



March 14, 2023
(Revised December 7, 2023)

Mr. Jeremy Grant

The Alton Development Inc.
1402 Queen Street
Caledon, Ontario
L7K 0C3

Re: Agnes Street Residential Development – Town of Caledon
Functional Servicing Report: Ontario Building Code Sewage Systems
Our File: D3082

Dear Mr. Grant,

The proposed residential development is to consist of 67 townhouse units, which are to be developed into fourteen (14) condominium blocks, with each condominium block under separate land ownership. Each condominium block will include for 4 or 5 townhouse units.

Municipal sanitary sewers are not available to service the proposed development, however municipal water is to be provided. Wastewater servicing for each residential block (4 or 5 townhouse units) will be serviced with an on-site sewage system. Each condominium Townhouse Block (Blocks 1 to 14) will each be serviced by one Ontario Building Code (OBC) compliant Class IV Tertiary Sewage Treatment System and a Type 'A' Dispersal Bed, with each of the 14 sewage systems having a daily design sewage flow of less than 10,000 L/day. Refer to attached Drawing SP-1 for the Townhouse Condominium Block layout and dispersal / septic bed locations. The permitting jurisdiction for these proposed Ontario Building Code (OBC) sewage systems will fall under the jurisdiction of the Town of Caledon Building Department (i.e. not the Ministry of the Environment, Conservation and Parks). In addition, and since the maximum number of residential units for each condominium block / land ownership is five, a Municipal Responsibility Assessment (MRA) is not required. We note that condominium townhouse blocks will be managed by the respective condominium association, to include for on-going service and maintenance, and funding for upgrades and component replacement within their designated reserve funds.

A septic test pit investigation was undertaken on August 11, 2022, with test pit locations shown on attached Drawing SP-1. The scope of the test pit investigation included identification of native soil type & percolation rate, as well as groundwater elevation observations in the area of each sewage system Type 'A' Dispersal Bed. The test pit results concluded that the native soils were coarse sand, with a percolation rate ranging between 6-10 mins/cm. Groundwater was not encountered in any test pit during the investigation. In addition, there was no soil staining that would be indicative of a seasonal high groundwater elevation. Preliminary design drawings have been prepared for the proposed on-site sewage treatment and effluent dispersal systems for the proposed Agnes Street residential development, Town of Caledon. Based on the soil percolation rates of the native soil, site topography and layout, and absence of groundwater, soil staining that would be indicative of a seasonal high groundwater elevation, in the septic test pits; Waterloo Biofilter tertiary treatment sewage systems, complete with Type 'A' Dispersal Beds, for each residential Condominium Block, has been proposed. There are 14 on-site sewage systems in total.

The configuration of the typical proposed sanitary servicing system is shown on the attached preliminary site plan Drawings, SP1-1, SP5-1 and SP9-1, as described below:

Design Sanitary Flows

The sewage treatment plant and effluent dispersal system servicing each of the 14 residential Blocks will have daily design flow sewage capacities ranging from 7,700 to of 9,900 L/day. Each Block includes 4 or 5 three (3)-bedroom townhouse units.

Individual townhouse daily design sewage flows for these 3-bedroom units are based on OBC Table 8.2.1.3.A. The size of the Type 'A' Dispersal Beds is based on OBC Section 8.7.7. Detailed calculations are illustrated on the preliminary sewage system layouts (Drawings SP1-1, SP5-1 and SP9-1), complete with our Ontario Building Code Compliance Analysis.

Proposed Sewage Treatment System

The proposed sewage treatment system for each residential townhouse condominium Block will include a Class IV tertiary treatment system (Waterloo Biofilter). The Waterloo Biofilter sewage treatment system meets Ontario Building Code Level IV (tertiary) quality effluent ($\text{CBOD}_5 \leq 10 \text{ mg/L}$ and $\text{TSS} \leq 10 \text{ mg/L}$), and is certified under the CAN/BNQ 3680-600 testing protocol per OBC Table 8.6.2.2. The Waterloo Biofilter sewage treatment system will each consist of a 22,500 L (5,000 gal) W.B. Anaerobic Digester with gravity flow to a 9,000 L Pump Station. Sewage effluent will be time dosed to a BT-22500 22,500 L (5,000 gal.) basket Biofilter tank. The Biofilter tank, c/w two (2) pumps; one pump to re-circulate to the W.B. Anaerobic Digester, the second pump to demand dose to the 18,000 L (4,000 gal.) WaterNox Tank (LS-18000), for nitrate treatment to 5 mg/L, as detailed in the Terraprobe hydro-geological report. Sewage from the WaterNox Tank will be demand dosed to the Type 'A' Dispersal Bed (timed dosed via the Pump Station).

The Waterloo Biofilter WaterNOx-LS Denitrification Unit underwent BNQ 3680-600 testing in 2016 for nitrogen removal. The test results are attached to this report. During the CAN/BNQ 3680-600 protocol Period A (based on NSF-40), the total nitrogen removal of the system was 92% with an average effluent concentration of 4.8 mg/L (TKN was 4.6 mg/L and $\text{NO}_3\text{-N} + \text{NO}_2\text{-N}$ was 0.20 mg/L). During the CAN/BNQ 3680-600 protocol Period B (strenuous working parent schedule), the total nitrogen removal of the system was 80% with an average effluent concentration of 11.9 mg/L (TKN was 8.5 mg/L and $\text{NO}_3\text{-N} + \text{NO}_2\text{-N}$ was 3.38 mg/L). The testing results indicated that the WaterNOx-LS system can successfully remove very high levels of total nitrogen passively, while buffering pH to neutral and keeping CBOD_5 and TSS levels below 10 mg/L.

Effluent Dispersal Systems

Treated effluent from the sewage treatment plant, servicing each townhouse Block, will be discharged to a Type 'A' Dispersal Bed, with a daily design sewage flow ranging from 7,700 to 9,900 L/day. Preliminary design calculations for the effluent dispersal systems are outlined on the sewage system design details on attached site plan drawings (i.e. typical sewage system preliminary layouts for Townhouse Blocks 1, 5, and 9). Specified OBC clearance distances for

the Type ‘A’ dispersal bed stone layers are shown on the attached drawings. The native sand soils were assessed with a soil percolation rate of $T = 6 - 10$ min/cm.

Summary

In summary, the property is able to accommodate the proposed domestic sewage treatment and on-site disposal from the proposed residential townhouse development, with the detailed 14 sewage treatment / dispersal bed systems. The sewage systems will be designed in accordance with the Ontario Building Code (OBC), to treat the effluent from the proposed residential development, for each of the 14 townhouse condominium block sewage systems.

We trust that the above description of the on-site sewage systems meets your requirements. Please do not hesitate to contact us if you have any questions.

Yours truly,

GUNNELL ENGINEERING LTD.



