FUNCTIONAL SERVICING REPORT

Far Sight Investments Limited
Subdivision Plan for the barzo Lands

everett, township of adjala-tosorontio
county of simcoe

PEARSON ENGINEERING

PEARSONENG.COM

May 2021

10063.02

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FUNCTIONAL SERVICING REPORT

FARSIGHT HOMES RESIDENTIAL SUBDIVISION - BARZO DEVELOPMENT

1. INTRODUCTION

PEARSON Engineering Ltd. (PEARSON) has been retained by Farsight Homes (Client) to prepare a Functional Servicing Report (FSR) in support of the proposed Farsight Homes Residential Subdivision, Barzo Development (Project) located on Part of Lot 13, Concession 5 and Part of Lot 14, Concession 5 in Everett, Township of Adjala-Tosorontio (Township), Simcoe County. This FSR is provided to the Township in support of the Planning Report for the Subdivision Draft Plan of Subdivision and Zoning By-law Amendment.

The Project lands are approximately 96.6 hectares in size with a developable area of 61 hectares and currently consist of farmed area and open space with a farmhouse and farming buildings located near the center of the property. The Project is proposed to be developed into 1,238 residential lots consisting of 823 single family detached lots, 415 townhouse lots, and park lands. The Project lands are located east of County Road 13, west of the future Concession Road 6 extension, north of the Farsight Everett Residential Development and south of an existing farm and woodlot. A Wastewater Treatment Plant (WWTP) is proposed on a parcel of land east of the Project lands on the east side of Concession Road 6. A Stormwater Management (SWM) Pond is also proposed to be located on the same parcel as the WWTP as well as on the west side of Concession Road 6. The Project would connect a road network from the proposed Farsight Everett Subdivision to the south at three locations (refer to Figure 1 – Site Location Plan on the following page for reference).

This FSR will assess the internal services required for the proposed Project and the existing municipal infrastructure located in the vicinity of the Project site, complete with preliminary grading, servicing, SWM facilities and associated design calculations.

1.1. BACKGROUND INFORMATION

The Everett Secondary Plan Master Servicing Plan (ESPMSP) was prepared by Greenland International Consulting in 2013 for the Township to develop a strategy regarding the provisions for water, wastewater, stormwater and transportation servicing for the future development of Everett. The ESPMSP determined the recommended upgrades to the water network, transportation intersection upgrades, new SWM pond requirements, and the construction of a new wastewater treatment plant to service the entire town of Everett including new development.

Subsequent to the completion of the ESPMSP, the Township engaged Greenland International Consulting in 2014 to complete a Schedule C Class Environmental Assessment (EA) - Everett Wastewater Treatment Plant & Surface Water Outfall Expansion.

Stantec completed a Water Distribution System Hydraulic Analysis report, dated April 8, 2019, which analyzed Everett's water distribution system including the Barzo development. This FSR along with the ESPMSP were utilized to confirm drinking water requirements for the site and is discussed in more detail in Section 4.

FARSIGHT HOMES SUBDIVISION, BARZO

SITE LOCATION PLAN

PEARSON ENGINEERING
PEARSONENG.COM PH. 705.719.4785

DESIGNED BY	IR	HORIZ SCALE	N/A	PROJECT #	10063.02
DRAWN BY	MJWP	VERT SCALE	N/A	DRAWING #	FIG–1
CHECKED BY	GMP	DATE	JULY 2019	REVISION #	0

1.2. SITE DESCRIPTION

The Township is geographically rolling countryside below the Niagara Escarpment to the West, with the Nottawasaga River cutting through it. According to the *Soil Survey of Simcoe County, Report No.29 of the Ontario Soil Survey, Ministry of Agriculture and Food*, the subject lands are comprised of the soil group Tioga Sand Loam (Tisl). Tioga soils are of Hydrologic Group "A" which are well draining and have a high infiltration capacity.

Previously completed Geotechnical Assessments by Terraprobe Inc. available for this site indicate the soil characteristic to have about 0.30 m of sandy topsoil underlain by sand deposits which vary in silt content from 2% to 25%. These conditions are favourable to Low Impact Design (LID) infiltration measures. Refer to geotechnical reports in Appendix A for detailed analyses and borehole results. The groundwater levels are typically encountered at approximately 2 m to 4 m below surface level on average across the property. Surface drainage features and shallow groundwater discharge is expected to divide both to the west and east towards tributaries of the Pine River. Regional groundwater flow is expected to be in a westerly direction towards the Pine River.

1.3. PROPOSED LAND USE

The proposed subdivision development will consist of a total of 1,238 lots including 823 single detached residential units ranging from 10 m to 13 m frontages and 415 townhouse units. There will be designated open spaces including a park and parkette, with interconnecting pathways and environmental protection areas. A SWM Pond will be constructed in the southeast and lowest portion of the site and immediately south of the proposed WWTP and a new road network will be constructed with three connections to the existing Farsight Everett subdivision to the south.

2. SUPPORTING DOCUMENTS

The following design guidelines have been referenced in the preparation of this report:

- Design Guidelines for Sewage Works, Ministry of the Environment, 2008
- Design Guidelines for Drinking-Water Systems, Ministry of the Environment, 2008
- Stormwater Management Planning and Design Manual, Ministry of the Environment, March 2003
- The Ontario Building Code, 2006
- Design Criteria Manual for the Township of Adjala-Tosorontio, January 2006
- NVCA Stormwater Technical Guide, Nottawasaga Valley Conservation Authority, December 2013
- Low Impact Development Stormwater Management Planning and Design Guide, Credit Valley Conservation and Toronto and Region Conservation Authority, 2010

The following reports have been referenced in the preparation of this report:

- Golder Associates, 'Farsight Homes Everett Hydrogeological Study', March 2019
- Terraprobe, 'Preliminary Geoenvironmental Due Diligence Assessment, Barzo Development, 6385 County Road 13, Adjala-Tosorontio, Ontario', January 7, 2016
- Terraprobe, 'Assessment of Groundwater Levels', June 25, 2018
- JD Northcote Engineering Inc., Traffic Impact Study, August 10, 2020
- Greenland International Consulting Ltd., 'Everett Secondary Plan Master Servicing Plan', January 2013
- Greenland International Consulting Ltd., 'Schedule C Class Environmental Assessment (EA) - Everett Wastewater Treatment Plant & Surface Water Outfall Expansion', September 2014
- Stantec Consulting Inc., 'Everett WWTP – Design Brief', December 2017
- Stantec Consulting Inc., 'Water Distribution System Hydraulic Analysis', April 2019

3. DESIGN POPULATION

The ESPMSP Volume 3 Part 3 – Water Servicing Master Plan Study Report - January 2013 previously completed by Greenland Consulting Engineers contains a detailed assessment of the servicing of the existing hamlet of Everett including proposed future development. A detailed review of the ESPMSP has been completed in conjunction with the preparation of this FSR to determine the services requirements for the Project.

The ESPMSP was completed based on the assumption that the Barzo subdivision would have a total of 442 residential units and a population of 1,357 people. The potential required upgrades to the existing services infrastructure in Everett, based on the proposed Project development of 1,238 units has been completed.

The following design populations have been calculated for the determination of the servicing requirements for this project:

Proposed Lots: Residential = 1,238 units

From ESPMSP Vol. 3, Part 3 Appendix WS-B:

Residential Unit Population = 2.67 ppl/unit

Therefore, the revised proposed **Farsight – Barzo Project Population**:

Pop. Single Detached = 1,238 x 2.67 = 3,306 people

Previous Barzo population = 1,357 people (ESPMSP Vol. 3, Part 3 Table 1.1)

Proposed Barzo Population = 3,306 people

Existing Population + Farsight Project Development: 1,929 + 1,955 = 3,884 people

Total Proposed Population: 3,884 + 3,306 = 7,190 people

Resultant increase of proposed population: 3,306 – 1,357 = 1,949 people

Therefore, the Barzo Project's design population is **3,306** people, for a total Everett design population of **7,190** with the proposed Barzo Project. Refer to Appendix B for more detailed calculations.

4. WATER SUPPLY AND DISTRIBUTION

4.1. OVERVIEW

The total design population of the Project is 3,306 people. The Project's water servicing is for domestic use and fire protection. The extensive review of Everett's existing water servicing capacity including the provision for future development has been captured in the Water Distribution System Hydraulic Analysis completed by Stantec Consulting Ltd (Stantec). The following factors within the ESPMSP have been evaluated with the corresponding updated Project plan of subdivision and respective design population:

- Domestic Water Requirements
- Well and Aquifer Capacity
- Water Treatment
- Fire Flow Requirements
- Reservoir Capacity
- Water Distribution

Refer to Appendix B for more detailed calculations of the summarized data in the following water sections.

4.2. DOMESTIC WATER REQUIREMENTS

ESPMSP Volume 3 Part 3 Section 2.1 notes: '*For assessing residual capacity in the existing water infrastructure, the existing population was assumed to continue to require the measured 201 L/c/d per-capita-demand (2010-2011 average daily demand). For future populations (eg. R&M Homes Draft Plan Approved Subdivision), the value used was 275 L/c/d which is approximately equal to 110% of the average per capita sewage flows measured in the New Horizon Development. Peaking factors for MDD and PHD were adjusted based on the Study Area population.'*

However, the Stantec analysis utilized an average day demand of 275 L/c/d for proposed development, and 167 L/c/d for existing development. On this basis, the water demand per capita of 167 L/cap/day has been adopted for the Existing Everett Population, and the water demand per capita of 275 L/cap/day has been adopted for all proposed developments, including the Barzo Population. The following Table 1 summarizes the calculated design flows taken from the Stantec report.

Table 1: Existing and Projected Water Demands

Scenario	Population (People)	ADD		MDD		PHD	
		m^3/day	L/s	m^3/day	L/s	m^3/day	L/s
1	3,834	846	9.79	1,692	19.58	2,538	29.38
2	7,158	1,760	20.37	3,520	40.74	5,280	61.11
3	12,293	3,381	39.13	6,423	74.34	9,635	111.52

Note:
Scenario 1: Includes Farsight Subdivision.
Scenario 2: Includes Farsight, Barzo, and Cumac Subdivisions.
Scenario 3: Includes Farsight, Barzo, and Future Development Areas.
In summary, the Barzo Project is part of Scenario 2 which utilizes a total equivalent population (EP) of 7,158 persons, requiring an ADD of 20.37 L/s, an MDD of 40.74 L/s, and a PHD of 61.11 L/s.

4.3. WELL AND AQUIFER CAPACITY

The Everett water supply system consists of three (3) active groundwater wells: the Ballpark Supply Well, the Grohal Supply Well, and the Grohal Stand-By Well. The wells have a combined hydraulic rated capacity of 4,870 m^3/day based on the facility's Permit-to-Take Water.

ESPMSP Volume 3 Part 3 Section 2.2 notes that a Preliminary Hydrogeological Investigation was completed by Golder Associates in 2012 (attached within Appendix WS-C of ESPMSP Volume 3 Part 3) in order to determine the existing operating flow rates of the Everett water supply system. A summary of the results of this study representing the operating capacity of the current well systems in Everett is as follows:

Table 2: Everett Well Capacity

Well Name	Operating Capacity (L/s)	Operating Capacity (m^3/d)
Grohal Supply Well	21.7	1,875
Grohal Stand-by Well	11	950
Ball Park Well	22.7	1,961
Total:	**55.4**	**4,787**

From ESPMSP Vol. 3, Part 3 – 2.2, '*a new well and pump system would be required prior to the Town reaching a total equivalent population of 5,359 persons to satisfy maximum daily water demands.*' Therefore, since the combined Existing Population plus the Farsight Everett, Farsight Barzo, and Cumac subdivisions (Scenario 2 of the Stantec report) have a combined population of 7,190 people which exceeds the threshold population of 5,359, an additional production well is required. As per the ESPMSP and Stantec report, this well is to be constructed within the Farsight Everett subdivision Park Block.

From ESPMSP Vol. 3, Part 3 – 2.2, *'It should also be noted that the Golder Study concluded that the Existing Everett well system groundwater aquifer average day capacity is 2,500 m^3/d. As such, once the ADD exceeds 2,500 m^3/d, a new water source will need to be explored to supplement the existing facilities.'* Therefore, since the proposed ADD of 1,760 m^3/d is less than the aquifer capacity of 2,500 m^3/d, the aquifer has sufficient capacity to supply water for the Barzo subdivision.

4.4. FIRE FLOW REQUIREMENTS

MECP Design Guidelines for Drinking Water Systems Section 8.4.2 states that Fire Flows shall meet a minimum of 123.3 L/s at 140 kPa residual pressure for a duration of 2 hours for the combined Existing Population plus Farsight Project Development (Everett + Barzo).

The Stantec analysis includes a fire flow model based on the Fire Underwriter Survey (FUS) method and included the Barzo subdivision assuming 1,200 lots. While the actual number of lots is nominally more at 1,238, this will not impact the current water model conclusions. The analysis concluded that under existing conditions, many of Everett's existing hydrants do not meet the required fire flow requirements. With Stantec's proposed upgrades including additional looping, add Concession Road 6 watermain, add booster pumps etc., fire flow demands would be increased to meet current standards.

Fire hydrants are proposed on all internal Streets to ensure hydrant spacing meets Township design requirements. Mainline valve requirements for the proposed development will be in accordance with Township Standards to ensure proper watermain isolation can occur.

4.5. RESERVOIR CAPACITY

There is an existing water storage facility with a storage volume of 1,600 m^3 at the southeast corner of the Secondary Plan Area on the west side of Concession Road 6, south of County Road 5, at 5976 Concession Road 6 behind an existing dwelling. The water from the three town wells is pumped to this elevated storage facility which then provides the Township with the required water pressure and fire protection volume.

According to the Stantec analysis, this storage will be increased from 1,600 m^3 to 3,500 m^3 to accommodate the proposed Barzo development. Timing of this expansion will be determined later including a cost shared allowance justified for all new developments, but current modeling shows that additional storage will be required prior to the completion of the Farsight Everett Project.

4.6. WATER DISTRIBUTION

ESPMSP Vol. 3, Part 3 – 3.4 details alternatives for the provision of watermains for the fully developed Everett Secondary Plan. The preferred identified option WD-1 requires that all new trunk watermains in the Community of Everett will be a minimum 300mm diameter while secondary watermains have been sized to 150mm diameter.

The Stantec water analysis reviewed the water modeling completed for the ESPMSP which found that there were several areas in the existing water modeling which did not have adequate pressure. Therefore, for the purposes of this report the conclusions from the Stantec report were found to govern. An additional 300 mm diameter trunk main is proposed to be constructed on Concession Road 6 following Phase 4 of the Farsight Everett project as well as include a 150 mm diameter connection from the northern limit of the Barzo project to Concession Road 6 to improve water pressure in the area. The Stantec model will be updated as the Barzo project progresses.

A 300 mmm diameter will be provided on Street ‘M’ connecting to the existing 300 mm diameter watermain from the Farsight Everett project to the south at Streets L, M, and N. The remaining watermains will be designed with a diameter of 150mm. Each residential unit will be provided with a 25 mm diameter service connection complete with main and curb stop. Refer to drawing WM-1 Water Servicing Plan for reference.

Based on the above information, the water servicing for the development is feasible.

5. SANITARY SERVICING

5.1. OVERVIEW

The ESPMSP was prepared by Greenland International Consulting in 2012 for the Township of Adjala-Tosorontio to develop a strategy regarding the provisions for water, wastewater, stormwater and transportation servicing for the future development of Everett. The ESPMSP determined the recommended upgrades to the water network, transportation intersection upgrades, new SWM pond requirements, and the construction of a new wastewater treatment plant to service the entire town of Everett including new development.

Subsequent to the completion of the ESPMSP, the Township engaged Greenland International Consulting in 2014 to complete a Schedule C Class Environmental Assessment (EA) - Everett Wastewater Treatment Plant & Surface Water Outfall Expansion. The purpose of this Class EA was to evaluate design concepts for a Wastewater Treatment Plant (WWTP) which will address the issues of existing and future provision of wastewater treatment and disposal in Everett and satisfy the future needs as identified in the ESPMSP.

Stantec Consulting Ltd. (Stantec) completed an Everett WWTP – Design Brief, dated December 21, 2017 which details the design of the proposed WWTP which will service the proposed Everett, Barzo, and existing New Horizons developments. The following sections will summarize relevant information from the report and the WWTP design brief can be seen in Appendix C.

5.2. WASTEWATER COLLECTION

The Barzo Development will be serviced with a network of gravity sanitary sewer mains in accordance with Township and MECP guidelines. The sanitary sewers will have a minimum diameter of 200 mm and designed at grades to maintain minimum and maximum velocities under full flow conditions. The minimum cover to be used will be 2.75 m below the road centreline to service basements. Pre-cast manhole structures with minimum diameters of 1200 mm will be spaced at 110 m maximum intervals, at junctions, changes in grades, size, material or deflections in the sewer. Each residential unit will have a single 125 mm diameter service connection, including a test fitting. The trunk sewer will cross Concession Road 6 and connect to the existing WWTP forcemain inlet. Refer to drawing SAN-1 Sanitary Servicing Plan for the sanitary collection system details.

Based on the above information, the sanitary servicing for the development is feasible.

6. STORMWATER MANAGEMENT

6.1. OVERVIEW

A key component of the Barzo Development is the need to address environmental and related Stormwater Management (SWM) issues. These are examined in a framework aimed at meeting the Township's objectives outlined in the ESPMSP, as well as the requirements of the NVCA and MECP. This FSR focuses on the necessary measures to satisfy the approval agency's SWM requirements.

The ESPMSP Volume 3 Part 1 – Master Drainage Plan Study Report was completed by Greenland Consulting Engineers in January 2013. The overall goal of this section of the ESPMSP was to prepare a comprehensive master drainage and stormwater management strategy for the existing and future build-out of the Everett area that addresses functional drainage concerns of the Town, while addressing various other issues of concern within the community such as existing flooding conditions and the enhancement of tributary stream and Nottawasaga River watershed water quality.

The ESPMSP Volume 3 Part 1 Section 7 notes, '*The recommended preferred Master Drainage Plan (MDP) for the Everett Secondary Plan includes the following general characteristics:*

- *Six (6) new Stormwater Management Facilities (SWMF) are proposed for the Secondary Plan, including the proposed R&M Homes* (now Farsight) *SWMF.*
- *Each of the Six (6) Proposed Stormwater Management Facilities are proposed as wet pond facilities that meet MOE Enhanced water quality control requirements.*
- *Each of the six (6) Stormwater Management Facilities are proposed to control post development flows to pre-development levels for all storms up to and including the 100-Year storm event. All newly proposed facilities which ultimately drain to Node 100* (includes sub-catchment areas 3 to 9, 14, 16 and 17 noted on Figure A-4 in Appendix D attached) *shall be designed to overcontrol runoff to account for the increase in overall contributing area to this drainage node under post-development conditions.*
- *All Stormwater Management Facilities proposed in the MDP provide 24 hour detention of the 25 mm storm for erosion control purposes.*
- *End of Pipe Stormwater Management Facility infiltration and exfiltration systems to promote infiltration and reduce thermal impacts are proposed in the MDP where soil and groundwater conditions permit.*
- *All development including Stormwater Management Facilities are proposed outside the Natural Environment Area land uses, including the Regional storm flood elevation, the erosion hazard set-back limit, wetland areas and the 30m natural heritage/fisheries set-back from the Secondary Plan natural heritage areas.*
- *In areas where soil/groundwater conditions permit, at source infiltration measures such as soakaway pits or equivalent measures are to be installed at lot level.*
- *Road infiltration trenches should be installed where soil/groundwater conditions permit.*

The outcomes of the MDP listed above are a summary of the preferred Option MDP-3 Full Development of Plan Area with Local/Regional SWMFs derived from the comprehensive evaluation process under the ESPMSP. The locations of the flow nodes and proposed SWMF locations are detailed on the ESPMSP MDP Option 3 figure attached in Appendix D.

It is understood the objectives of the SWM plan are to:

- Protect life and property from flooding and erosion;
- Maintain existing storm drainage and runoff patterns;
- Protect and maintain groundwater flow regimes and significant natural features;
- Maintain water quality for ecological integrity, recreational opportunities etc.;
- Protect aquatic and fishery communities and habitats.

6.2. ANALYSIS METHODOLOGY

The design of the SWM Facilities for this site has been conducted in accordance with:

- The Ministry of the Environment Stormwater Management Planning and Design Manual, March 2003
- Nottawasaga Valley Conservation Authority Stormwater Technical Guide, December 2013
- ESPMSP Volume 3 Part 1 – Master Drainage Plan Study Report

In order to design the facilities to meet these requirements, it is essential to select the appropriate modeling methodology for the storm system design. Given the size of the site and the number of catchment areas, the computer model Visual OTTHYMO is appropriate for the design for the SWM system.

6.3. EXISTING DRAINAGE CONDITIONS

The Everett Secondary Plan study area under the ESPMSP is divided by three (3) primary watercourses in the Nottawasaga River Watershed including: the main branch of the Pine River (north west corner of the Secondary Plan Area); the Everett Drain (center of the Secondary Plan Area) which is tributary to a branch of the Pine River; and, a tributary of the Boyne River, in the south west portion of the Secondary Plan. The existing drainage catchments for the affected watercourses in the Secondary Plan Area are presented in Figure A-4 attached in Appendix D. The Farsight Barzo Lands Development is located within Area 16 of this plan.

The majority of the Project site is currently vacant agricultural land, with treed areas around the edges of the site. The development is approximately 65.2 hectares in size and generally slopes from west to east at an average grade of 0.5% to 1.5% toward Concession Road 6 until it eventually enters the Pine River tributary.

According to the *Soil Survey of Simcoe County, Report No.25 of the Ontario Soil Survey, Ministry of Agriculture and Food*, the subject lands drainage area is comprised of a Tioga Sandy Loam (Tisl) and Muck (M). The Tioga sandy loam is generally characterized as a grey, calcareous outwash sand with good drainage and is classified as being part of the Hydrologic soil group A. The soil group Muck is generally characterized as well decomposed organic material underlain by rock, sand silt of clay with very poor drainage and is classified as being part of the Hydrologic soil group B.

Drawing STM-2 Pre-Development Storm Catchment Plan shows the existing storm drainage patterns for the development. The pre-development peak flows from the site were calculated using Visual OTTHYMO and are provided in Table 7 below. The peak flow calculations and the Visual OTTHYMO Parameter calculations can be found in Appendix D.

Table 7 - Pre-Development Peak Flows

	2 Year Storm	5 Year Storm	10 Year Storm	25 Year Storm	50 Year Storm	100 Year Storm
Chicago Storm (m^3/s)	0.14	0.26	0.35	0.49	0.60	0.72
SCS Storm (m^3/s)	0.33	0.57	0.76	1.03	1.25	1.48

6.4. PROPOSED DRAINAGE CONDITIONS

The minor and major system flows of the proposed drainage from the Project will be conveyed southeasterly to the proposed stormwater management pond. The minor system will be conveyed via catch basin and storm sewer system which has been designed to convey the 5-year storm event. Preliminary layout for stormwater servicing can be found on drawing STM-1 Stormwater Servicing Plan. The proposed storm drainage patterns can be seen on drawing STM-3 Post-Development Storm Catchment Plan.

