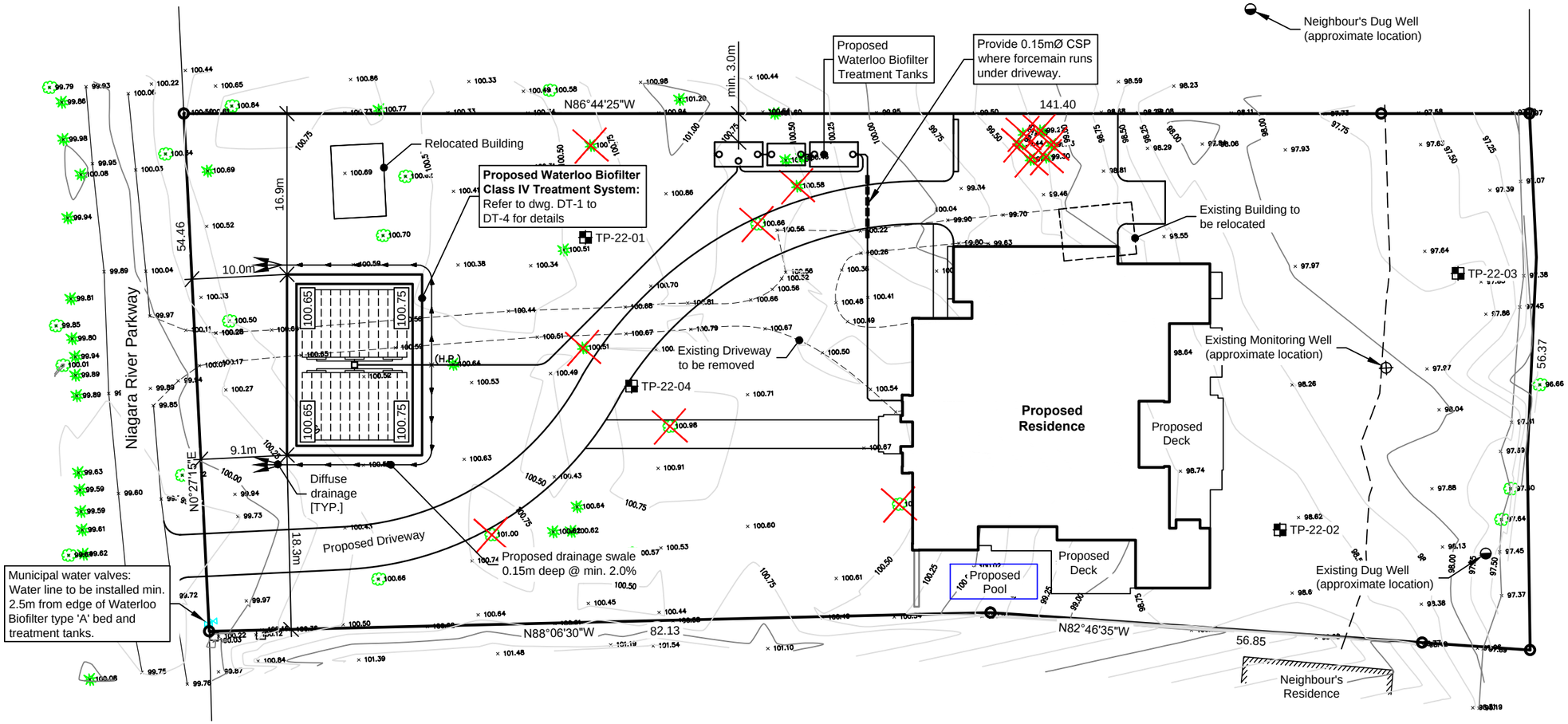
Sewage System Design Only

Refer to Owner's grading plan for detailed overall site grading, except for the grading in the area of the septic system, as detailed herein.

Notes:
1. All landscaped areas to be reinstated with 150mm top-soil and sod or seed, except septic field area to be provided with 200 / 300 mm of topsoil & be sodded.
2. Existing elevations as noted, ie. 221.84
3. Proposed swale elevations as noted, ie. (221.95)
4. Proposed elevations as noted, ie. 220.40
5. Existing slopes shown, ie. (2.2%)
6. Maintain maximum slopes at 3 horizontal to 1 vertical, except slopes to be maximum 4:1 at septic field.
7. Provide new swales as detailed.
8. All site grading to be in accordance with OBC & Niagara Region requirements.

Note:
1. All services including sewer, water, hydro, cable, telephone, and gas should be staked out prior to construction and appropriate pre-cautions taken to protect the existing services.
2. Soil and ground water conditions may be variable across the site. If soil and underground water conditions, other than those used to prepare this design, are encountered during the installation, Gunnell Engineering Ltd. should be contacted to determine the effect on the proposed sewage system.
3. Contractor to verify location of neighbouring wells, if any, prior to septic system installation. Any conflict between wells and septic system, i.e. less than 30 metre clearance, should be discussed with Gunnell Engineering Ltd. prior to septic system installation.



