FlowSpec ENGINEERING

October 23, 2020

Ms. Sarah Primmer, P.Eng.
GM BluePlan Engineering Limited
330 Trillium Drive, Unit D
Kitchener, ON N2E 3J2

File No.: 00009-2
Document No.: 00009-2.01.REV1

Dear Ms. Primmer:

Subject: Wastewater Servicing Assessment
Whistle Bare Campground – Proposed Expansion
1898 Whistle Bare Road
Township of North Dumfries

This report by FlowSpec Engineering ("FlowSpec") presents an assessment of wastewater servicing in support of a proposed expansion of Whistle Bare Campground ("Whistle Bare"), located at 1898 Whistle Bare Road in the Township of North Dumfries.

This assessment is intended to supplement and be conjoined with a broader functional servicing assessment ("FSR") by GM BluePlan Engineering. Onsite wastewater servicing is necessary for Whistle Bare, given the absence of proximal municipal or communal servicing in the area; and on this basis, the FSR addresses wastewater collection/conveyance and this report addresses wastewater treatment/dispersal.

Whistle Bare currently consists of 80 seasonal trailer-sites (each equipped with a dedicated water supply-line and septic system), a public washroom (serviced by a dedicated septic system), a recreation pavilion (no plumbing fixtures), and a picnic pavilion. The campground is situated on the rear (i.e., north) half of the property, while two single-family residences are located at the front of the property.

As it pertains to wastewater servicing, the proposed campground expansion will be comprised of the following: i) realignment of the existing 80 trailer-sites, ii) increase of the total number of sites to 383, including several cabin-sites and overnight-sites, and iii) construction of two recreation hall and pool areas.

In executing the proposed expansion, the existing septic systems that service the campground will be decommissioned and a collection system (i.e., sewers, forcemain, and pump stations) constructed to convey all wastewater to a proposed centralized treatment and subsurface dispersal system or Class 4 wastewater treatment system ("WTS"). Dedicated septic systems will continue to service the two single-family residences. A preliminary site layout and sanitary servicing plan is illustrated on Drawing 3 of the FSR. Drawing 3 also depicts a location at the south corner of the property for the WTS, which has an allotted area of about 10,000 m^2.

The wastewater flows (i.e., theoretical peak flows calculated using fixed formula from the Ontario Building Code ("OBC")) for both the existing and proposed expanded campground exceed 10,000 L/day, such that the property lies within the jurisdiction of the Ontario Ministry of the Environment, Conservation and Parks ("MECP") under Section 53 of the Ontario Water Resources Act; and therefore, construction of the proposed WTS will require procurement of an Environmental Compliance Approval from the MECP.

Based on the foregoing, the primary purpose of this assessment is to derive relevant preliminary design criteria, and evaluate the suitability of the allotted area for the proposed WTS to accommodate wastewater servicing of the proposed expanded campground.

Design Criteria

For the purpose of this assessment, the principal design criteria for a WTS are percolation time (i.e., soil infiltration rate), wastewater flow, and effluent quality. Preliminary derivation of these parameters is provided below.

Percolation Time

A detailed description of the property, as well as general geological and hydrogeological conditions may be found in the associated hydrogeological assessment report prepared by Chung & Vander Doelen Engineering and submitted concurrently with this report.

The subsurface of the proposed WTS location was explored on July 26, 2017 by excavating seven test pits. FlowSpec monitored the excavation, documented soil stratigraphy and groundwater conditions, and collected representative soil samples for visual examination and laboratory-derived particle-size analysis.

The encountered soil stratigraphy and groundwater conditions are described on appended test pit logs. The location of each test pit was surveyed by FlowSpec and is overlain on an appended version of Drawing 3 of the FSR.

Three selected soil samples were submitted to Stantec (Kitchener) for laboratory-derived particle-size analysis, which was completed in accordance with ASTM Method D422-63, "Standard Test Method for Particle-Size Analysis". The resulting particle-size distribution curves are appended.

The soil stratigraphy and groundwater conditions encountered during the subsurface exploration are described on the appended test pit logs. The soil stratigraphy was generally comprised of surficial topsoil, overlying layers of sandy silt and silty sand/gravel to a depth of up to 0.95 m, and underlain by granular deposits of sand and sand/gravel with a trace of silt. The test pits exhibited no observed groundwater seepage or related wet soil conditions.

For contextual purposes, the monitoring well logs contained in the hydrogeological assessment report (monitoring by FlowSpec during installation) indicate that the granular deposits around the proposed WTS location extend to at least the drilling termination depth of 13.7 m, and the groundwater depth is approximately 10 m.