In the event of a major storm, defined as storms larger than the 5-year event and up to the 100-year event, the minor storm system will surcharge, forcing stormwater to the site's surface. In events larger than the 5-year return storm, the site has been graded to include an overland flow route. This route allows the stormwater to overtop and flow overland through the proposed road right of ways to the Development's SWM Pond. As per existing conditions, peak flows released from the SWM pond will outlet to a flow spreader which conveys flow easterly to the Pine River tributary via sheet flow.

Table 8 below summarizes the post-development Peak Flows for the 4-Hour Chicago and 24 SCS II storm events, as determined from the OTTHYMO modeling.

Table 8 – Post-Development Peak Flows

	25 mm Storm	2 Year Storm	5 Year Storm	10 Year Storm	25 Year Storm	50 Year Storm	100 Year Storm	Regional Storm
Chicago Storm (m^3/s)	0.08	0.13	0.22	0.29	0.40	0.48	0.59	
SCS Storm (m^3/s)		0.30	0.53	0.70	0.95	1.13	1.35	4.80

6.5. SWM POND DESIGN

The proposed Farsight Barzo Lands will be serviced with a wet pond located in the southeast corner of the development. The proposed wet SWM pond has been designed with internal side slopes of 5:1, with a 3.0 m wide 7:1 safety shelf on either side of the permanent pool. The pond will include a forebay designed to maximize the length to width ratio. A proposed culvert crossing Concession Road 6 will convey flow from the forebay to the main wet cell of the SWM Pond.

The outlet structure is located at the east section of the SWM pond, which will comprise of a reverse slope pipe complete with 200 mm and 300 mm diameter orifice plates to convey the 2 – 100 year storm events, as well as an overflow weir to convey the Regional Storm. The outlet structure will be designed to ensure 0.30 m of freeboard will be available. Table 9 below summarizes the preliminary storage volumes and water levels for the SWM pond associated with the various storm events.

Table 9: SWM Pond Release Rates and Water Levels

	25 mm Storm	2 Year Storm	5 Year Storm	10 Year Storm	25 Year Storm	50 Year Storm	100 Year Storm	Regional Storm
Post Development Peak Flow (m^3/s) 24 Hour SCS Storm	-	0.18	0.24	0.27	0.58	0.94	1.23	4.34
Post Development Storage Volume (m^3) 24 Hour SCS Storm	-	11,618	16,159	19,452	22,661	24,448	26,518	28,184
Post Development Elevation (m) 24 Hour SCS Storm	-	235.63	235.92	236.11	236.29	236.39	236.50	236.58
Post Development Peak Flow (m^3/s) 4 Hour Chicago Storm	0.06	0.07	0.17	0.20	0.24	0.26	0.28	-
Post Development Storage Volume (m^3) 4 Hour Chicago Storm	5,768	8,107	11,030	13,066	15,903	17,946	20,343	-
Post Development Elevation (m) 4 Hour Chicago Storm	235.22	235.39	235.59	235.72	235.90	236.02	236.16	-

The MECP Storm Drainage Manual indicates the drawdown time for the 25 mm storm is to be between 24 and 48 hours for erosion control. The SWM facility has been designed with a drawdown time of 43 hours for the 25 mm storm event. Calculations can be found in Appendix D.

6.6. SWM Pond Outlet Channel

Pearson completed a SWM Pond & Outlet Report in November 2016 for the Farsight Everett Project which outlined various alternatives for the development's outlet through the wetland to the east of Concession Road 6. We expect the outlet for the Barzo to adopt the same recommendations from this report and resemble the outlet channel for the Farsight Everett subdivision. The proposed SWM Pond outlet channel will be examined in more detail during detailed design.

6.7. Low Impact Development

Modern Stormwater Management practices have evolved to incorporate Low Impact Development (LID) techniques where appropriate. When properly implemented, LID techniques enhance runoff infiltration into the shallow soil regime. However, these techniques when implemented in appropriately cause future problems such as saturated ground that does not dry up in a reasonable time. Under these circumstances, future remediation may be required. It is proposed that LID techniques be implemented in only portions of the Project Lands where appropriate soil conditions will exist after completion of all grading.

Similar to the Farsight Everett project to the south, the Barzo project has soils suitable for LID SWM design as per the Soils Report by Terraprobe. Due to the similarity between the two projects, the LID implementation for the Barzo project is expected to resemble the previous design for the Farsight Everett project which consisted of French drains located at every lot to provide infiltration to meet water balance requirements. Phosphorous levels will be reduced with the French drains, quality wet pond, and downstream vegetated outlet. LID alternatives will be examined in more detail at the detailed design stage.

6.8. QUALITY CONTROL

The MECP issued a "Stormwater Management Planning and Design Manual" in March 2003. This manual has been adopted by a variety of agencies including the Township and NVCA. The SWM Pond's quality control is designed to meet MECP's Enhanced Protection.

ESPMSP Volume 3 Part 1 notes, '*There is considerable information available with respect to water quality information for the Pine River, which is the receiving water course for the majority of the Secondary Plan Area drainage. This information has been documented in the Pine River Assimilative Capacity Study, completed by Greenland International Consulting Ltd., in 2012 (Appendix MDP-E). In general terms, the Pine River at Everett, has relatively good water quality and assimilative capacity for the key parameters of concern for the Nottawasaga River watershed, namely ammonia and phosphorus. The Pine River would be considered a Ministry of Environment (MOE) Level 1 receiving water course and requires Enhanced level protection from a stormwater management perspective.'*

To achieve enhanced protection, permanent and temporary control of erosion and sediment transport are proposed and are discussed in the following sections.

6.8.1. PERMANENT QUALITY CONTROL

The Township and NVCA SWM Guidelines require Enhanced Level quality protection which will be provided by the SWM Pond. The SWM Pond's quality control volume is designed to meet the MECP Preferred Criteria guidelines for Enhanced Control (80% long-term total suspended solid removal). Approximately 57 hectares of the proposed Developed will be directed to the proposed SWM Pond. Utilizing Table 3.2 of the MECP Manual (Water Quality Storage Requirements based on Receiving Waters) and a site imperviousness of 60% for the proposed development, the SWM Pond permanent pool volume required is approximately 9,171 m^3. As per the Stage Storage Discharge table provided within Appendix D, it is proposed to set the permanent pool to an elevation of 234.75, resulting in about 9,200 m^3 of volume for quality control. Detailed quality control calculations can be seen in Appendix D.

6.8.2. STORMWATER QUALITY CONTROL DURING CONSTRUCTION

To ensure stormwater quality control during construction, it is imperative that effective environmental and sedimentation controls be in place throughout the entire area subject to construction activities. With the requirement of earth grading, there will be a potential of soil erosion. It is therefore recommended that the following be implemented to assist in achieving acceptable stormwater runoff quality:

- Restoration of exposed surfaces with vegetation and non-vegetative material as soon as construction schedules permit;
- Installation of filter strips, silt fences and rock check dams or other similar facilities throughout the site, and specifically during all construction activities;
- Reduce stormwater drainage velocities where possible;
- Ensure that disturbed areas are vegetated and stabilized as quickly as possible;
- Minimize the amount of existing vegetation removed.

7. GRADING

A preliminary grading design has been completed for the Project to confirm drainage of the site. The grading has been designed to mimic the existing topography of the site as much as is reasonably possible. The Project's roadways have been designed with minimum road grades and the majority of the site drains from the west to the southeast towards the proposed SWM Pond. A proposed overland flow route for the major storm system is provided at a low point adjacent to SWM Block which will convey stormwater to the pond. The grading will tie into at three proposed connection points to the existing Farsight Everett subdivision to the south and will match existing elevations. Refer to drawing GRD-1 Preliminary Site Grading Plan for details of the preliminary grading design.

8. SECONDARY UTILITIES

As this development is within the Everett settlement area it is anticipated that secondary utilities will be able to service this site. Letters have been sent to all secondary utilities to notify them of the proposed development, gain information on the availability of their services for the site and ensure they are able to adequately support the proposed development. Copies of these letters have been included in Appendix E.

9. CONCLUSIONS

The proposed Farsight Barzo Lands Development, including 1,226 residential lots, can be adequately serviced by the provision of on-site services including the following:

- Extension of the internal road network from the Farsight Everett development.
- Municipal water extended from the Farsight Everett development.
- Gravity sanitary sewer system flowing through the Farsight Everett development to the new WWTP with eventual discharge to surface water at Pine River.
- LID techniques where soil/infiltration conditions allow.
- Construction of a new stormwater Management Pond to provide both quantity and quality control.
- Extension of existing utilities from the Farsight Everett Development (yet to be verified)

The analysis and conceptual designs outlined in this report demonstrates that the servicing is feasible.

All of which is respectfully submitted,

PEARSON ENGINEERING LTD.

Taylor Arkell, P. Eng.
Project Engineer

Gary Pearson, P. Eng.
Principal

Mike Dejean, P. Eng.
Manager of Engineering Services

Appendix A

Geotechnical Analyses Reports

Terraprobe

Consulting Geotechnical & Environmental Engineering
Construction Materials Inspection & Testing

DRAFT

PRELIMINARY GEOENVIRONMENTAL DUE DILIGENCE ASSESSMENT BARZO DEVELOPMENT 6385 COUNTY ROAD 13 ADJALA-TOSORONTIO, ONTARIO

Prepared for: Farsight Homes
117 Ringwood Drive, Unit 18
Stouffville, ON
L4A 8C1

Attention: Mr. Robert Schickendanz

File No. 33-15-2100
January 7, 2016

Distribution of Report:
1 copy: Farsight Homes
1 copy: Terraprobe Inc.

Terraprobe Inc.

Greater Toronto
11 Indell Lane
Brampton, Ontario L6T 3Y3
(905) 796-2650 Fax 796-2250
brampton@terraprobe.ca

Hamilton - Niagara
903 Barton Street, Unit 22
Stoney Creek, Ontario L8E 5P5
(905) 643-7560 Fax 643-7559
stoneycreek@terraprobe.ca

Central Ontario
220 Bayview Drive, Unit 25
Barrie, Ontario L4N 4Y8
(705) 739-8355 Fax 739-8369
barrie@terraprobe.ca

Northern Ontario
1012 Kelly Lake Rd.
Sudbury, Ontario P3E 5P4
(705) 670-0460 Fax 670-0558
sudbury@terraprobe.ca

www.terraprobe.ca

TABLE OF CONTENTS

Attachments:

Figure 1: Site Location Plan
Figure 2: Testhole Location Plan
Grain Size Analyses
Appendix A: Table 1 Summary of Test Pits
Appendix B: Chemistry Results

1.0 INTRODUCTION

Terraprobe was retained to conduct a Geoenvironmental Due Diligence Assessment for the proposed Barzo development located at 6385 County Road 13, Adjala-Tosorontio. (see Figure 1).

The subject property is located north of Everett.

A Phase One Environmental Site Assessment was completed by Terraprobe in November 2015 as requested and should be read in conjunction with this report.

The purpose of the insitu testing was to provide a preliminary assessment of possible soil impact identified in localized areas in the Phase One ESA and to provide an initial soil/groundwater characterization of the property from a geotechnical perspective.

Based on topographic information from Simcoe County Web Mapping the elevation of the property is approximately 240 m.a.s.l.

Regional groundwater flow (i.e. deeper aquifers) is expected to be in an westerly direction, towards the Pine River. Near surface groundwater flow may be influenced by surface water courses. Surface drainage features and shallow groundwater discharge is anticipated to divide both to the east and west towards tributaries of the Pine River.

Based on published geological information for the general area, the near surface soil at and in the vicinity of the subject property generally consists of recent age, Newmarket tills sandy silt to silt matrix, with moderate to high matrix of carbonate content, clast content is moderate to high[1]. The subject property and surrounding area is underlain by bedrock of the Georgian Bay (Carlsbad & Russel) formation. This formation consists of grey shale with limestone interbeds[2].

It should be noted that the subsurface soil and groundwater conditions described above represent generalized conditions only and should not be considered site specific.

[1]Quaternary Geology of Ontario, southern sheet

[2]Paleozoic Geology of Southern Ontario

2.0 INVESTIGATION METHOD

2.1 General

Prior to the commencement of field activities, requests were submitted to the various utility providers (gas, hydro, etc.) through the Ontario One Call network to identify the locations of their services/plants on the property, and to verify that the proposed test pits would be clear of those services.

In addition, a private service locate was conducted prior to excavating.

The test pit locations are presented on the Testhole Location Plan (Figure 2). A description of the field methods that were implemented for this investigation follows.

2.2 Test Pits and Soil Sampling

The test holes were excavated on December 14, 2015 by Rumball Excavation Inc. Terraprobe field staff were present to supervise test pitting program.

Table 1 provides a summary of test pits, see Appendix A. Test Pit Locations are provided on Figure 2.

Test Pit 1: water seepage from bottom of test pit at 4.5m. A standpipe was installed and the water level was measured on December 22, 2015 to be 3.9m.

Test Pit 2: no caving or water seepage.

Test Pit 3: a standpipe was installed and the water level was measured on December 22, 2015 to be dry to 3.5m.

Test Pit 4: water seepage from bottom of test pit and a standpipe was installed. The water level on December 22, 2015 was measured to be 3.4m.

Test Pit 5: open and dry.

Test Pit 6: a standpipe was installed and water level was measured on December 22, 2015 to be dry to 3.2m.

Test Pit 7: a standpipe was installed and water level measured at 3.6m on December 22, 2015.

Test Pit 8: a standpipe was installed and water level was measured at 1.7m on December 22, 2015.

Test Pit 9: a standpipe was installed and water level was measured at 2.6m on December 22, 2015.

It is anticipated that the water table will rise in the spring (i.e. wetter seasons). Monitoring of the installed standpipes monthly would be recommended.

2.3 Analytical Testing

Soil samples were obtained in order to determine any impact from the historical railway, pesticides on the farm field and hydrocarbons from the oil stained area. These were the three (3) areas identified in the Phase One ESA with respect to possible contaminants of concern.

Surface soil samples were taken on November 13, 2015 from locations identified on Figure 2.

No odourous soils (olfactory observations) were noted during the test pit investigation in Test Pits 1 to 9 with the exception of an area where a total petroleum surface stain was noted, this area is identified as S4, S5 on Figure 2.

S1 and S2 were taken from the soil in the farm field and tested for pesticides. S3 was taken from the historic railway line and S4, S5 was taken from the area where staining was observed.

The soil analyses was completed by AGAT Laboratories, located at 5835 Coopers Avenue in Mississauga, Ontario. AGAT Laboratories is accredited and approved for specific analyses by the following national or provincial (Ontario) agencies:

- The Canadian Association for Laboratory Accreditation (CALA)
- The Standards Council of Canada (SCC)
- Canadian Council of Ministers of the Environment (CCME)
- Ontario Ministry of the Environment and Climate Change
- Ontario Ministry of Environment and Climate Change Drinking Water Testing License

Analytical results are attached as Appendix B.

The results from the historic rail line and topsoil exceed some parameters if compared to Table 1 Residential, but meet Table 2 Residential which is the appropriate standard for the proposed development.

The samples from the oil stained area (S4) indicated that the results were above Table 2 Residential standards. Terraprobe staff sampled below the oil stained soil and the deeper sample met the standard. This indicates that the impact is a surface issue. We estimate that the material requiring disposal can be removed with a shallow excavation and containerization (i.e. likely less than 500 cu.m).

2.4 General Soil and Groundwater Characterization

Soil and groundwater conditions were logged at the selected TP1 to TP9 test pits. Generally the site is characterized by nominal sandy topsoil up to 0.3m thickness, underlain by glaciolacustrine sand deposits which vary in silt content from very low near 2 percent to 25 percent (i.e. see Grain Size Analyses attached). These conditions are conducive to incorporating storm water infiltration (i.e. LID measures) as part of the Stormwater Management Plan. More specific sampling and assessment should be carried out to facilitate a more comprehensive evaluation of hydraulic conductivity of the variable sand deposit.

Soil bearing capacity is estimated to be in the 100 to 150 kPa range which is sufficient/normal to found residential dwelling foundations and associated features.

Groundwater levels were generally below 3m on the west and north sides of the property. Levels were near 1.7m to 2.6m in Tests Pits 8 and 9 along the east property boundary where an existing and proposed storm ponds are contemplated. As discussed previously, these groundwater levels are anticipated to rise during wetter seasons (i.e. spring). Monitoring the groundwater levels in the installed standpipes monthly over the next few months would be prudent to provide an initial assessment of seasonal fluctuation.

Excavation for services into the groundwater table will require positive dewatering prior to excavation and obtaining a Permit to Take Water (PTTW) from the MOECC.

4.0 CONCLUSIONS

The results of the Geoenvironmental Due Diligence Assessment is that the property consists of loose to compact sand with no clay or peat deposits. This soil is suitable for building houses.

The Phase One ESA report that was completed by Terraprobe in November 2015 did not result in any significant areas of concern. The Phase One noted the presence of the historical rail line; however, the laboratory analysis of a soil sample in this area determined there was no impact to soils. The only area that requires attention is the removal of the material impacted by oil at Sample Location 4. We estimate that this can be removed locally be subexcavation and containerized for disposal off site at a licenced waste receiver facility.

Groundwater levels being typically below 2.5m should not pose a major constraint for house basements. However, monitoring water levels in the installed standpipe monthly through the next few months would be prudent to provide an initial assessment of seasonal fluctuations. Excavations for services into the groundwater table are expected to require positive dewatering and obtaining a Permit to Take Water (PTTW) from MOECC.

We trust this adequately summarizes our findings to date. If you have any questions, or if we can be of further assistance, please do not hesitate to contact the undersigned.

Sincerely,

Terraprobe Inc.

DRAFT

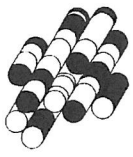
DRAFT

Kimberley Pickett, B.Sc., C.E.T.

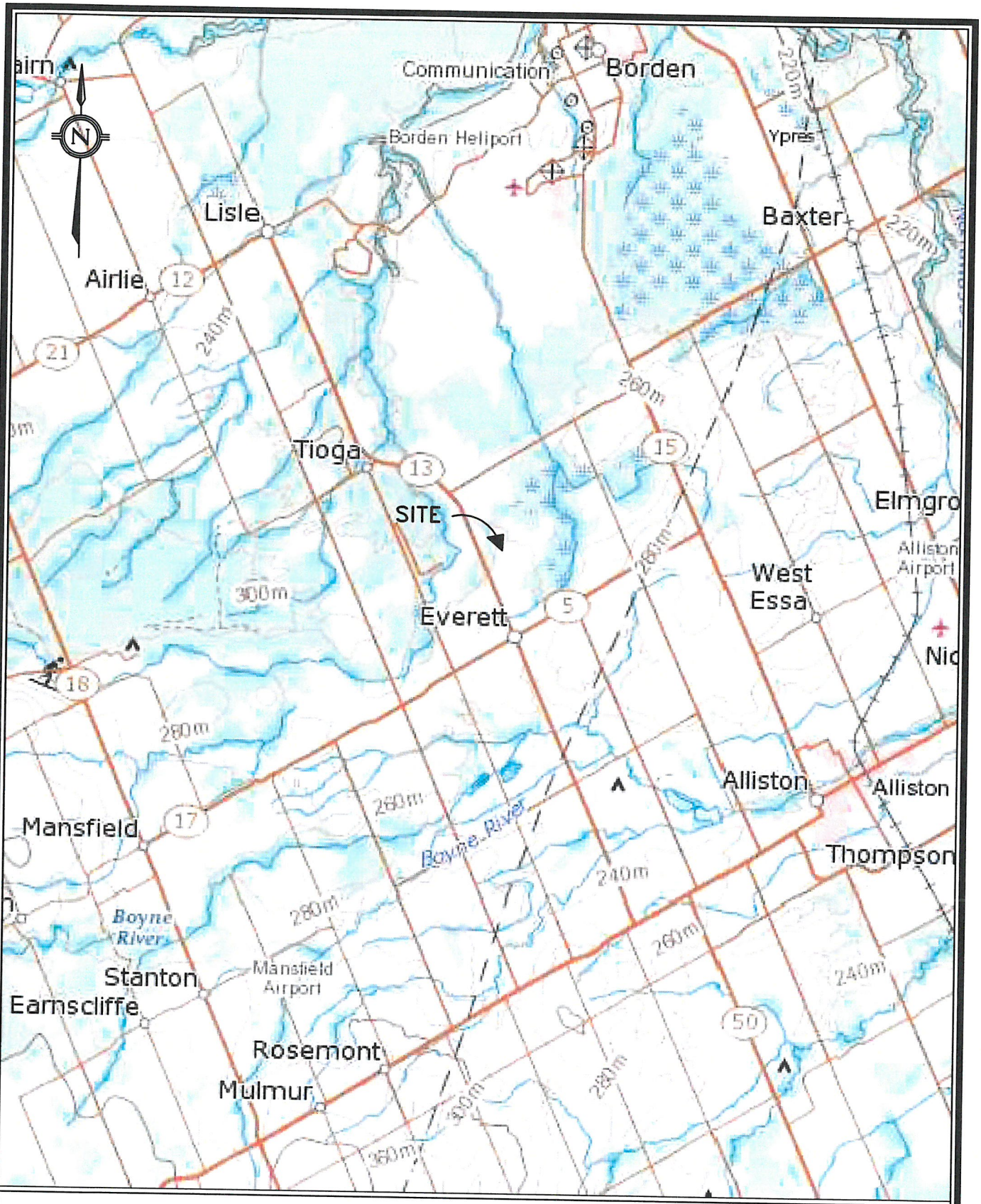
Kirk R. Johnson, P.Geo, P.Eng.
Associate

KP/ct
Barrie Office

FIGURES



Terraprobe Inc.