Survey reference: R-PE Surveying Ltd.
dated: September 7, 2021

Gunnell Engineering Ltd.
1110 Stellar Drive, Unit 106
Newmarket, ON L3Y 7B7
bus: 905-868-9400
fax: 905-853-5734
www.septicdesign.ca

LEGEND
- Septic Test Pit

LICENSED PROFESSIONAL ENGINEER
June 22, 2022
E. L. GUNNELL
PROVINCE OF ONTARIO

Paolicelli Residence
14785 Niagara River Pkwy
Part 1, Lots 8 & 9
Niagara Region

Site & Part Grading Plan
Sewage System Design

Scale: 1:500	Designed By: EG
Date: 22-Jun-2022	Drawn By: CS
Project No.: D3495	Checked By: EG
	Drawing No.: SP-1

File: Z:\Gunnell Engineering Auto\CAD\D3400 - PROJECTS\D3495 - 14785 Niagara R Pkwy - NOT\CAD\~AA~ Septic Design\D3495A~SP1.dwg
Plotted on: _____

Sewage System Details: Waterloo Biofilter AD-BA100
Class IV Tertiary Treatment Sewage System, c/w Type 'A' Dispersal Bed
Ontario Building Code Compliance Analysis

Proposed Residence = 1,382.5 m² (14,880.9 ft²): 8 bedrooms + 11 washrooms

Base Sewage Flow = 2,500 L/day (based on 5 bedrooms)

Fixture Units = 9 washroom groups x 6 = 54 + 11.0 (2 powder rooms x 5.5) + 4.5 (3 additional showers x 1.5) + 1.5 (laundry sink) + 1.5 (washing machine) + 1.5 (dishwasher) + 3.0 (2 kitchen sinks x 1.5) + 2.0 (2 bidets x 1.0) = 79

Additional Flows:
1) No. Fixture Units (above 20) = 59 x 50 L = 2,950 L
2) House Size: (each 10m² from 201m² to 400m²) = 20 x 100 L = 2,000 L
   (each 10m² from 401m² to 600m²) = 20 x 75 L = 1,500 L
   (each 10m² over 600m²) = 79 x 50 L = 3,950 L; Total = 7,450 L
3) No. Bedrooms (over 5) = 3 x 500 = 500 L

Q = 9,950 L/day (2,500 L + 7,450 L) [House size governs]: Daily Design Sewage Flow

Waterloo Biofilter Anaerobic Digester:
Anaerobic Digester size = 1.89 x Q: 1.89 x 9,950 L = 18,806 L, Provide 22,500 L (5,000 gal.) single compartment concrete tank (to Waterloo Biofilter specifications) with gravity flow to Pump Station.

Waterloo Biofilter Dosing Pump Station: Provide 9,000 L (2,000 gal.) pump tank, c/w timed dosing to Waterloo Biofilter Treatment System.

Waterloo Biofilter: Sewage Treatment System (Based on Q = 9,950 L/day):
Waterloo Biofilter - Configuration AD-BA100, rated to a treatment capacity of 10,000 L/day, based on CAN/BNQ 3680-600 Certificate No. 2312. Refer to drawing DT-3 for Waterloo Biofilter details. Treatment system is to demand dose (time dosed via pump station) into Type 'A' Dispersal Bed, with 50% recirculation to Anaerobic Digester.

Soil Percolation: T = 12 min/cm. Test pit investigation carried out by Gunnell Engineering Ltd. on May 3, 2022 identified sandy soils (TP-22-04). Refer to soil profiles on drawing DT-2 and laboratory analysis on drawing DT-4.

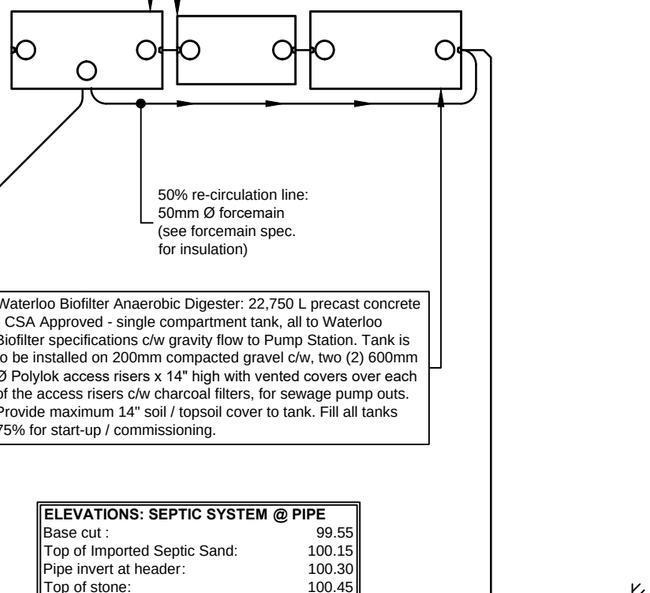
Type 'A' Dispersal Bed (Based on Q = 9,950 L/day & T = 12 min/cm):
1) Washed Stone Layer = Maximum loading = 50 L/m² (Q > 3,000 L); Q / 50 = 9,950 / 50 = 199.0m². Designed area: 17.0m x 12.2m = 207.4m².
2) Absorption Bed (Sand Contact Area): = Q x T / 850 = 9,950 x 12 / 850 = 140.5m². Provide: 19.0m x 14.2m = 269.8m².
3) Mantle: N/A (i.e., T ≤ 15 min/cm)