A percolation time was assessed using the following methodology: i) classify each relevant soil encountered during the subsurface exploration using the Unified Soil Classification System, ii) account for characteristics observed during the subsurface exploration (i.e., density and structure), and iii) correlate with a percolation time using OBC Supplementary Standard SB-6, "Percolation Time and Soil Descriptions". The assessment is summarized in the following table:

Soil Description	Unified Soil Classification	Percolation Time (min/cm)
Fine-grained SAND, trace silt (sampled from Test Pit 1)	SP-SM	5
Fine- to medium-grained SAND, trace silt (sampled from Test Pit 2)	SP	2
Fine- to medium-grained SAND AND GRAVEL, trace silt (sampled from Test Pit 3)	SP-SW	2
Medium- to coarse-grained SAND AND GRAVEL, trace silt (Test Pits 4 and 5)	SW	2 (estimated)

A percolation time of 5 min/cm was used for the assessment, based on founding of the proposed leaching bed on the granular deposits described above.

Wastewater Flow

Wastewater flow from seasonal trailer-sites varies with available service connections (i.e., water and wastewater), the type/size of trailer-unit, and plumbing specifics within the trailer-unit (wastewater generated by the recreation halls and pool areas is considered incidental to use of the trailer-sites).

In this case, the sites will be provided with water and wastewater connections. Theoretical peak flow-rates are specified for such sites in the OBC and DGSW, as well as in the MECP documents, "Manual of Policy, Procedure and Guidelines for Onsite Sewage Systems" and "Interim Fact Sheet: MOECC Design Sewage Flow Rates for Seasonal Trailer Parks and Park Model Units", and are summarized in the following table:

Document	Peak Wastewater Flow-Rate (L/day)
Ontario Building Code	425
Design Guidelines for Sewage Works	800
Manual of Policy, Procedure and Guidelines for Onsite Sewage Systems	125 - 425
Interim Fact Sheet: MOECC Design Sewage Flow Rates for Seasonal Trailer Parks and Park Model Units	800

As evidenced by the table above, theoretical flow-rates vary widely; and for this reason, FlowSpec typically approaches design for seasonal campgrounds using a combination of theoretical and empirical flow-rates (empirical rates are calculated from metered water-usage). In the experience of FlowSpec, empirical peak flow-rates are typically in the order of about 200 to 250 L/day/site for travel-trailers and up to about 425 L/day/site for larger park-model-units.

For specific design of the proposed WTS at Whistle Bare, FlowSpec will derive a total peak wastewater flow using a combination of empirical water-use data from the existing 80 trailer-sites and theoretical flow-rates commensurate with the proposed expansion. This figure will be determined once additional information is available concerning the units to be placed on the sites; and therefore, for the purpose of this assessment, the hydraulic capacity of the available area was evaluated to determine its suitability to accommodate a reasonable peak flow for the proposed expanded campground (discussed below).

Effluent Quality

DGSW Section 22.5, "Assessment of Impact on Water Resources", sets forth the environmental impact assessment requirements for "Large Subsurface Sewage Disposal Systems" (i.e., systems with theoretical peak wastewater flows which exceed 10,000 L/day). Specifically, the document speaks to assessing impact on water resources in conformance with MECP contaminant emission guidelines. "Water resources" are typically comprised of the following:

- groundwater which is currently used or could reasonably be used in future as a potable water-supply (typically within 500 m of the proposed leaching bed location); and
- surface water in the form of creeks, rivers, ponds, or wetlands (typically within 300 m of the proposed leaching bed location).

In this case, groundwater is used as a water-supply in the area, and a wetland complex and outflowing tributary to Blair Creek are located on the northerly portion of the property (described in further detail in the hydrogeological assessment report). Therefore, an assessment of impact of water resources will be required to be performed as part of the design process and to the satisfaction of the MECP.

Specifically, DGSW Subsection 22.5.5, "Critical Contaminants", stipulates that nitrate-nitrogen is the critical contaminant normally to be used in the assessment of impact on groundwater; and phosphorous, ammonia-nitrogen, and nitrate-nitrogen are the critical contaminants normally to be used in the assessment of impact on surface water. Since ammonia-nitrogen is presumed to convert completely to nitrate-nitrogen in the subsurface, nitrate-nitrogen and phosphorous would be the critical contaminants used in the impact assessment.

