeen Ojibway Nation Environment Office is responsible to the Joint Council of the Saugeen Ojibway Nation composed of Saugeen First Nation and the Chippewas of Nash Unceded First Nation. We handle consultation for all projects in the SON territory.

We just need clarification of who we should be communicating with for the two projects for Hanover - the Wastewater Treatment Plant and the Landfill projects. We have already engaged with the archaeology consultants for both projects for the fieldwork, but we will require entering into a Letter of Agreement for both projects to cover our expenses to peer review the environmental impact reporting.

I'm attaching reference documents.

Karen

On Wed, Dec 13, 2023 at 11:09 AM Tiffany Taylor <t.taylor@indigenousaware.com> wrote:

> Aaniin Karen, hope you are well.
>
> Little introduction, we were approached by Ainley to assist with Indigenous consultation – I basically send out the information on behalf of Ainley and basically assist with the relationship building and force us out of the equation.
>
> For my understanding, SON represents Saugeen and Neyaashiinigmiing (Nawash)? Or only one or the other?
>
> Miigwech for any assistance you may be able to provide.

Tiffany D. Taylor (she/her/kwe)

Indigenous Aware Coordinator

CIPS, Cambium Indigenous Professional Services

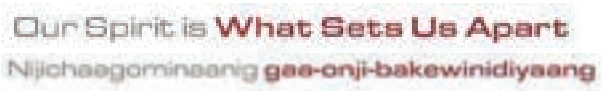
Email: t.taylor@indigenousaware.com

Phone: 705-400-6722 | Mobile: 705-917-1321

1109 Mississauga Street

Curve Lake First Nation, Ontario K0L 1R0

www.indigenousaware.com



From: Karen Heisler <associate.ri@saugeenojibwaynation.ca>
Sent: Wednesday, December 13, 2023 10:14 AM
To: Beth Wang <beth.wang@ainleygroup.com>
Cc: Tiffany Taylor <t.taylor@indigenousaware.com>; Ron Cooper <rcooper@hanover.ca>; Jatin Singh <jatin.singh@ainleygroup.com>; Environment Office Archaeology <archaeology@saugeenojibwaynation.ca>; Charlene Leonard <manager.ri@saugeenojibwaynation.ca>
Subject: Re: Hanover WWTP Class EA-Application Form

Good morning Beth,

Yes the SON EO will waive the $500.00 consultation application fee.

Yes, entering into a letter of agreement is required for the SON EO to peer review the reports prepared for you project. As archaeology fieldwork often occurs prior to the completion of the all of the studies undertaken in an application or Municipal Class EA, we will consult on the archaeology work first and submit an invoice for that phase of the consultation to ensure SON Monitors are present. The LOA will outline the costs incurred by our office to review the studies prepared for for your Class EA. Can you please provide us with a list of studies completed and/or to be completed as you evaluate alternatives.

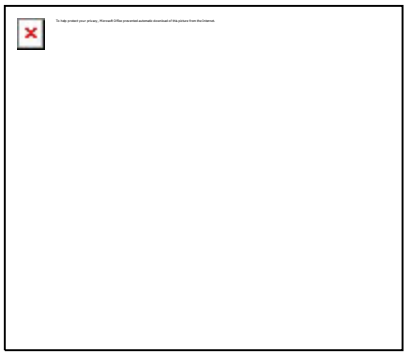
In review of our files and communication we see that Hanover has also contacted our office for consultation for a landfill Municipal Class EA process as well, which I believe is lead by Cobide Engineering. It would be helpful for our office if we could prepare LOA's for both projects with Hanover and understand the timeline for these projects.

Can we please arrange a meeting to discuss?

Thank you,

Karen Heisler

Karen Heisler, Ph.D.
Resources & Infrastructure Associate
Direct T: (705) 798-3312



10129 Hwy 6 Georgian Bluffs, ON
N0H 2T0
saugeenojibwaynation.ca

I am grateful to live, work, and benefit from the Lands and Waters of the Saugeen Ojibway Nation.

On Thu, Nov 30, 2023 at 4:34 PM Beth Wang <beth.wang@ainleygroup.com> wrote:

> Good afternoon Karen,
>
> Hope all is well!
>
> Please find the attached completed application form and notice of study commencement issued on October 6, 2022.
>
> The Town has scheduled the payment for stage 2 field work participation by cheque, which will be issued tomorrow. Blake Williams from ASI will further contact you to coordinate the field investigation schedule.

Could you please confirm whether the $500 application fee mentioned in the application form can be waived for municipalities?

Additionally, could you also confirm whether, after SON accepts the application, a letter of agreement will be provided by SON, as stated on the last page of the application form?

Please let us know you need additional information.

Regards,

Beth Wang, EIT

Engineering Intern



www.ainleygroup.com

Tel: (905) 452-5172 Ext. 321

Cell: (289) 541-8086

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Beth Wang

From: Beth Wang
Sent: June 7, 2024 11:15 AM
To: archaeology@saugeenojibwaynation.ca
Cc: Tiffany Taylor; Jatin Singh
Subject: RE: 122059-Hanover WWTP Class EA-Draft Stage 2 AA Report and Indigenous Engagement Supplementary Documentation

Hi Natalie,

Hope all is well!

Regarding the questions you provided on April 5 for the Stage 2 AA report, the responses are as follows:

In the Stage 2 Archaeological Report, the project personnel section includes only ASI staff or those subcontracted by ASI. Indigenous representatives are documented as representing their communities within the Indigenous Engagement Supplementary Documentation (IESD). IESD is not public and there is an approval process if someone request to review it.

This project is an Environmental Class Assessment; therefore, no construction will be involved. We do not anticipate extending the proposed work beyond the current study area, nor do we expect changes to the project design or temporary workspace requirements that would necessitate the inclusion of previously un-surveyed lands.

Our archaeological subconsultant, ASI, will finalize the Stage 2 AA report, which we will then circulate for your records.

Regards,

Beth Wang, EIT
Engineering Intern
Ainley
www.ainleygroup.com
Tel: (905) 452-5172 Ext. 321
Cell: (289) 541-8086

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From: Tiffany Taylor <t.taylor@indigenousaware.com>
Sent: April 5, 2024 1:16 PM
To: Beth Wang <beth.wang@ainleygroup.com>
Subject: Fwd: FOLLOW-UP: 122059-Hanover WWTP Class EA-Draft Stage 2 AA Report and Indigenous Engagement Supplementary Documentation

Aaniin, please see below response from Saugeen Nation.

Have a good day, Tiffany

Get Outlook for iOS

From: SON Archaeology <archaeology@saugeenojibwaynation.ca>
Sent: Friday, April 5, 2024 12:03:48 PM
To: Tiffany Taylor <t.taylor@indigenousaware.com>; Charlene Leonard <manager.ri@saugeenojibwaynation.ca>
Subject: Re: FW: FOLLOW-UP: 122059-Hanover WWTP Class EA-Draft Stage 2 AA Report and Indigenous Engagement Supplementary Documentation

Hi Tiffany,

We have reviewed the reports and have a couple of suggestions.