Teika Zilans
Environmental Technician

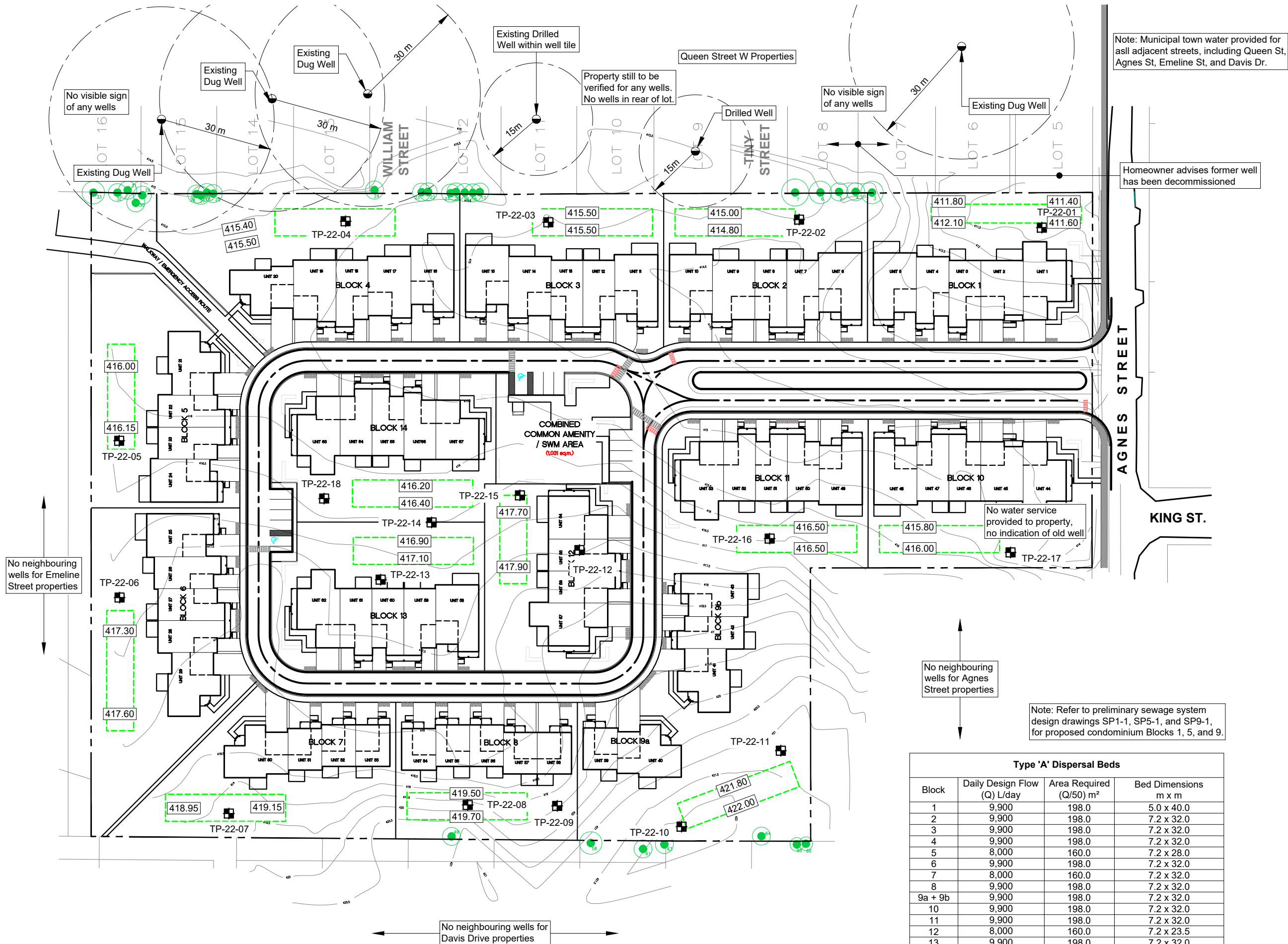


Eric Gunnell, P.Eng.

Attachments:

- Gunnell Engineering Ltd Preliminary. Drawings SP-1, SP1-1, SP5-1, SP9-1, DT-1, DT-2 and DT-3
- Waterloo Biofilter WaterNOx-LS Third Party Testing Summary

File: \\Gunnell\\Gunnell\\Shared\\Gunnell Engineering AutoCAD\\D3082 - Agnes Street Townhouse Development\\Site Plan\\D3082BC-SP1.dwg
Plotted On: Thu, 30 Nov 2023 4:26pm





Gunnell Engineering Ltd.

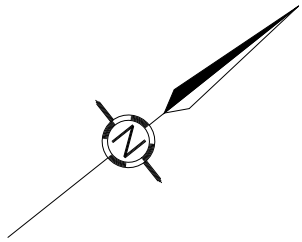
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- LEGEND
-  Existing Known Wells
 -  Test Pit Locations
 -  Type 'A' Dispersal Beds (14)

Preliminary

Rev. No.	Date	Description	CAD
Rev. 1	25-Jul-2022	Updated Well Locations	KD
Rev. 2	7-Mar-2023	Updated Site Plan	JK
Rev. 3	28-NOV-2023	Town Comments	JK

Agnes Street Townhouse

Residential Development

Town of Caledon

Overall Site Plan:

Neighbouring Well Locations

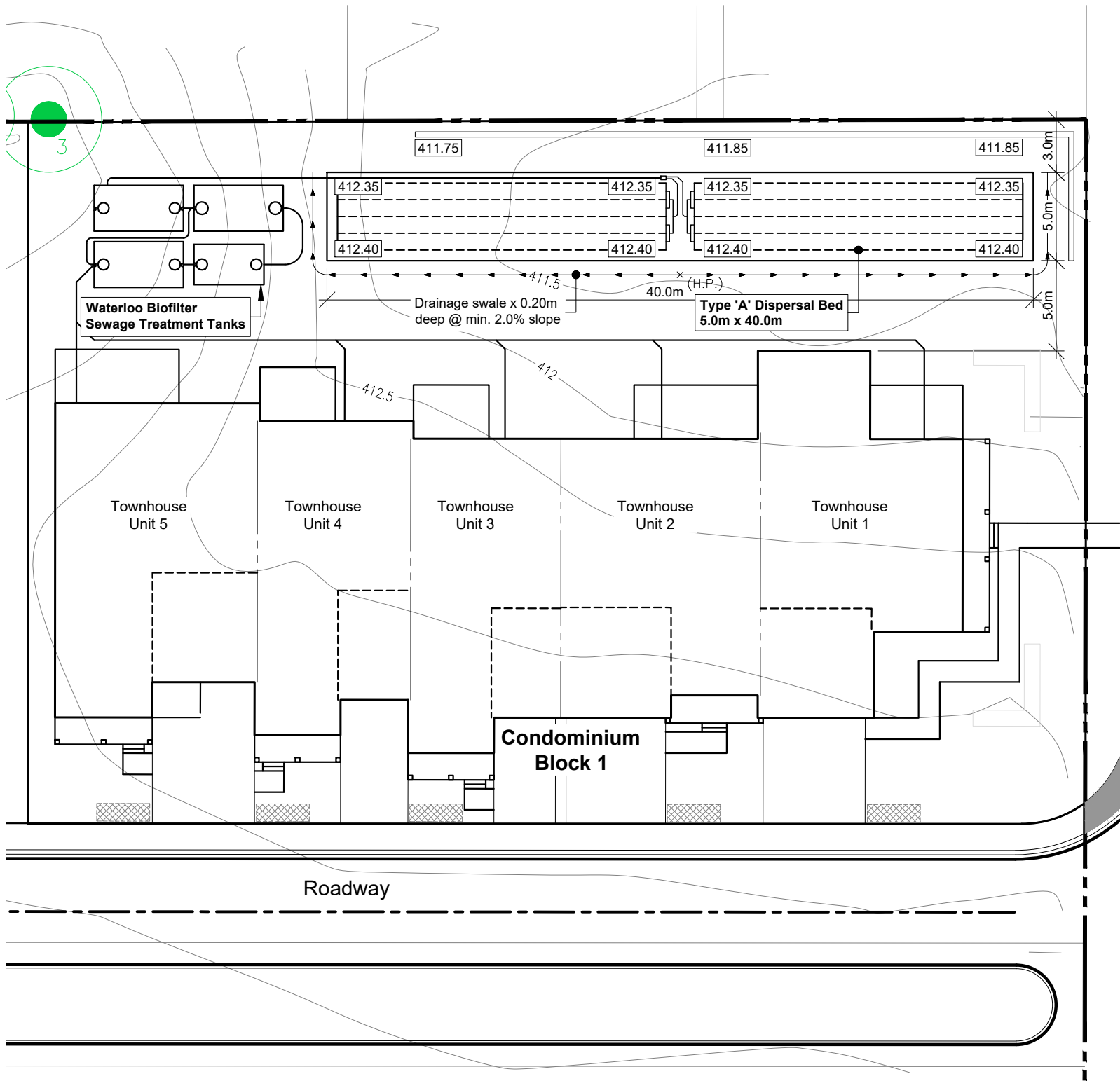
Test Pit Locations

Septic Field Locations

Scale: 1:1,000	Designed By: EG
Date: 21-JUL-2022	Drawn By: JK
Project No.:	Checked By: EG
	Drawing No.:

D3082

SP-1



Class IV Tertiary Treatment System: Waterloo Biofilter - Preliminary Design: Block 1

Q = 9,900 L/day (Five 3-bedroom, 3-bathroom Townhouses, each at 1,980 L/day)

Sewage Treatment: CBOD5 ≤ 10 mg/L, TSS ≤ 10 mg/L, Nitrates ≤ 5 mg/L

W.B. Anaerobic Digester: 1.89 x daily flow = 1.89 x Q = 1.89 x 9,900 L = 18,711 L
Provide Waterloo Biofilter Anaerobic Digester: 22,500 L (5,000 gal.) with gravity flow to Pump Station.