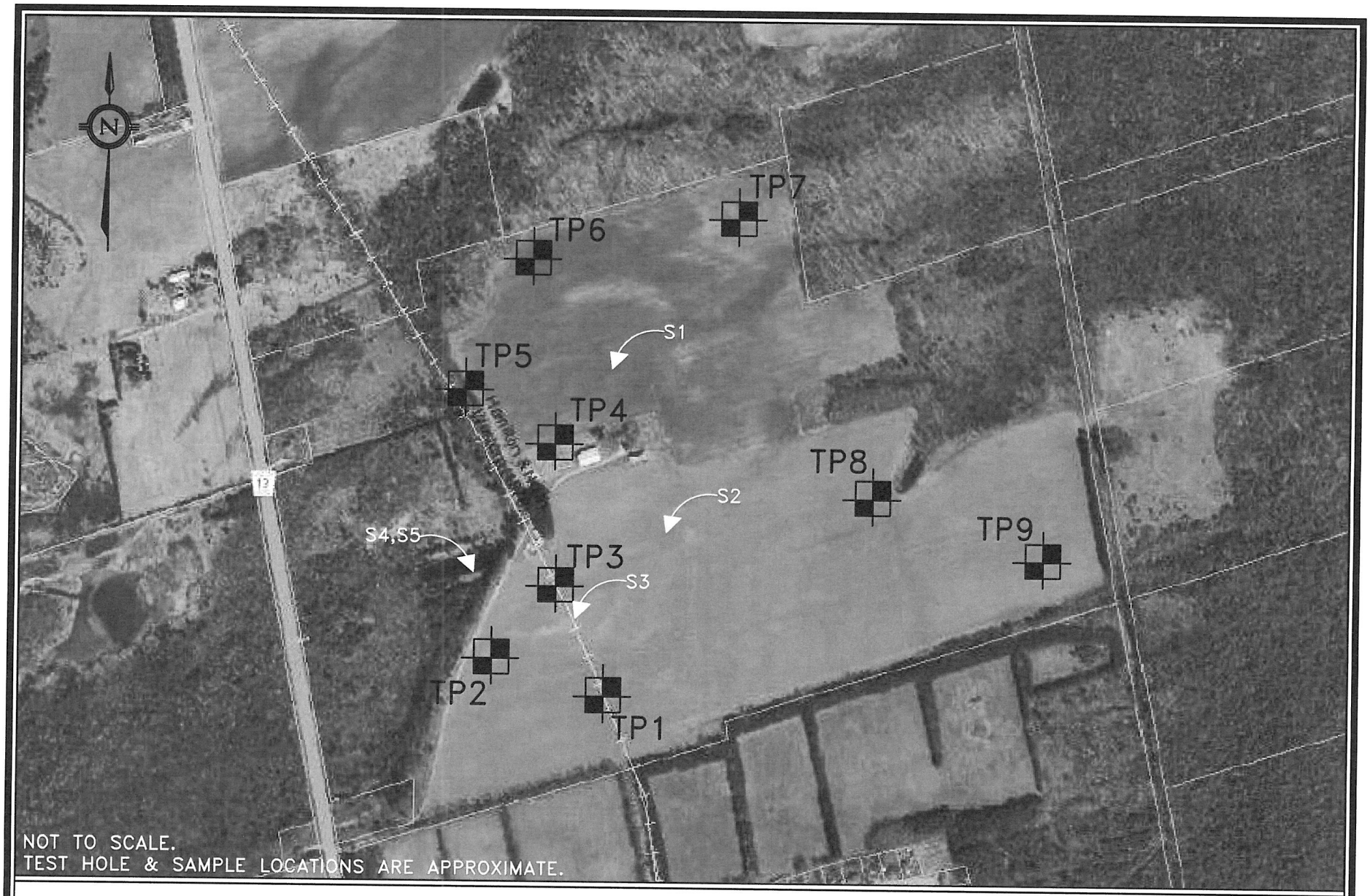
NOVEMBER 2015

SITE LOCATION PLAN

33-15-2100

Terraprobe

FIGURE 1



NOVEMBER 2015

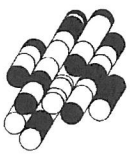
TEST HOLE & SOIL SAMPLE LOCATION PLAN

33-15-2100

Terraprobe

FIGURE 2

GRAIN SIZE ANALYSIS



Terraprobe Inc.

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WASH SIEVE ANALYSIS TEST REPORT

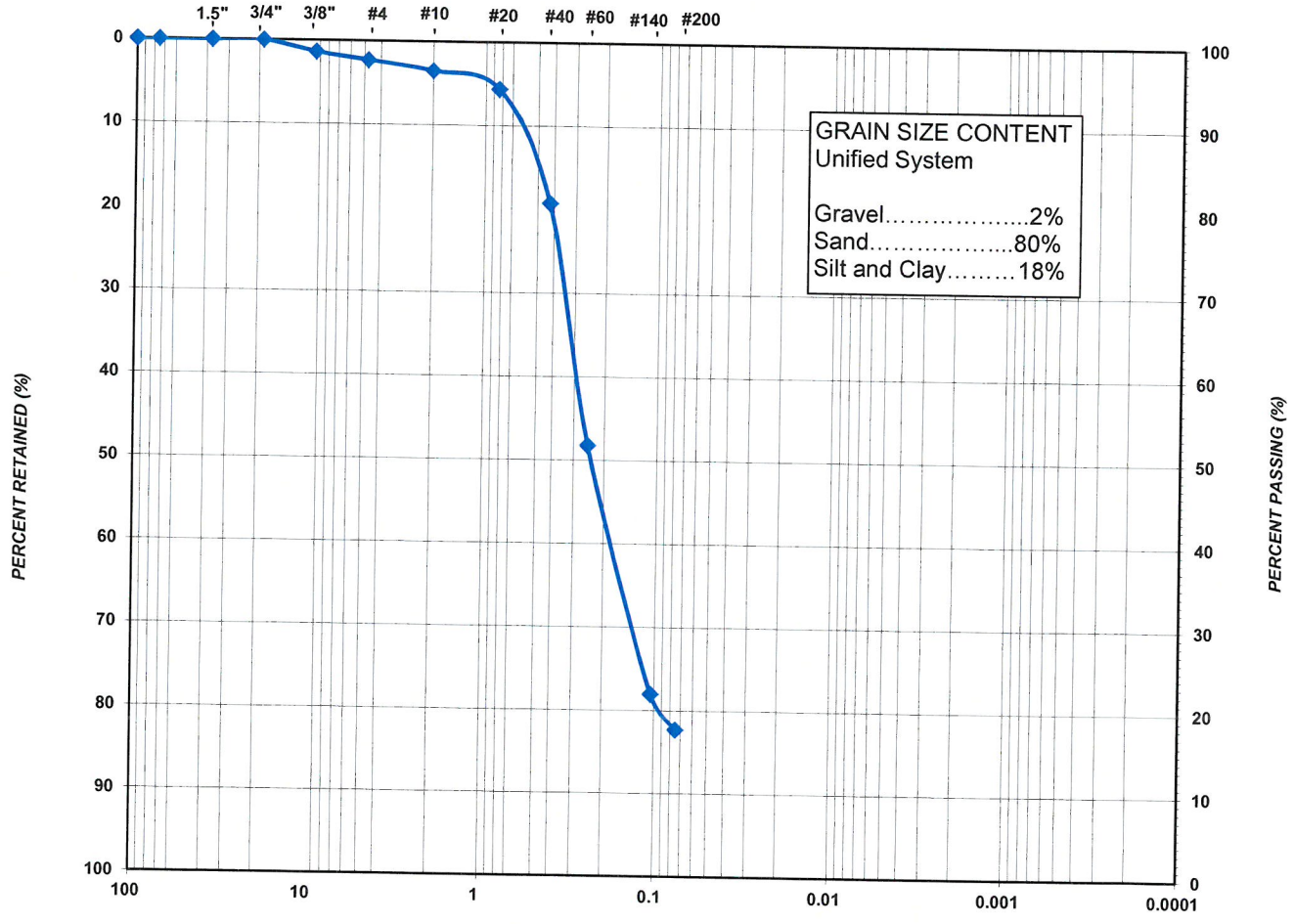
PROJECT: **Barzo Development**
LOCATION: **Everett, ON**
CLIENT: **Farsight Homes**

FILE NO.: **33-15-2100**
LAB NO.: **2202a**
SAMPLE DATE: **Dec-14-15**
SAMPLED BY: **B.H.**

TEST PIT NUMBER: **2**
SAMPLE DEPTH: **0.7m**
SAMPLE NUMBER: **1**
SAMPLE LOCATION: **as above**
SAMPLE DESCRIPTION: **Sand, some silt, trace gravel**

GRAIN SIZE DISTRIBUTION

U.S. STANDARD SIEVE SIZES



MIT SYSTEM	GRAVEL	COARSE	MEDIUM	FINE	SILT	CLAY
		SAND				

UNIFIED SYSTEM	COARSE	FINE	COARSE	MEDIUM	FINE	
	GRAVEL		SAND			SILT AND CLAY

Terraprobe

WASH SIEVE ANALYSIS TEST REPORT

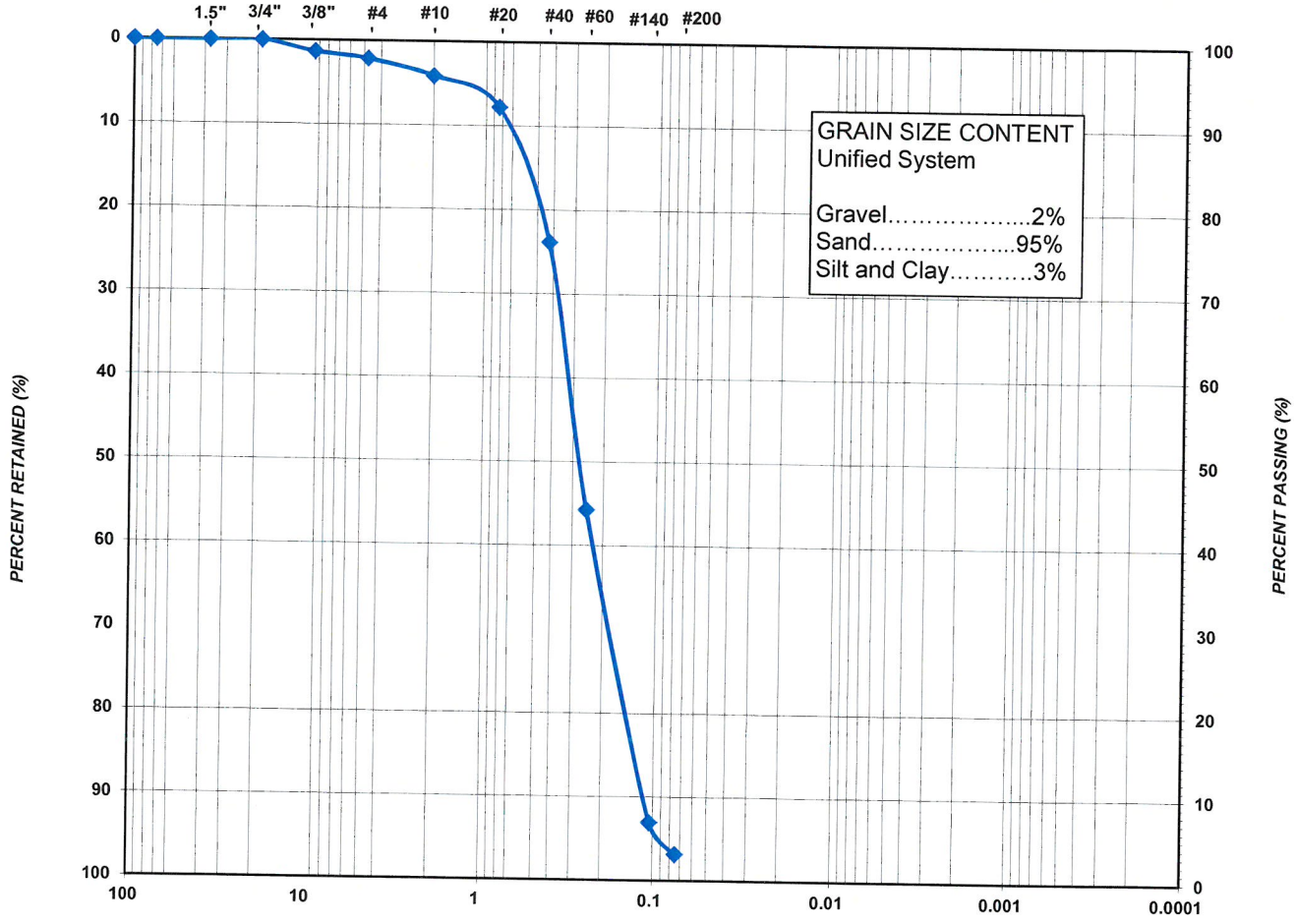
PROJECT: **Barzo Development**
LOCATION: **Everett, ON**
CLIENT: **Farsight Homes**

FILE NO.: **33-15-2100**
LAB NO.: **2202b**
SAMPLE DATE: **Dec-14-15**
SAMPLED BY: **B.H.**

TEST PIT NUMBER: **2**
SAMPLE DEPTH: **1.5m**
SAMPLE NUMBER: **2**
SAMPLE LOCATION: **as above**
SAMPLE DESCRIPTION: **Sand, trace silt, trace gravel**

GRAIN SIZE DISTRIBUTION

U.S. STANDARD SIEVE SIZES



MIT SYSTEM	GRAVEL		COARSE	MEDIUM	FINE	SILT	CLAY
			SAND				

UNIFIED SYSTEM	COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
	GRAVEL		SAND			

Terraprobe

WASH SIEVE ANALYSIS TEST REPORT

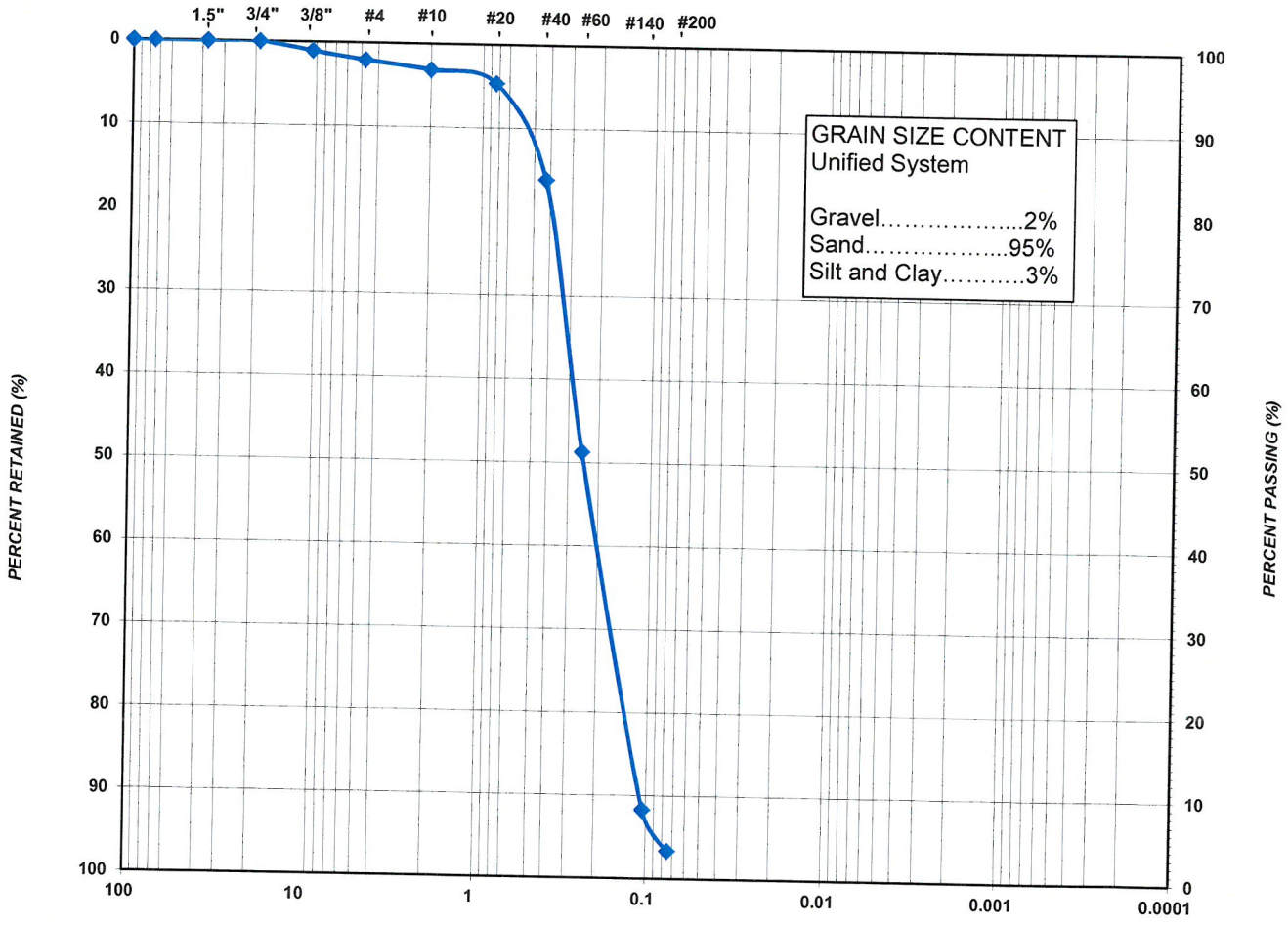
PROJECT: **Barzo Development**
LOCATION: **Everett, ON**
CLIENT: **Farsight Homes**

FILE NO.: **33-15-2100**
LAB NO.: **2202c**
SAMPLE DATE: **Dec-14-15**
SAMPLED BY: **B.H.**

TEST PIT NUMBER: **3**
SAMPLE DEPTH: **1.8m**
SAMPLE NUMBER: **2**
SAMPLE LOCATION: **as above**
SAMPLE DESCRIPTION: **Sand, trace silt, trace gravel**

GRAIN SIZE DISTRIBUTION

U.S. STANDARD SIEVE SIZES



MIT SYSTEM	GRAVEL	COARSE	MEDIUM	FINE	SILT	CLAY
		SAND				

UNIFIED SYSTEM	COARSE	FINE	COARSE	MEDIUM	FINE	
	GRAVEL		SAND			SILT AND CLAY

Terraprobe

WASH SIEVE ANALYSIS TEST REPORT

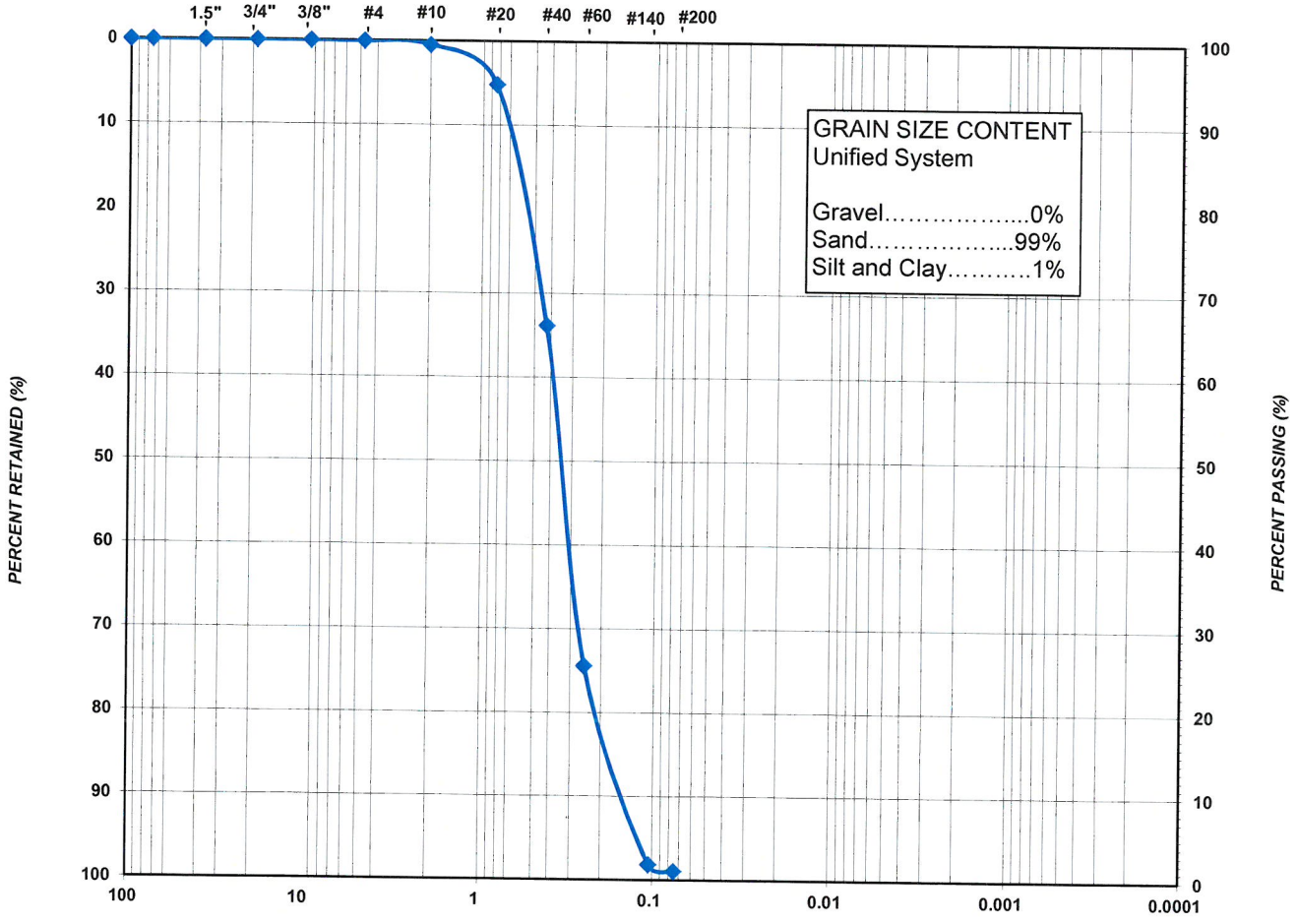
PROJECT: **Barzo Development**
LOCATION: **Everett, ON**
CLIENT: **Farsight Homes**

FILE NO.: **33-15-2100**
LAB NO.: **2203a**
SAMPLE DATE: **Dec-14-15**
SAMPLED BY: **B.H.**

TEST PIT NUMBER: **5**
SAMPLE DEPTH: **1.0m**
SAMPLE NUMBER: **1**
SAMPLE LOCATION: **as above**
SAMPLE DESCRIPTION: **Sand, trace silt**

GRAIN SIZE DISTRIBUTION

U.S. STANDARD SIEVE SIZES



MIT SYSTEM	GRAVEL		COARSE / MEDIUM / FINE SAND		SILT	CLAY
UNIFIED SYSTEM	COARSE / FINE GRAVEL		COARSE / MEDIUM / FINE SAND		SILT AND CLAY	