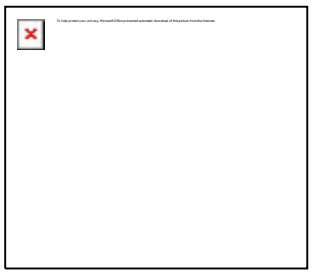
First, could you please have SON Archaeology staff included in the report under project personnel - Dr. Robert Martin was on-site for this.

The polygon for SON Monitoring and recommendations as worded are acceptable.

Additional information:
The client should notify the Saugeen Ojibway Nation (SON) before the start of the construction works, so that the SON can assign a representative to be present to observe ground disturbing within the construction monitoring buffer (Figure 3); and
Should the proposed work extend beyond the current Study Area or should changes to the project design or temporary workspace requirements result in the inclusion of previously un-surveyed lands, these lands should be subject to a Stage 2 archaeological assessment.

Miigwetch,

Natalie Kuipers
SON Archaeology Department
Resource & Infrastructure Department



10129 Hwy 6
Georgian Bluffs, ON
N0H 2T0
saugeenojibwaynation.ca

On Mon, Mar 25, 2024 at 3:08 PM Tiffany Taylor <t.taylor@indigenousaware.com> wrote:

> Good afternoon, please see attached two report we received for Stage 2 Archaeological Assessment for the Hanover WWTP Class EA.

Please review and if you have any feedback, concerns or questions, please let us know.

Miigwech,

Tiffany D. Taylor (she/her/kwe)

Indigenous Aware Coordinator

CIPS, Cambium Indigenous Professional Services

Email: t.taylor@indigenousaware.com

Phone: 705-400-6722 | Mobile: 705-917-1321

1109 Mississauga Street

Curve Lake First Nation, Ontario K0L 1R0

www.indigenousaware.com

Our Spirit is What Sets Us Apart

Nijicheegominaanig gaa-onji-bakewinidiyaang

Beth Wang

From: Karen Heisler <associate.ri@saugeenojibwaynation.ca>
Sent: February 7, 2024 9:02 AM
To: Beth Wang; Ron Cooper; Jatin Singh; Tiffany Taylor
Cc: Natalie Kuipers; Charlene Leonard; Amber Debassige
Subject: Re: Hanover WWTP EA-Discussion with SON
Attachments: Archaeology _ Hanover WWTP _ 2024.02.05.pdf

Good morning Beth,

Please find attached a letter providing the results of the SON Archaeology Monitoring for the Hanover WWTP EA. Regarding the review of the Natural Environment Reports for this EA, unfortunately our department is unable to complete reviews of these documents, as there has been an unprecedented volume of development application reviews in January and scheduled reviews in February. We would however, like to continue to receive notifications as the Environmental Assessment proceeds. As outlined in the archaeology letter, we would also like to see the archaeology report prior to submission the Ministry and we would like to arrange Archaeology monitoring of the site when site ground disturbance commences for construction of the new WWTP, to ensure there is no damage to possible archaeological artifacts on the site.

Thank you, please contact me if you have any further questions.

Karen Heisler

On Thu, Feb 1, 2024 at 2:36 PM Beth Wang <beth.wang@ainleygroup.com> wrote:

> Good afternoon Karen,
>
> Hope all is well!
>
> Bring this to the top of your inbox, following up on the reviewing progress on submitted reports. We are not proceeding with any hydrological study, instead, we are having the floodplain modeling ongoing. Our subconsultants are awaiting comments to finalize the study reports. If you could kindly provide the timeline for review, it would be greatly helpful.
>
> Your prompt attention to this matter is greatly appreciated. If you have any questions or concerns, please let us know.

Regards,

Beth Wang, EIT

Engineering Intern



www.ainleygroup.com

Tel: (905) 452-5172 Ext. 321

Cell: (289) 541-8086

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From: Karen Heisler <associate.ri@saugeenojibwaynation.ca>
Sent: December 20, 2023 10:43 AM
To: Beth Wang <beth.wang@ainleygroup.com>; Tiffany Taylor <t.taylor@indigenousaware.com>; Ron Cooper <rcooper@hanover.ca>; Jatin Singh <jatin.singh@ainleygroup.com>
Cc: Natalie Kuipers <gis@saugeenojibwaynation.ca>; Charlene Leonard <manager.ri@saugeenojibwaynation.ca>; Amber Debassige <execassist.ri@saugeenojibwaynation.ca>
Subject: Re: Hanover WWTP EA-Discussion with SON

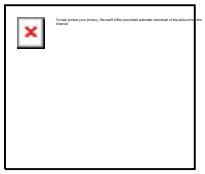
Thank you for meeting with our team this morning to discuss the proposed Town of Hanover Wastewater Treatment Plant Municipal Class EA process. At the meeting we identified that the SON EO will peer review studies to evaluate the impact (if any) that the project may have on SON's Indigenous Rights and Interest in the SON Territory. I can confirm that Tiffany has been in communication with our office and provided us the with ASI cultural heritage and archaeological stage 1 reports and teh Natural Heritage report completed by Palmer. Our office has also arranged for SON Arch Monitors to participate in the Stage 2 fieldwork conducted in November 2023. In the meeting I requested the any other hydrology, or hydrogeological studies that have been completed for the project be sent to our office. Once received we will then prepare a letter of agreement and send it to the Town of Hanover.

Please ensure that my email address is included in all communication with our office.

Thank you,

Karen Heisler

Karen Heisler, Ph.D.
Resources & Infrastructure Associate
Direct T: (705) 798-3312



10129 Hwy 6 Georgian Bluffs, ON
N0H 2T0
saugeenojibwaynation.ca

I am grateful to live, work, and benefit from the Lands and Waters of the Saugeen Ojibway Nation.

On Fri, Dec 15, 2023 at 9:43 AM Beth Wang <beth.wang@ainleygroup.com> wrote:

> Good morning,
>
> This meeting is scheduled for Wednesday, December 20th, from 10am to 11am.
>
> Please let me know if you have any conflicts.
>
> Beth
>
> ---
>
> # Microsoft Teams meeting
>
> **Join on your computer, mobile app or room device**

Click here to join the meeting

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Passcode: hCcMKw

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010129 Highway 6,
Georgian Bluffs, ON
N0H 2T0
(519) 534-5507
saugeenojibwaynation.ca

Environment Office
Saugeen Ojibway Nation.

Ron Cooper
Director, Public Works
Town of Hanover

Email: rcooper@hanover.ca

Aaniin,

SON Archaeology was engaged and consulted with the Stage 1 and 2 archaeological as a part of assessments that occurred for the proposed Hanover WasteWater Treatment Plant site. SON's archaeologist, Dr. Robert Martin, attended the Stage 2 assessment with ASI Heritage on December 13th-15. No archaeological resources were recovered in the study. However, there is concern that archaeological resources could be uncovered by the upcoming construction closest to the Saugeen River. A map of the area of concern was created by the ASI field director, Jose Gutierrez.

SON Archaeology recommends having SON Monitors present for soil stripping in the polygon. SON Archaeology should be consulted prior to soil stripping in the area of concern and we can discuss a suitable procedure when the project begins.