Pump Station: Provide 9,000 L (PT-9000) pump tank to time dose to BT-22500 Biofilter Tank.

Biofilter Tank: Provide 22,500 L (5,000 gal.) BT22500 Basket Biofilter tank, provided by Waterloo Biofilter.
Biofilter Tank to have two pumps; one pump to re-circulate to W.B. Anaerobic Digester, second pump to demand dose to WaterNox Tank (advanced nitrate treatment).

WaterNox-LS Tank: Provide 18,000 L (4,000 gal.) LS-18000 Tank (to Waterloo Biofilter Specifications), to dose on a demand basis to Type 'A' Dispersal bed.

Soil Percolation: T = 6 min/cm. Test Pit Investigation Undertaken on August 11, 2022 by Gunnell Engineering identified Sand Soils.

Type 'A' Dispersal Bed (Based on Q = 9,900 L/day & T = 6 min/cm)

Stone Layer: Maximum loading = 50 L/sm/day (i.e.: Q > 3,000 L/day); 9,900 / 50 = 198.0 sm.
Provide Stone Layer Area = 200.0 sm. (5.0m x 40.0m)

Dispersal Bed Area: QT/850: 9,900 x 6 / 850 = 69.8m². Provide Dispersal Bed Area: 5.0m x 40.0m = 200 m²

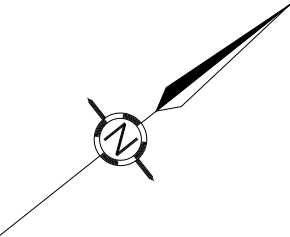
Mantle - N/A (i.e. T < 15 min/cm).

Stone Layer (c/w distribution piping) is to be a minimum of:

- 15.0m from drilled wells
- 30.0m from dug wells
- 3.0m from property lines
- 5.0m from townhouses

Note: Type 'A' Dispersal Bed is not raised above finished grade, therefore no increase to setbacks to stone layer.

- Sewage System / Adjacent Grading Design Criteria:**
1. 4:1 max. down slopes away from septic field.
 2. No slopes directly down to septic fields (direct surface water around field with swales).
 3. Swales are to be min. 0.15m deep with max. 4:1 side slopes adjacent to septic fields.
 4. Septic fields are to be min. 3.0m from property lines and 5.0m from residences and installed at existing grades.
 5. Septic tanks are to be min. 3.0m from property lines and 1.5m from residences.
 6. No retaining walls constructed adjacent to septic fields.



LEGEND

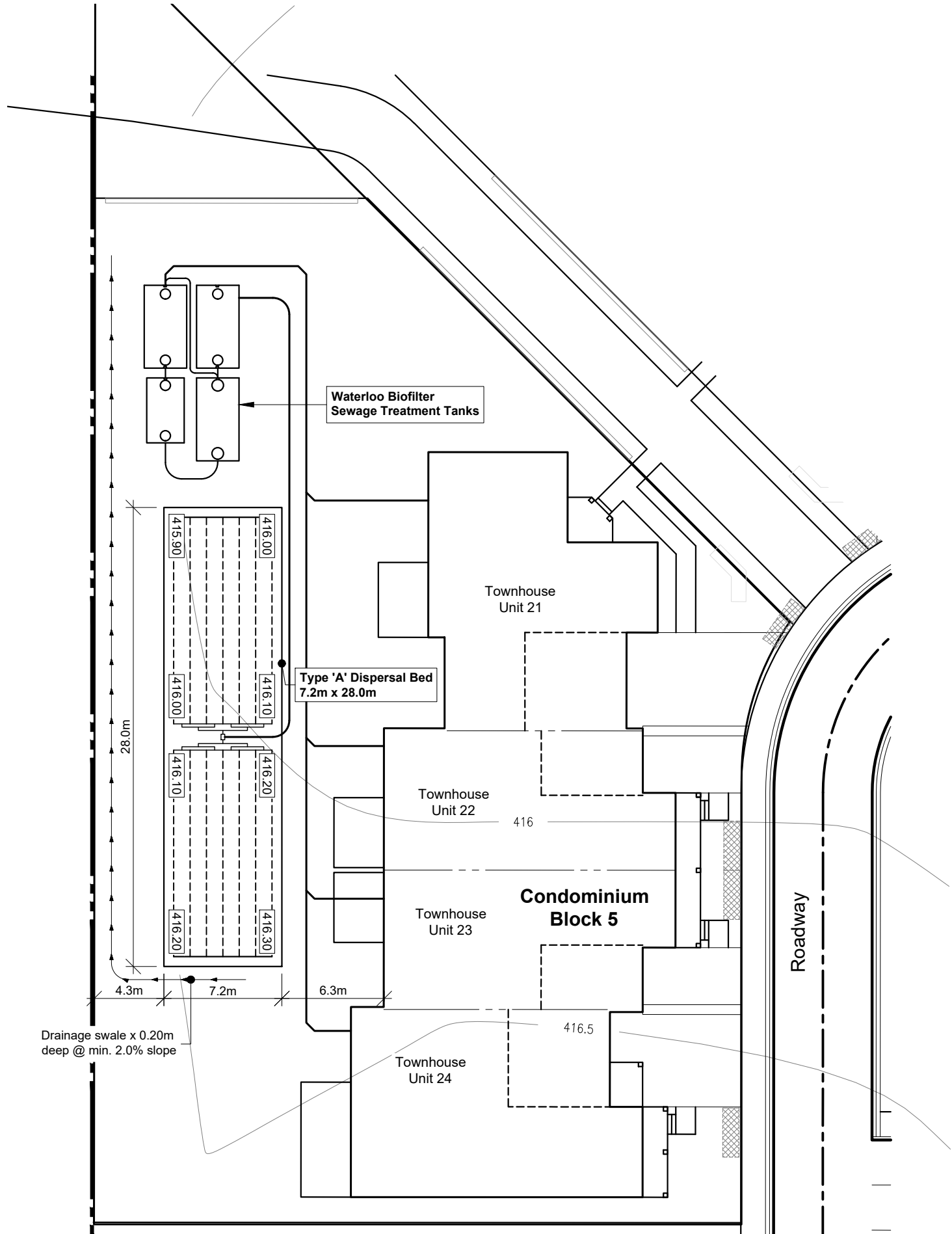
Preliminary

**Agnes Street Townhouse
Residential Development
Town of Caledon**

**Typical Sewage System
Layout: Block 1**

Scale: 1:300	Designed By: EG
Date: 7-Mar-2023	Drawn By: JK
Project No.:	Checked By: EG
D3082	SP1-1

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Class IV Tertiary Treatment System: Waterloo Biofilter - Preliminary Design: Block 5

Q = 8,000 L/day (Four 3-bedroom, 3-bathroom Townhouses, each at 2,000 L/day)

Sewage Treatment: CBOD5 ≤ 10 mg/L, TSS ≤ 10 mg/L, Nitrates ≤ 5 mg/L

W.B. Anaerobic Digester: 1.89 x daily flow = 1.89 x Q = 1.89 x 8,000 L = 15,120 L
Provide Waterloo Biofilter Anaerobic Digester: 18,000 L (4,000 gal.) with gravity flow to Pump Station.

Pump Station: Provide 6,800 L (PT-6800) pump tank to time dose to BT-18000 Biofilter Tank.

Biofilter Tank: Provide 18,000 L (4,000 gal.) BT-18000 Basket Biofilter tank, provided by Waterloo Biofilter.
Biofilter Tank to have two pumps; one pump to re-circulate to W.B. Anaerobic Digester, second pump to demand dose to WaterNox Tank (advanced nitrate treatment).

WaterNox-LS Tank: Provide 13,500 L (3,000 gal.) LS-13500 Tank (to Waterloo Biofilter Specifications), to dose on a demand basis to Type 'A' Dispersal bed.

Soil Percolation: T = 6 min/cm. Test Pit Investigation Undertaken on August 11, 2022 by Gunnell Engineering identified Sand Soils.