Terraprobe

WASH SIEVE ANALYSIS TEST REPORT

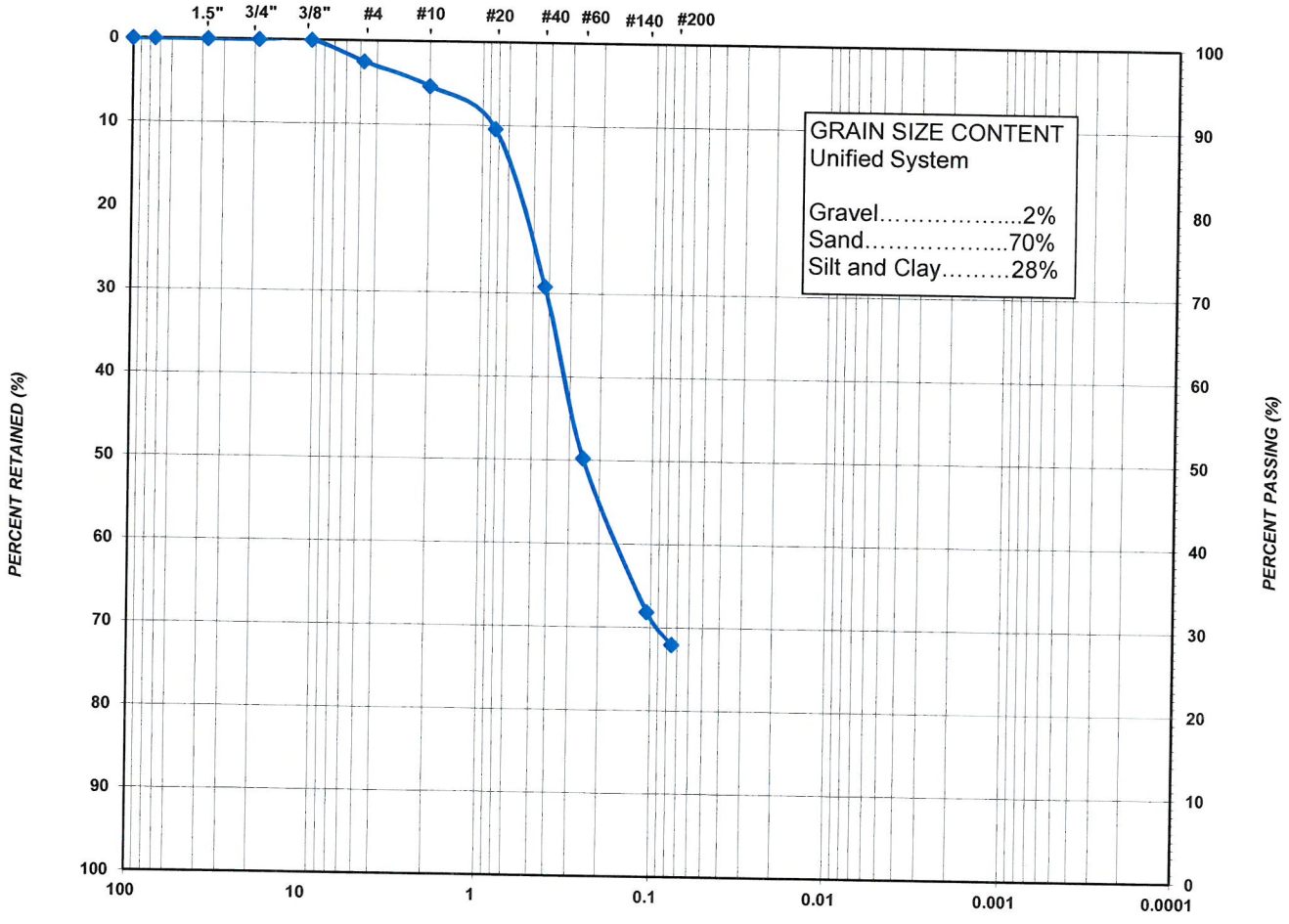
PROJECT: **Barzo Development**
LOCATION: **Everett, ON**
CLIENT: **Farsight Homes**

FILE NO.: **33-15-2100**
LAB NO.: **2203b**
SAMPLE DATE: **Dec-14-15**
SAMPLED BY: **B.H.**

TEST PIT NUMBER: **6**
SAMPLE DEPTH: **0.7m**
SAMPLE NUMBER: **1**
SAMPLE LOCATION: **as above**
SAMPLE DESCRIPTION: **Silty sand, trace gravel**

GRAIN SIZE DISTRIBUTION

U.S. STANDARD SIEVE SIZES



MIT SYSTEM	GRAVEL	COARSE	MEDIUM	FINE	SILT	CLAY
		SAND				

UNIFIED SYSTEM	COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
	GRAVEL		SAND			

Terraprobe

WASH SIEVE ANALYSIS TEST REPORT

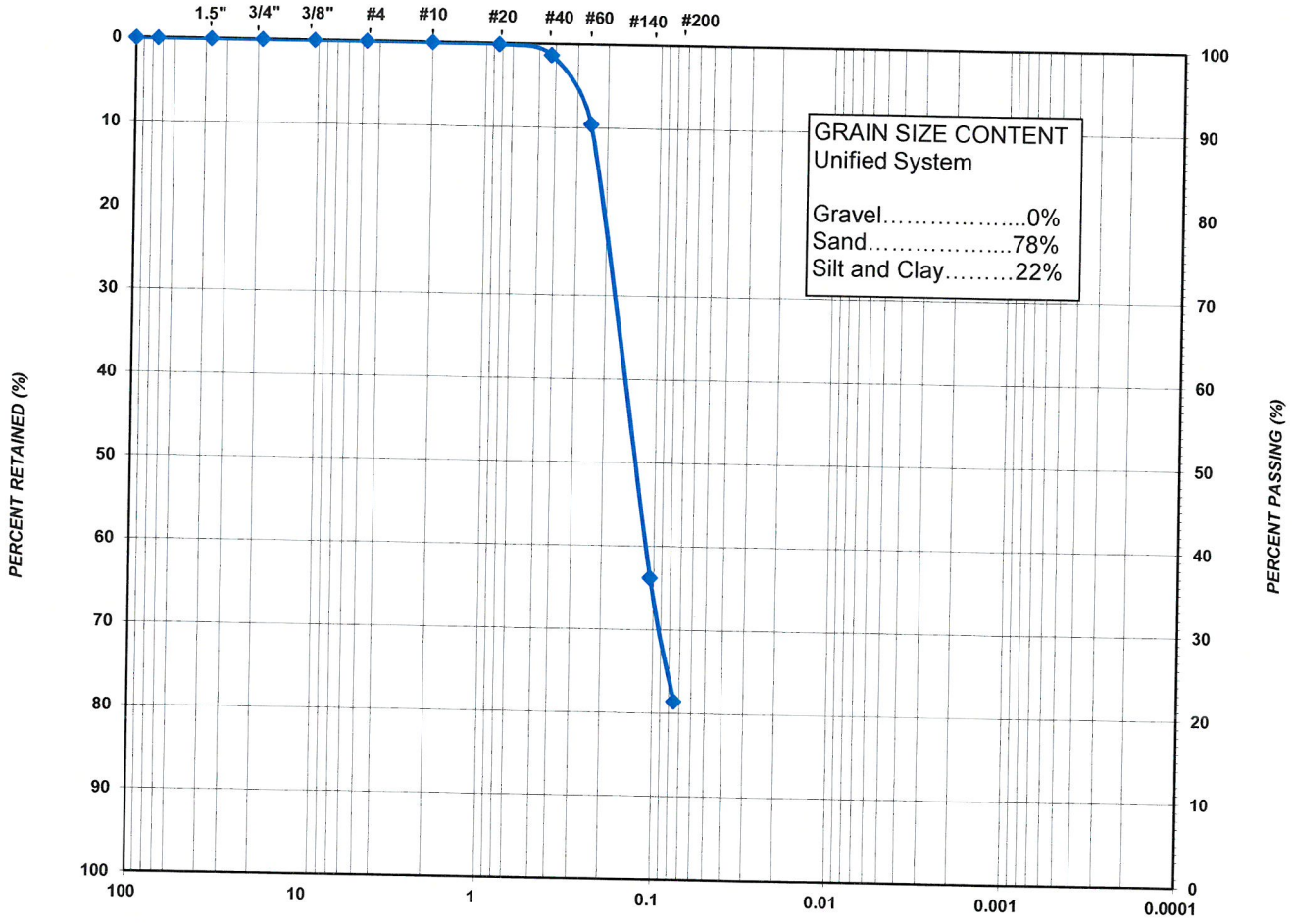
PROJECT: **Barzo Development**
LOCATION: **Everett, ON**
CLIENT: **Farsight Homes**

FILE NO.: **33-15-2100**
LAB NO.: **2204a**
SAMPLE DATE: **Dec-14-15**
SAMPLED BY: **B.H.**

TEST PIT NUMBER: **7**
SAMPLE NUMBER: **1**
SAMPLE DEPTH: **0.6m**
SAMPLE LOCATION: **as above**
SAMPLE DESCRIPTION: **Silty sand**

GRAIN SIZE DISTRIBUTION

U.S. STANDARD SIEVE SIZES



MIT SYSTEM	GRAVEL	COARSE	MEDIUM	FINE	SILT	CLAY
		SAND				

UNIFIED SYSTEM	COARSE	FINE	COARSE	MEDIUM	FINE	
	GRAVEL		SAND			SILT AND CLAY

Terraprobe

WASH SIEVE ANALYSIS TEST REPORT

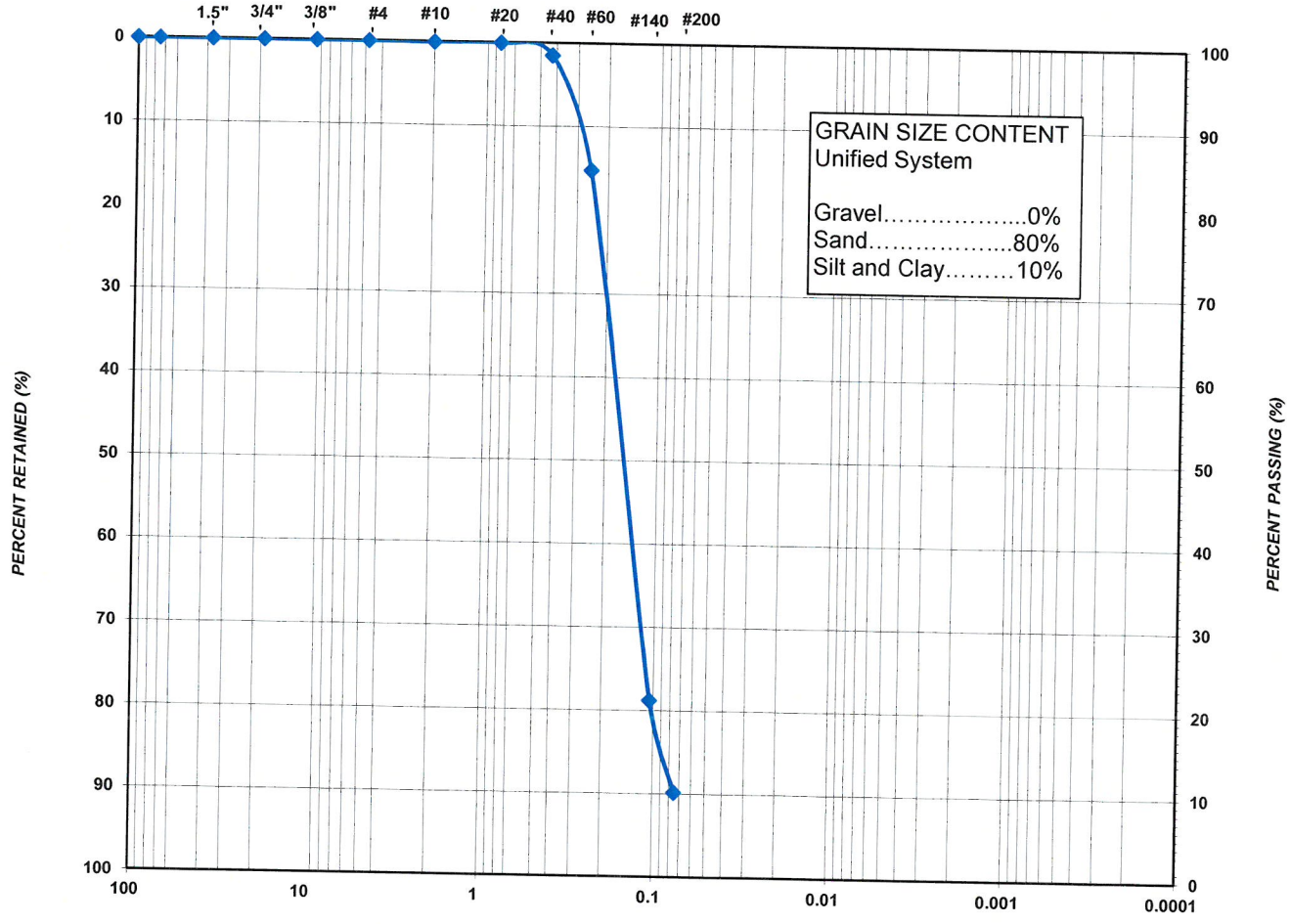
PROJECT: **Barzo Development**
LOCATION: **Everett, ON**
CLIENT: **Farsight Homes**

FILE NO.: **33-15-2100**
LAB NO.: **2204b**
SAMPLE DATE: **Dec-14-15**
SAMPLED BY: **B.H.**

TEST PIT NUMBER: **8**
SAMPLE DEPTH: **1.0m**
SAMPLE NUMBER: **1**
SAMPLE LOCATION: **as above**
SAMPLE DESCRIPTION: **Sand, some silt**

GRAIN SIZE DISTRIBUTION

U.S. STANDARD SIEVE SIZES



MIT SYSTEM	GRAVEL	COARSE	MEDIUM	FINE	SILT	CLAY
		SAND				

UNIFIED SYSTEM	COARSE	FINE	COARSE	MEDIUM	FINE	
	GRAVEL		SAND			SILT AND CLAY

Terraprobe

WASH SIEVE ANALYSIS TEST REPORT

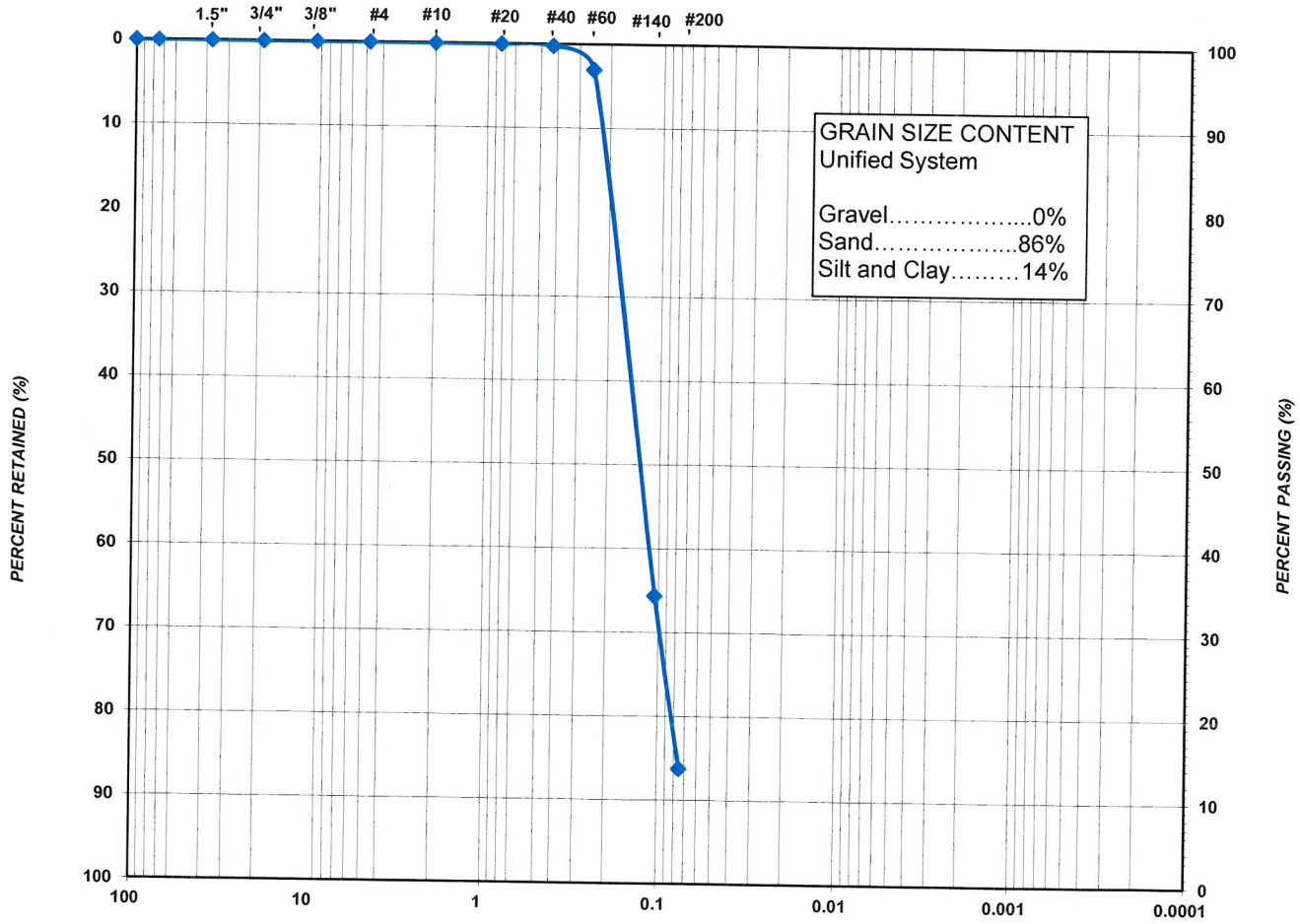
PROJECT: **Barzo Development**
LOCATION: **Everett, ON**
CLIENT: **Farsight Homes**

FILE NO.: **33-15-2100**
LAB NO.: **2204c**
SAMPLE DATE: **Dec-14-15**
SAMPLED BY: **B.H.**

TEST PIT NUMBER: **8**
SAMPLE DEPTH: **2.5m**
SAMPLE NUMBER: **3**
SAMPLE LOCATION: **as above**
SAMPLE DESCRIPTION: **Sand, some silt**

GRAIN SIZE DISTRIBUTION

U.S. STANDARD SIEVE SIZES



MIT SYSTEM	GRAVEL	COARSE	MEDIUM	FINE	SILT	CLAY
		SAND				

UNIFIED SYSTEM	COARSE	FINE	COARSE	MEDIUM	FINE	
	GRAVEL		SAND			SILT AND CLAY

Terraprobe

WASH SIEVE ANALYSIS TEST REPORT

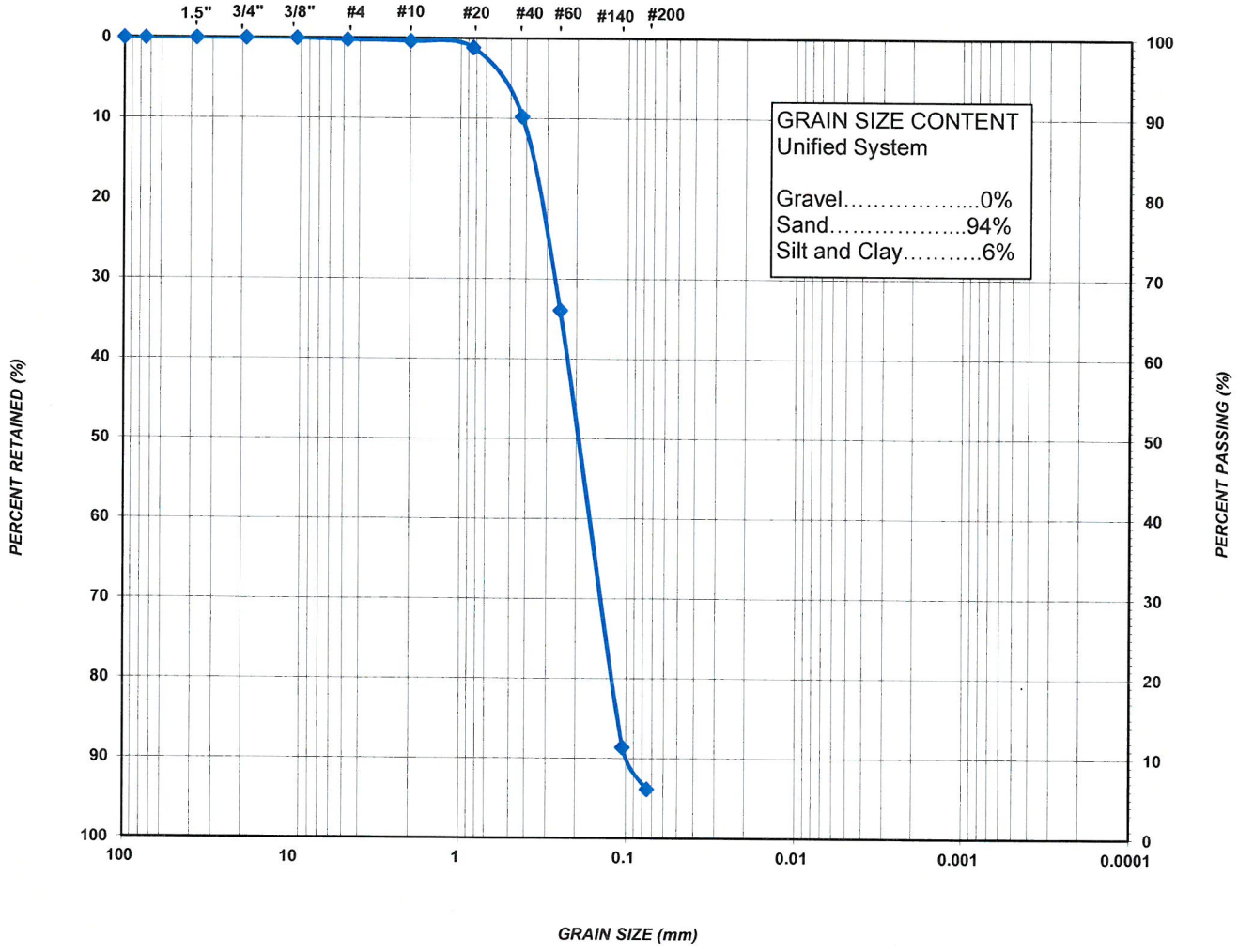
PROJECT: **Barzo Development**
LOCATION: **Everett, ON**
CLIENT: **Farsight Homes**

FILE NO.: **33-15-2100**
LAB NO.: **2205a**
SAMPLE DATE: **Dec-14-15**
SAMPLED BY: **B.H.**

TEST PIT NUMBER: **9**
SAMPLE DEPTH: **0.5m**
SAMPLE NUMBER: **1**
SAMPLE LOCATION: **as above**
SAMPLE DESCRIPTION: **Sand, trace silt**

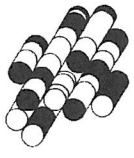
GRAIN SIZE DISTRIBUTION

U.S. STANDARD SIEVE SIZES



MIT SYSTEM	GRAVEL		COARSE	MEDIUM	FINE	SILT	CLAY
			SAND				
UNIFIED SYSTEM	COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY	
	GRAVEL		SAND				

APPENDIX A



Terraprobe Inc.