Please ensure our office receives a copy of the Stage 1-2 report when completed by ASI. Dr. Martin will review the report prior to submission to the Ministry of Citizenship and Multiculturalism (MCM).

Miigwetch,



Natalie Kuipers
SON Archaeology Department
Resource & Infrastructure Department

Cc: Beth Wang <beth.wang@ainleygroup.com>; Tiffany Taylor <t.taylor@indigenousaware.com>; Jatin Singh <jatin.singh@ainleygroup.com>

From:	Beth Wang
To:	"Chief@nawash.ca"; "SON Archaeology"; "manager@saugeenojibwaynation.ca"; "associate.ri@saugeenojibwaynation.ca"; "peterc1908@hotmail.com"; "GLMC@metisnation.org"; "Coordinator LRC HSM"
Cc:	"Andrew Wilken"; Jatin Singh; "Tiffany Taylor"
Subject:	Follow-Up: Town of Hanover, Hanover Wastewater Treatment Plant Class EA - Notice of Completion
Date:	December 23, 2025 3:43:00 PM
Attachments:	Hanover WWTP Class EA-Notice of Completion.pdf

Good afternoon,

This is a friendly reminder regarding the Schedule C Municipal Class Environmental Assessment (Class EA) for the upgrade and expansion of the Hanover Wastewater Treatment Plant.

As noted previously, the Environmental Study Report (ESR) is available for review through the link provided in the notice. Comments may be submitted until **December 29, 2025**.
Should you have any questions or require further information, please do not hesitate to reach out.

Regards,

Beth Wang, EIT
Engineering Intern

Tel: (905) 452-5172, Ext. 321
Cell: (289) 541-8086
Email: beth.wang@ainleygroup.com

WWW.AINLEYGROUP.COM

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From: Beth Wang
Sent: November 27, 2025 12:27 PM
To: 'Chief@nawash.ca' <Chief@nawash.ca>; 'SON Archaeology' <archaeology@saugeenojibwaynation.ca>; 'manager@saugeenojibwaynation.ca' <manager@saugeenojibwaynation.ca>; 'associate.ri@saugeenojibwaynation.ca' <associate.ri@saugeenojibwaynation.ca>; 'peterc1908@hotmail.com' <peterc1908@hotmail.com>; 'GLMC@metisnation.org' <GLMC@metisnation.org>; 'Coordinator LRC HSM' <hsmlrcc@bmts.com>
Cc: 'Andrew Wilken' <awilken@hanover.ca>; Jatin Singh <jatin.singh@ainleygroup.com>; 'Tiffany Taylor' <t.taylor@indigenousaware.com>
Subject: Town of Hanover, Hanover Wastewater Treatment Plant Class EA - Notice of Completion

Good afternoon,

Please find attached important information regarding the **completion of the Schedule C Municipal Class Environmental Assessment (Class EA)** for the upgrade and expansion of the Hanover Wastewater Treatment Plant, and details on how to access the Environmental Study Report (ESR).

The ESR is now **available** for review through the link provided in the notice, and comments on this Class EA may be submitted until **December 29, 2025**.

Should you have any questions or require further information, please do not hesitate to reach out.

Regards,

Beth Wang, EIT
Engineering Intern

Tel: (905) 452-5172, Ext. 321
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From: Beth Wang
Sent: November 13, 2025 2:44 PM
To: Chief@nawash.ca; SON Archaeology <archaeology@saugeenojibwaynation.ca>; manager@saugeenojibwaynation.ca; associate.ri@saugeenojibwaynation.ca; peterc1908@hotmail.com; GLMC@metisnation.org; Coordinator LRC HSM <hsmlrcc@bmts.com>
Cc: 'Andrew Wilken' <awilken@hanover.ca>; Jatin Singh <jatin.singh@ainleygroup.com>; 'Tiffany Taylor' <t.taylor@indigenousaware.com>
Subject: Town of Hanover WWTP Class EA - Notice of Completion

Good afternoon,

Hope all is well!

On behalf of Tiffany Taylor, our Indigenous Coordinator from CIPS, who is currently on vacation, I am sharing the Notice of Completion for the Hanover WWTP Class EA.

The Environmental Study Report will be available online through the link provided in the notice on November 27, 2025.
If you have any questions or concerns, please let us know.

Regards,

Beth Wang, EIT
Engineering Intern



Tel: (905) 452-5172, Ext. 321
Cell: (289) 541-8086
Email: beth.wang@ainleygroup.com

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From:	hsmlrcc
To:	Beth Wang
Cc:	awilken@hanover.ca; Jatin Singh
Subject:	Re: Follow-Up: Town of Hanover, Hanover Wastewater Treatment Plant Class EA - Notice of Completion
Date:	January 8, 2026 2:48:34 PM
Attachments:	Screenshot 2026-01-05 at 12.24.31 PM.png

Good afternoon,

Thank you for providing the Notice of Completion regarding the Town of Hanover Schedule 'C' Class Environmental Assessment - Wastewater Treatment Plant Upgrades.

Apologies for the delayed response on this matter. The HSM Department of Lands, Waters, and Consultation has reviewed the EA and has no concerns or feedback at this time. We appreciate the inclusion of HSM's previous recommendations in this report and look forward to future opportunities for collaboration.

Best,

Neala

Neala MacLeod Farley
Coordinator, Lands, Waters & Consultation

Historic Saugeen Métis
204 High Street
Southampton, ON
www.saugeenmetis.com
519-483-4000

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> On Dec 23, 2025, at 3:43 PM, Beth Wang <beth.wang@ainleygroup.com> wrote:
>
> Good afternoon,
>
> This is a friendly reminder regarding the Schedule C Municipal Class Environmental Assessment (Class EA) for the upgrade and expansion of the Hanover Wastewater

Treatment Plant.

As noted previously, the Environmental Study Report (ESR) is available for review through the link provided in the notice. Comments may be submitted until **December 29, 2025**. Should you have any questions or require further information, please do not hesitate to reach out.

Regards,

Beth Wang, EIT
Engineering Intern
<image001.jpg>
Tel: (905) 452-5172, Ext. 321
Cell: (289) 541-8086
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Cc: 'Andrew Wilken' <awilken@hanover.ca>; Jatin Singh <jatin.singh@ainleygroup.com>; 'Tiffany Taylor' <t.taylor@indigenousaware.com>
Subject: Town of Hanover, Hanover Wastewater Treatment Plant Class EA - Notice of Completion

Good afternoon,

Please find attached important information regarding the **completion of the Schedule C Municipal Class Environmental Assessment (Class EA)** for the upgrade and expansion of the Hanover Wastewater Treatment Plant, and details on how to access the Environmental Study Report (ESR).

The ESR is now **available** for review through the link provided in the notice, and comments on this Class EA may be submitted until **December 29, 2025**.

Should you have any questions or require further information, please do not hesitate to

reach out.

Regards,

Beth Wang, EIT
Engineering Intern
<image001.jpg>
Tel: (905) 452-5172, Ext. 321
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Cc: 'Andrew Wilken' <awilken@hanover.ca>; Jatin Singh <jatin.singh@ainleygroup.com>; 'Tiffany Taylor' <t.taylor@indigenousaware.com>
Subject: Town of Hanover WWTP Class EA - Notice of Completion

Good afternoon,

Hope all is well!