Waterloo Biofilter: Configuration BA100 (refer to DT-3), buried at grade c/w 3 Polylok x 610mm Ø access risers x 14" high with insulated lids, with pumped disposal to Type 'A' Dispersal Bed. Provide for 50% recirculation. Design based on Q = 9,950 L/day. Waterloo Biofilter: Provide BA100 (rated to 10,000 L/day) single compartment holding tank, c/w 2 wirebaskets & a total min. 9.8m³ of Biofilter Foam Medium. Provide 1/2 H.P. Little Giant pump model WS50HM, c/w high level alarm and inline filter. Provide Waterloo smart panel for demand dosing to Type 'A' Dispersal Bed with demand dosing of 1,130L (565L to Type 'A' Dispersal Bed & 565L recirculation to Anaerobic Digester tank). Confirm all pump, design & performance requirements with Waterloo Biofilter - 519-856-0757. For Biofilter tank venting, provide vented covers over each of the access risers x 14" high, c/w charcoal filters. Provide union fitted plumbing for pump removal within access riser, including poly rope for pump removal. Set pump on 450mm x 450mm x 50mm concrete patio slab. Provide dedicated electrical circuits for pump and alarm panel. Provide maximum 14" soil / topsoil cover to tank.

Dosing Pump Station: 9,000 L precast concrete - single compartment pump tank c/w a 1/2 H.P. Little Giant pump model WS50HM, c/w Waterloo Smart Panel control panel alarm, for timed dosing between 6.0 L - 10.0 L per cubic meter of foam (minimum foam volume = 9.8m³) = 58.8 L - 98.0 L/dose. Provide dosing = 103.6 L/dose each 15 min. x 96 doses / day = 9,950 L/day. All design requirements to be confirmed with Waterloo Biofilter & adjusted by installer to suit field conditions. An inline filter is to be installed within the pump chamber to prevent debris from entering the treatment tank. Tank is to be installed on a 200mm compacted gravel c/w two (2) 610mm Ø Polylok access risers x 14" high for sewage pump outs & pump maintenance. Provide union fitted plumbing for pump removal within access riser, including poly rope for pump removal. Set pump on 450mm x 450mm x 50mm concrete patio slab. Provide dedicated electrical circuits for pump and alarm panel. Provide maximum 14" soil / topsoil cover to tank.

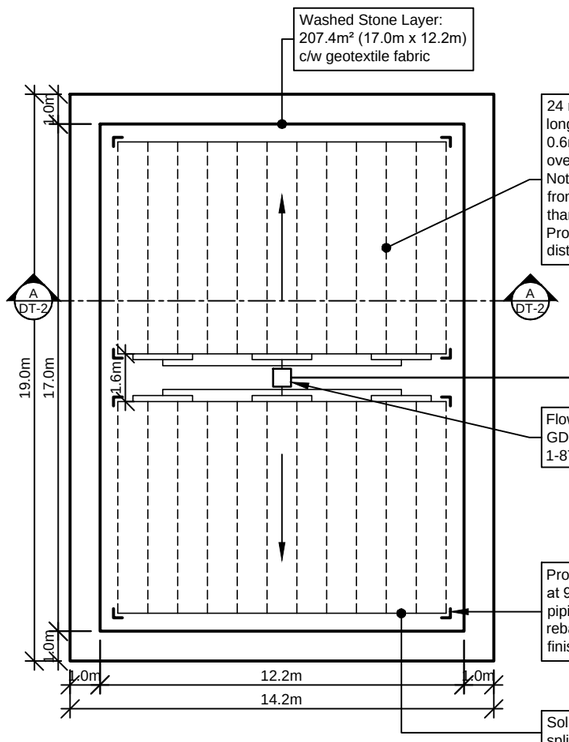
The edge of Stone Layer (c/w distribution piping) is to be a minimum of:
- 15.4m from drilled wells
- 30.4m from dug wells
- 3.4m from property lines
- 5.4m from structures

Note: Type 'A' Dispersal Bed system raised 0.20m above finished grade, therefore increase setbacks by 0.4m.



Waterloo Biofilter Anaerobic Digester: 22,750 L precast concrete - CSA Approved - single compartment tank, all to Waterloo Biofilter specifications c/w gravity flow to Pump Station. Tank is to be installed on 200mm compacted gravel c/w, two (2) 600mm Ø Polylok access risers x 14" high with vented covers over each of the access risers c/w charcoal filters, for sewage pump outs. Provide maximum 14" soil / topsoil cover to tank. Fill all tanks 75% for start-up / commissioning.