Type 'A' Dispersal Bed (Based on Q = 8,000 L/day & T = 6 min/cm)

Stone Layer: Maximum loading = 50 L/sm/day (i.e.: Q ≥ 3,000 L/day); 8,000 / 50 = 160.0 sm.
Provide Stone Layer Area = 201.6 sm. (7.2m x 28.0m)

Dispersal Bed Area: QT/850: 8,000 x 6 / 850 = 56.5m². Provide Dispersal Bed Area: 7.2m x 28.0m = 201.6 m²

Mantle - N/A (i.e. T < 15 min/cm).

Stone Layer (c/w distribution piping) is to be a minimum of:

- 15.0m from drilled wells
- 30.0m from dug wells
- 3.0m from property lines
- 5.0m from townhouses

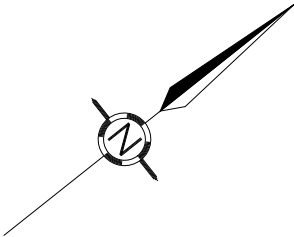
Note: Type 'A' Dispersal Bed is not raised above finished grade, therefore no increase to setbacks to stone layer.

Sewage System / Adjacent Grading Design Criteria:

1. 4:1 max. down slopes away from septic field.
2. No slopes directly down to septic fields (direct surface water around field with swales).
3. Swales are to be min. 0.15m deep with max. 4:1 side slopes adjacent to septic fields.
4. Septic fields are to be min. 3.0m from property lines and 5.0m from residences and installed at existing grades.
5. Septic tanks are to be min. 3.0m from property lines and 1.5m from residences.
6. No retaining walls constructed adjacent to septic fields.



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Preliminary

Rev. No.	Date	Description	CAD
Rev. 1	28-NOV-2023	Town Comments	JK

**Agnes Street Townhouse
Residential Development
Town of Caledon**

**Typical Sewage System
Layout: Block 5**

Scale: 1:300	Designed By: EG
Date: 7-Mar-2023	Drawn By: JK
Project No.: D3082	Checked By: EG Drawing No.: SP5-1

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- Sewage System / Adjacent Grading Design Criteria:**
- 4:1 max. down slopes away from septic field.
 - No slopes directly down to septic fields (direct surface water around field with swales).
 - Swales are to be min. 0.15m deep with max. 4:1 side slopes adjacent to septic fields.
 - Septic fields are to be min. 3.0m from property lines and 5.0m from residences and installed at existing grades.
 - Septic tanks are to be min. 3.0m from property lines and 1.5m from residences.
 - No retaining walls constructed adjacent to septic fields.

Stone Layer (c/w distribution piping) is to be a minimum of:
- 15.0m from drilled wells
- 30.0m from dug wells
- 3.0m from property lines
- 5.0m from townhouses
Note: Type 'A' Dispersal Bed is not raised above finished grade, therefore no increase to setbacks to stone layer.

Class IV Tertiary Treatment System: Waterloo Biofilter - Preliminary Design: Block 9

Q = 9,900 L/day (Five 3-bedroom, 3-bathroom Townhouses, each at 1,980 L/day)

Sewage Treatment: CBOD5 ≤ 10 mg/L, TSS ≤ 10 mg/L, Nitrates ≤ 5 mg/L

W.B. Anaerobic Digester: 1.89 x daily flow = 1.89 x Q = 1.89 x 9,900 L = 18,711 L
Provide Waterloo Biofilter Anaerobic Digester: 22,500 L (5,000 gal.) with gravity flow to Pump Station.

Pump Station: Provide 9,000 L (PT-9000) pump tank to time dose to BT-22500 Biofilter Tank.

Biofilter Tank: Provide 22,500 L (5,000 gal.) BT22500 Basket Biofilter tank, provided by Waterloo Biofilter.
Biofilter Tank to have two pumps; one pump to re-circulate to W.B. Anaerobic Digester, second pump to demand dose to WaterNox Tank (advanced nitrate treatment tank).

WaterNox-LS Tank: Provide 18,000 L (4,000 gal.) LS-18000 Tank (to Waterloo Biofilter Specifications), to dose on a demand basis to Type 'A' Dispersal bed.

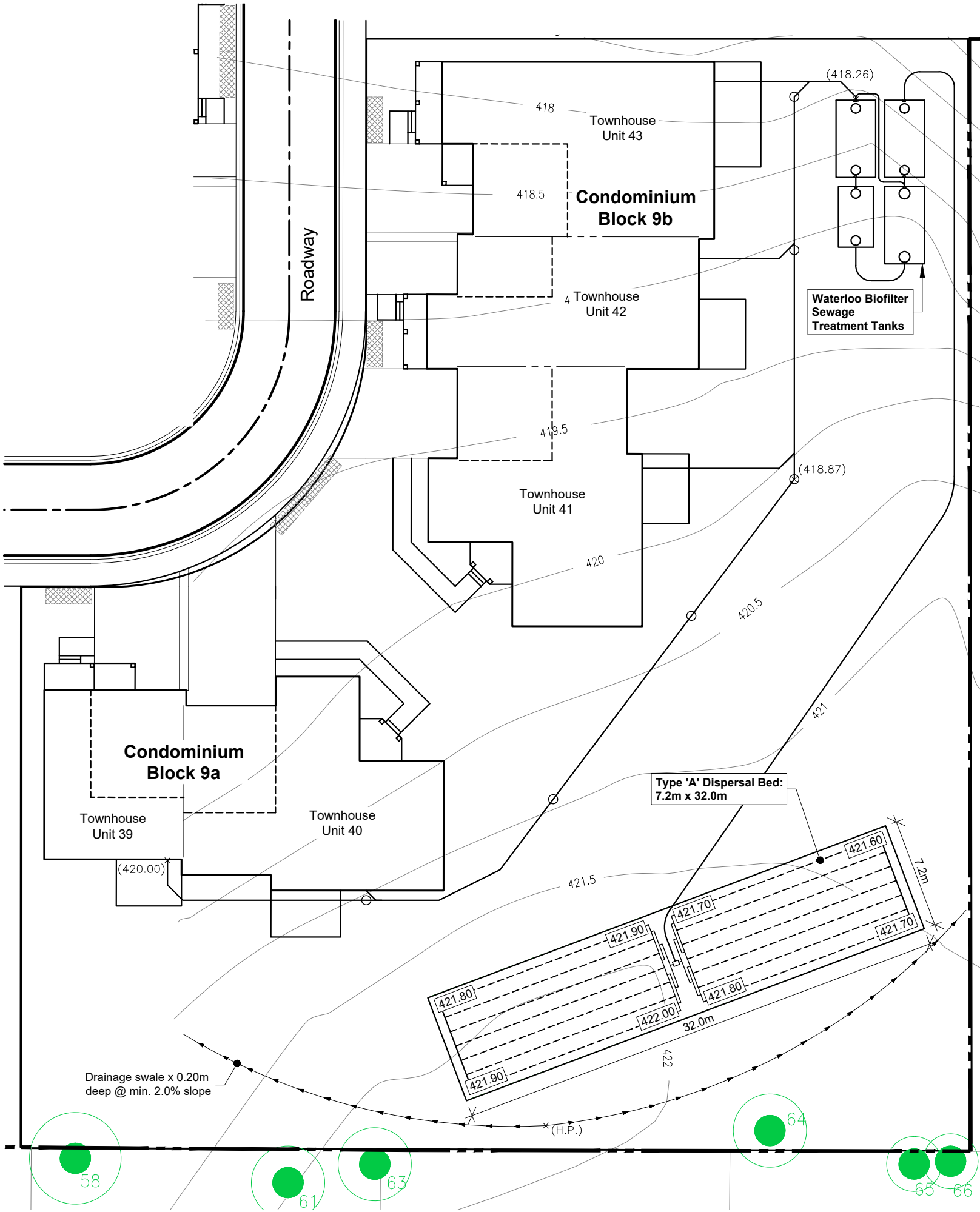
Soil Percolation: T = 8 min/cm. Test Pit Investigation Undertaken on August 11, 2022 by Gunnell Engineering identified Sand Soils.