On behalf of Tiffany Taylor, our Indigenous Coordinator from CIPS, who is currently on vacation, I am sharing the Notice of Completion for the Hanover WWTP Class EA.

The Environmental Study Report will be available online through the link provided in the notice on November 27, 2025.
If you have any questions or concerns, please let us know.

Regards,

Beth Wang, EIT
Engineering Intern
<image001.jpg>
Tel: (905) 452-5172, Ext. 321
Cell: (289) 541-8086
Email: beth.wang@ainleygroup.com

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<Hanover WWTP Class EA-Notice of Completion.pdf>

Summary of Comments Received

Town of Hanover
Hanover WWTP CLASS EA
SUMMARY OF COMMENTS RECEIVED

NO.	RESPONDENT INFORMATION	COMMENTS RECEIVED	RESPONSE / ACTION REQUIRED
AGENCY COMMENTS			
Notice of Commencement – October 2022			
1.	Michael J. Cook Environmental Planning Technician Saugeen Valley Conservation Authority 519-377-3406 m.cook@svca.on.ca	**Comment Received via email on October 10, 2022:** "It is the understanding of Saugeen Valley Conservation Authority (SVCA) staff the Town of Hanover is undertaking a Municipal Class Environmental Assessment for the construction of a leachate pumping station and force main to connect to the Hanover Wastewater Treatment Plant (HWWTP), which will increase the wastewater flow received by HWWTP. SVCA staff have not received details on the proposed plans to date and as such our comments are based upon a review of our files, resource mapping, and SVCA's Environmental Planning and Regulations Policies Manual, amended October 16, 2018. Please see the attached letter for additional information. If you have any questions, please feel free to contact me."	No response required.
2.	Joseph Harvey Heritage Planner Ministry of Heritage, Sport, Tourism and Culture Industries 613.242.3743 Joseph.Harvey@ontario.ca	**Comment Received via email on November 11, 2022:** "Please find attached comments on the above referenced undertaking, Please note that the responsibility for administration of the *Ontario Heritage Act* and matters related to cultural heritage recently transferred from the Ministry of Tourism, Culture and Sport (MTCS) to the Ministry of Citizenship and Multiculturalism (MCM). Individual staff roles and contact information remain unchanged. Please continue to send any notices, report and/or documentation to both Karla Barboza and Joseph Harvey. Please do not hesitate to contact me with any questions or concerns."	Contact list has been updated.
Notice of Public Information Centre #1 (PIC#1) – May 2024			
1.	Adam Kennedy Regional Planner Ontario Ministry of Natural Resources and Forestry 705-761-3374 Adam.Kennedy@ontario.ca	**Comment Received via email on May 3, 2024:** **"**Please find attached Ministry of Natural Resources and Forestry (MNRF) comments per the Class EA for the Town of Hanover Wastewater Treatment Plant upgrades circulated May 2, 2024. If you have any questions please let me know."	No response required.
2.	Michael Oberle Environmental Planning Coordinator Saugeen Valley Conservation Authority 519-373-4175 m.oberle@svca.on.ca	**Comment Received via email on May 8, 2024:** "This email is further to the email of below regarding the above refenced proposal. Thank you for including the Saugeen Valley Conservation Authority (SVCA) in your circulation. The SVCA does not have any specific comment to provide at this time, and the SVCA looks forward to working together with our municipal partners, where required, as this proposal progresses. I trust that the above is helpful at this time. Any questions, please do not hesitate to ask."	No *response* required.
3.	Joseph Harvey Heritage Planner Ministry of Heritage, Sport, Tourism and Culture Industries 613.242.3743 Joseph.Harvey@ontario.ca	**Comment Received via email on May 27, 2024:** "Thanks for providing us with the attached notice. To assist us in tracking archaeological assessment reports, please provide us with the Project Information Form (PIF) number(s) of any archaeological assessments being prepared for this project. Please let us know if the project has been screened for impacts to known (previously recognized) or potential built heritage resources and cultural heritage landscapes. The Ministry's *Criteria for Evaluating Potential for Built Heritage Resources and Cultural Heritage Landscapes* should be completed to help determine whether this EA project may impact known or potential built heritage resources and/or cultural heritage landscapes. If there is potential for built heritage resources and/or cultural heritage landscapes on the property or within the project area, a Cultural Heritage Evaluation Report (CHER) should be undertaken by a qualified person to	**Response Provided by Ainley via email on June 25, 2024:** " The Project Information Form (PIF) number for Stage 1 Archaeological Assessment is P094-0366-2023, and the PIF number for Stage 2 Archaeological Assessment is P383-0422-2023. Additionally, we conducted a cultural heritage study, and the study report is available for your review (as attached). Please let us know if you have any questions or comments."

NO.	RESPONDENT INFORMATION	COMMENTS RECEIVED	RESPONSE / ACTION REQUIRED
		determine the cultural heritage value or interest of the property (or project area). If the property (or project area) is determined to be of cultural heritage value or interest and alterations or development is proposed, MCM recommends that a Heritage Impact Assessment (HIA), prepared by a qualified consultant, be completed to assess potential project impacts. Please send the HIA to MCM and the Town of Hanover for review and comment and make it available to local organizations or individuals who have expressed interest in review." **Comment Received via email on July 22, 2024:** "Please find attached our comments on the Cultural Heritage Report prepared in support of the above referenced undertaking. Please do not hesitate to contact me with any questions or concerns."	No response required.
4.	Stephanie Lacey-Avon County of Grey planning@grey.ca	**Comment Received via email on May 10, 2024:** "County planning staff request that a ToR be completed in collaboration with the County's ecology staff for the Natural Heritage Assessment / Environmental Inventory Study (EIS). They can be reached at ecology@grey.ca. Staff have no further comments at this time. Please note, a paper copy will not be provided unless requested. Let us know if you have any questions."	**Response Provided by Ainley via email on May 15, 2024:** "As background on this Class EA study, the Town of Hanover has retained the services of the Ainley Group to complete a Schedule 'C' Municipal Class EA to identify alternatives to increase the wastewater treatment capacity to meet future needs. The Public Information Centre #1 was recently released online on May 2, 2024. We received a comment from Grey County Planning Department indicating that a ToR needs to be completed in collaboration with the County's Ecology Department for the Natural Heritage Assessment. At this stage, an Interim Natural Heritage Report has been finished, which is attached for your review. Please let us know if you have any comments and advise on the next steps for collaboration." This response was provided to the County's Ecology Department at ecology@grey.ca.
5.	Derek Mcmurdie County of Grey planning@grey.ca	**Comment Received via email on June 4, 2024:** "County Planning Ecology staff have reviewed the Natural Environment Report and have a comment stating, Natural Heritage The property contains and/or is adjacent to significant woodlands, significant wildlife habitat, potential habitat for threatened and/or endangered species, other wetlands, and fish habitat. It is Grey County staffs understanding that the proposed development will be located within and/or adjacent to the features. It is Grey County Staffs understanding that subsequent drafts of this NER/EIS is warranted and anticipated through the MCEA process. This evaluation will include a description of the preferred design, additional studies, general mitigations to develop at detailed design, and outline the expected permitting requirements. Stormwater Management It is Grey County Staffs understanding stormwater management infrastructure is not needed for the proposal. If needed, a stormwater management report and plan must be prepared which demonstrates an acceptable level of outlet water quality as per the standards within the Stormwater Management Planning and Design Manual (MECP, 2003). A sediment and erosion control plan will be required at minimum, and an impact assessment of	No response required.