ELEVATIONS: SEPTIC SYSTEM @ PIPE	
Base cut :	99.55
Top of Imported Septic Sand:	100.15
Pipe invert at header:	100.30
Top of stone:	100.45
Top of Landscaping:	Varies 100.65 to 100.75



24 runs perforated distribution piping, ea. 7.1m long (Total 170.4m), 75mm dia. @ 1.0m o/c, 0.6m in from sides and ends, c/w geotextile fabric over complete stone area, prior to backfilling. Note: each pipe to have uniform downward slope from inlet of not less than 30mm and not more than 50mm for each 10m of distribution piping. Provide 30mm slope over specified 7.1m distribution pipe lengths.

Flow Divider - by Quanics, Model GDS ZS300, Contact: 1-877-782-6427 www.Quanics.net

Provide 15M rebar bars (15mm Ø) x 24" long bent at 90°, located at outside corners of the distribution piping (8 total) for subsurface detection. Top of rebar bars to be installed 0.20/0.30m below finished grade (i.e. to top of Stone Layer) [TYP.]

Solid piping at both ends, split headers as detailed

50mm Forcemain
- Polyethylene
- 75 PSI rated
- To CSA B137.1
- In 100mm sand bedding
- forward slope forcemain to flow divider
- When soil cover < 1.2m, provide 2" rigid x 600mm wide insulation cover + 2 sides x 300mm deep

Gravity discharge from building @ min. 2.0% slope (4" Sch. 40 or SDR35 PVC Pipe), c/w 4" rigid x 600mm wide insulation cover + 2 sides x 300mm deep. Provide cleanouts every 15.0m min.

All sewage tanks are to be installed to provide a maximum of 14" soil / topsoil cover to top of tanks. Note: all main floor & second floor residence sanitary plumbing to be routed to basement ceiling, to discharge through basement foundation wall to gravity flow into WB Anaerobic Digester. Basement sanitary plumbing to gravity flow into a sewage ejector pit and be pumped to the gravity flow sanitary plumbing discharging to the WB Anaerobic Digester.

Schematic layout of septic system. Provide setback distances as specified on drawing SP-1.

Note: Plumber to provide sewage back flow preventor (optional at discretion of owner) at building just beyond sewage discharge at foundation wall c/w metal access cover at grade: Mainline backwater valve, c/w access box / cover. (Contact Armco Agencies; Phone No. 905-238-8448)

Waterloo Biofilter Sewage System, c/w Type 'A' Dispersal Bed - Plan View

Gunnell Engineering Ltd.
1110 Stellar Drive, Unit 106
Newmarket, ON L3Y 7B7
bus: 905-868-9400
fax: 905-853-5734
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All sewage tanks to be a minimum of 1.5m from buildings, 3.0m from property lines & 15.0m from wells.

See drawing DT-4 for imported sand fill, and full specifications & notes.

Paolicelli Residence
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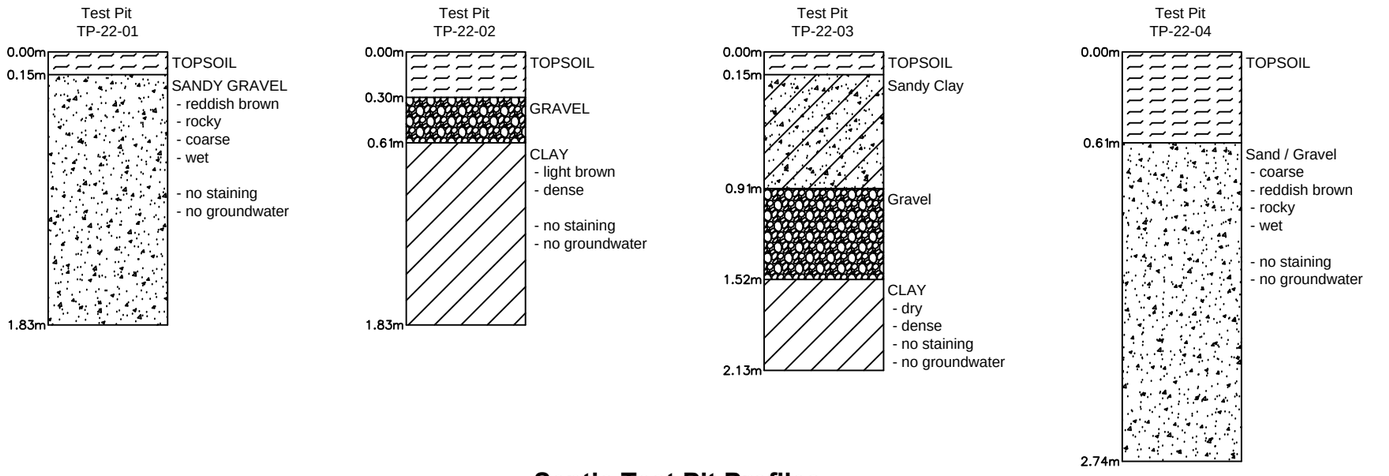
Part 1, Lots 8 & 9
Niagara Region