Type 'A' Dispersal Bed (Based on Q = 9,900 L/day & T = 8 min/cm)

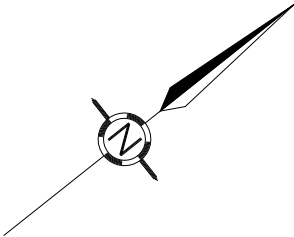
Stone Layer: Maximum loading = 50 L/sm/day (i.e.: Q ≥ 3,000 L/day); 9,900 / 50 = 198.0 sm.
Provide Stone Layer Area = 200.0 sm. (5.0m x 40.0m)

Dispersal Bed Area: QT/850: 9,900 x 8 / 850 = 93.2m². Provide Dispersal Bed Area: 7.2m x 32.0m = 230.4 m²

Mantle - N/A (i.e. T < 15 min/cm).



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Rev. No.	Date	Description	CAD
Rev. 1	28-NOV-2023	Town Comments	JK

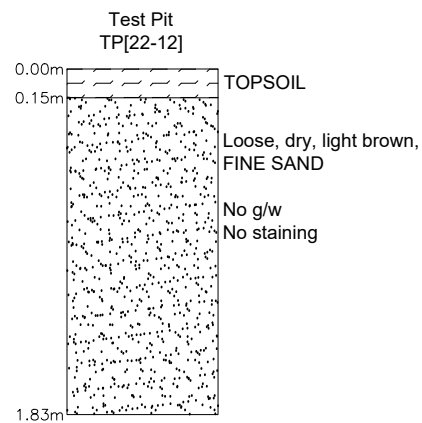
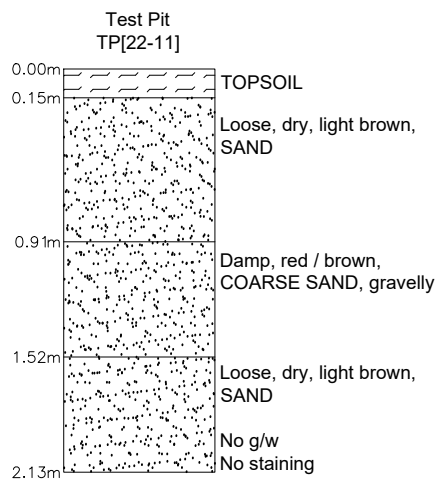
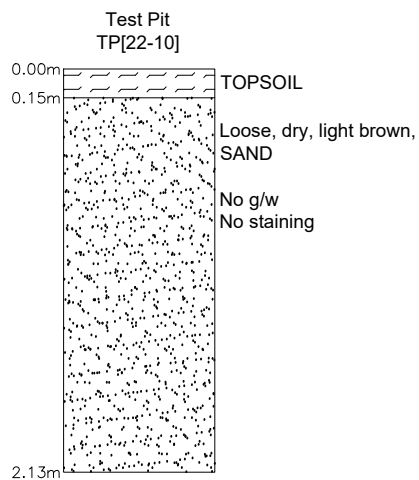
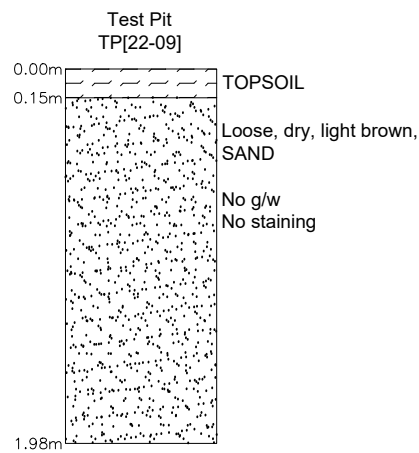
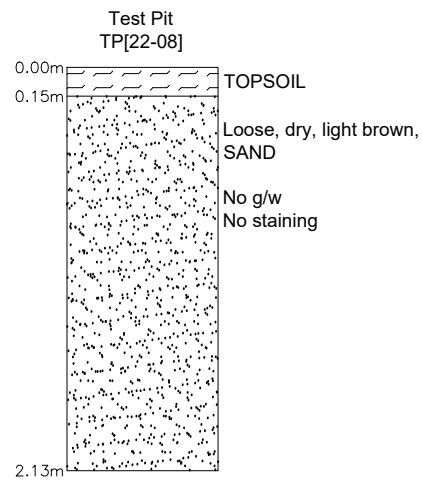
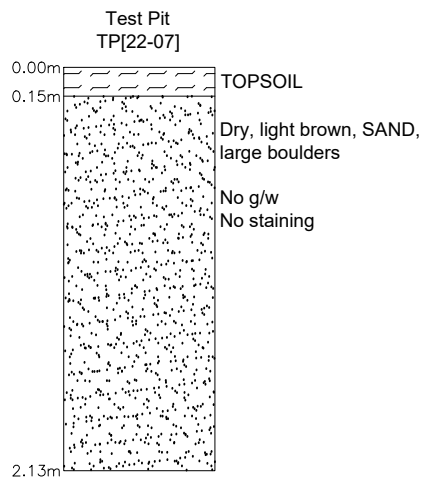
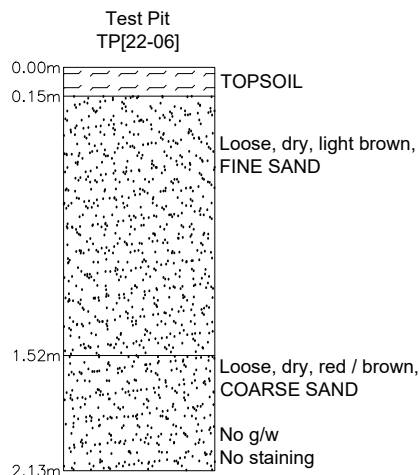
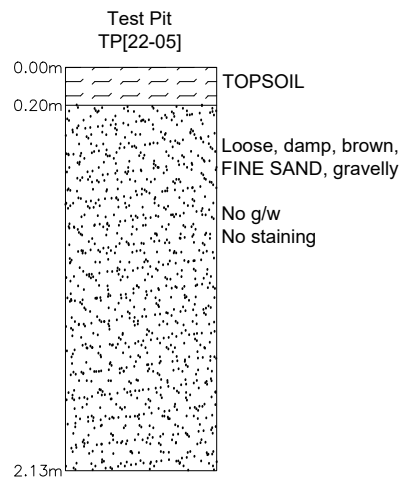
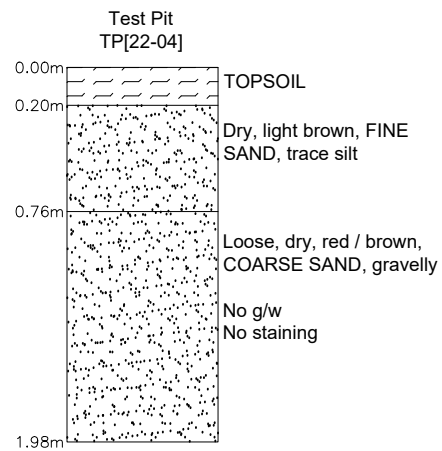
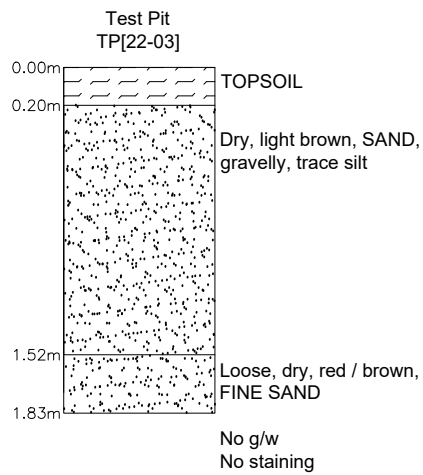
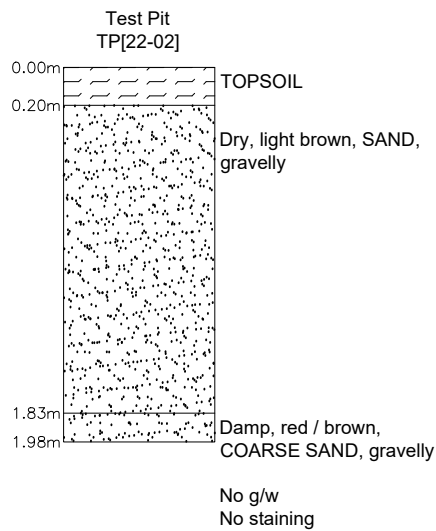
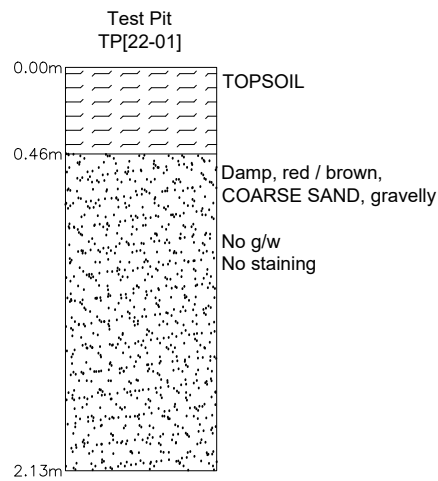
**Agnes Street Townhouse
Residential Development
Town of Caledon**