NO.	RESPONDENT INFORMATION	COMMENTS RECEIVED	RESPONSE / ACTION REQUIRED
		the thermal regime of the cool-cold water fishery is needed. We recommend the consultant contact this office to determine a Terms of Reference for the report. Source Water Protection It is Grey County Staffs understanding that the property does not contain protection areas that are subject to policies of the Source Water Protection Act. The property does lie within an area designated as having potential influence on highly vulnerable aquifers, as such, low-impact development and infrastructure is recommended. Provided County Planning Ecology staffs' comments are addressed; County Planning staff have no concerns with the Natural Environment Report. Please note, a paper copy will not be provided unless requested. Let us know if you have any questions.”	
Notice of PIC#2 – April, 2025			
1.	Adam Kennedy Regional Planner Ontario Ministry of Natural Resources and Forestry 705-761-3374 Adam.Kennedy@ontario.ca	**Comment Received via email on April 30, 2025:** **“**The Ministry of Natural Resources (MNR) received the Notice of PIC 2 for the Town of Hanover - Schedule ‘C’ Class Environmental Assessment - Wastewater Treatment Plant Upgrades, on April 3, 2025. Thank you for circulating this to our office. MNR has prepared the attached **MNR Southern Region Information Package – For External Proponent Environmental Assessments** (Package) to help project proponents understand MNR's role as a commenting agency and interests related to environmental assessment within the Ministry’s mandate. The Package also provides information on the Ministry’s regulatory authority to issue authorizations, permits, licenses and/or approvals. The information provided is subject to change from time to time and it is the proponent’s responsibility to ensure the information used to support project planning and compliance with *Environmental Assessment Act* requirements is current and accurate. It is the proponent’s responsibility to be aware of, and comply with, all relevant federal or provincial legislation, municipal by-laws and/or other agency approvals. Of particular note, please review the section on “Special Policy Areas” found on p.8, and MNR’s “Regulatory Authority” found in Appendix A. MNR suggests reviewing the remaining sections as well. If the project requires a potential approval from the MNR please contact the ministry well in advance of finalizing the project to discuss the process and application requirements. If you have any questions or require clarification per the comments above please let me know.”	No response required.
2.	Brandi Walter Environmental Planning Coordinator Saugeen Valley Conservation Authority 519-364-1255 EXT. 236 b.walter@svca.on.ca	**Comment Received via email on May 6, 2025:** “Please find attached, SVCA’s comments relating to the Class ‘C’ EA for the Hanover, WWTP expansion. Feel free to contact me if you have any questions.” **Comment Received via email on May 7, 2025:** “SVCA staff would be happy to meet with the Town to discuss our comments.	**Response Provided by Ainley via email on May 6, 2025:** “Thank you for your comments. We believe it would be helpful to schedule a Microsoft Teams call to review your feedback and discuss next steps. As you know, the Flood Plain Study was submitted to SVCA on March 12, 2024. Receiving comments after a 14-month interval presents some challenges, particularly as we are working toward closing the Environmental Assessment. Please let us know your availability for a Team meeting next week, and we’ll be happy to coordinate a time that works for everyone.” **Response Provided by Ainley via email on May 15, 2025:** “As discussed in the call, please see attached Natural Environment Report. Also attached is the correspondence with Michael Oberle.”

NO.	RESPONDENT INFORMATION	COMMENTS RECEIVED	RESPONSE / ACTION REQUIRED
		It was my understanding that public input was required prior to May 8th, 2025 as indicated on the recent "Notice of Public Information Centre #2." As for the Flood Plain Study submission, I apologize for the delayed response. As you may be aware, I was on secondment from SVCA during that time-period and I only returned to my current position in January 2025. Hopefully, we can clarify any miscommunication relating to SVCA's role in this EA process during our upcoming meeting. Regarding meeting dates/times: SVCA staff can be available for a virtual meeting between 1:30 – 3:30 p.m. on May 12th, or between 2:00 – 3:30 p.m. on May 14th. I look to hearing from you." **Comment Received via email on May 20, 2025:** "Thank you for this. I will have a look and update my comments, if applicable. Attached is a copy of SVCA's floodplain study for Hanover. As noted, it is older. However, the information should still be applicable. I have copied Clayton on this email for this information. Once Clayton has reviewed the report, he could update the floodplain study for the HWTTP where appropriate. Please have Clayton contact me if he has any comments or questions."	**Response Provided by Ainley's subconsultant via email on May 20, 2025:** " I have had a look at the report you provided and note the following: The report is now 48 years old The report indicates that the flows were determined by an empirical method as small scale mapping was unavailable. They note that "further calibration" of the method was out of their scope and due to the lack of large storms and runoff events There are general descriptions of the runoff flow nodes but no Figure that shows the location for the flow points listed in Table 3.7 Hard to make an accurate comparison based on the information provided. The report was completed using imperial units with unknown input information using 50 year old methodology and technology. Only 93 cross sections were used for the entire study area and there is no figures provided (to us) of where these sections are located. The provided report is missing the 17 floodplain maps listed in Section 7.1 The Regional Storm information provided in Table 2.1 does not match the Timmins Storm. I am unclear where that "Regional Storm" data came from but it is not current."
		Comment Received via email on June 6, 2025: "SVCA is satisfied with Clayton Capes response to our questions regarding the Flood Study. We have no further concerns relating to the floodplain delineation. As discussed, a SVCA permit will be required to undertake the development within the floodplain. At that time, we will require engineered drawings that demonstrate the fill required for floodproofing be designed to withstand the velocities experienced during the Hurricane Hazel Flood Event. I recommend that SVCA permit application be submitted well in advance of the proposed start date for construction to address any technical issues that may arise. Now that the floodplain issue has been addressed, I would like to draw your attention again to the remainder of SVCA's comments relating to development in the wetlands, and potential watercourse alterations (related to sewer outfall) in the attached correspondence provided to you on May 6, 2025. Relating to wetland interference, I will expand on our comments here. SVCA's wetland policies do not support development in wetlands. Any application that proposes to remove a wetland by developing on it must be approved by SVCA's board of directors. As indicated in the correspondence, to complete your SVCA application to develop in the wetland, we will require that a professional hydrologist/hydrogeologist undertake a hydrologic/hydrogeologic study to identify the existing hydrologic function of the wetland and the impacts the proposed would have on the control of flooding and erosion. Any proposed work that would have an impact on the control of flooding and erosion and / or where there would be an impact to public health and safety or to property damage could not be approved by SVCA. Please refer to the attached comments for more direction relating to watercourse interference relating to proposed upgrades to the outlet.	No response required. The full consultation records with SVCA are included in Appendix J.