The impact assessment would yield effluent concentration objectives and/or limits for one or both of nitrate-nitrogen or phosphorous, which would then be vetted by the MECP during pre-application consultation; and upon finalization of the criteria, design of the WTS would incorporate treatment infrastructure as required to achieve the criteria.

Assessment

On the basis of the design criteria described above, the proposed WTS will be comprised of the following key components:

- treatment system capable of achieving Level IV (i.e., tertiary) effluent quality, and including treatment infrastructure for reduction of nitrate-nitrogen and/or phosphorous if deemed necessary by the assessment of impact on water resources; and
- Type A dispersal leaching bed for final treatment and dispersal of effluent to the subsurface (consisting of a layer of imported stone containing a series of perforated gravity distribution pipes, and underlain by a layer of imported sand fill with a percolation time of 6 to 10 min/cm).

As described in the introduction, an area of about 10,000 m^2 has been allotted for the proposed WTS, and specifically the leaching bed. The maximum peak wastewater flow that may be accommodated by a Type A dispersal bed occupying the entirety of the allotted area is calculated below, based on OBC Sentence 8.7.7.1.(6). which addresses the minimum required stone area:

$Q = A \times 50\ L/day/m^2$

where:
Q = maximum peak wastewater flow (L/day)
A = available area (m^2)

$Q = 10{,}000\ m^2 \times 50\ L/day/m^2$
$= 500{,}000\ L/day$

Where the percolation time is 15 min/cm or less, the overall area requirement for a Type A dispersal leaching bed is based solely on the minimum required stone area. Given the percolation time is 5 min/cm in the proposed leaching bed area, the maximum peak wastewater flow that may be accommodated in the 10,000 m^2 allotted area is 500,000 L/day.

A groundwater mounding analysis was applied to the maximum peak flow, and yielded a maximum mound-height of about 1 m; and therefore, based on a groundwater depth of about 10 m, groundwater mounding will not affect performance of the leaching bed.

Based on the proposed expanded campground site total of 383, a peak wastewater flow of 500,000 L/day yields a peak flow-rate of approximately 1,300 L/day/site, which is well-above both the theoretical and empirical flow-rates for seasonal trailer-sites described above.

Conclusion

In conclusion, the proposed expanded campground may be serviced by an onsite Class 4 WTS within the 10,000 m^2 area allotted for the proposed leaching bed, provided the following processes are undertaken following the Zoning By-law Amendment Application process: i) an assessment of impact on water resources is to be performed to the satisfaction of the MECP, ii) pre-application consultation is to be completed with the MECP to finalize effluent criteria, and iii) an Environmental Compliance Approval is to be procured from the MECP.

Should you have any questions regarding the above, please do not hesitate to contact the undersigned.

Yours truly,
FlowSpec Engineering Ltd.

David Morlock, P.Eng.
Consulting Engineer

Test Pit 1

Date of Excavation: *July 26, 2017*
Machine: *Mini-Excavator*
Surface Elevation: *--*
Field Technician: *DM*

Depth (m)	Elevation (m)	Soil Description	Sample No.	Sample Depth (m)
0.00	--	*TOPSOIL*: Dark brown sandy silt, some gravel, moist		
0.20	--	*SANDY SILT:* Rusty brown sandy silt, some gravel, moist		
0.40	--	*GRAVELLY SAND*: Loose, brown, gravelly fine to coarse sand, trace silt, damp		
0.80	--	*SAND*: Compact, brown fine sand, trace silt, damp	1	1.0 – 1.2

Comments:

- test pit terminated at 1.9 m
- no groundwater seepage observed
- dry caving observed at 1.7 m

Test Pit 2

Date of Excavation: *July 26, 2017*
Machine: *Mini-Excavator*
Surface Elevation: *--*
Field Technician: *DM*

Depth (m)	Elevation (m)	Soil Description	Sample No.	Sample Depth (m)
0.00	--	*TOPSOIL*: Dark brown silt, moist		
0.25	--	*SILT:* Firm, rusty brown silt, some clay and sand, trace gravel, moist		
0.80	--	*SILTY SAND*: Brown silty sand, moist		
0.95	--	*SAND AND GRAVEL*: Loose, brown medium sand and gravel, trace silt, damp		
1.30	--	*SAND*: Compact, brown fine to medium sand, trace silt, damp	1	1.6 – 1.8

Comments:

- test pit terminated at 2.1 m
- no groundwater seepage observed
- test pit sidewalls stable at completion of excavation