Table 1
Summary of Test Pits
6385 County Road 13, Adjala Tosorontio
(Excavated December, 2015)

Test Pit Number	Depth (m)	Soil Description	Samples		Comments
			Depth (m)	Moisture (%)	
1	0 - 0.3	Sandy topsoil layer			
	0.3 - 1.0	brown, damp, sand trace silt	1.2		water seepage from bottom of test pit at 4.5 m, no caving
	1.0 - 1.9	brown, damp, sand, trace gravel		N/A	
	1.9 - 4.0	brown, damp, fine sand, trace gravel	2.1		install standpipe 1m screen
	4.0 - 4.5	brown, wet, sand	4.3		water level on December 22, 2015 measured at 3.9m.
2	0.0 - 0.4	Sandy topsoil layer			
	0.4 - 1.1	Brown, damp, sand, some silt	0.7		
	1.1 - 2.5	Brown, damp, sand, trace silt, trace gravel, compact below 1.2m	1.5	N/A	no caving and water seepage
	2.5 - 3.3	Brown, damp, sand, some silt, trace gravel	2.7		
	3.3 - 4.5	Brown, damp, fine sand, trace gravel	4.0		
3	0.0 - 0.3	Sandy topsoil layer		N/A	
	0.3 - 1.1	brown, damp, sand, trace silt	1.0		no water seepage and caving
	1.1 - 2.2	brown, damp, sand, trace silt, trace gravel, compact to dense below 1.2 m	1.8		install standpipe 1m screen
	2.2 - 3.1	brown, damp, sand, fine	2.6		water level on December 22, 2015 measured dry to 3.5m.
	3.1 - 4.0	brown, damp to moist, fine sand, trace silt	4.0		

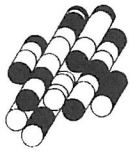
Table 1
Summary of Test Pits
6385 County Road 13, Adjala Tosorontio
(Excavated December, 2015)

Test Pit Number	Depth (m)	Soil Description	Samples		Comments
			Depth (m)	Moisture (%)	
4	0.0 - 0.3	Sandy topsoil		N/A	
	0.3 - 1.2	Brown, damp, sand, trace silt	0.5		water seepage bottom of test pit caving below 1.3 m
	1.2 - 1.6	Brown, damp, gravelly sand	1.3		install standpipe (1m screen)
	1.6 - 2.9	Brown, damp, fine sand, trace silt	2.0		water level on December 22, 2015 measured at 3.4m.
	2.9 - 3.5	Brown, wet, sand, trace silt	3.0		
5	0.0 - 0.2	Sandy topsoil layer		N/A	open and dry
	0.2 - 0.8	Brown, damp, sand, some silt, compact			
	0.8 - 2.0	Brown, damp, sand, trace silt, dense below 1.4m	1.0m		
	2.0 - 3.7	Brown, damp, fine sand, trace gravel	2.3m		
	3.7 - 4.5	Brown, damp, sand, some gravel	4.0m		
6	0.0 - 0.3	Sandy topsoil layer		N/A	no caving and water seepage
	0.3 - 1.2	Brown, damp, silty sand, trace gravel			install standpipe 1m screen
	1.2 - 3.8	Brown, damp, silty sand, trace gravel, compact	1.6 3.0		water level on December 22, 2015 measured dry to 3.2m.
	3.8 - 4.2	Brown, moist to wet, silty sand	4.0		

Table 1
Summary of Test Pits
6385 County Road 13, Adjala Tosorontio
(Excavated December, 2015)

Test Pit Number	Depth (m)	Soil Description	Samples		Comments
			Depth (m)	Moisture (%)	
7	0.0 - 0.2	Sandy topsoil layer		N/A	
	0.2 - 1.0	Brown, damp, silty sand	0.6		no caving and water seepage
	1.0 - 2.2	Brown, damp, sand, trace silt, loose to compact below 1.3m	1.7		install standpipe 1m screen
	2.2 - 4.0	Brown, damp, fine sand	3.5		water level on December 22, 2015 measured at 3.6m.
8	0.0 - 0.2	Sandy topsoil layer		N/A	caving below 2m
	0.2 - 1.4	Brown, damp, sand, some silt, loose to compact below 1.3m	1.0		install standpipe 1m screen
	1.4 - 2.6	Brown, moist to wet, sand, some silt	1.6 2.5		water level on December 22, 2015 measured at 1.7m.
9	0.0 - 0.3	Sandy topsoil layer		N/A	caving below 1.0m
	0.3 - 1.0	Brown, damp, sand, trace silt, loose	0.5		install standpipe 1m screen
	1.0 -1.9	Brown, damp, sand, trace gravel, loose to compact below 1.5m	1.2		water level on December 22, 2015 measured at 2.6m.
	1.9 - 2.7	Brown, wet, sand (fine), trace to some silt	2.3		

APPENDIX B



Terraprobe Inc.

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: TERRAPROBE INC.
220 BAYVIEW DRIVE, UNIT 25
BARRIE, ON L4N4Y8
(705) 739-8355

ATTENTION TO: Kimberly Pickett

PROJECT: 33-15-2100

AGAT WORK ORDER: 15T042713

SOIL ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Coordinator

TRACE ORGANICS REVIEWED BY: Oksana Gushyla, Trace Organics Lab Supervisor

DATE REPORTED: Nov 20, 2015

PAGES (INCLUDING COVER): 11

VERSION*: 2

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES
VERSION 2:Report updated to include additional testing and re-issued on Nov 30,2015.

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

AGAT Laboratories

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MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 15T042713

PROJECT: 33-15-2100

CLIENT NAME: TERRAPROBE INC.

SAMPLING SITE:

ATTENTION TO: Kimberly Pickett

SAMPLED BY:BH

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2015-11-16

DATE REPORTED: 2015-11-20

		SAMPLE DESCRIPTION:		Railway (S3)
		SAMPLE TYPE:		Soil
		DATE SAMPLED:		11/13/2015
Parameter	Unit	G / S	RDL	7198646
Antimony	µg/g	1.3	0.8	<0.8
Arsenic	µg/g	18	1	<1
Barium	µg/g	220	2	27
Beryllium	µg/g	2.5	0.5	<0.5
Boron	µg/g	36	5	<5
Boron (Hot Water Soluble)	µg/g	NA	0.10	0.21
Cadmium	µg/g	1.2	0.5	<0.5
Chromium	µg/g	70	2	6
Cobalt	µg/g	21	0.5	1.5
Copper	µg/g	92	1	2
Lead	µg/g	120	1	2
Molybdenum	µg/g	2	0.5	<0.5
Nickel	µg/g	82	1	3
Selenium	µg/g	1.5	0.4	<0.4
Silver	µg/g	0.5	0.2	<0.2
Thallium	µg/g	1	0.4	<0.4
Uranium	µg/g	2.5	0.5	<0.5
Vanadium	µg/g	86	1	12
Zinc	µg/g	290	5	15
Chromium VI	µg/g	0.66	0.2	<0.2
Cyanide	µg/g	0.051	0.040	<0.040
Mercury	µg/g	0.27	0.10	<0.10
Electrical Conductivity	mS/cm	0.57	0.005	0.051
Sodium Adsorption Ratio	NA	2.4	NA	0.093
pH, 2:1 CaCl2 Extraction	pH Units		NA	7.42

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use

7198646 EC & SAR were determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio.

Certified By: Amanjot Bhela

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
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AGAT WORK ORDER: 15T042713

PROJECT: 33-15-2100

CLIENT NAME: TERRAPROBE INC.

SAMPLING SITE:

ATTENTION TO: Kimberly Pickett

SAMPLED BY:BH

O. Reg. 153(511) - BNA (full) + PAHs (Soil) - Cresol

DATE RECEIVED: 2015-11-16

DATE REPORTED: 2015-11-20

		SAMPLE DESCRIPTION:		Railway (S3)
		SAMPLE TYPE:		Soil
		DATE SAMPLED:		11/13/2015
Parameter	**Unit**	**G / S**	**RDL**	**7198646**
o-Cresol	µg/g		0.1	<0.1
m & p - Cresol	µg/g		0.2	<0.2
Moisture Content	%		0.1	10.8
Surrogate	**Unit**	**Acceptable Limits**		
2,4,6-Tribromophenol	%	50-140		93
Chrysene-d12	%	50-140		67

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

7198646 Results are based on the dry weight of the soil.
Note: The result for Benzo(b)Fluoranthene is the total of the Benzo(b)&(j)Fluoranthene isomers because the isomers co-elute on the GC column.

Certified By:

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5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

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AGAT WORK ORDER: 15T042713

PROJECT: 33-15-2100

CLIENT NAME: TERRAPROBE INC.

SAMPLING SITE:

ATTENTION TO: Kimberly Pickett

SAMPLED BY:BH

O. Reg. 153(511) - OC Pesticides + PCBs (Soil)

DATE RECEIVED: 2015-11-16

DATE REPORTED: 2015-11-20

		SAMPLE DESCRIPTION:		Topsoil 1 (S1)	Topsoil 2 (S2)
		SAMPLE TYPE:		Soil	Soil
		DATE SAMPLED:		11/13/2015	11/13/2015
Parameter	Unit	G / S	RDL	7198643	7198645
Gamma-Hexachlorocyclohexane	µg/g	0.01	0.005	<0.005	<0.005
Heptachlor	µg/g	0.05	0.005	<0.005	<0.005
Aldrin	µg/g	0.05	0.005	<0.005	<0.005
Heptachlor Epoxide	µg/g	0.05	0.005	<0.005	<0.005
Endosulfan	µg/g	0.04	0.005	<0.005	<0.005
Chlordane	µg/g	0.05	0.007	<0.007	<0.007
DDD	µg/g	0.05	0.007	<0.007	<0.007
DDE	µg/g	0.05	0.007	**0.20**	**0.13**
DDT	µg/g	1.4	0.007	0.26	0.14
Dieldrin	µg/g	0.05	0.005	0.021	0.006
Endrin	µg/g	0.04	0.005	<0.005	<0.005
Methoxychlor	µg/g	0.05	0.005	<0.005	<0.005
Hexachlorobenzene	µg/g	0.01	0.005	<0.005	<0.005
Hexachlorobutadiene	µg/g	0.01	0.01	<0.01	<0.01
Hexachloroethane	µg/g	0.01	0.01	<0.01	<0.01
Aroclor 1242	µg/g		0.10	<0.10	<0.10
Aroclor 1248	µg/g		0.10	<0.10	<0.10
Aroclor 1254	µg/g		0.10	<0.10	<0.10
Aroclor 1260	µg/g		0.10	<0.10	<0.10
Polychlorinated Biphenyls	µg/g	0.3	0.10	<0.10	<0.10
Moisture Content	%		0.1	13.6	11.2
Surrogate	**Unit**	**Acceptable Limits**			
TCMX	%	50-140		64	72
Decachlorobiphenyl	%	60-140		75	106

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use

7198643-7198645 Results are based on the dry weight of the soil.
Note: DDT applies to the total of op'DDT and pp'DDT, DDD applies to the total of op'DDD and pp'DDD and DDE applies to the total of op'DDE and pp'DDE. Endosulfan applies to the total of Endosulfan I and Endosulfan II.
Chlordane applies to the total of Alpha-Chlordane and Gamma-Chlordane.

Certified By:

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5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
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Certificate of Analysis

AGAT WORK ORDER: 15T042713

PROJECT: 33-15-2100

CLIENT NAME: TERRAPROBE INC.

SAMPLING SITE:

ATTENTION TO: Kimberly Pickett

SAMPLED BY:BH

O. Reg. 153(511) - PHCs F1 - F4 (Soil) F2-F4

DATE RECEIVED: 2015-11-16

DATE REPORTED: 2015-11-20

		SAMPLE DESCRIPTION:		Railway (S3)	Oil stain (S4)	Below stain (S5)
		SAMPLE TYPE:		Soil	Soil	Soil
		DATE SAMPLED:		11/13/2015	11/13/2015	11/13/2015
Parameter	Unit	G / S	RDL	7198646	7198648	7198649
F2 (C10 to C16)	µg/g	10	10	<10	**1100**	<10
F3 (C16 to C34)	µg/g	240	50	<50	**34000**	<50
F4 (C34 to C50)	µg/g	120	50	<50	**9800**	<50
Gravimetric Heavy Hydrocarbons	µg/g	120	50	NA	NA	NA
Moisture Content	%		0.1	10.8	8.1	2.3
Surrogate	**Unit**	**Acceptable Limits**				
Terphenyl	%	60-140		84	87	88

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use

7198646-7198649 Results are based on sample dry weight.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons are not included in the Total C16-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
The chromatogram has returned to baseline by the retention time of nC50.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.
Fractions 2-4 are quantified with the contribution of PAHs. Under Ontario Regulation 153, results are considered valid without determining the PAH contribution if not requested by the client.
Quality Control Data is available upon request.

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AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Guideline Violation

AGAT WORK ORDER: 15T042713

PROJECT: 33-15-2100

CLIENT NAME: TERRAPROBE INC.

ATTENTION TO: Kimberly Pickett

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	GUIDEVALUE	RESULT
7198643	Topsoil 1 (S1)	ON T1 S RPI/ICC	O. Reg. 153(511) - OC Pesticides + PCBs (Soil)	DDE	0.05	0.20
7198645	Topsoil 2 (S2)	ON T1 S RPI/ICC	O. Reg. 153(511) - OC Pesticides + PCBs (Soil)	DDE	0.05	0.13
7198648	Oil stain (S4)	ON T1 S RPI/ICC	O. Reg. 153(511) - PHCs F1 - F4 (Soil) F2-F4	F2 (C10 to C16)	10	1100
7198648	Oil stain (S4)	ON T1 S RPI/ICC	O. Reg. 153(511) - PHCs F1 - F4 (Soil) F2-F4	F3 (C16 to C34)	240	34000
7198648	Oil stain (S4)	ON T1 S RPI/ICC	O. Reg. 153(511) - PHCs F1 - F4 (Soil) F2-F4	F4 (C34 to C50)	120	9800

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5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Quality Assurance

CLIENT NAME: TERRAPROBE INC.

PROJECT: 33-15-2100

SAMPLING SITE:

AGAT WORK ORDER: 15T042713

ATTENTION TO: Kimberly Pickett

SAMPLED BY:BH

Soil Analysis

RPT Date: Nov 20, 2015

PARAMETER	Batch	Sample Id	DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
			Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	7219161		<0.8	<0.8	NA	< 0.8	86%	70%	130%	109%	80%	120%	105%	70%	130%
Arsenic	7219161		2	2	NA	< 1	115%	70%	130%	98%	80%	120%	101%	70%	130%
Barium	7219161		14	14	0.0%	< 2	106%	70%	130%	101%	80%	120%	98%	70%	130%
Beryllium	7219161		<0.5	<0.5	NA	< 0.5	105%	70%	130%	109%	80%	120%	107%	70%	130%
Boron	7219161		<5	<5	NA	< 5	79%	70%	130%	111%	80%	120%	104%	70%	130%
Boron (Hot Water Soluble)	7215403		<0.10	<0.10	NA	< 0.10	102%	60%	140%	97%	70%	130%	96%	60%	140%
Cadmium	7219161		<0.5	<0.5	NA	< 0.5	98%	70%	130%	98%	80%	120%	97%	70%	130%
Chromium	7219161		6	6	NA	< 2	100%	70%	130%	107%	80%	120%	106%	70%	130%
Cobalt	7219161		2.7	2.6	3.8%	< 0.5	101%	70%	130%	100%	80%	120%	97%	70%	130%
Copper	7219161		10	11	9.5%	< 1	100%	70%	130%	107%	80%	120%	97%	70%	130%
Lead	7219161		3	3	NA	< 1	109%	70%	130%	102%	80%	120%	94%	70%	130%
Molybdenum	7219161		<0.5	<0.5	NA	< 0.5	104%	70%	130%	102%	80%	120%	104%	70%	130%
Nickel	7219161		4	4	NA	< 1	100%	70%	130%	99%	80%	120%	94%	70%	130%
Selenium	7219161		<0.4	<0.4	NA	< 0.4	92%	70%	130%	98%	80%	120%	98%	70%	130%
Silver	7219161		<0.2	<0.2	NA	< 0.2	93%	70%	130%	102%	80%	120%	99%	70%	130%
Thallium	7219161		<0.4	<0.4	NA	< 0.4	111%	70%	130%	108%	80%	120%	104%	70%	130%
Uranium	7219161		<0.5	<0.5	NA	< 0.5	98%	70%	130%	99%	80%	120%	95%	70%	130%
Vanadium	7219161		12	11	8.7%	< 1	102%	70%	130%	102%	80%	120%	104%	70%	130%
Zinc	7219161		21	19	NA	< 5	107%	70%	130%	109%	80%	120%	108%	70%	130%
Chromium VI	7213158		<0.2	<0.2	NA	< 0.2	95%	70%	130%	97%	80%	120%	102%	70%	130%
Cyanide	7222491		<0.040	<0.040	NA	< 0.040	101%	70%	130%	114%	80%	120%	104%	70%	130%
Mercury	7219161		<0.10	<0.10	NA	< 0.10	109%	70%	130%	95%	80%	120%	91%	70%	130%
Electrical Conductivity	7213158		0.276	0.279	1.1%	< 0.005	98%	90%	110%	NA			NA		
Sodium Adsorption Ratio	7213050		0.372	0.353	5.2%	NA	NA			NA			NA		
pH, 2:1 CaCl2 Extraction	7215358		7.32	7.45	1.8%	NA	101%	80%	120%	NA			NA		

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Amanjot Bhela

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Quality Assurance

CLIENT NAME: TERRAPROBE INC.

PROJECT: 33-15-2100

SAMPLING SITE:

AGAT WORK ORDER: 15T042713

ATTENTION TO: Kimberly Pickett

SAMPLED BY:BH

Trace Organics Analysis

RPT Date: Nov 20, 2015

PARAMETER	Batch	Sample Id	DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
			Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - OC Pesticides + PCBs (Soil)															
Gamma-Hexachlorocyclohexane	7191037		< 0.005	< 0.005	NA	< 0.005	76%	50%	140%	70%	50%	140%	116%	50%	140%
Heptachlor	7191037		< 0.005	< 0.005	NA	< 0.005	68%	50%	140%	97%	50%	140%	96%	50%	140%
Aldrin	7191037		< 0.005	< 0.005	NA	< 0.005	72%	50%	140%	81%	50%	140%	79%	50%	140%
Heptachlor Epoxide	7191037		< 0.005	< 0.005	NA	< 0.005	73%	50%	140%	80%	50%	140%	85%	50%	140%
Endosulfan	7191037		< 0.005	< 0.005	NA	< 0.005	74%	50%	140%	70%	50%	140%	65%	50%	140%
Chlordane	7191037		< 0.007	< 0.007	NA	< 0.007	73%	50%	140%	82%	50%	140%	98%	50%	140%
DDD	7191037		< 0.007	< 0.007	NA	< 0.007	97%	50%	140%	115%	50%	140%	72%	50%	140%
DDE	7191037		< 0.007	< 0.007	NA	< 0.007	72%	50%	140%	81%	50%	140%	114%	50%	140%
DDT	7191037		< 0.007	< 0.007	NA	< 0.007	60%	50%	140%	79%	50%	140%	84%	50%	140%
Dieldrin	7191037		< 0.005	< 0.005	NA	< 0.005	73%	50%	140%	82%	50%	140%	90%	50%	140%
Endrin	7191037		< 0.005	< 0.005	NA	< 0.005	62%	50%	140%	75%	50%	140%	84%	50%	140%
Methoxychlor	7191037		< 0.005	< 0.005	NA	< 0.005	65%	50%	140%	111%	50%	140%	90%	50%	140%
Hexachlorobenzene	7191037		< 0.005	< 0.005	NA	< 0.005	81%	50%	140%	79%	50%	140%	69%	50%	140%
Hexachlorobutadiene	7191037		< 0.01	< 0.01	NA	< 0.01	66%	50%	140%	65%	50%	140%	65%	50%	140%
Hexachloroethane	7191037		< 0.01	< 0.01	NA	< 0.01	73%	50%	140%	61%	50%	140%	70%	50%	140%
Aroclor 1242	7191037		< 0.10	< 0.10	NA	< 0.10	NA	60%	140%	NA	60%	140%	NA	60%	140%
Aroclor 1248	7191037		< 0.10	< 0.10	NA	< 0.10	NA	60%	140%	NA	60%	140%	NA	60%	140%
Aroclor 1254	7191037		< 0.10	< 0.10	NA	< 0.10	NA	60%	140%	NA	60%	140%	NA	60%	140%
Aroclor 1260	7191037		< 0.10	< 0.10	NA	< 0.10	NA	60%	140%	NA	60%	140%	NA	60%	140%
Polychlorinated Biphenyls	7191037		< 0.10	< 0.10	NA	< 0.10	99%	60%	140%	86%	60%	140%	91%	60%	140%
O. Reg. 153(511) - PHCs F1 - F4 (Soil) F2-F4															
F2 (C10 to C16)	7195152		< 10	< 10	NA	< 10	94%	60%	130%	90%	80%	120%	74%	70%	130%
F3 (C16 to C34)	7195152		< 50	< 50	NA	< 50	94%	60%	130%	87%	80%	120%	98%	70%	130%
F4 (C34 to C50)	7195152		< 50	< 50	NA	< 50	82%	60%	130%	85%	80%	120%	107%	70%	130%
O. Reg. 153(511) - BNA (full) + PAHs (Soil) - Cresol															
o-Cresol	7200140		< 0.1	< 0.1	NA	< 0.1	84%	50%	140%	79%	50%	140%	69%	50%	140%
m & p - Cresol	7200140		< 0.2	< 0.2	NA	< 0.2	77%	50%	140%	85%	50%	140%	51%	50%	140%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable(NA).

Certified By:

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Method Summary

CLIENT NAME: TERRAPROBE INC.