Sewage System Details

Scale: 1:200	Designed By: EG
Date: 22-Jun-2022	Drawn By: CS
Project No.: D3495	Checked By: EG
	Drawing No.: DT-1



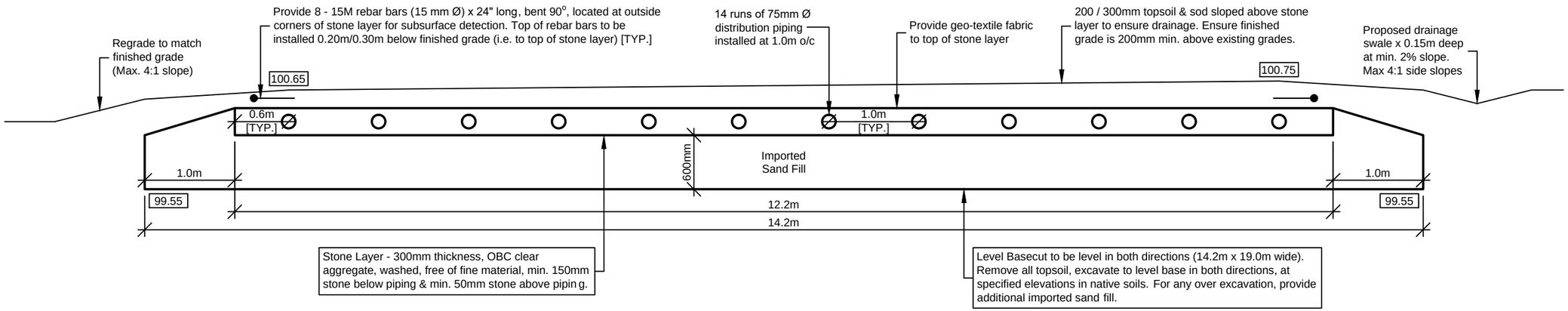
Septic Test Pit Profiles
excavated May 3, 2022

Note: All topsoil in the area of the Type 'A' Dispersal Bed is to be removed and stockpiled for re-use. Any fill and clay soils to be excavated & removed from site.

ELEVATIONS: SEPTIC SYSTEM @ PIPE	
Base cut :	99.55
Top of Imported Septic Sand:	100.15
Pipe invert at header:	100.30
Top of stone:	100.45
Top of Landscaping:	Varies 100.65 to 100.75

The edge of Stone Layer (c/w distribution piping) is to be a minimum of:
- 15.4m from drilled wells
- 30.4m from dug wells
- 3.4m from property lines
- 5.4m from structures

Note: Type 'A' Dispersal Bed system raised 0.20m above finished grade, therefore increase setbacks by 0.4m.



Waterloo Biofilter Sewage System, c/w Type 'A' Dispersal Bed : Longitudinal Section A-A

Gunnell Engineering Ltd.
1110 Stellar Drive, Unit 106
Newmarket, ON L3Y 7B7
bus: 905-868-9400
fax: 905-853-5734
www.septicdesign.ca

LICENSED PROFESSIONAL ENGINEER
June 22, 2022
E. L. GUNNELL
PROVINCE OF ONTARIO

Paolicelli Residence
14785 Niagara River Pkwy
Part 1, Lots 8 & 9
Niagara Region

Sewage System Details

Scale: N.T.S.	Designed By: EG
Date: 22-Jun-2022	Drawn By: CS
Project No.: D3495	Checked By: EG
	Drawing No.: DT-2

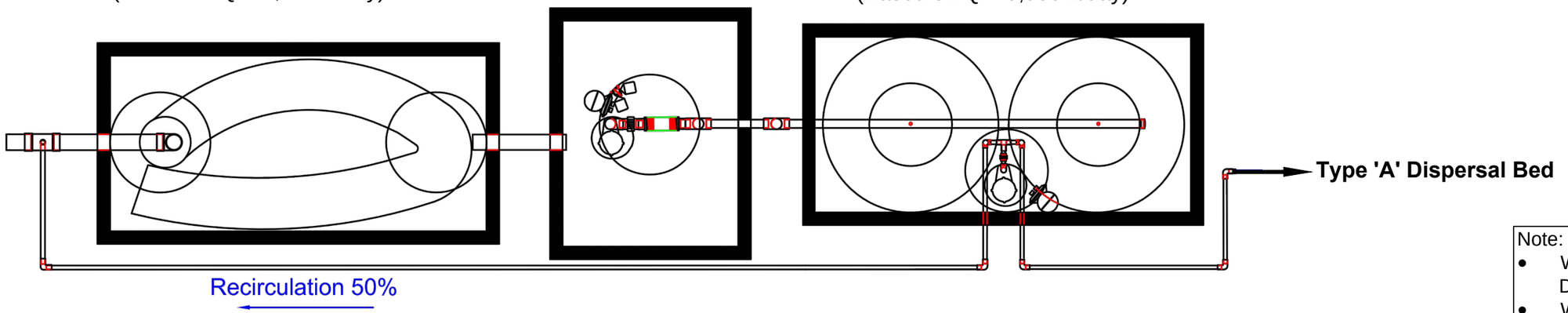
Gunnell Engineering Ltd.
1110 Stellar Drive, Unit 106
Newmarket, ON L3Y 7B7
bus: 905-868-9400
fax: 905-853-5734
www.septicdesign.ca