**Typical Sewage System
Layout: Block 9**

Scale: 1:300	Designed By: EG
Date: 7-Mar-2023	Drawn By: JK
Project No.:	Checked By: EG
	Drawing No.:

D3082 SP9-1

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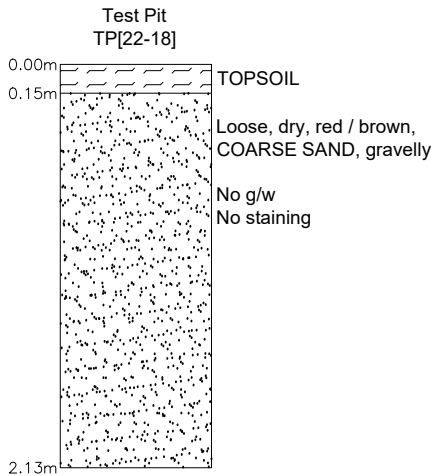
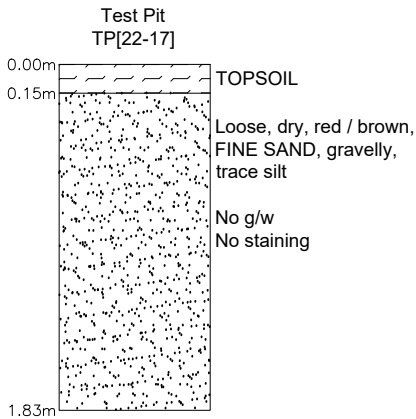
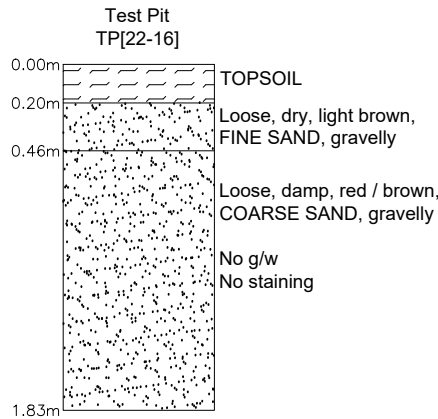
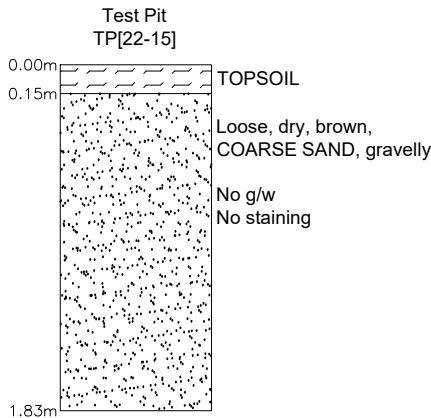
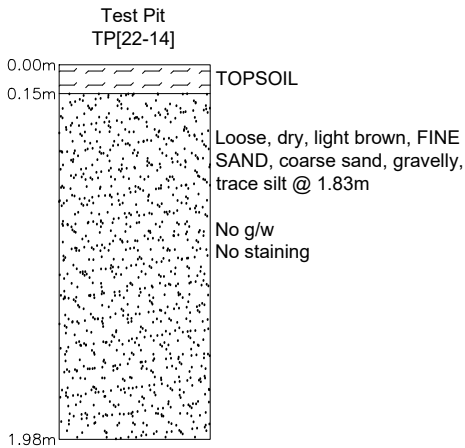
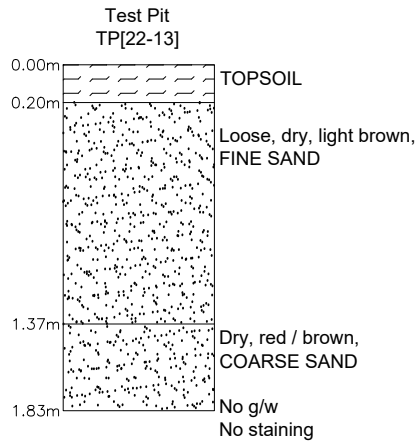
Test Pit Soil Profiles

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Date: 19-AUG-2022	Drawn By: KD
Project No.:	Checked By: EG
D3082	DT-1

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Plotted On: Thu, 30 Nov 2023 4:26pm