Test Pit 3

Date of Excavation: *July 26, 2017*
Machine: *Mini-Excavator*
Surface Elevation: *--*
Field Technician: *DM*

Depth (m)	Elevation (m)	Soil Description	Sample No.	Sample Depth (m)
0.00	--	*TOPSOIL*: Dark brown sandy silt, moist		
0.30	--	*SANDY SILT:* Rusty brown sandy silt, trace gravel, damp to moist		
0.50	--	*SILTY SAND AND GRAVEL*: Loose, brown, silty sand and gravel, damp		
0.90	--	*SAND AND GRAVEL*: Loose, brown fine to medium sand and gravel, trace silt, frequent cobbles and boulders, damp	1	1.2 – 1.4
1.40	--	*SAND*: Loose, brown medium sand, trace silt, damp		

Comments:

- test pit terminated at 2.0 m
- no groundwater seepage observed
- dry caving observed at 1.4 m

Test Pit 4

Date of Excavation: *July 26, 2017*
Machine: *Mini-Excavator*
Surface Elevation: *--*
Field Technician: *DM*

Depth (m)	Elevation (m)	Soil Description	Sample No.	Sample Depth (m)
0.00	--	*TOPSOIL*: Dark brown sandy silt, damp		
0.20	--	*SAND:* Compact, brown medium sand, some gravel, trace silt, damp		
1.10	--	medium to coarse sand	1	1.2 – 1.4
1.80	--	fine sand		

Comments:

- test pit terminated at 2.0 m
- no groundwater seepage observed
- test pit sidewalls stable at completion of excavation

Test Pit 5

Date of Excavation: *July 26, 2017*
Machine: *Mini-Excavator*
Surface Elevation: *--*
Field Technician: *DM*

Depth (m)	Elevation (m)	Soil Description	Sample No.	Sample Depth (m)
0.00	--	*TOPSOIL*: Dark brown sandy silt, moist		
0.20	--	*SANDY SILT:* Rusty brown sandy silt, moist		
0.35	--	*SILTY SAND AND GRAVEL*: Brown silty sand and gravel, moist		
0.60	--	*SAND AND GRAVEL*: Loose, brown medium to coarse sand and gravel, trace silt, damp		

Comments:

- test pit terminated at 1.7 m
- no groundwater seepage observed
- test pit sidewalls stable at completion of excavation

Test Pit 6

Date of Excavation: *July 26, 2017*
Machine: *Mini-Excavator*
Surface Elevation: *--*
Field Technician: *DM*

Depth (m)	Elevation (m)	Soil Description	Sample No.	Sample Depth (m)
0.00	--	*TOPSOIL*: Dark brown sandy silt, moist		
0.20	--	*SANDY SILT:* Rusty brown sandy silt, moist		
0.35	--	*SILTY SAND AND GRAVEL*: Brown silty sand and gravel, moist		
0.65	--	*SAND AND GRAVEL*: Loose, brown medium to coarse sand and gravel, trace silt, damp; veins of medium to coarse sand, damp		

Comments:

- test pit terminated at 1.8 m
- no groundwater seepage observed
- dry caving observed at 0.8 m