Configuration Details

Waterloo Biofilter Anaerobic Digester
(Based on Q = 9,950 L/day)

Pump Station
(Based on Q = 9,950 L/day)

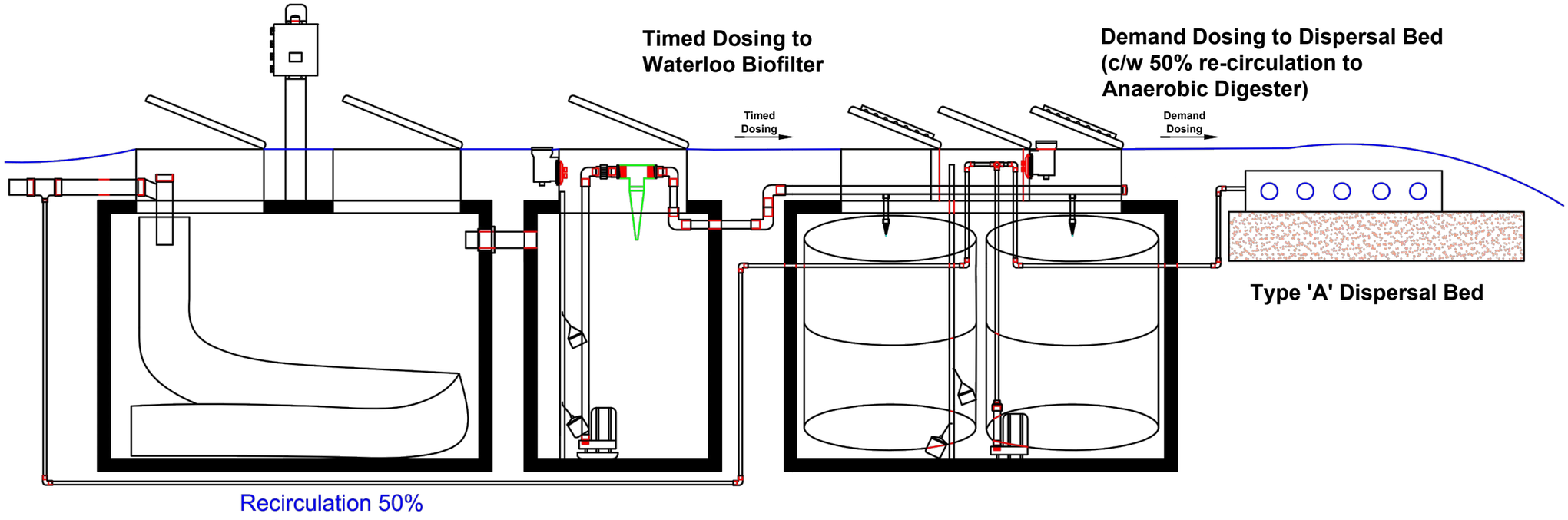
Waterloo Biofilter Treatment Tank
(Based on Q = 9,950 L/day)



Note:
- Waterloo Biofilter Anaerobic Digester based on Q = 9,950 L/day.
- Waterloo Biofilter Treatment Unit based on Q = 9,950 L/day
- Provide Waterloo Biofilter Sewage System, model AD-BA100, with treatment capacity of 10,000 L/day

Timed Dosing to Waterloo Biofilter

Demand Dosing to Dispersal Bed (c/w 50% re-circulation to Anaerobic Digester)



LICENSED PROFESSIONAL ENGINEER
June 22, 2022
E. L. GUNNELL
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Paolicelli Residence
14785 Niagara River Pkwy
Part 1, Lots 8 & 9
Niagara Region