NO.	RESPONDENT INFORMATION	COMMENTS RECEIVED	RESPONSE / ACTION REQUIRED
		Thank you for your cooperation in this matter. Feel free to contact me with any questions. I look forward to further discussing this project with you."	
Notice of Completion – November 2025			
1.	Amanda Antwi-Nsiah Heritage Planner Ministry of Citizenship and Multiculturalism 437.212.5945 Amanda.Antwi-Nsiah@ontario.ca	**Comment Received via email on December 17, 2025:** **"**Thank you for sending the Notice of Completion for the above-referenced project to the Ministry of Citizenship and Multiculturalism (MCM). Please find attached MCM's comments on the Environmental Study Report (ESR). If you have any questions, please do not hesitate to contact me." A copy of the comment leter is included in Appendix J.	No response required.
2.	Brandi Walter Environmental Planning Coordinator Saugeen Valley Conservation Authority 519-364-1255 EXT. 236 b.walter@svca.on.ca	**Comment Received via email on December 22, 2025:** "Please find attached, SVCA's comments on the draft ESR for the HWWTP EA. Feel free to contact me if you have any questions." A copy of the comment letter is included in Appendix J.	No response required.
3.	Monika Macki Environmental Resource Planner/Environmental Assessment Coordinator Ministry of the Environment, Conservation and Parks monika.macki@ontario.ca	**Comment Received via email on February 6, 2026:** "Thank you for your patience and the opportunity to review the Town of Hanover's WWTP EA. Please find attached MECP comments. I look forward to your response." A copy of the comment letter is included in Appendix J.	A copy of the response letter is included in Appendix J.
INDIGENOUS COMMUNITY COMMENTS			
Notice of Commencement – October 2022			
1.	Karen Heisler Resources & Infrastruture Associate Saugeen Ojibway Nation Environment Office 705-798-3312 associate.ri@saugeenojibwaynation.ca	**Comment Received via email on November 29, 2023:** "My name is Karen Heisler, I work for the Saugeen Ojibway Nation Environment Office, in the Resource and Infrastructure Department. We were recently contact by Tiffany Taylor from CIPS regarding archaeology consultation for the proposed Hanover Wastewater Treatment Plant Class EA. Our archaeology department has replied to Tiffany, to arrange our participation in late season field work. We have sent an invoice to cover our expenses to organize a SON Archaeological Monitor for the archaeology fieldwork. Could you please send me more information about your project? The Resource and Infrastructure team is responsible for assessing the impact of all development that occurs within SON Territory. I have attached information about our process. Please let us know what environmental impact studies you are required to complete as a part of your Class EA and the timeline. As outlined in the attached documents the SON EO would like to enter into a Letter of Agreement with the Town of Hanover to facilitate our review to measure potential impact on SON's Indigenous rights and interests (the application fee for consultation is waived for municipalities). We look forward to working with you."	**Response Provided by Ainley via email on November 30, 2023:** "Please find the attached completed application form and notice of study commencement issued on October 6, 2022. The Town has scheduled the payment for stage 2 field work participation by cheque, which will be issued tomorrow. Blake Williams from ASI will further contact you to coordinate the field investigation schedule. Could you please confirm whether the $500 application fee mentioned in the application form can be waived for municipalities? Additionally, could you also confirm whether, after SON accepts the application, a letter of agreement will be provided by SON, as stated on the last page of the application form? Please let us know you need additional information." The full consultation records with SON are included in Appendix J.
Notice of PIC#1 – May 2024			
No comments were received from Indigenous Communities during the PIC#1 consultation period.			
Notice of PIC#2 – April 2025			

NO.	RESPONDENT INFORMATION	COMMENTS RECEIVED	RESPONSE / ACTION REQUIRED
1.	Neala MacLeod Farley Coordinator, Lands, Waters & Consultation Historic Saugeen Métis 519-483-4000 hsmlrcc@bmts.com	**Comment Received via email on April 30, 2025:** "Thank you for providing notice regarding the Hanover Wastewater Treatment Plant Upgrades EA. The Historic Saugeen Métis (HSM) Lands, Waters and Consultation Department has no concerns at this time, but wishes to review the archaeological and cultural heritage assessment and any future studies relating to archaeology or natural heritage impacts. HSM appreciates the opportunity to provide comment and wishes to remain informed on this project." **Comment Received via email on May 1, 2025:** "Thank you for providing the Stage 1 Archaeological Report, Stage 2 Archaeological Report, the Cultural Heritage Report, and the Natural Environment Report regarding the Hanover Wastewater Treatment Plant Upgrades EA. The Historic Saugeen Métis (HSM) Lands, Waters and Consultation Department has reviewed the documents provided and offers the following comments: Natural Environment Report • HSM supports the mitigation measures presented in section 7 of the Natural Environment Report. • HSM recommends that the following measures be required: the development of an Arborist Report and Tree Protection Plan and the offsetting of all necessary tree removal through the planting of new native trees at a 2:1 ratio of trees planted to trees lost. Cultural Heritage Report, Stage 1 Archaeological Report, and Stage 2 Archaeological Report • Future Cultural Heritage Reports and Archaeological Reports should be enhanced through the inclusion of information regarding the history of the HSM community. Given that reference to the history of early traders was included, it would be appropriate to also include mention of HSM ancestors who came to the area as traders in the early 1800s. Our office is happy to provide research support at any time. HSM appreciates the opportunity to provide comment and wishes to remain informed on this project." **Comment Received via email on May 1, 2025:** "Yes, that would be appropriate from HSM's perspective. Anywhere on or offsite where planting could help to maintain or develop a vegetative buffer between the Saugeen River and development could be particularly impactful."	**Response Provided by Ainley via email on April 30, 2025:** "thank you for your comments. We will share the archaeological and cultural heritage assessments that have been completed for the project. Below is the link to access the Stage 1 Archaeological Report, Stage 2 Archaeological Report, the Cultural Heritage Report, and the Natural Environment report. Please let us know if you have any questions or require additional information." **Response Provided by Ainley via email on May 1, 2025:** "can the offsetting of all necessary tree removal be done at another site within the Town (if there is no space onsite)?" No response required. The full consultation records with HSM are included in Appendix J.
Notice of Completion – November 2025			
1.	Neala MacLeod Farley Coordinator, Lands, Waters & Consultation Historic Saugeen Métis 519-483-4000 hsmlrcc@bmts.com	**Comment Received via email on January 8, 2026:** "Thank you for providing the Notice of Completion regarding the Town of Hanover Schedule 'C' Class Environmental Assessment - Wastewater Treatment Plant Upgrades. Apologies for the delayed response on this matter. The HSM Department of Lands, Waters, and Consultation has reviewed the EA and has no concerns or feedback at this time. We appreciate the inclusion of HSM's previous recommendations in this report and look forward to future opportunities for collaboration."	No response required.
PUBLIC COMMENTS			
Notice of Commencement – October 2022			
No comments were received from the public during the Notice of Commencement consultation period.			
Notice of PIC#1 – May 2024			
1.	[redacted]	**Comment Received via email on May 24, 2024:** "As a resident of Hanover, I offer the following comments for your consideration.	**Response Provided by Ainley via email on July 9, 2024:** "1. We understand your concerns related to flood plain and wetland. During the Class EA, a floodplain study was completed which confirmed that the west side of the plant can be filled to an elevation of existing plant and this will not negatively impact the floodplain depth or extents. A Natural Environment Impact Study (EIS),

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<tr><th>NO.</th><th>RESPONDENT INFORMATION</th><th>COMMENTS RECEIVED</th><th>RESPONSE / ACTION REQUIRED</th></tr>
<tr><td></td><td></td><td>1. The Public Information Centre shows as an option Long-Listed General Alternative No. 8, "Build a New WWTP at a Different Location". This Alternative should should be thoroughly considered for implementation as a long term goal beyond the present Upgrade proposal.