PROJECT: 33-15-2100

SAMPLING SITE:

AGAT WORK ORDER: 15T042713

ATTENTION TO: Kimberly Pickett

SAMPLED BY:BH

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Arsenic	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Barium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Beryllium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron (Hot Water Soluble)	MET-93-6104	EPA SW 846 6010C; MSA, Part 3, Ch.21	ICP/OES
Cadmium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Copper	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Lead	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Molybdenum	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Nickel	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Selenium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Silver	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Thallium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Uranium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Vanadium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Zinc	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium VI	INOR-93-6029	SM 3500 B; MSA Part 3, Ch. 25	SPECTROPHOTOMETER
Cyanide	INOR-93-6052	MOE CN-3015 & E 3009 A;SM 4500 CN	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Electrical Conductivity	INOR-93-6036	McKeague 4.12, SM 2510 B	EC METER
Sodium Adsorption Ratio	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010B	ICP/OES
pH, 2:1 CaCl2 Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	PH METER

AGAT Laboratories

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Method Summary

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SAMPLING SITE:

AGAT WORK ORDER: 15T042713

ATTENTION TO: Kimberly Pickett

SAMPLED BY:BH

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
o-Cresol	ORG-91-5114	EPA SW-846 3541 & 8270C	GC/MS
m & p - Cresol	ORG-91-5114	EPA SW-846 3541 & 8270C	GC/MS
Moisture Content		MOE E3139	BALANCE
2,4,6-Tribromophenol	ORG-91-5114	EPA SW-846 3541 & 8270C	GC/MS
Chrysene-d12	ORG-91-5114	EPA SW-846 3541 & 8270C	GC/MS
Gamma-Hexachlorocyclohexane	ORG-91-5113	EPA SW-846 3541, 3620,8081	GC/ECD
Heptachlor	ORG-91-5113	EPA SW-846 3541, 3620,8081	GC/ECD
Aldrin	ORG-91-5113	EPA SW-846 3541, 3620,8081	GC/ECD
Heptachlor Epoxide	ORG-91-5113	EPA SW-846 3541, 3620,8081	GC/ECD
Endosulfan	ORG-91-5113	EPA SW-846 3541, 3620,8081	GC/ECD
Chlordane	ORG-91-5113	EPA SW-846 3541, 3620,8081	GC/ECD
DDD	ORG-91-5113	EPA SW-846 3541, 3620,8081	GC/ECD
DDE	ORG-91-5113	EPA SW-846 3541, 3620,8081	GC/ECD
DDT	ORG-91-5113	EPA SW-846 3541, 3620,8081	GC/ECD
Dieldrin	ORG-91-5113	EPA SW-846 3541, 3620,8081	GC/ECD
Endrin	ORG-91-5113	EPA SW-846 3541, 3620,8081	GC/ECD
Methoxychlor	ORG-91-5113	EPA SW-846 3541, 3620,8081	GC/ECD
Hexachlorobenzene	ORG-91-5113	EPA SW-846 3541, 3620,8081	GC/ECD
Hexachlorobutadiene	ORG-91-5113	EPA SW-846 3541, 3620,8081	GC/ECD
Hexachloroethane	ORG-91-5113	EPA SW-846 3541, 3620,8081	GC/ECD
Aroclor 1242	ORG-91-5113	EPA SW-846 3541, 3620 & 8082	GC/ECD
Aroclor 1248	ORG-91-5113	EPA SW-846 3541, 3620 & 8082	GC/ECD
Aroclor 1254	ORG-91-5113	EPA SW-846 3541, 3620 & 8082	GC/ECD
Aroclor 1260	ORG-91-5113	EPA SW-846 3541, 3620 & 8082	GC/ECD
Polychlorinated Biphenyls	ORG-91-5113	EPA SW-846 3541, 3620 & 8082	GC/ECD
TCMX	ORG-91-5112	EPA SW-846 3541, 3620,8081	GC/ECD
Decachlorobiphenyl	ORG-91-5113	EPA SW-846 3541, 3620,8081	GC/ECD
F2 (C10 to C16)	VOL-91-5009	CCME Tier 1 Method, EPA SW846 8015	GC / FID
F3 (C16 to C34)	VOL-91-5009	CCME Tier 1 Method, EPA SW846 8015	GC / FID
F4 (C34 to C50)	VOL-91-5009	CCME Tier 1 Method, EPA SW846 8015	GC / FID
Gravimetric Heavy Hydrocarbons	VOL-91-5009	CCME Tier 1 Method	BALANCE
Moisture Content	VOL-91-5009	CCME Tier 1 Method	BALANCE
Terphenyl	VOL-91-5009		GC/FID

AGAT Laboratories

5835 Coopers Avenue
Mississauga, ON
L4Z 1Y2
www.agatlabs.com · webearth.agatlabs.com
P: 905.712.5100 · F: 905.712.5122 · TF: 800.856.6261

Chain of Custody Record

Client Information

Company: ~~AGAT~~ Terraprobe
Contact: Kim Pickett
Address: 220 Bayview Dr
Barrie, ON
Phone: (705) 739 8355 Fax:
Project: 315 2100 PO:
AGAT Quotation #:

Please note, if quotation number is not provided, client will be billed full price for analysis.

Regulatory Requirements

- [x] Regulation 153/04 (reg. 511 Amend.)
  - Table 1 (Indicate one)
  - [ ] Ind/Com
  - [x] Res/Park
  - [ ] Agriculture
  - Soil Texture (check one): [x] Coarse [ ] Fine
- [ ] Sewer Use
  - Region (Indicate one)
  - [ ] Sanitary
  - [ ] Storm
- [ ] Regulation 558
- [ ] CCME
- [ ] Other (specify)
- [ ] Prov. Water Quality Objectives (PWQO)
- [ ] None

Laboratory Use Only

Arrival Temperature: 4.6 - 4.4 - 4.2
AGAT WO #:
Lab Temperature: 3.5 - 3.2 - 3
Notes: 1ST042713

Turnaround Time Required (TAT) Required*

Regular TAT

- [x] 5 to 7 Working Days

Rush TAT (please provide prior notification)

Rush Surcharges Apply

- [ ] 3 Working Days
- [ ] 2 Working Days
- [ ] 1 Working Day

OR

Date Required (Rush surcharges may apply):

*TAT is exclusive of weekends and statutory holidays

Invoice To

Same: Yes [ ] No [ ]

Company:
Contact:
Address:

Is this a drinking water sample? (potable water intended for human consumption) [ ] Yes [ ] No

If "Yes", please use the *Drinking Water Chain of Custody Form*

Is this submission for a **Record of Site Condition**? [ ] Yes [ ] No

Legend Matrix

GW Ground Water | O Oil
SW Surface Water | P Paint
SD Sediment | S Soil

Report Information – reports to be sent to:

1. Name: Kim Pickett
   Email: kpickett@terraprobe.ca
2. Name:
   Email:

Sample Identification	Date Sampled	Time Sampled	Sample Matrix	# of Containers	Comments Site/Sample Information	Metals and Inorganics	Metal Scan	Hydride Forming Metals	Client Custom Metals	ORPs: ☐ B-HWS ☐ Cl- ☐ CN- ☐ EC ☐ FOC ☐ Cr+6- ☐ SAR ☐ NO_3/NO_2 ☐ N- Total ☐ Hg ☐ pH	Nutrients: ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_3/NO_2	VOC: ☐ VOC ☐ THM ☐ BTEX	CCME Fractions 2 to 4	ABNs	PAHs	Chlorophenols	PCBs	Organochlorine Pesticides	TCLP Metals/Inorganics	Sewer Use	Cresol
Topsoil 1 (S1)	Nov. 13	AM	S	1													✓	✓		
Topsoil 2 (S2)	"	"	S	1													✓	✓		
Railway (S3)	"	"	S	1										✓						
Oilstain (S4)	"	"	S	1										✓						✓
Below Stain (S5)	"	"	S	1										✓						

Samples Relinquished By (Print Name and Sign): Boxing Huang
Date/Time: Nov 13/15
Samples Received By (Print Name and Sign): NOV 16/2015
Date/Time: 9:30
Samples Relinquished By (Print Name and Sign):
Date/Time: 2015-11-16 10:43
Samples Received By (Print Name and Sign):
Date/Time:

Pink Copy - Client
Yellow Copy - AGAT
White Copy - AGAT

Page _____ of _____
N°: 195679

Terraprobe
Consulting Geotechnical & Environmental Engineering
Construction Materials Inspection & Testing

June 25, 2018 Our File No. 33-15-2100

FarSight Homes
117 Ringwood Drive, Unit 18
Stouffville, ON
L4A 8C1

Attention: Mr. Robert Schickedanz Email: bobs@farsight.ca

**RE: ASSESSMENT OF GROUNDWATER LEVELS
FEBRUARY 2016 TO JUNE 2018 MONITORING
PROPOSED RESIDENTIAL DEVELOPMENT
BARZO & R&M HOMES SITES
EVERETT, ONTARIO**

Dear Sir;

Further to our geotechnical investigation report being prepared for the above property, Terraprobe was authorized by Mr. Robert Schickedanz to visit the above site periodically beginning in February 2016 in order to assess anticipated fluctuations in the groundwater level.

The attached graphs and tabulated data summarize our measured water levels in the previously installed piezometers through these periods to the present date. Test hole location plans are also attached indicating standpipe piezometer locations.

The most recent visit to the site (June 14, 2018) generally indicated groundwater levels falling following a period of rising levels through the spring. Groundwater levels were generally measured to be at their lowest stable elevation in December 2016 and September 2017 as shown on the attached graphs. Peak levels recorded to date were measured in April/May 2016, May 2017 and February to June 2018.

The peak groundwater levels recorded in the spring seasons of 2016, 2017 and 2018 may not represent the highest levels to be expected. However, based on the monitoring data, these levels represent suitable seasonal peak levels to consider for design purposes.

Water levels during the peak events were encountered within 1.1 to 3.1m of the existing ground surface.

Further to your earlier direction, unless otherwise instructed, Terraprobe will discontinue with groundwater level monitoring as of this date.

We trust that the above information and attachments are sufficient for your present requirements. If you should have any questions, or if we can be of further assistance, please do not hesitate to contact the undersigned.

Sincerely,
Terraprobe Inc.

Blair E. Goss, P. Eng.
Associate

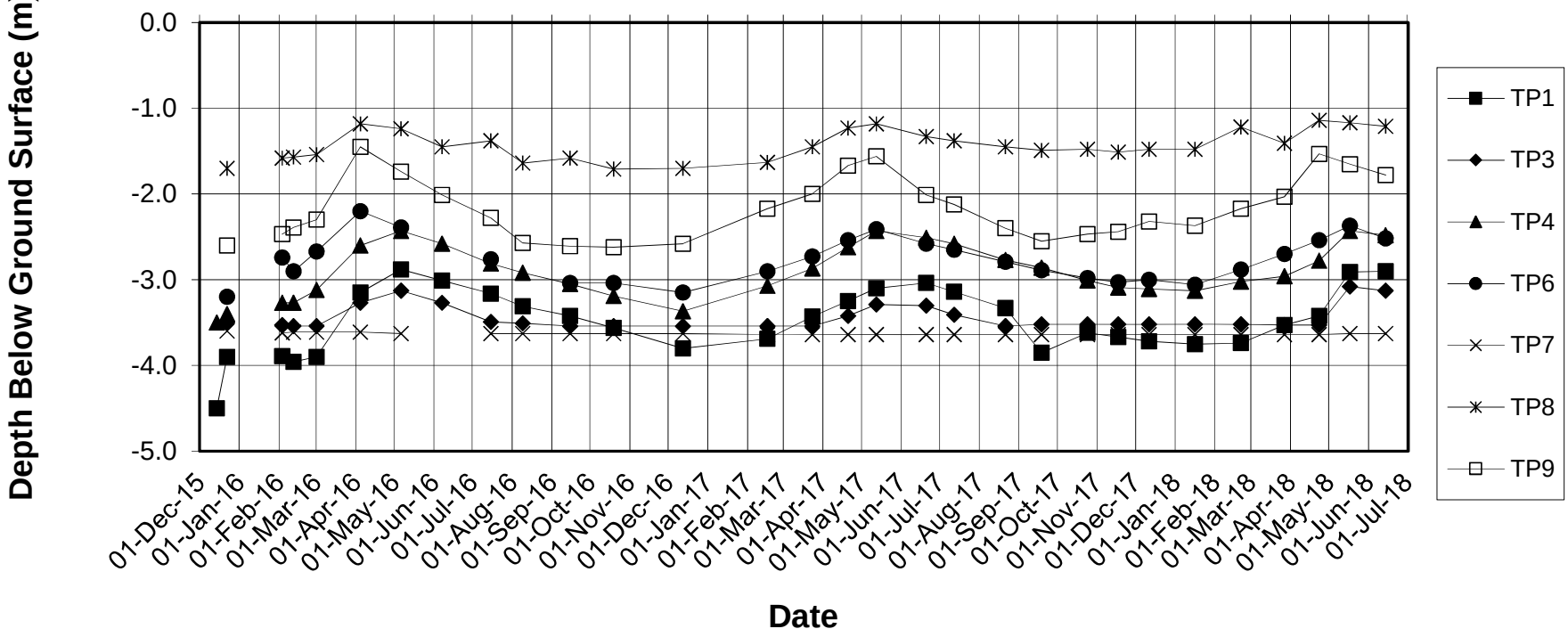
Attached: Static Water Level Monitoring Graphs and Data Table
Test Pit Table & Borehole Logs
Figures

Terraprobe -- 33-15-2100
Farsight Homes North (Barzo) Development, Everett

Monitoring/ Test Pit Location	Ground Surface Elevation (m)	Static Water Level Depth Below Existing Ground Surface (m)																														
		14-Dec-15	22-Dec-15	3-Feb-16	12-Feb-16	1-Mar-16	4-Apr-16	6-May-16	7-Jun-16	15-Jul-16	9-Aug-16	15-Sep-16	19-Oct-16	12-Dec-16	16-Feb-17	23-Mar-17	20-Apr-17	12-May-17	20-Jun-17	12-Jul-17	21-Aug-17	18-Sep-17	24-Oct-17	17-Nov-17	11-Dec-17	16-Jan-18	21-Feb-18	27-Mar-18	23-Apr-18	17-May-18	14-Jun-18	
TP1	241.2	-4.5	-3.9	-3.9	-4.0	-3.9	-3.2	-2.9	-3.0	-3.2	-3.3	-3.4	-3.6	-3.8	-3.7	-3.4	-3.3	-3.1	-3.0	-3.1	-3.3	-3.9	-3.6	-3.7	-3.7	-3.8	-3.7	-3.5	-3.4	-2.9	-2.9	
TP3	240.9		-3.5	-3.5	-3.5	-3.5	-3.3	-3.1	-3.3	-3.5	-3.5	-3.5	-3.5	-3.5	-3.5	-3.5	-3.4	-3.3	-3.3	-3.4	-3.5	-3.5	-3.5	-3.5	-3.5	-3.5	-3.5	-3.5	-3.5	-3.1	-3.1	
TP4	240.1	-3.5	-3.4	-3.3	-3.3	-3.1	-2.6	-2.4	-2.6	-2.8	-2.9	-3.1	-3.2	-3.4	-3.1	-2.9	-2.6	-2.4	-2.5	-2.6	-2.8	-2.9	-3.0	-3.1	-3.1	-3.1	-3.0	-3.0	-2.8	-2.4	-2.5	
TP6	240.1		-3.2	-2.7	-2.9	-2.7	-2.2	-2.4		-2.8		-3.0	-3.0	-3.2	-2.9	-2.7	-2.5	-2.4	-2.6	-2.7	-2.8	-2.9	-3.0	-3.0	-3.0	-3.1	-2.9	-2.7	-2.5	-2.4	-2.5	
TP7	239.6		-3.6	-3.6	-3.6	-3.6	-3.6	-3.6		-3.6	-3.6	-3.6	-3.6	-3.6	-3.6	-3.6	-3.6	-3.6	-3.6	-3.6	-3.6	-3.6	-3.6	-3.6	-3.6	-3.6	-3.6	-3.6	-3.6	-3.6	-3.6	
TP8	237.1		-1.7	-1.6	-1.6	-1.5	-1.2	-1.2	-1.5	-1.4	-1.6	-1.6	-1.7	-1.7	-1.6	-1.5	-1.2	-1.2	-1.3	-1.4	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.2	-1.4	-1.1	-1.2	-1.2	
TP9	237.6		-2.6	-2.5	-2.4	-2.3	-1.5	-1.7	-2.0	-2.3	-2.6	-2.6	-2.6	-2.6	-2.2	-2.0	-1.7	-1.6	-2.0	-2.1	-2.4	-2.6	-2.5	-2.4	-2.3	-2.4	-2.2	-2.0	-1.5	-1.7	-1.8	
		noted		3,7 Dry	1,3,7 Dry	3,7 Dry	7 Dry	7 Dry		7 Dry	3,7 Dry	3,7 Dry	3,7,9 Dry	3,6,7 Dry	3,7 Dry	3,7 Dry	7 Dry	7 Dry	7 Dry	7 Dry	3,7 Dry	3,7 Dry	3,7 Dry	3,7 Dry	3,7 Dry	3,7 Dry	3,7 Dry	3,7 Dry	3,7 Dry	3,7 Dry	7 Dry	7 Dry	

Monitoring/ Test Pit Location	Ground Surface Elevation (m)	Static Water Level Elevation (m)																														
		14-Dec-15	22-Dec-15	3-Feb-16	12-Feb-16	1-Mar-16	4-Apr-16	6-May-16	7-Jun-16	15-Jul-16	9-Aug-16	15-Sep-16	19-Oct-16	12-Dec-16	16-Feb-17	23-Mar-17	20-Apr-17	12-May-17	20-Jun-17	12-Jul-17	21-Aug-17	18-Sep-17	24-Oct-17	17-Nov-17	11-Dec-17	16-Jan-18	21-Feb-18	27-Mar-18	23-Apr-18	17-May-18	14-Jun-18	
TP1	241.2	236.7	237.3	237.4	237.3	237.3	238.1	238.4	238.2	238.1	237.9	237.8	237.7	237.4	237.6	237.8	238.0	238.1	238.2	238.1	237.9	237.4	237.6	237.6	237.5	237.5	237.5	237.7	237.8	238.3	238.3	
TP3	240.9		237.4	237.4	237.4	237.4	237.6	237.8	237.6	237.4	237.4	237.4	237.4	237.4	237.4	237.4	237.5	237.6	237.6	237.5	237.4	237.4	237.4	237.4	237.4	237.4	237.4	237.4	237.4	237.8	237.8	
TP4	240.1	236.6	236.7	236.8	236.8	237.0	237.5	237.7	237.5	237.3	237.2	237.0	236.9	236.7	237.0	237.2	237.5	237.7	237.6	237.5	237.3	237.2	237.1	237.0	237.0	237.0	237.1	237.1	237.3	237.7	237.6	
TP6	240.1		236.9	237.4	237.2	237.4	237.9	237.7		237.3		237.1	237.1	237.0	237.2	237.4	237.6	237.7	237.5	237.5	237.3	237.2	237.1	237.1	237.1	237.0	237.2	237.4	237.6	237.7	237.6	
TP7	239.6		236.0	235.9	236.0	236.0	236.0	235.9		235.9	235.9	235.9	235.9	235.9	235.9	235.9	235.9	235.9	235.9	235.9	235.9	235.9	235.9	235.9	235.9	235.9	235.9	235.9	235.9	235.9	235.9	
TP8	237.1		235.4	235.6	235.6	235.6	236.0	235.9	235.7	235.8	235.5	235.6	235.4	235.4	235.5	235.7	235.9	236.0	235.8	235.8	235.7	235.6	235.7	235.6	235.7	235.7	235.9	235.7	236.0	236.0	235.9	
TP9	237.6		235.0	235.1	235.2	235.3	236.1	235.8	235.6	235.3	235.0	235.0	235.0	235.0	235.4	235.6	235.9	236.0	235.6	235.5	235.2	235.0	235.1	235.1	235.3	235.2	235.4	235.5	236.0	235.9	235.8	
		noted		3,7 Dry	1,3,7 Dry	3,7 Dry	7 Dry	7 Dry		7 Dry	3,7 Dry	3,7 Dry	3,7,9 Dry	3,6,7 Dry	3,7 Dry	3,7 Dry	7 Dry	7 Dry	7 Dry	7 Dry	3,7 Dry	3,7 Dry	3,7 Dry	3,7 Dry	3,7 Dry	3,7 Dry	3,7 Dry	3,7 Dry	3,7 Dry	3,7 Dry	7 Dry	7 Dry	

Static Water Level Monitoring -- December 2015 to Present
Farsight North (Barzo) Residential Development -- Everett
Terraprobe -- 33-15-2100



Static Water Level Monitoring -- December 2015 to Present
Farsight North (Barzo) Residential Development -- Everett
Terraprobe -- 33-15-2100

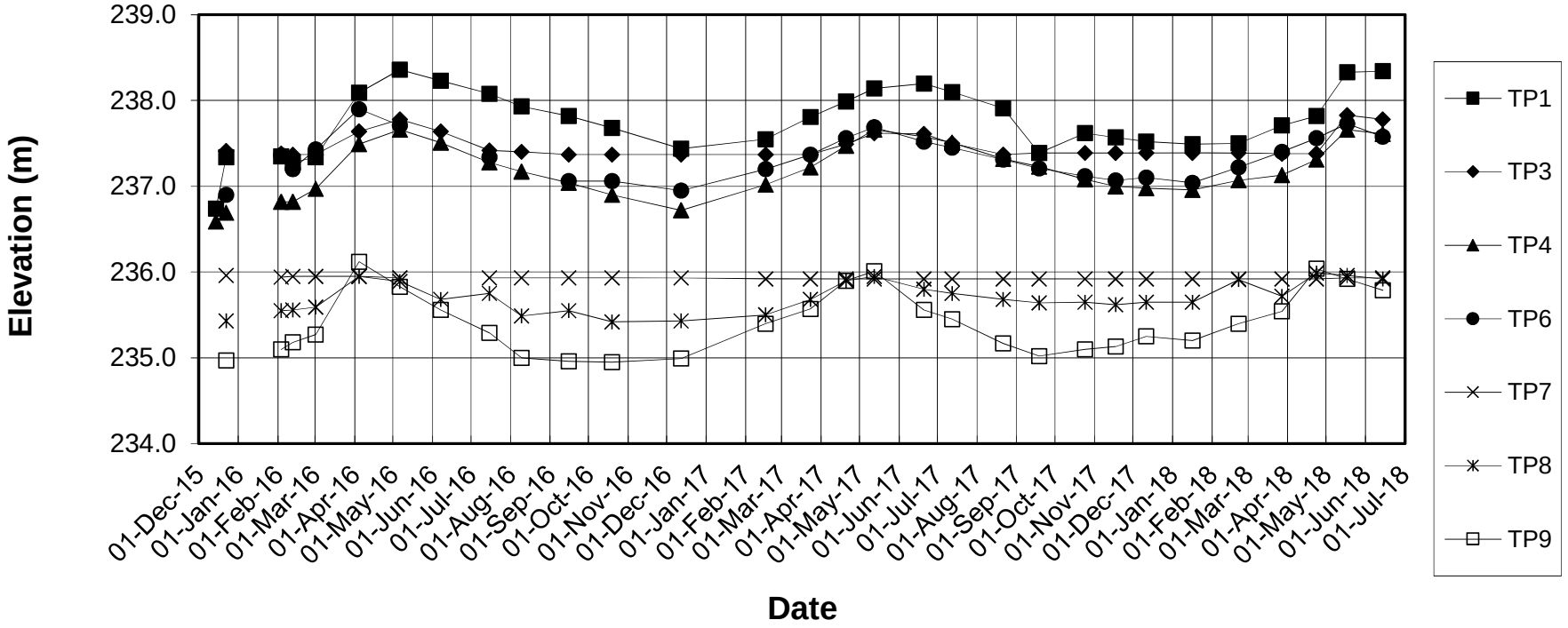


Table 1
Summary of Test Pits
6385 County Road 13, Adjala Tosorontio
(Excavated December, 2015)