Test Pit 7

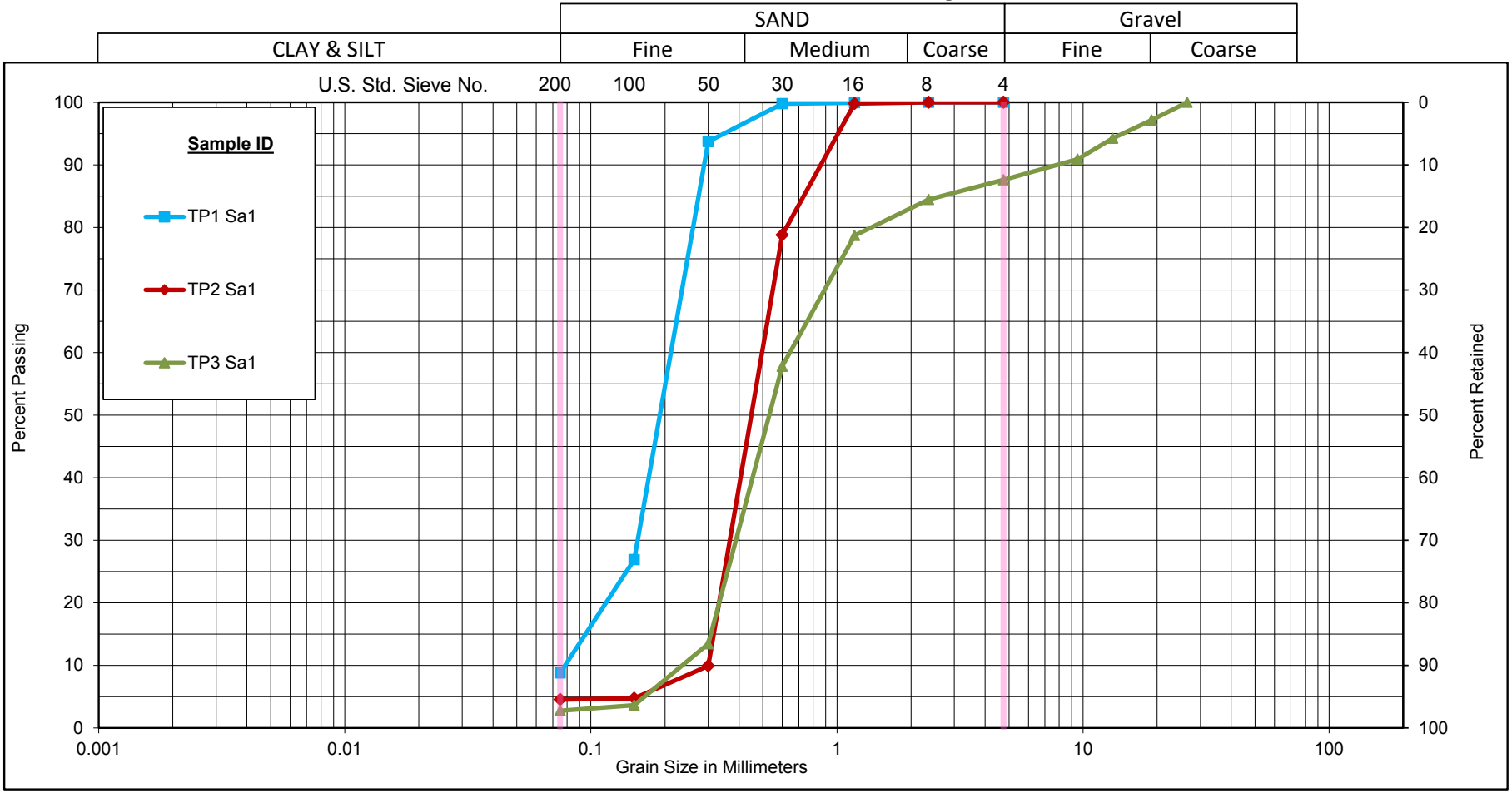
Date of Excavation: *July 26, 2017*
Machine: *Mini-Excavator*
Surface Elevation: *--*
Field Technician: *DM*

Depth (m)	Elevation (m)	Soil Description	Sample No.	Sample Depth (m)
0.00	--	*TOPSOIL*: Dark brown sandy silt, moist		
0.25	--	*SANDY SILT:* Rusty brown sandy silt, moist		
0.45	--	*SILTY SAND AND GRAVEL*: Brown silty sand and gravel, moist		
0.80	--	*SAND AND GRAVEL*: Loose, brown medium sand and gravel, damp		
1.40	--	*SAND*: Compact, brown fine sand, trace silt, damp		

Comments:

- test pit terminated at 2.0 m
- no groundwater seepage observed
- dry caving observed at 1.1 m

Unified Soil Classification System



Sample ID	Depth (m)	% Gravel	% Sand	% Silt & Clay
TP1 Sa1	1.0-1.2	0.0	91.2	8.8
TP2 Sa1	1.6-1.8	0.0	95.5	4.5
TP3 Sa1	1.2-1.4	12.4	84.9	2.7