The current proposed expansion area will extend into the flood plain and wetland. Ideally, these features should be avoided. But beyond just the current expansion proposal, there is no area available for further future expansions that can completely avoid these environmental features. Presumably there will need to be other expansions or even a replacement facility some decades into the future. Rather than continuing to contend with these site limitations in perpetuity, the Town should commit to securing in the future an alternate location for a new WWTP. For example, a portion of the undeveloped lands north of the Main Saugeen River and south of Grey Road 28 might present an opportunity. Given that the area north of the river is largely undeveloped except for the outer fringe, there are many advantages to a future treatment plant at this locale. For example: a site could be acquired well in advance of need; access to the river is available for the plant outlet; sewer routes can be pre-planned; adequate setbacks from other land uses can be established; and, land use planning documents can place appropriate designations and zoning well before adjacent lands are developed. The new site may not be needed for decades, but beginning to prepare for it now would be practical and forward-thinking.

As a local example, the Mount Forest Wastewater Treatment Plant followed a process similar to what is described above. In their case they constructed a new sewage plant at a new location on the edge of town, converted the original plant into a pumping station and flow equalization facility (the original plant was constrained by flood plain and valley slope), and constructed a new sewage forcemain between the two facilities.

For Hanover, the background work and studies needed for a new WWTP site will take many years. But, the process has to have a starting point and it should not be ignored indefinitely. Accordingly, to support such a concept, the current Treatment Plant Upgrades Study should include a recommendation that the Town investigate a new WWTP at a new location as an action item for the future but prior to another expansion of the WWTP at the present location (that is, beyond the current proposal). With that recommendation as supporting justification, the Town can then budget for and undertake the necessary studies over the long term.

2. A Natural Environment Impact Study (EIS) including field work should be undertaken as part of the Environmental Assessment. The field work should extend at least over a three-season period. There are vernal pools in the flood plain and wetland that might only be used in the spring time by amphibious and aquatic species. In addition, some fish species, such as muskie and pike, may make use of the river flats as spawning areas during the spring flood season. Therefore, the EIS should include field work for the spring, summer, and fall seasons.

3. Was the raised area north of the existing WWTP considered for the expansion area? This level high ground (possibly consisting of old fill) might not be large enough to accommodate all of the expansion, and so some filling may still be necessary, but perhaps there would be less encroachment into the flood plain and wetland compared to the proposed site.

4. If the expansion is allowed to encroach into the flood plain (and assuming the expanded facility will be appropriately protected from river flooding), there will be a net loss of flood water storage volume. Presumably a "cut and fill" technique will be a requirement, whereby existing ground is removed from the flood plain to balance the loss of storage volume due to fill being imported at the construction site. This option is generally only appropriate where soil can be removed at or near the same cross-section of the flood plain as the encroachment location. But, the existing WWTP site has limited high ground available that is suitable for the "cut" portion. However, the Hanover/Walkerton Landfill Site is across the river from the WWTP and it might provide a location where natural land is available (i,e, not part of the active landfill) to achieve the "cut" portion of the cut and fill procedure. Alternatively, if the landfill site property isn't feasible, perhaps the raised area north of the existing WWTP (mentioned in the preceding comment) is a candidate for the cut area.</td><td>Archeology assessment, Cultural Heritage assessment, Assimilative capacity study (ACS) has also been conducted for the site.

As part of Phase 2 of the Class EA process, several general alternatives were developed to address the problem/opportunity statement. One of these alternatives was the construction of a new WWTP at another location. A preliminary screening was conducted on all general alternatives, and based on the evaluation, this alternative was not pursued further. This decision was due to the uncertainty of acquiring suitable land for a new WWTP. Additionally, a new treatment plant would require a new outfall, a comprehensive Assimilative Capacity Study (ACS) of the receiver, and significant modifications to the collection system in the Town. Furthermore, there are challenges and inefficiencies associated with diverting existing sewers between two treatment locations or fully redirecting the existing collection system to a new location.

Based upon approved and projected development the existing rated capacity will be reached in the next 1 - 2 years. Although building a new WWTP at another location may be considered a long-term solution (beyond the 30 year study period of this study), it poses significant challenges in addressing the imminent shortage of treatment capacity. Therefore, within the scope of this Class EA, building a new WWTP at another location is not considered a feasible solution.

During Phase 3 of EA if it is found that the site is limited for further expansions (beyond this study period), we may include a recommendation in the Environmental Study Report (ESR) to explore alternative locations. It is important to note that there are more advanced technologies that can provide effective wastewater treatment in a small footprint.

2. EIS was conducted which included fieldwork between the end of May and early August 2023 (detail schedule in the following table) to cover breeding amphibians within any potential vernal pools, Saugeen River and marsh habitat north of the existing structures. Turtle basking and an aquatic habitat survey were conducted within the Saugeen River and marsh. Breeding bird surveys, ELC and plant inventory was completed by wandering through all the adjacent natural features. While certain timing windows such as spawning was missed, we can provide insight based on the available background information and data collected in 2023. The completed natural environment surveys give an understanding of the surrounding environment.

Similar to an EIS, the surveys completed have been used to characterize the existing conditions of the Study Area. The next step in the EA process will be to determine the Preferred Alternative and determine the general mitigations and permitting required for the selected alternative. At detailed design, these will be developed into a mitigation plan, and further surveys may be completed, based on identified need.

<table>
<tr><td>Date</td><td>Field Task</td></tr>
<tr><td>May 29, 2023</td><td>Amphibian Survey</td></tr>
<tr><td>May 30, 2023</td><td>Breeding Bird Survey, Turtle Baking Survey, ELC and Plant Inventory</td></tr>
<tr><td>June 7, 2023</td><td>Turtle Baking Survey</td></tr>
<tr><td>June 14,2023</td><td>Turtle Baking Survey</td></tr>
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<tr><th>NO.</th><th>RESPONDENT INFORMATION</th><th>COMMENTS RECEIVED</th><th>RESPONSE / ACTION REQUIRED</th></tr>
<tr><td></td><td></td><td>5. There is a branch of the Hanover Community Trail near the west and south extent of the proposed expansion area. Although this branch is barely a narrow footpath (unlike the rail trail portion nearby), the design of the expansion area should either avoid the trail or accommodate it in some way. Although this trail branch is not of high quality at present, that doesn't necessarily mean it may not be improved at some future date. Thus, the trail location should not be disregarded in the WWTP expansion design.