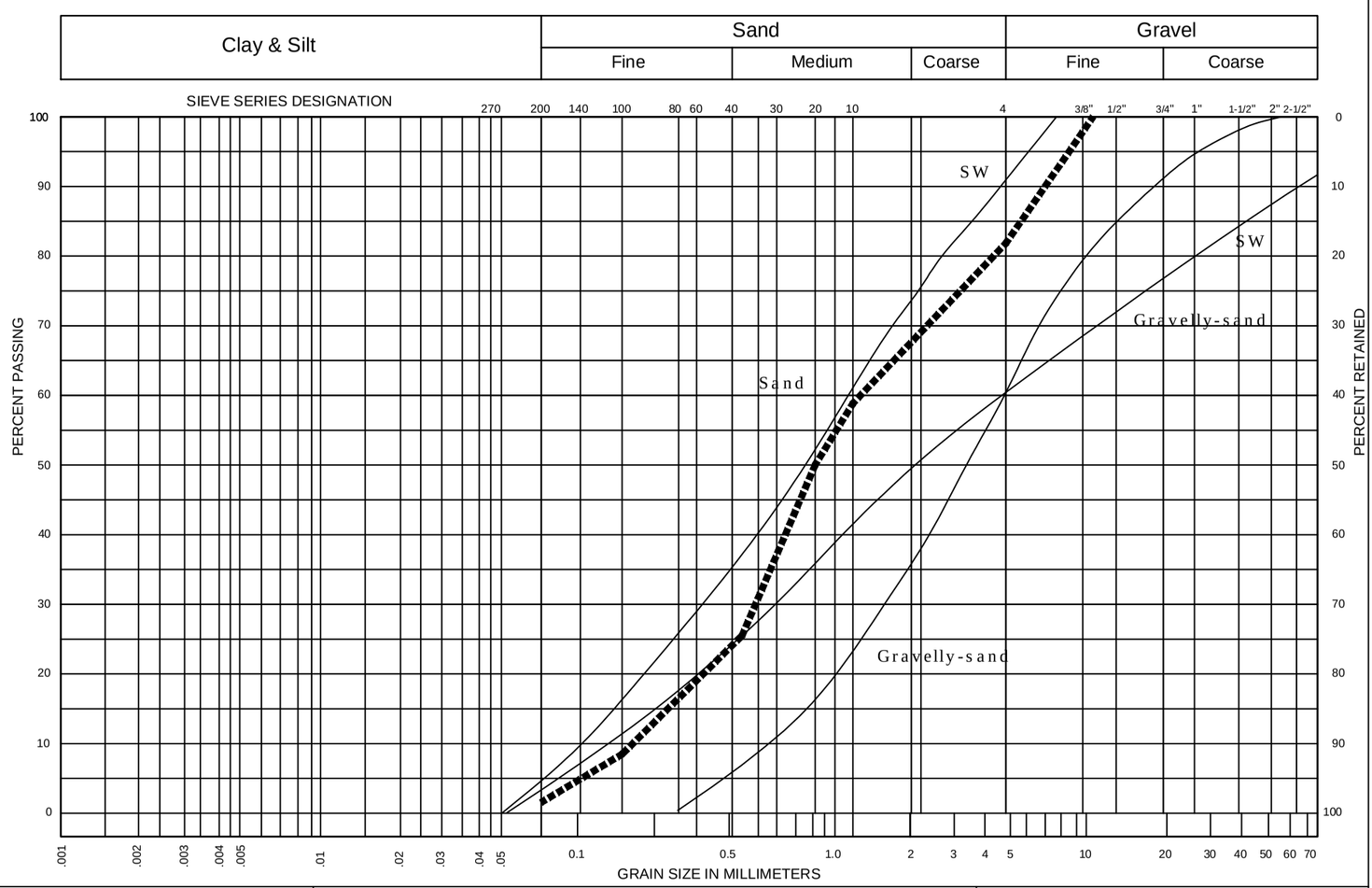
Waterloo Biofilter Details

Scale: N.T.S.	Designed By: EG
Date: 22-Jun-2022	Drawn By: CS
Project No.: **D3495**	Checked By: EG
	Drawing No.: **DT-3**

Standard Notes - Private Waste System: Waterloo Biofilter Treatment System - Class IV, c/w Type 'A' Dispersal Bed, Niagara Region