Test Pit Number	Depth (m)	Soil Description	Samples		Comments
			Depth (m)	Moisture (%)	
1	0 - 0.3	Sandy topsoil layer			
	0.3 - 1.0	brown, damp, sand trace silt	1.2		water seepage from bottom of test pit at 4.5 m, no caving
	1.0 - 1.9	brown, damp, sand, trace gravel		N/A	install standpipe 1m screen
	1.9 - 4.0	brown, damp, fine sand, trace gravel	2.1		water level on December 22, 2015 measured at 3.9m.
	4.0 - 4.5	brown, wet, sand	4.3		
2	0.0 - 0.4	Sandy topsoil layer			
	0.4 - 1.1	Brown, damp, sand, some silt	0.7		no caving and water seepage
	1.1 - 2.5	Brown, damp, sand, trace silt, trace gravel, compact below 1.2m	1.5	N/A	
	2.5 - 3.3	Brown, damp, sand, some silt, trace gravel	2.7		
	3.3 - 4.5	Brown, damp, fine sand, trace gravel	4.0		
3	0.0 - 0.3	Sandy topsoil layer		N/A	
	0.3 - 1.1	brown, damp, sand, trace silt	1.0		no water seepage and caving
	1.1 - 2.2	brown, damp, sand, trace silt, trace gravel, compact to dense below 1.2 m	1.8		install standpipe 1m screen
	2.2 - 3.1	brown, damp, sand, fine	2.6		water level on December 22, 2015 measured dry to 3.5m.
	3.1 - 4.0	brown, damp to moist, fine sand, trace silt	4.0		

Table 1
Summary of Test Pits
6385 County Road 13, Adjala Tosorontio
(Excavated December, 2015)

Test Pit Number	Depth (m)	Soil Description	Samples		Comments
			Depth (m)	Moisture (%)	
4	0.0 - 0.3	Sandy topsoil		N/A	
	0.3 - 1.2	Brown, damp, sand, trace silt	0.5		water seepage bottom of test pit caving below 1.3 m
	1.2 - 1.6	Brown, damp, gravelly sand	1.3		install standpipe (1m screen)
	1.6 - 2.9	Brown, damp, fine sand, trace silt	2.0		water level on December 22, 2015 measured at 3.4m.
	2.9 - 3.5	Brown, wet, sand, trace silt	3.0		
5	0.0 - 0.2	Sandy topsoil layer		N/A	open and dry
	0.2 - 0.8	Brown, damp, sand, some silt, compact			
	0.8 - 2.0	Brown, damp, sand, trace silt, dense below 1.4m	1.0m		
	2.0 - 3.7	Brown, damp, fine sand, trace gravel	2.3m		
	3.7 - 4.5	Brown, damp, sand, some gravel	4.0m		
6	0.0 - 0.3	Sandy topsoil layer		N/A	no caving and water seepage
	0.3 - 1.2	Brown, damp, silty sand, trace gravel			install standpipe 1m screen
	1.2 - 3.8	Brown, damp, silty sand, trace gravel, compact	1.6 3.0		water level on December 22, 2015 measured dry to 3.2m.
	3.8 - 4.2	Brown, moist to wet, silty sand	4.0		

Table 1
Summary of Test Pits
6385 County Road 13, Adjala Tosorontio
(Excavated December, 2015)

Test Pit Number	Depth (m)	Soil Description	Samples		Comments
			Depth (m)	Moisture (%)	
7	0.0 - 0.2	Sandy topsoil layer		N/A	
	0.2 - 1.0	Brown, damp, silty sand	0.6		no caving and water seepage
	1.0 - 2.2	Brown, damp, sand, trace silt, loose to compact below 1.3m	1.7		install standpipe 1m screen
	2.2 - 4.0	Brown, damp, fine sand	3.5		water level on December 22, 2015 measured at 3.6m.
8	0.0 - 0.2	Sandy topsoil layer		N/A	caving below 2m
	0.2 - 1.4	Brown, damp, sand, some silt, loose to compact below 1.3m	1.0		install standpipe 1m screen
	1.4 - 2.6	Brown, moist to wet, sand, some silt	1.6 2.5		water level on December 22, 2015 measured at 1.7m.
9	0.0 - 0.3	Sandy topsoil layer		N/A	caving below 1.0m
	0.3 - 1.0	Brown, damp, sand, trace silt, loose	0.5		install standpipe 1m screen
	1.0 -1.9	Brown, damp, sand, trace gravel, loose to compact below 1.5m	1.2		water level on December 22, 2015 measured at 2.6m.
	1.9 - 2.7	Brown, wet, sand (fine), trace to some silt	2.3		

Terraprobe

LOG OF BOREHOLE ..1..

PROJECT NAME: Everett Subdivision
PROJECT No.: 3-10-6158
CLIENT: R&M Homes
BORING DATE: January 7, 2011
LOCATION: Everett, Ontario
ELEVATION DATUM: Geodetic

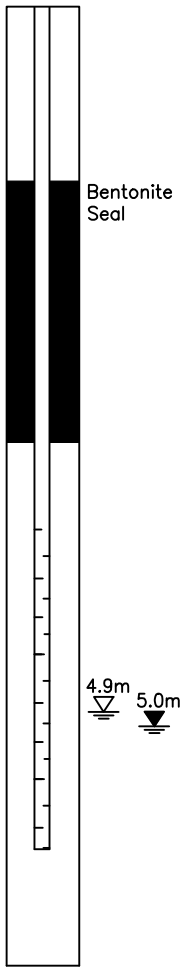
BORING METHOD: CME45 Crawler-mounted Drill Rig / Solid Stem Augers

DEPTH SCALE IN METRES	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	"N" VALUE
	GROUND SURFACE		244.4			
0	150mm – Sandy Topsoil		0.0			
	Orange to Brown; Loose to Compact; Moist to Wet			1	SS	7
1	SAND, fine, trace to some silt, trace gravel			2	SS	7
2				3	SS	20
				4	SS	14
3				5	SS	27
4						
				6	SS	28
5						
6				7	SS	27
			237.8			
7	End of Borehole		6.6			
8						
9						

PENETRATION RESISTANCE PLOT
20 40 60 80
SHEAR STRENGTH kPa
nat.V – + Q – ●
rem.V – ⊕ U – ○
20 40 60 80

WATER CONTENT (%)
wP w wL
10 20 30

INSTALLATION INFORMATION



1. Borehole caved at 5.5m upon completion of drilling.

2. Water level noted at 4.9m during drilling.

3. Water level on January 19, 2011 measured at 5.0m (elev. 239.4m).

Terraprobe

LOG OF BOREHOLE ..2..

PROJECT NAME: Everett Subdivision
PROJECT No.: 3-10-6158
CLIENT: R&M Homes
BORING DATE: January 7, 2011
LOCATION: Everett, Ontario
ELEVATION DATUM: Geodetic

BORING METHOD: CME45 Crawler-mounted Drill Rig / Solid Stem Augers

DEPTH SCALE IN METRES	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	"N" VALUE
	GROUND SURFACE		243.7			
0	Orange to Brown, Compact to Dense, Moist to Wet		0.0	1	SS	6
1	SAND, fine, trace to some silt, trace gravel			2	SS	16
2				3	SS	33
3				4	SS	28
4				5	SS	43
5				6	SS	46
6	Brown, Dense, Wet SILTY SAND		238.1 5.6 237.1	7	SS	50
7	End of Borehole		6.6			
8						
9						

PENETRATION RESISTANCE PLOT
SHEAR STRENGTH kPa
nat.V – + Q – ●
rem.V – ⊕ U – ○
20 40 60 80

WATER CONTENT (%)
wP w wL
10 20 30

INSTALLATION INFORMATION

1. Borehole remained open upon completion of drilling.

2. Water level noted at 4.9m during drilling.

3. Water level on January 19, 2011 measured at 5.5m (elev. 238.2m).

Terraprobe

LOG OF BOREHOLE ..3..

PROJECT NAME: Everett Subdivision
PROJECT No.: 3-10-6158
CLIENT: R&M Homes
BORING DATE: January 7, 2011
LOCATION: Everett, Ontario
ELEVATION DATUM: Geodetic

BORING METHOD: CME45 Crawler-mounted Drill Rig / Solid Stem Augers

DEPTH SCALE IN METRES	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUE	PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (nat.V – +, rem.V – ⊕, Q – ●, U – ○)	WATER CONTENT (%) (WP, W, WL)	INSTALLATION INFORMATION
0	GROUND SURFACE		242.9						
0	Orange to Brown, Compact to Dense, Moist to Wet		0.0	1	SS	6	x	○	
1	SAND, fine, trace to some silt, trace gravel			2	SS	24	x	○	
2				3	SS	49	x	○	
3				4	SS	69	x	○	
4				5	SS	79	x	○	
5				6	SS	62	x	○	
6				7	SS	76	x	○	
			236.3						
	End of Borehole		6.6						
7									
8									
9									

Bentonite Seal

4.0m

4.3m

1. Borehole caved at 5.5m upon completion of drilling.

2. Water level noted at 4.3m during drilling.

3. Water level on January 19, 2011 measured at 4.0m (elev. 238.9m).

Terraprobe

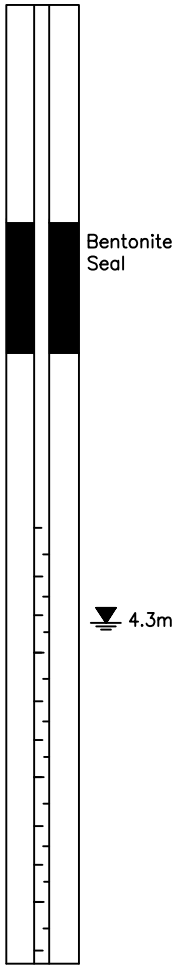
LOG OF BOREHOLE ..4..

PROJECT NAME: Everett Subdivision
PROJECT No.: 3-10-6158
CLIENT: R&M Homes
BORING DATE: January 7, 2011
LOCATION: Everett, Ontario
ELEVATION DATUM: Geodetic

BORING METHOD: CME45 Crawler-mounted Drill Rig / Solid Stem Augers

DEPTH SCALE IN METRES	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	"N" VALUE	PENETRATION RESISTANCE PLOT (20 40 60 80) / SHEAR STRENGTH kPa (nat.V, rem.V, Q, U) (20 40 60 80)	WATER CONTENT (%) (wP, w, wL) (10 20 30)
0	GROUND SURFACE		242.2					
	Orange to Brown Compact to Very Dense Moist to Wet		0.0	1	SS	9	x	o
1	SAND, fine, trace to some silt, trace gravel			2	SS	14	x	o
				3	SS	49	x	o
2				4	SS	27	x	o
3				5	SS	63	x	o
4								
				6	SS	38	x	o
5								
6			235.6	7	SS	17	x	o
	End of Borehole		6.6					
7								
8								
9								

INSTALLATION INFORMATION



1. Borehole caved at 4.5m upon completion of drilling.

2. Water level noted at 4.3m during drilling.

3. Water level on January 19, 2011 measured at 4.3m (elev. 237.9m).

Terraprobe

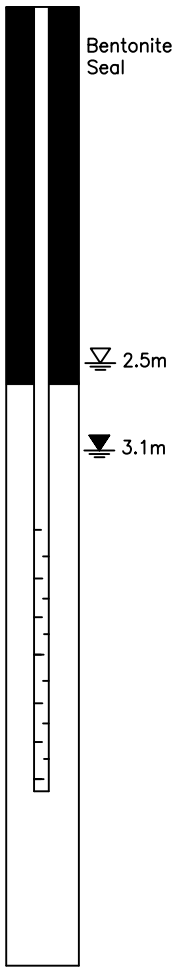
LOG OF BOREHOLE ..5..

PROJECT NAME: Everett Subdivision
PROJECT No.: 3-10-6158
CLIENT: R&M Homes
BORING DATE: January 7, 2011
LOCATION: Everett, Ontario
ELEVATION DATUM: Geodetic

BORING METHOD: CME45 Crawler-mounted Drill Rig / Solid Stem Augers

DEPTH SCALE IN METRES	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	"N" VALUE	PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (nat.V +, rem.V ⊕, Q ●, U ○)	WATER CONTENT (%) (wP, w, wL)
	GROUND SURFACE		241.1					
0	Orange to Brown, Loose to Dense, Moist to Wet		0.0	1	SS	4		
1	SAND, fine, trace to some silt, trace gravel, silty sand layer/seam at 2.5m			2	SS	8		
2				3	SS	42		
3				4	SS	23		
4				5	SS	31		
5				6	SS	26		
6				7	SS	13		
			234.5					
7	End of Borehole		6.6					
8								
9								

INSTALLATION INFORMATION



1. Borehole caved at 2.5m upon completion of drilling.

2. Water level noted at 2.5m during drilling.

3. Water level on January 19, 2011 measured at 3.1m (elev. 238.0m).

Terraprobe

LOG OF BOREHOLE ..6..

PROJECT NAME: Everett Subdivision
PROJECT No.: 3-10-6158
CLIENT: R&M Homes
BORING DATE: January 10, 2011
LOCATION: Everett, Ontario
ELEVATION DATUM: Geodetic

BORING METHOD: CME45 Crawler-mounted Drill Rig / Solid Stem Augers

DEPTH SCALE IN METRES	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUE	PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (nat.V, rem.V, Q, U)	WATER CONTENT (%) (WP, W, WL)	INSTALLATION INFORMATION
	GROUND SURFACE		240.8						
0	Orange to Brown; Compact to Dense; Moist to Wet		0.0	1	SS	5	x	○	Bentonite Seal
1	SAND, fine, trace to some silt, trace gravel			2	SS	12	x	○	
2				3	SS	26	x	○	
3				4	SS	22	x	○	▽ 3.3m ▼ 3.5m
4				5	SS	45	x	○	
5				6	SS	25	x	○	
6				7	SS	19	x	○	
7			234.2						
8	End of Borehole		6.6						
9									

1. Borehole caved at 3.3m upon completion of drilling.

2. Water level noted at 3.3m during drilling.

3. Water level on January 19, 2011 measured at 3.5m (elev. 237.3m).

Terraprobe

LOG OF BOREHOLE ..7..

PROJECT NAME: Everett Subdivision
PROJECT No.: 3-10-6158
CLIENT: R & M Homes
BORING DATE: January 11, 2011
LOCATION: Everett, Ontario
ELEVATION DATUM: Geodetic

BORING METHOD: CME45 Crawler-mounted Drill Rig / Solid Stem Augers

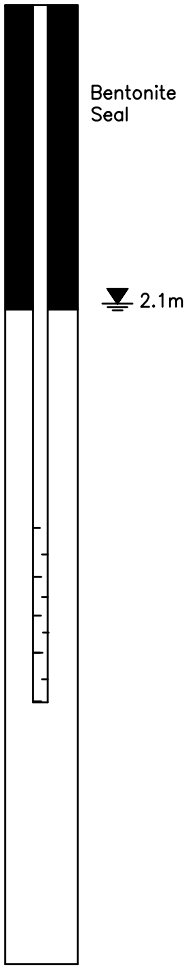
DEPTH SCALE IN METRES

DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	"N" VALUE
GROUND SURFACE		239.0			
Brown Loose to Compact Moist to Wet		0.0	1	SS	11
SAND, fine, trace to some silt, trace gravel			2	SS	8
			3	SS	8
			4	SS	22
			5	SS	22
			6	SS	12
			7	SS	13
		232.4			
End of Borehole		6.6			

PENETRATION RESISTANCE PLOT
20 40 60 80
SHEAR STRENGTH kPa
nat.V – + Q – ●
rem.V – ⊕ U – ○
20 40 60 80

WATER CONTENT (%)
wP w wL
10 20 30

INSTALLATION INFORMATION



1. Borehole caved at 2.1m upon completion of drilling.

2. Water level noted at 2.1m during drilling.

3. Water level on January 19, 2011 measured at 2.1m (elev. 236.9m).

Terraprobe

LOG OF BOREHOLE ..8..

PROJECT NAME: Everett Subdivision
PROJECT No.: 3-10-6158
CLIENT: R & M Homes
BORING DATE: January 11, 2011
LOCATION: Everett, Ontario
ELEVATION DATUM: Geodetic

BORING METHOD: CME45 Crawler-mounted Drill Rig / Solid Stem Augers

DEPTH SCALE IN METRES	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUE	PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (nat.V +, rem.V ⊕, Q ●, U ○)	WATER CONTENT (%) (WP, W, WL)	INSTALLATION INFORMATION
0	GROUND SURFACE		239.6						
	400mm – Sandy Topsoil		0.0						
	Orange to Brown; Dense to Compact; Moist to Wet			1	SS	25			
1	SAND, fine, trace to some silt, trace gravel			2	SS	39			
2				3	SS	16			
				4	SS	22			
3				5	SS	22			
4									
5				6	SS	13			
6				7	SS	14			
			233.0						
7	End of Borehole		6.6						1. Borehole caved at 2.7m upon completion of drilling. 2. Water level noted at 2.5m during drilling.
8									
9									

Terraprobe

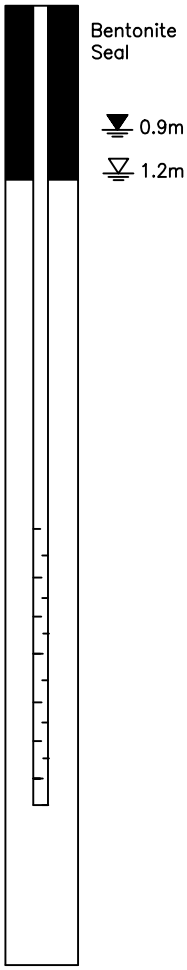
LOG OF BOREHOLE ..9..

PROJECT NAME: Everett Subdivision
PROJECT No.: 3-10-6158
CLIENT: R & M Homes
BORING DATE: January 11, 2011
LOCATION: Everett, Ontario
ELEVATION DATUM: Geodetic

BORING METHOD: CME45 Crawler-mounted Drill Rig / Solid Stem Augers

DEPTH SCALE IN METRES	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	"N" VALUE	PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (nat.V +, rem.V ⊕, Q ●, U ○)	WATER CONTENT (%) (WP, W, WL)
	GROUND SURFACE		237.6					
0	150mm - Sandy Topsoil		0.0					
	Orange to Brown, Compact to Wet			1	SS	7	x	
1	SAND, fine, trace to some silt, trace gravel			2	SS	19	x	
2				3	SS	27	x	
				4	SS	26	x	
3				5	SS	13	x	
4								
				6	SS	12	x	
5								
6				7	SS	20	x	
			231.0					
	End of Borehole		6.6					
7								
8								
9								

INSTALLATION INFORMATION



1. Borehole caved at 1.2m upon completion of drilling.

2. Water level noted at 1.2m during drilling.

3. Water level on January 19, 2011 measured at 0.9m (elev. 236.7m).

Terraprobe

LOG OF BOREHOLE ..10..

PROJECT NAME: Everett Subdivision
PROJECT No.: 3-10-6158
CLIENT: R & M Homes
BORING DATE: January 11, 2011
LOCATION: Everett, Ontario
ELEVATION DATUM: Geodetic

BORING METHOD: CME45 Crawler-mounted Drill Rig / Solid Stem Augers

DEPTH SCALE IN METRES

SOIL PROFILE			SAMPLES			PENETRATION RESISTANCE PLOT	WATER CONTENT (%)	INSTALLATION INFORMATION
DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	"N" VALUE	20 40 60 80 SHEAR STRENGTH kPa; nat.V - +; rem.V - ⊕; Q - ●; U - ○	wP w wL; 10 20 30	
GROUND SURFACE		237.8						
150mm - Sandy Topsoil		0.0						
Orange to Brown, Loose to Dense, Moist to Wet			1	SS	10	x	○	
			2	SS	8	x	○	
SAND, fine, trace to some silt, trace gravel			3	SS	18	x	○	
			4	SS	19	x	○	
			5	SS	11	x	○	
			6	SS	33	x	○	
			7	SS	15	x	○	
		231.2						
End of Borehole		6.6						1. Borehole caved at 1.8m upon completion of drilling. 2. Water level noted at 1.5m during drilling.

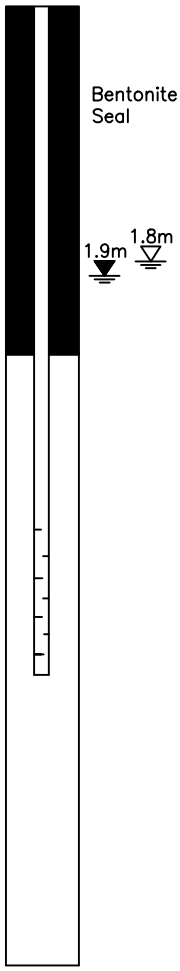
Terraprobe

LOG OF BOREHOLE ..11..

PROJECT NAME: Everett Subdivision
PROJECT No.: 3-10-6158
CLIENT: R & M Homes
BORING DATE: January 11, 2011
LOCATION: Everett, Ontario
ELEVATION DATUM: Geodetic

BORING METHOD: CME45 Crawler-mounted Drill Rig / Solid Stem Augers

DEPTH SCALE IN METRES	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	"N" VALUE	PENETRATION RESISTANCE PLOT (20 40 60 80) / SHEAR STRENGTH kPa (nat.V – +, rem.V – ⊕, Q – ●, U – ○) (20 40 60 80)	WATER CONTENT (%) (WP, W, WL) (10 20 30)	INSTALLATION INFORMATION
0	GROUND SURFACE		238.2						
	150mm – Sandy Topsoil		0.0						
	Orange to Brown; Dense to Compact; Moist to Wet			1	SS	6	x	○	
1	SAND, fine, trace to some silt, trace gravel, sandy silt layer/seam at 2.5m			2	SS	6	x	○	
				3	SS	24	x	○	
2				4	SS	48	x	○	
3				5	SS	37	x	○	
4									
5				6	SS	17	x	○	
6				7	SS	14	x	○	
			231.6						
7	End of Borehole		6.6						
8									
9									



1. Borehole caved at 2.4m upon completion of drilling.

2. Water level noted at 1.8m during drilling.

3. Water level on January 19, 2011 measured at 1.9m (elev. 236.3m).

Terraprobe

LOG OF BOREHOLE ..12..

PROJECT NAME: Everett Subdivision
PROJECT No.: 3-10-6158
CLIENT: R&M Homes
BORING DATE: January 10, 2011
LOCATION: Everett, Ontario
ELEVATION DATUM: Geodetic

BORING METHOD: CME45 Crawler-mounted Drill Rig / Solid Stem Augers

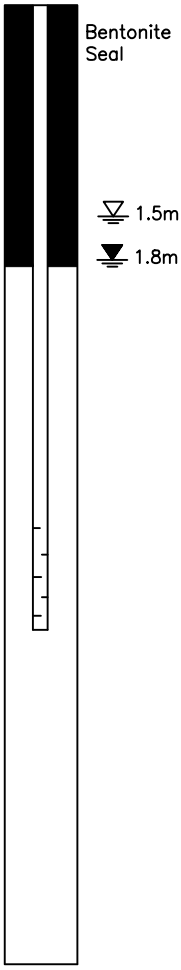
DEPTH SCALE IN METRES

DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	"N" VALUE
GROUND SURFACE		236.5			
50mm – Sandy Topsoil		0.0			
Orange to Brown, Loose to Dense, Moist to Wet			1	SS	2
			2	SS	2
SAND, fine, trace to some silt, trace gravel, sandy silt layer/seam at 3.2m			3	SS	19
			4	SS	34
			5	SS	32
			6	SS	28
			7	SS	12
		229.9			
End of Borehole		6.6			

PENETRATION RESISTANCE PLOT
SHEAR STRENGTH kPa
nat.V – +
rem.V – ⊕
Q – ●
U – ○
20 40 60 80

WATER CONTENT (%)
WP w WL
10 20 30

INSTALLATION INFORMATION



1. Borehole caved at 1.8m upon completion of drilling.

2. Water level noted at 1.5m during drilling.

3. Water level on January 19, 2011 measured at 1.8m (elev. 234.7m).

Terraprobe

LOG OF BOREHOLE ..13..