6. While the spring season is the most common time for river flooding, high water can occur at any time of the year. For instance, a very large flood occurred in June, 2017 and water overtopped the Community Trail (former rail line route) near the WWTP. Filling and construction activity within the expansion site could be exposed to this flood risk, regardless of the time of year. Therefore, the expansion project should address potential flooding during the construction phase, such as advising the contractor of the flood risk; storing equipment, materials and fuel at a sufficient elevation, and ensuring sediment control measures can avoid or withstand inundation by the river.

Thank you for the opportunity to comment. Please add my name to the contact list for future EA notices on this project.”</td><td><table><tr><td>June 22, 2023</td><td>Amphibian Survey</td></tr><tr><td>June 23, 2023</td><td>Breeding Bird Survey, Turtle Baking Survey, ELC and Plant Inventory</td></tr><tr><td>June 30, 2023</td><td>Turtle Baking Survey</td></tr><tr><td>August 4, 2023</td><td>Aquatic Habitat Assessment</td></tr></table>
3. There is a Hydro Easement located on the north side of the Wastewater WWTP, making expansion to the north not feasible.

4. During the EA, a floodplain study was completed as required by the Saugeen Valley Conservation Authority (SVCA). The report confirmed that the south side of the plant can be filled to an elevation of existing plant with a 3:1 side slope, and this will not negatively impact the floodplain depth or extents.

5. We agree that Hanover Community Trail near the west and south extent of the proposed expansion area should be protected. The Public Information Centre #1 (PIC#1) provides a preliminary solution. In subsequent phases, this comment will be taken into consideration when selecting the preferred design alternative.

6. We will delineate the extent of the floodplain in the ESR, which will clarify flooding concerns.

Contact list has been updated.”</td></tr>
<tr><td colspan="4">Noice of PIC#2 – April 2025</td></tr>
<tr><td colspan="4">No comments were received from the public during the PIC#2 consultation period.</td></tr>
<tr><td colspan="4">Notice of Completion – November 2025</td></tr>
<tr><td>1.</td><td>[redacted]</td><td><u>Comment Received via email on December 7, 2025:</u>
“ I offer the following comments regarding the Draft Environmental Study Report, dated November, 2025.

1. The proposed plant expansion will result in the new filled and raised area being within a few metres of the Main Saugeen River and much closer to the river than the present facility. The proposed location could expose the filled slope to erosive flows during high runoff events. While such a risk may be low if the flood is in a free flow state, the circumstances might change if there happens to be an obstruction in the river channel, such as an ice jam or log jam, and the flow is redirected. Given the critical nature of the Wastewater Treatment Plant, perhaps heavy rip rap should be installed on the north and west sides of the new slope, to reduce the risk from river erosion during unusual flood events. Moreover, the unpredictable nature and randomness of these types of obstructions means attempting to realistically model the flood flow velocities under such conditions is virtually impossible.

As rationale for the above comment, I'll mention an incident that occurred in about 1993 that is perhaps relevant. The Town's watermain which runs through the flood plain just west of the Wastewater Treatment Plant, connecting the Drinking Water Treatment Plant with the 7th Ave. pump station, was exposed due to erosion. This incident was caused by one flood and not due to gradual soil loss. During that flood the flow crossed the narrow neck of land inside of the oxbow and scoured a new high flow channel, causing the buried watermain to be exposed. The Town repaired the site by backfilling the new channel and placing rip rap. I think a large log jam at the oxbow which partially obstructed the flood flow might have been the primary cause for the river cutting the new channel (log jam was removed afterward).</td><td><u>Response Provided by Ainley via email on December 16, 2025:</u>
“Thank you for your review and comments on the ESR.
We greatly value your input, and please find our responses to your questions provided in red below.

1. The detailed measures required to prevent erosive flows to the Saugeen River during high runoff events will be determined during the design phase. We value the recommendation and the historical incident you have brought to our attention. This information will be documented in the EA consultation summary for record keeping and for reference by the future design team.

2. The sediment control measures will be determined during the design and construction phases. We value the recommendation, and it will be documented in the EA consultation summary for record keeping and for reference by the future design team and construction contractor.

3. During the design phase, a geotechnical investigation and an excess soil management study will likely be conducted based on the area required for expansion. Based on the study findings, excess soil will be managed in accordance with the recommendations.</td></tr>
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NO.	RESPONDENT INFORMATION	COMMENTS RECEIVED	RESPONSE / ACTION REQUIRED
		2. Given that construction will likely be extending into winter and spring seasons, conventional sediment control measures alone, such as sediment fencing, will likely be insufficient. Heavy snow and spring flooding could render sediment fencing ineffective. Therefore, more robust sediment control measures may be needed. For example, low gravel berms with geotextile inside positioned at key locations are more likely to withstand the elements. Excavated shallow sediment basins might also be an option to consider. 3. Given the riverine and wetland environment, it's likely the existing soils at the expansion site will be unsuitable for use. If so, all excavated excess soil should be removed from the property, to minimize affecting the flood plain. In addition, excess soil should not be temporarily stockpiled in the flood plain, but should be removed promptly. 4. On page 46, Stormwater Management, it states: "Develop a stormwater management plan during detailed design the [to] ensure pre-development run-off levels are maintained after construction." While it would be typical to control post-development runoff to pre-development levels, for this particular site it is more appropriate to not detain runoff in my opinion. While there will be an increased rate of runoff due to the proposed expansion, given its location the flow will enter the river long before the river reaches its natural peak flow for the same rainfall event. Detaining the on-site runoff could actually create coincident peaks. As such, it is more appropriate in this case to allow the extra flow from the site to leave unrestricted. This suggestion assumes the runoff will be draining westward toward the river and not into the municipal storm sewer system (if it drains into the municipal system or other lands then detention would instead be appropriate). Of course, regardless of the outlet direction, stormwater quality control should still be implemented. Also, if stormwater management will follow the criteria suggested here, then it should be mentioned in the final ESR, to ensure compliance. 5. There is an existing sanitary sewer main that accesses the sewage plant from the south through the wetland and flood plain. It appears the proposed expansion will be located on top of or near this sewer main. The ESR doesn't appear to mention the presence of this main nor how it relates to the project. For example, does its accommodation in the new plant footprint also require any construction work beyond the project limits? 6. On page 44, Section 17.1.2, it states: "As a result, the conditions of the lakefront, which support tourism and recreational use, are expected to remain consistent with the baseline conditions." To what is this statement referring? 7. On Figure 41 a scale would be helpful. Thank you for the opportunity to comment.”	4. During the design phase, a Stormwater Management Plan will be prepared based on discussions with SVCA. 5. The existing sanitary sewer from the south is proposed to be connected to the new headworks facility within the expansion area. All modification works should be limited to the project expansion area. 6. This statement refers to maintaining the functionality of the Hanover Community Trail. 7. I believe this comment refers to Figure 4 on Page 41 rather than Figure 41. The drawing scale is 1:500, and this will be added to the drawing. If you have further questions or concerns, please let us know.”