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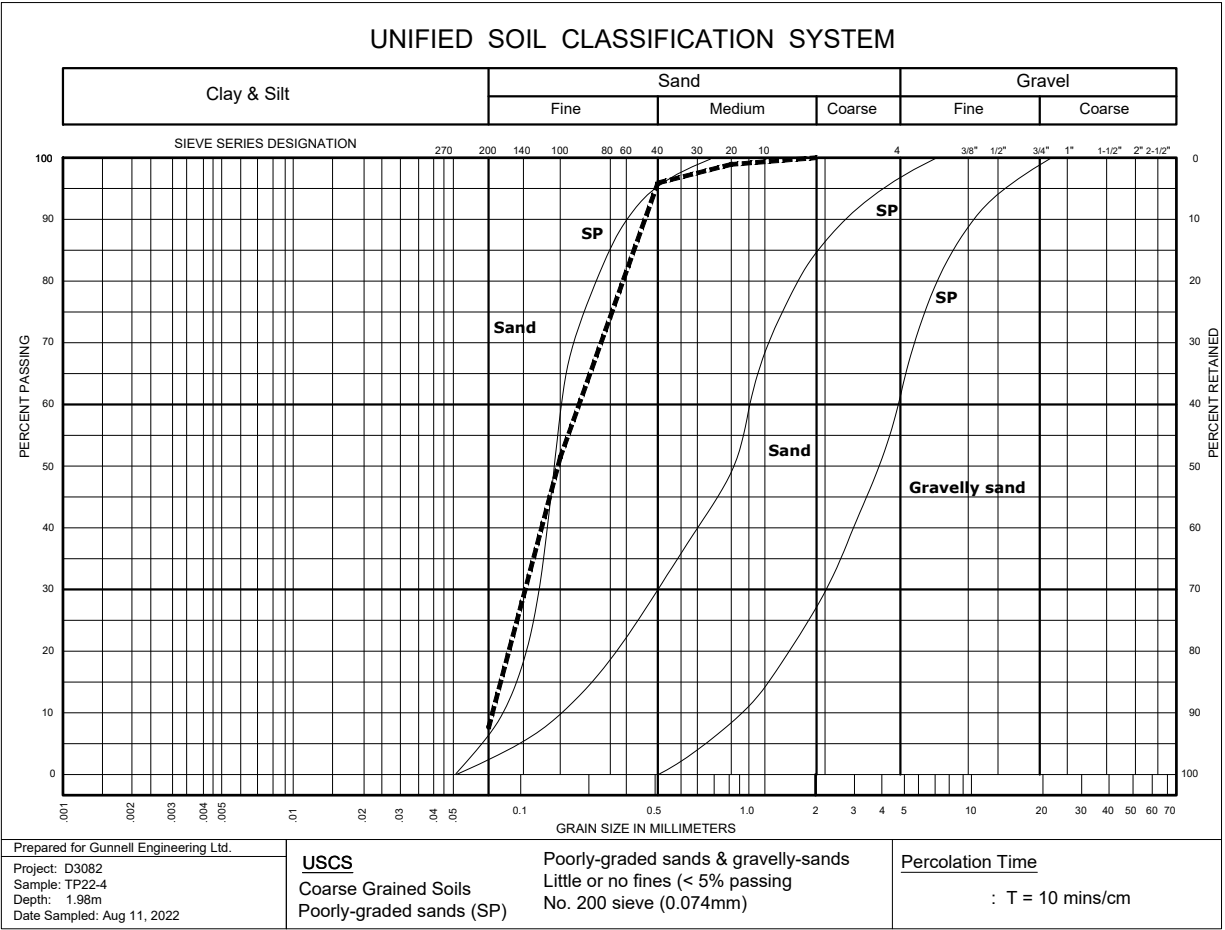
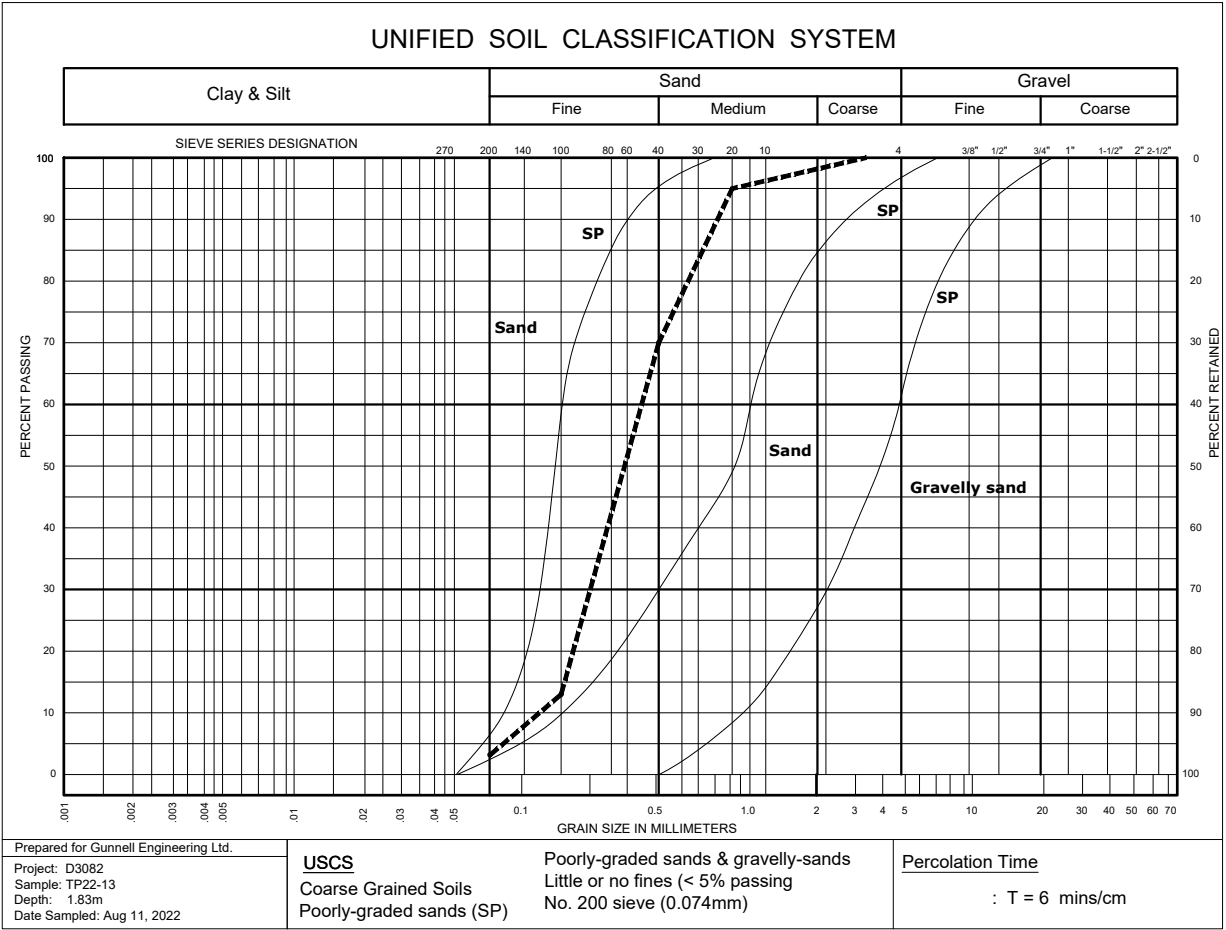
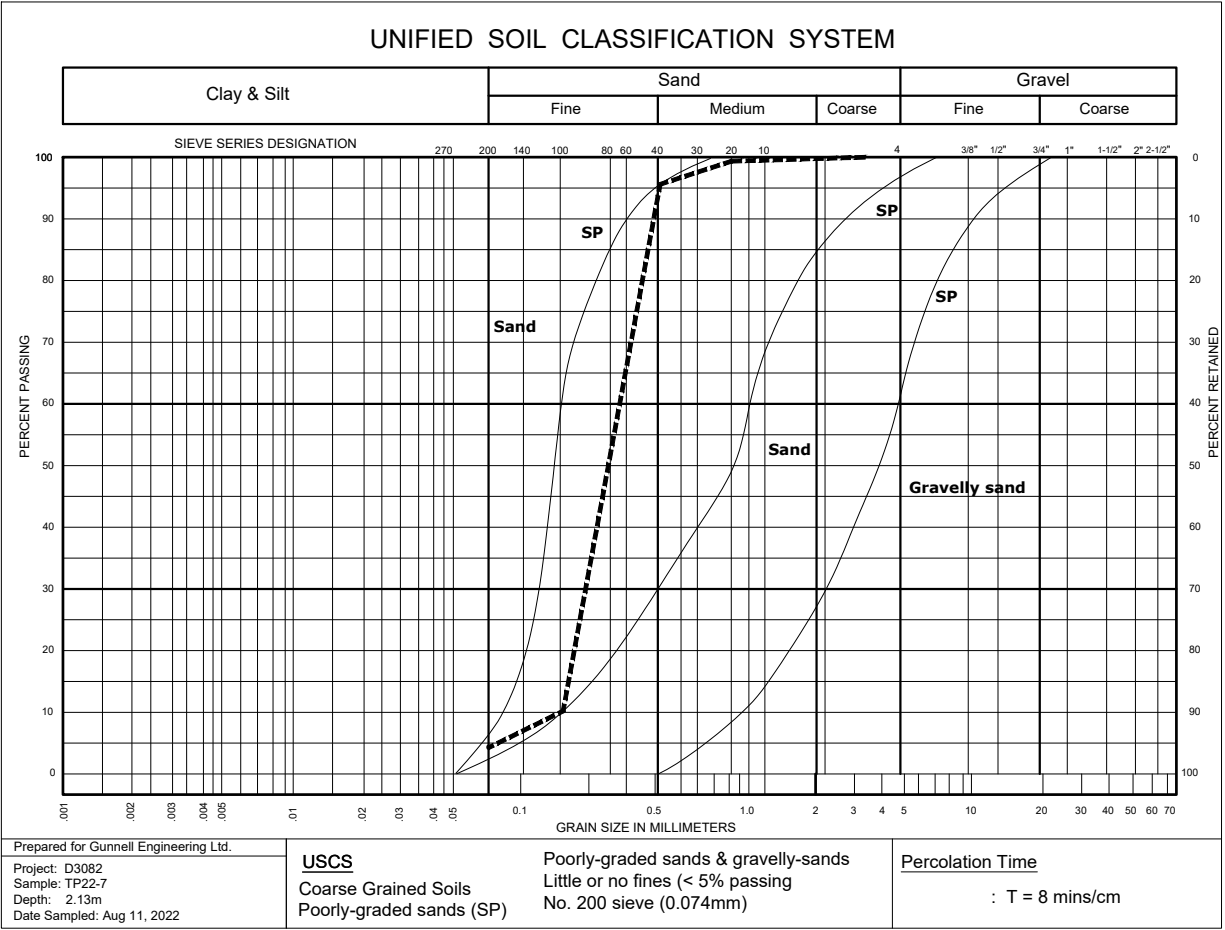
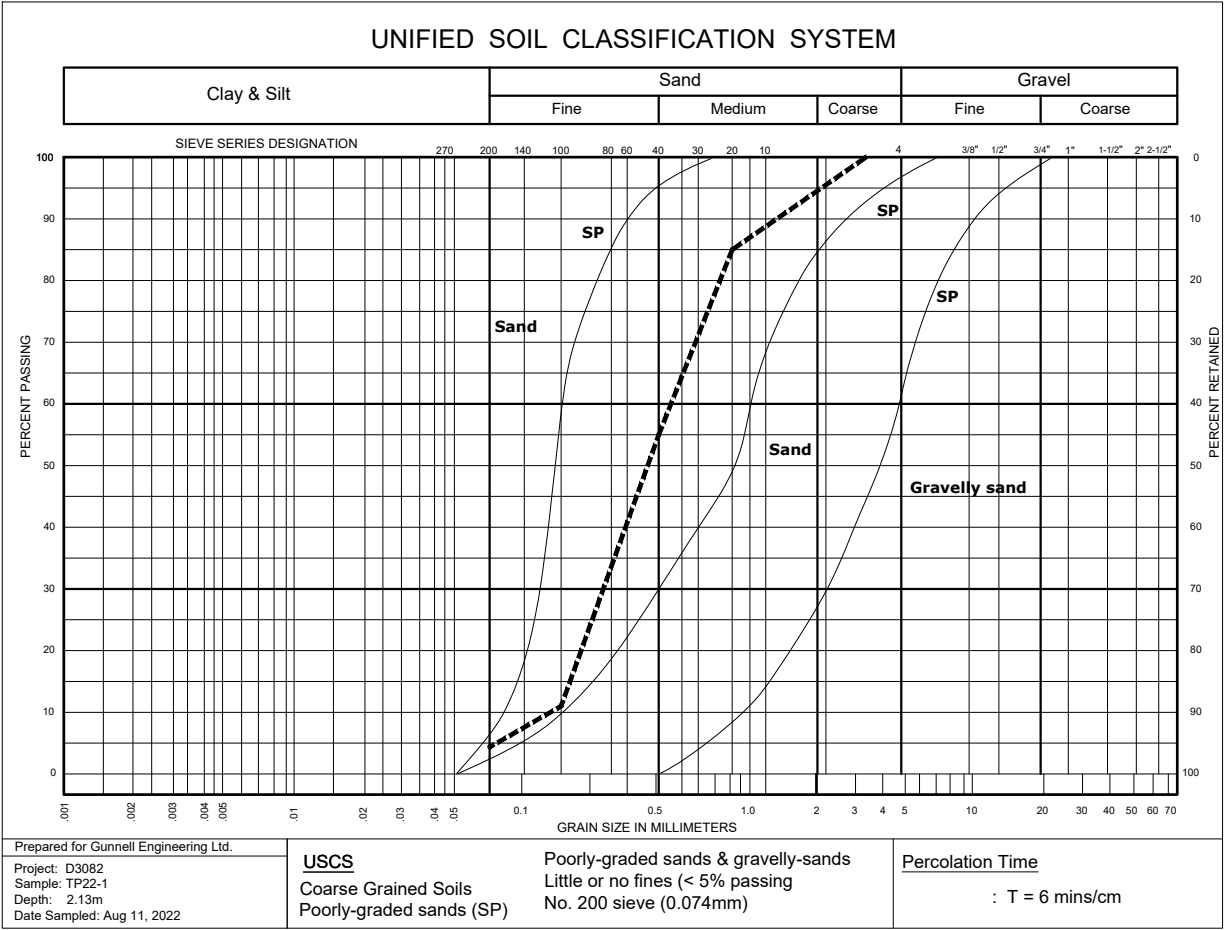