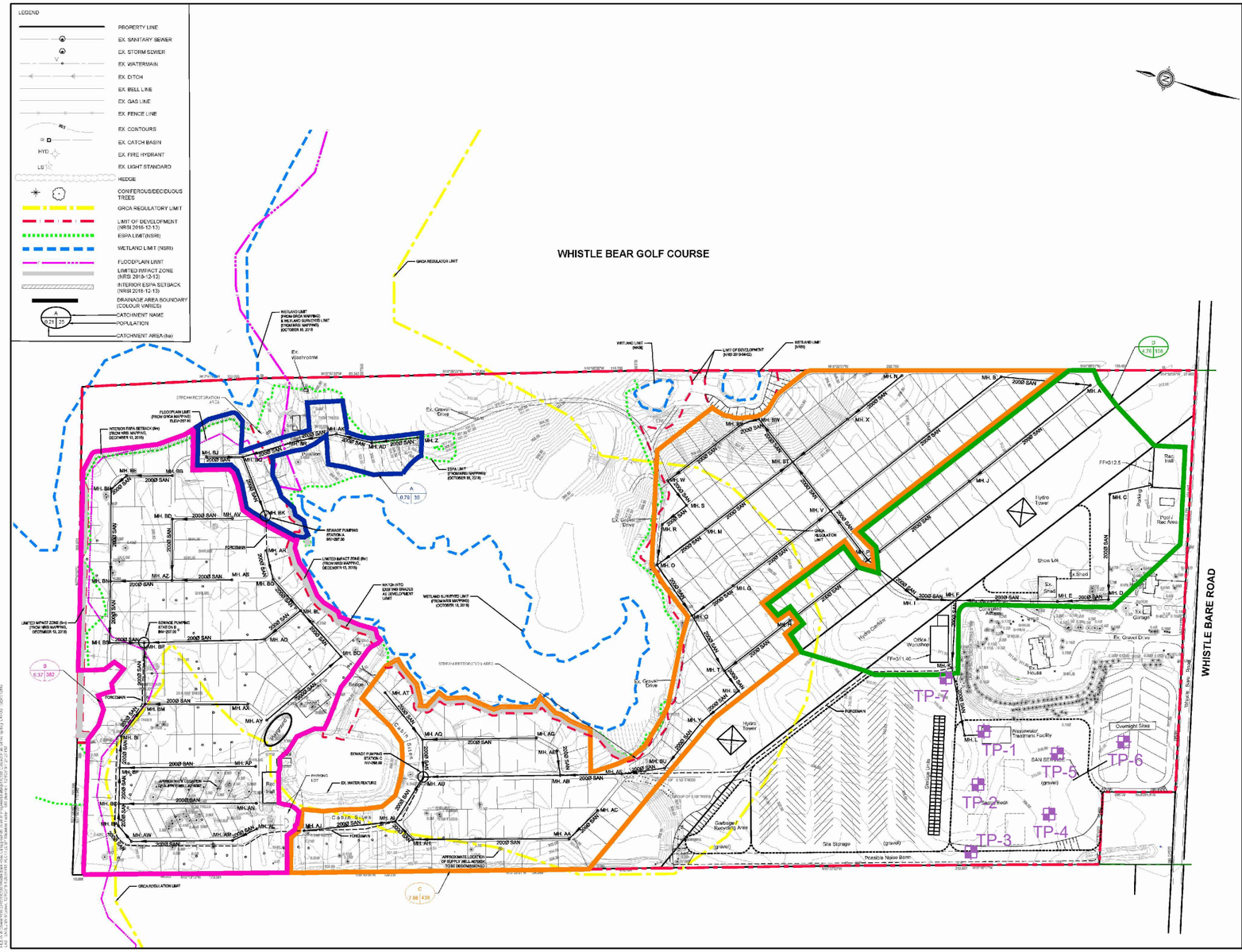
Stantec

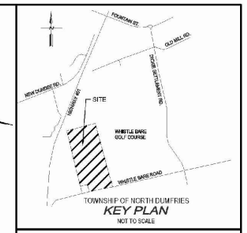
GRAIN SIZE DISTRIBUTION

Whistle Bear Campground - 00009-2

Figure No. 1

Project No. 122450173.200





NOTES :

1. TOPOGRAPHICAL SURVEY COMPLETED BY AGI SURVEY CONSULTANTS DATED MAY 31, 2017.
2. CONCEPT PLAN COMPLETED BY GSP GROUP DATED APRIL 2, 2019.

BENCH MARKS :

NO.	DATE	REVISION DESCRIPTION	CHKD.
1	12/04/19	ISSUED FOR ZONE CHANGE	S.J.P.

BluePlan ENGINEERING

WHISTLE BARE ROAD CAMPGROUNDS

1898 WHISTLE BARE ROAD

THE TOWNSHIP OF NORTH DUMFRIES (CAMBRIDGE)

PRELIMINARY SANITARY SERVICING PLAN

DRAWN BY :	APPROVED BY :	PROJECT NO. :	DRAWING NO. :
A.M.	S.J.P.	416130	3
DESIGNED BY :	DATE :	SCALE :	
S.J.P.	NOVEMBER 2017	1:1500	