1. All components and construction shall be in accordance with Part 8 of the 2012 Ontario Building Code, for Class IV Sewage Systems, and all governing legislation. All works and excavations are to be in accordance with the Ministry of Labour and Occupational Health & Safety requirements.
2. Only liquid wastes defined as 'sanitary sewage' in Part 2 of the OBC shall be discharged to a private waste disposal system.
3. The septic system shall be constructed by one licensed contractor and all imported sand fill and topsoil shall be placed under the direction of the contractor.
4. New sewage tanks shall:
   - 4.1. Conform to Canadian Standards Association Standard B66-21 'Design, material, and manufacturing requirements for prefabricated septic tanks and sewage holding tanks', except as detailed in Waterloo Biofilter CAN/BNQ 3680/2009-05-01, Certification No. 2312,
   - 4.2. Be bedded on 200 mm of compacted gravel or crushed stone,
5. Waterloo Biofilter System shall be supplied and installed in accordance with CAN/BNQ 3680-600 / 2009-05-01, Certificate No. 2312 dated July 5, 2016. Only manufacturer trained and authorized agents shall install the Waterloo Biofilter System.
6. The contractor shall provide reasonable notice to Niagara Region and Gunnell Engineering (where Gunnell Engineering has been authorized by client) to provide site inspections as follows:
   - 6.1. The basecut excavation for a system using imported sand material,
   - 6.2. The installation of treatment tanks and distribution pipe.
   - 6.3. Backfilling shall not proceed until each stage has been approved by Niagara Region. Backfilling shall not proceed until each stage has been approved by Niagara Region.
   - 6.4. Start up and commissioning.
7. All imported sand fill shall have a percolation rate of 6 to 10 min/cm, with less than 5% fines passing the No. 200 sieve.
8. Imported stone shall be 'septic' stone as detailed in the 2012 Ontario Building Code, Sentence 8.7.3.3.(5) and Table 8.7.3.3.A.
9. Imported sand fill material shall be placed in layers of 200 to 300 mm depth and shall be track compacted.
10. Type 'A' Dispersal Bed area shall be sodded to control erosion, and grass mowed during growing season.
11. Electrical & Mechanical Equipment
    - 11.1. The contractor to supply the pump and floats, as required and position them, as specified, in the tanks. The contractor to supply all alarm panels, timer control panels, junction boxes and conduit and wiring from the junction box to the building electrical room to all exterior disconnects to be located on the foundation wall of house.
    - 11.2. All pumps to be submersible, 38mm effluent pumps, with a 110 volt, single phase motors. All pumps will be protected from running dry by a float attached to the pump or control panel. Balancing pumps shall be controlled by electronic timers set at specified times. Pump / balancing pumps shall be controlled by a float switch set to produce to produce the specified dose. All pumps to be on individual / dedicated electrical circuits.
    - 11.3. Water-tight junction boxes and control panel for treatment system to be located to a location selected by the architect on building foundation wall. The bottom of the boxes will be located at least 900mm above the ground surface. The conduit containing the wires from the tank will be sufficiently large to permit the pump wire and plug to pass through the conduit. The conduit will be sealed to prevent the movement of gas and moisture from the tank into the box. The conduit to the building will extend through the building wall and will be grouted through the wall. The conduit will be sealed at the building end. Wiring conduits to be extended to electrical room.
    - 11.4. The alarm panel, to be located to a location selected by the architect. Will be powered by a separate, independently supplied circuit with its own breaker switch to avoid loss of power (and alarms) in the event that the pump circuit fails. All float switches & alarms to be field tested.
    - 11.5. All electrical installations and connections will be made by an experienced electrician and will meet current Electrical Safety Authority (ESA) specifications and requirements. Obtain required ESA permit and arrange for electrical inspections prior to completion.
12. Use of low volume plumbing fixtures recommended.
13. No garborator or food grinder shall be connected to house plumbing or septic system.
14. Sump pump, floor drains, hot tub / swimming pool, and water softener systems not to be connected to septic system.
15. None of the following shall be permitted in a sewage tank or Type 'A' Dispersal Bed area,
    - 15.1. Landscaping involving decks, berms, foundations, patios, walkways, driveways, or trees,
    - 15.2. Structures, including antenna foundations, swimming pools, accessory buildings, heat pumps, heat pump exchange grids, or tennis courts,
    - 15.3. Extraneous sources of water including automatic sprinklers, roof downspouts, sump discharges, soakaway pits, or infiltration systems.
16. Septic tank additives / starters may be harmful to septic systems and are not necessary to begin or continue septic tank operation.
17. Never put the following items or substances into a septic tank system: fats, oils and grease; prescription medications; gasoline, antifreeze; varnishes, paints and solvents; caustic drain & toilet bowl cleaners; photographic solutions, bleach, pesticides, nail polish remover; cat box litter; tampons, sanitary napkins, diapers, paper towels, facial tissues, condoms; plastics; coffee grounds, egg shells and other kitchen waste, or cigarette filters.
18. Ensure Anaerobic Digester Tank is inspected at least every two years by a qualified person and pump tank out at least every 3 to 5 years (or sooner since frequency depends on tank / household size) as recommended by the service & maintenance provider.
19. The property owner is required to enter into a Service and Maintenance Agreement with an authorized company for the Waterloo Biofilter system.
20. Septic system to be installed in such a way that the distribution piping can be detected by: magnetic means, magnetic tracer wire or other means of subsurface detection (as per OBC 8.7.2.2)

UNIFIED SOIL CLASSIFICATION SYSTEM



Prepared for Gunnell Engineering Ltd.

Project: D3495
Sample: TP-22-04
Depth: 2.74m
Date Sampled: May 3, 2022

USCS

Coarse Grained Soils
Well-graded sands (SW)

Gravelly sands
Little or no fines (< 5% passing
No. 200 sieve (0.074mm)

Percolation Time

: T = 12 mins/cm

Paolicelli Residence
14785 Niagara River Pkwy
Part 1, Lots 8 & 9
Niagara Region

Specifications & Notes
Laboratory Soil Analysis

Scale: N.T.S.
Date: 22-Jun-2022
Designed By: EG
Drawn By: CS
Checked By: EG

Project No.: **D3495**
Drawing No.: **DT-4**

LICENSED PROFESSIONAL ENGINEER
E. L. GUNNELL
June 22, 2022
PROVINCE OF ONTARIO

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