**Alton Residential Infill
Agnes Street
Town of Caledon**

Test Pit Soil Profiles

Scale: N.T.S.	Designed By: KD
Date: 19-AUG-2022	Drawn By: KD
Project No.:	Checked By: EG
D3082	DT-2

File: \\Gunnell\\MAP\\Shared\\Gunnell Engineering AutoCAD\\D3082 - Alton Residential Infill\\CAD\\-BC- Updated Site Plan\\D3082BC-DT3.dwg
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**Alton Residential Infill
Agnes Street
Town of Caledon**

Soil Laboratory Analysis

Scale: N.T.S. Designed By: --

Date: 7-MAR-2023 Drawn By: JK

Project No.: Checked By: --

D3082 DT-3

WaterNOx-LS Third Party Testing Summary

In the fall of 2016, Waterloo Biofilter Systems Inc. installed their WaterNOx-LS™ denitrification unit at the Bureau de Normalisation du Quebec (BNQ) test site located in Quebec City. The system underwent BNQ 3680-600 test protocol which includes two parts - Period A and Period B. Period A is based on the methodology of NSF/ANSI Standards 40 and 245, containing the same flow patterns and stress tests. Period B provides for a further 6 months of seasonal reliability testing to ensure that the test includes cold weather results.

The WaterNOx-LS is a passive autotrophic denitrification process using sulphur-limestone minerals in a submerged, up-flow configuration. The WaterNOx-LS, which was sized for 1,600 L/day (350 gpd) followed a Waterloo Biofilter nitrifying treatment unit.

Period A Test Results

During Period A wastewater is dosed according to the hydraulic loading specified in NSF-40. Period A includes the wash-day, working-parent, power failure, and vacation period stress tests. All sample results taken during stress tests are included in the analysis. Influent wastewater temperature values ranged from 10.0 °C (50 °F) to 16.5 °C (62 °F) with an average value of 13.3 °C (56 °F). Influent pH averaged 7.9 and effluent pH averaged 7.2.

Table 1 – Period A Results for the WaterNOx-LS

Parameters	Influent	Effluent	Removal
(c)BOD ₅	260	6	97.6%
TSS	312	3	99.2%
Fecal Coliforms	2,403,000	4,900	99.8%
NO _{2,3}	0.08	0.20	
TKN	57.1	4.6	92.0%
TN	57.1	4.8	91.6%

n = 123; n = 357 for fecals

All parameters in mg/L except Fecal Coliforms in cfu/100mL

All values arithmetic averages except Fecal Coliforms in geometric average

Weekly influent total nitrogen concentrations ranged from 43.0 mg/L to 68.8 mg/L with a six-month average concentration of 57.1 mg/L.

Weekly effluent NO_{2,3} concentrations ranged from < 0.02 mg/L to 3.33 mg/L with a six-month average of 0.20 mg/L. Weekly effluent TKN concentrations ranged from 1.5 mg/L to 16.9 mg/L with a six-month average of 4.6 mg/L. Weekly effluent total nitrogen concentrations ranged from 1.7 mg/L to 17.1 mg/L with a six-month average of 4.8 mg/L. The total nitrogen reduction over the six-month period was 91.6%.

Period B Test Results

Weekday hydraulic loading is modified during Period B to a strenuous 'working parent' schedule where 40% of the flow is delivered over three hours in the morning, and 60% is delivered over three hours in the evening. All samples taken during Period B are included in the analysis. Influent wastewater temperature values ranged from 10.1 °C (50 °F) to 15.8 °C (60 °F) with an average value of 12.3 °C (54 °F). Influent pH averaged 8.0 and effluent pH averaged 7.1.

Table 2 – Period B Results for the WaterNOx-LS

Parameters	Influent	Effluent	Removal
(c)BOD ₅	248	4	98.2%
TSS	304	3	99.1%
Fecal Coliforms	2,142,000	2,800	99.9%
NO _{2,3}	0.17	3.38	
TKN	60.3	8.5	85.9%
TN	60.4	11.9	80.3%

n = 59 except Fecal Coliforms n = 118

All parameters in mg/L except Fecal Coliforms in cfu/100mL

All values arithmetic averages except Fecal Coliforms in geometric average

Weekly influent total nitrogen concentrations ranged from 21.2 mg/L to 85.6 mg/L with a six-month average concentration of 60.4 mg/L.

Weekly effluent NO_{2,3} concentrations ranged from < 0.04 mg/L to 15.2 mg/L with a six-month average of 3.38 mg/L. Weekly effluent TKN concentrations ranged from 1.2 mg/L to 21.2 mg/L with a weekly average of 8.5 mg/L. Weekly effluent total nitrogen concentrations ranged from 3.7 mg/L to 22.2 mg/L with a six-month average of 11.9 mg/L. The total nitrogen reduction over the six-month period was 80.3%.

Conclusion

In summary, the WaterNOx-LS system can successfully remove very high levels of total nitrogen passively, while buffering pH to neutral and keeping cBOD₅ and TSS levels below 10 mg/L.