PROJECT NAME: Everett Subdivision
PROJECT No.: 3-10-6158
CLIENT: R&M Homes
BORING DATE: January 10, 2011
LOCATION: Everett, Ontario
ELEVATION DATUM: Geodetic

BORING METHOD: CME45 Crawler-mounted Drill Rig / Solid Stem Augers

DEPTH SCALE IN METRES	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	"N" VALUE	PENETRATION RESISTANCE PLOT (20 40 60 80) / SHEAR STRENGTH kPa (nat.V +, rem.V ⊕, Q ●, U ○) (20 40 60 80)	WATER CONTENT (%) (wP, w, wL) (10 20 30)	INSTALLATION INFORMATION
	GROUND SURFACE		235.9						
0	50mm – Sandy Topsoil		0.0						
	Orange to Brown; Loose to Compact; Moist to Wet			1	SS	4	x	○	Bentonite Seal
1	SAND, fine, trace to some silt, trace gravel			2	SS	9	x	○	▽ 1.5m
				3	SS	8	x	○	▼ 1.7m
2				4	SS	16	x	○	
3				5	SS	16	x	○	
4									
5				6	SS	9	x	○	
6				7	SS	16	x	○	
			229.3						
7	End of Borehole		6.6						
8									
9									

1. Borehole caved at 2.4m upon completion of drilling.

2. Water level noted at 1.5m during drilling.

3. Water level on January 19, 2011 measured at 1.7m (elev. 234.2m).

Terraprobe

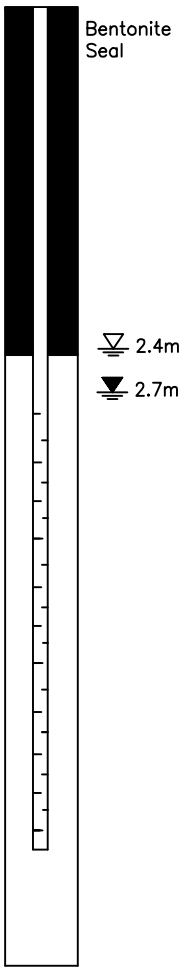
LOG OF BOREHOLE ..14..

PROJECT NAME: Everett Subdivision
PROJECT No.: 3-10-6158
CLIENT: R&M Homes
BORING DATE: January 10, 2011
LOCATION: Everett, Ontario
ELEVATION DATUM: Geodetic

BORING METHOD: CME45 Crawler-mounted Drill Rig / Solid Stem Augers

DEPTH SCALE IN METRES	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUE	PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (nat.V +, rem.V ⊕, Q ●, U ○)	WATER CONTENT (%) (WP, W, WL)
	GROUND SURFACE		236.8					
0	100mm – Sandy Topsoil		0.0					
	Orange to Brown, Loose to Dense, Moist to Wet			1	SS	4	x	
1	SAND, fine, trace to some silt, trace gravel			2	SS	4	x	
				3	SS	30	x	
2				4	SS	46	x	
3				5	SS	26	x	
4								
5				6	SS	11	x	
6				7	SS	22	x	
			230.2					
	End of Borehole		6.6					
7								
8								
9								

INSTALLATION INFORMATION



1. Borehole caved at 3.0m upon completion of drilling.

2. Water level noted at 2.4m during drilling.

3. Schedule 40, 50mm diameter monitoring well installed with 3.0m screen tip at 5.8m.

4. Water level on January 19, 2011 measured at 2.7m (elev. 234.1m).

Terraprobe

LOG OF BOREHOLE ..15..

PROJECT NAME: Everett Subdivision
PROJECT No.: 3-10-6158
CLIENT: R&M Homes
BORING DATE: January 10, 2011
LOCATION: Everett, Ontario
ELEVATION DATUM: Geodetic

BORING METHOD: CME45 Crawler-mounted Drill Rig / Solid Stem Augers

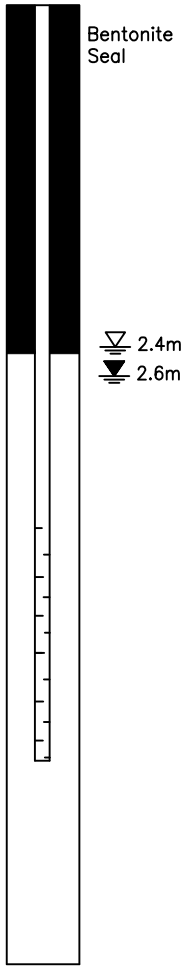
DEPTH SCALE IN METRES

DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	"N" VALUE
GROUND SURFACE		236.7			
50mm – Sandy Topsoil		0.0			
Orange to Brown; Loose to Compact; Moist to Wet			1	SS	4
			2	SS	5
SAND, fine, trace to some silt, trace gravel					
			3	SS	6
			4	SS	5
			5	SS	9
			6	SS	18
		230.1	7	SS	11
End of Borehole		6.6			

PENETRATION RESISTANCE PLOT
20 40 60 80
SHEAR STRENGTH kPa
nat.V – + Q – ●
rem.V – ⊕ U – ○
20 40 60 80

WATER CONTENT (%)
wP w wL
10 20 30

INSTALLATION INFORMATION



1. Borehole caved at 2.4m upon completion of drilling.
2. Water level noted at 2.4m during drilling.
3. Water level on January 19, 2011 measured at 2.6m (elev. 234.1m).

Terraprobe

LOG OF BOREHOLE ..16..

PROJECT NAME: Everett Subdivision
PROJECT No.: 3-10-6158
CLIENT: R&M Homes
BORING DATE: January 10, 2011
LOCATION: Everett, Ontario
ELEVATION DATUM: Geodetic

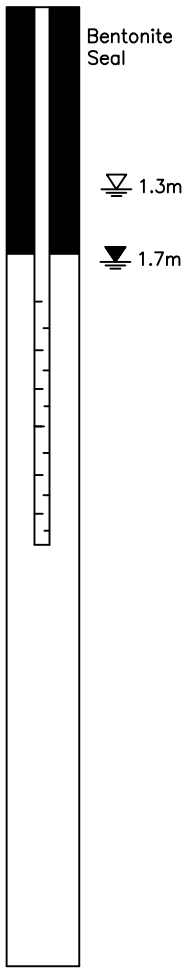
BORING METHOD: CME45 Crawler-mounted Drill Rig / Solid Stem Augers

DEPTH SCALE IN METRES	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	"N" VALUE
0	GROUND SURFACE		235.5			
	75mm – Sandy Topsoil		0.0	1	SS	3
	Orange to Brown; Loose to Compact; Moist to Wet					
1	SAND, fine, trace to some silt, trace gravel			2	SS	17
2				3	SS	8
				4	SS	14
3				5	SS	10
4						
5				6	SS	14
6			228.9	7	SS	15
	End of Borehole		6.6			
7						
8						
9						

PENETRATION RESISTANCE PLOT
20 40 60 80
SHEAR STRENGTH kPa
nat.V – + Q – ●
rem.V – ⊕ U – ○
20 40 60 80

WATER CONTENT (%)
wP w wL
10 20 30

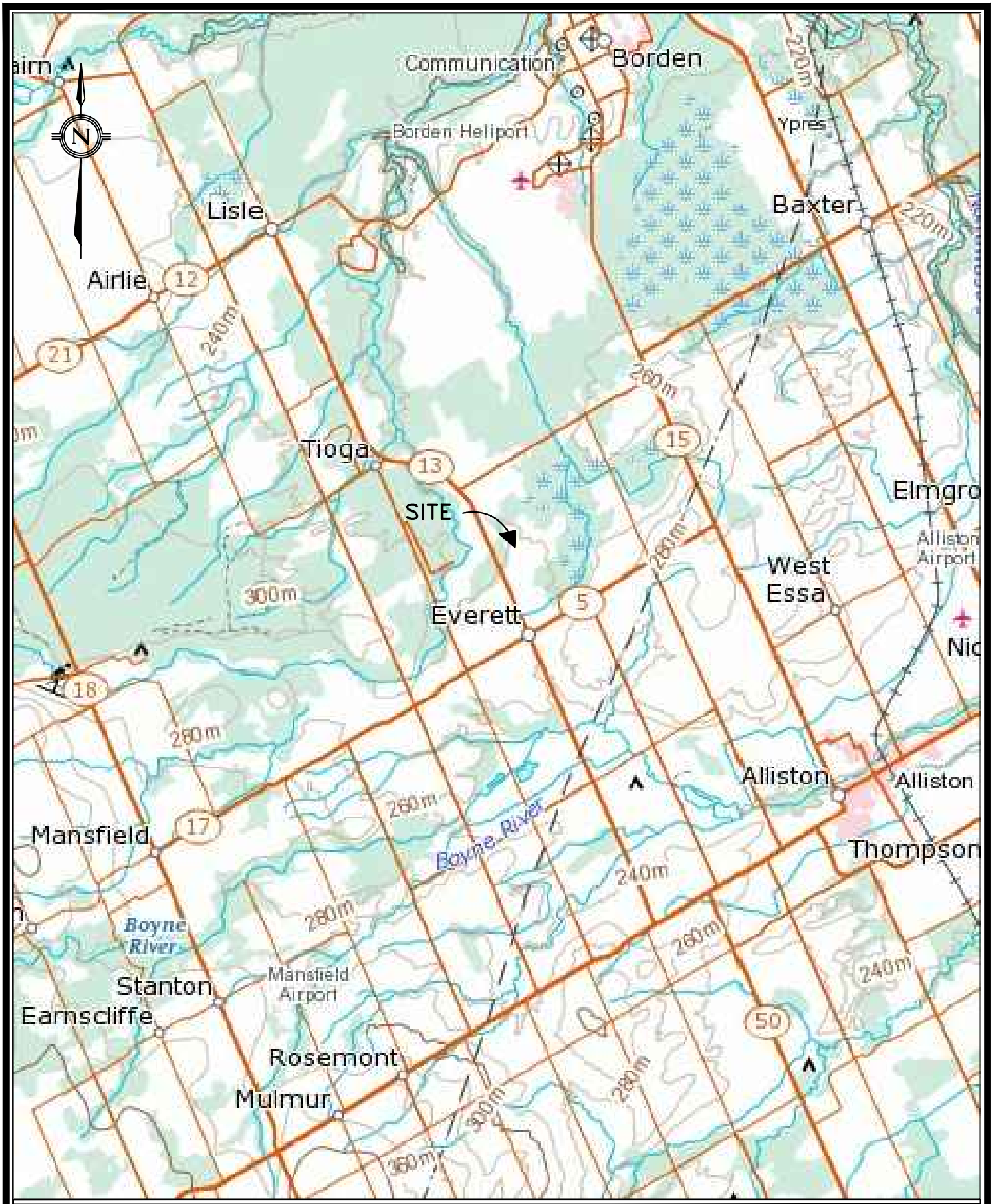
INSTALLATION INFORMATION



1. Borehole caved at 1.6m upon completion of drilling.

2. Water level noted at 1.3m during drilling.

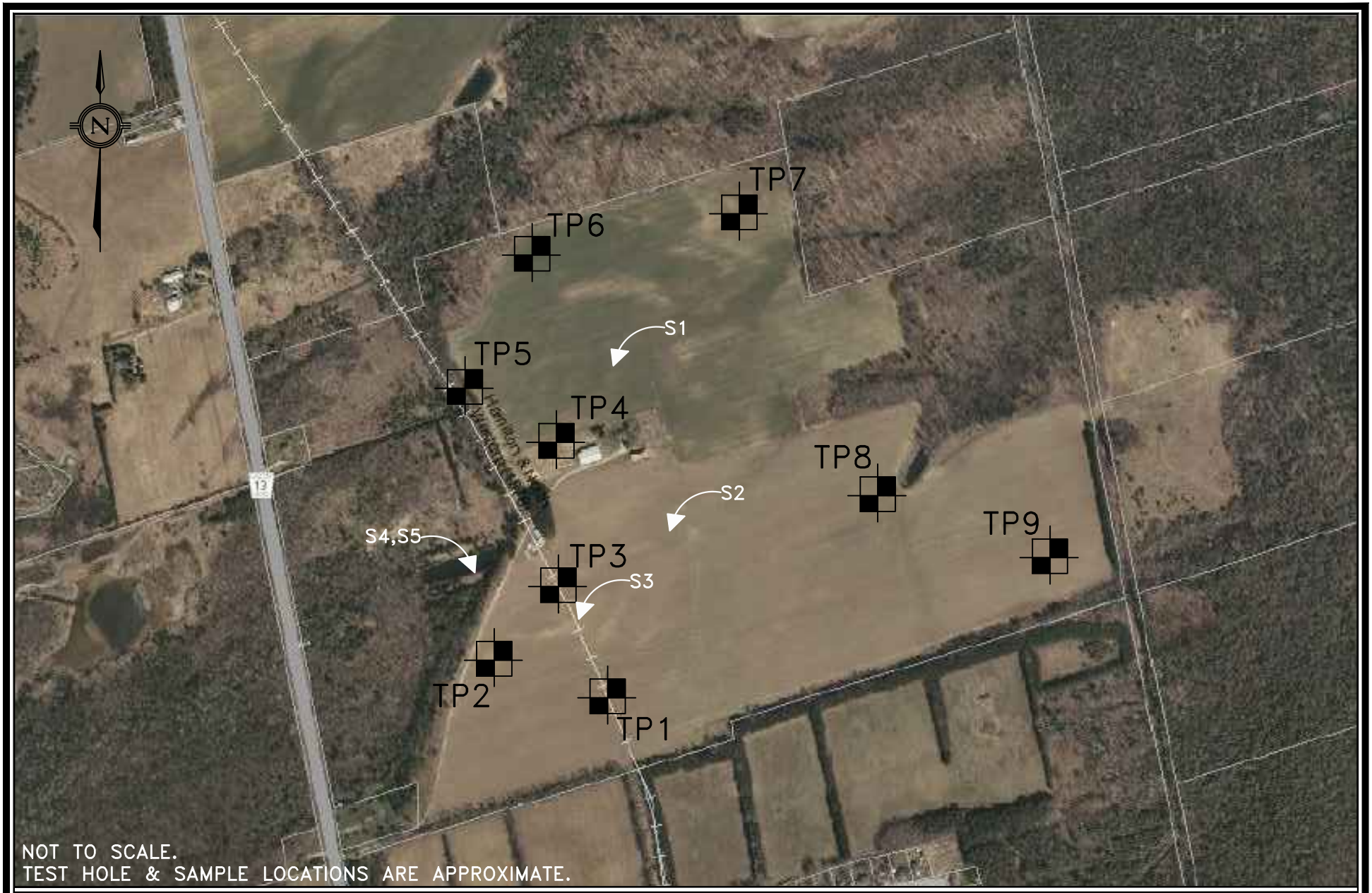
3. Water level on January 19, 2011 measured at 1.7m (elev. 233.8m).



NOVEMBER 2015 — SITE LOCATION PLAN — 33-15-2100

Terraprobe

FIGURE 1



NOVEMBER 2015

TEST HOLE & SOIL SAMPLE LOCATION PLAN

33-15-2100

Terraprobe

FIGURE 2

Appendix B

Water Demand Calculations and Supporting Documents

PEARSON ENGINEERING

Farsight Homes - Barzo Lands Development, Everett
Water Flow Calculations

Design Criteria - Existing Everett Population [1]:

Demand per Capita (Q):	201	L/cap/d
Peak Hour Demand Factor:	3.75	
Max. Day Demand Factor:	2.43	

Design Criteria - Barzo Lands, Farsight Everett Population [1]:

Demand per Capita (Q):	275	L/cap/d
Peak Hour Demand Factor:	2.99	(Also satisfies Table 3-1: Peaking Factors, MOE Design Guidelines for Drinking-Water Systems)
Max. Day Demand Factor:	2.05	(Also satisfies Table 3-1: Peaking Factors, MOE Design Guidelines for Drinking-Water Systems)

Site Data:

Description	Density		Units		Flow Rate	
Single-Detached	2.67	people/unit	823	units	275	L/cap/d
Townhouse	2.67	people/unit	415	units	275	L/cap/d

Prop. Barzo Population:

Prop. Barzo Pop. Total	=	Prop. Single-Detached		+	Prop. Townhouse			
Prop. Barzo Pop. Total	=	2.67	x	823	+	2.67	x	415
Prop. Barzo Pop. Total	**=**	**3,306**	**people**					

Ex. Population	=	1,929	people
Previous Farsight - Everett Population	=	1,476	people
Prop. Farsight - Everett Population	=	1,955	people
Ex. + Farsight - Everett Population	=	3,884	people

(ESPMSP Vol. 3 Part 3 Table 2.1 used 1,476 incorrectly instead of 1,466, so 1,476 is to be used for comparison purposes)

Total Proposed Ex. + Farsight + Barzo Development Por = **6,711** **people**

Development Phase	Total Equivalent Population (EP)	Average Day Demand (ADD) (m^3/d)	Max. Day Demand (MDD) (m^3/d)	Peak Hour Demand (PHD) (m^3/d)
Ex. Population	1,929	388	941	1,455
Farsight - Everett Pop	1,955	538	1,104	1,605
Ex. + Farsight Everett Pop.	3,884	925	2,045	3,060
Prop. Barzo Pop.	3,306	909	1,867	2,713
Ex. + Farsight + Barzo Pop.	7,190	1,834	3,912	5,773

Fire Flow Volumes [2]:

Storage = A + B + C Where: A = Fire Storage (Fire Flow for 2 hrs for Pop. ≤ 5,000 ppl, Fire Flow for 3 hrs for Pop. ≤ 13,

B = Equalization Storage (25% MDD)

C = Emergency Storage (25% (A + B))

Development Phase	Equiv. Population	Fire Flow (L/s)	MDD (m^3)	A (m^3)	B (m^3)	C (m^3)	Total (m^3)
Ex. Population	1929	92.7	941	668	235	226	1,128
Farsight - Everett Pop	1955	93.6	1,104	674	276	237	1,187
Ex. + Farsight Everett Pop.	3884	123.3	2,045	887	511	350	1,748
Prop. Barzo Pop.	3306	114.6	1,867	825	467	323	1,615
Ex. + Farsight + Barzo Pop.	7190	167.9	3,912	1,814	978	698	3,489

[1] Everett Secondary Plan Master Servicing Plan (ESPMSP) Volume 3 Part 3 - Water Servicing Master Plan Study Report, January 2013, Secti

[2] ESPMSP Vol. 3, Part 3 Table 2.4, & MOE Design Guidelines for Drinking Water Systems, Section 8.4.2.

[3] ESPMSP Vol. 3, Part 3 App. WS-B estimated a Barzo population of 1,357 people. Prop. Pop. based on current draft plan is approx. 3,306 pe

Figure A-4
Option WD-1

New Trunk Watermain with 450mm Upgrade to Ex. Watermain from Ex. Storage to County Road 5

FOREST HILL DRIVE
CONCESSION ROAD 4
COUNTY ROAD 13
COUNTY ROAD 5
MAIN STREET EVERETT
P-201
COUNTY ROAD 5
CONCESSION ROAD 6

Legend

- WaterCAD Junction Nodes
- Existing In-Ground Storage
- Proposed 450mm Watermain
- Existing Watermain
- Proposed 300mm Trunk Watermain
- Parcel
- Secondary Plan Study Area
- Roads
- 2 m Contour

N

1:15,000

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Notes:

Stantec

Water Distribution System Hydraulic Analysis

Everett Settlement Area

April 8, 2019

Prepared for:

FarSight Homes
117 Ringwood Drive, Unit 18
Stouffville, ON L4A 8C1

Prepared by:

Stantec Consulting Ltd.
600-171 Queens Avenue
London, ON N6A 5J7

Revision	Description	Author		Quality Check		Independent Review	
1	Draft	2017-12-13	NE	2018-01-04	VB		
2	Draft to Client	2018-01-31	NE				
3	Revision to Client	2018-02-28	NE				
4	Final	2018-04-05	NE				
5	Final Revised per Client Comments	2018-07-04	NE				
6	Updated per Municipal Comments	2019-04-01	NE	2019-04-08	AK	2019-04-08	EZ

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Prepared by _____
(signature)

Nick Emery, P.Eng.

Reviewed by _____
(signature)

Adam Kristoferson, P.Eng.

Approved by _____
(signature)

Elvio Zaghi, P.Eng.

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LIST OF APPENDICES

1.0 INTRODUCTION

The Everett Secondary Plan Master Servicing Plan Class Environmental Assessment was completed in support of the Everett Secondary Plan in 2013. The master plan presents a preliminary water servicing strategy to accommodate future growth in the Everett Settlement Area.

The purpose of this report is to review the Master Servicing Plan water servicing strategy, to identify the specific works required to service both the FarSight and Barzo Subdivisions and future development, and to identify triggers for implementing future works.

1.1 WATER DISTRIBUTION NETWORK OVERVIEW

The Everett water distribution network is supplied by two production wells. Storage is provided by an at-grade reservoir located on Concession 6, approximately 600 m south of County Road 5. The existing water distribution system components are shown on Figure 1.

1.2 HYDRAULIC ANALYSIS

Stantec developed a hydraulic model of the Everett Settlement Area water distribution system to evaluate the existing system conditions and identify the system improvements required to supply future demands. Future demands were evaluated for the following three consecutive development stages:

1. The FarSight Subdivision and the proposed wastewater treatment plant (WWTP);
2. The Barzo Subdivision; and
3. The remainder of the secondary plan development area.

1.3 FIRE FLOWS

Based on the correspondence presented in Appendix B, the following fire flow criteria were established at the proposed WWTP:

1. Provide a hydrant at the intersection of Street C and Concession Rd 6, as an interim measure, until the ultimate watermain is extended in the future along Concession Rd 6;
2. Provide sufficient fire flow to meet Ontario Building Code design targets prior to completion of the proposed Concession Road 6 300 mm diameter watermain; and
3. Provide sufficient fire flow to meet Fire Underwriters Survey design targets following completion of the proposed Concession Road 6 300 mm diameter watermain.

2.0 MODEL DEVELOPMENT

A water distribution system model was created for the Everett Settlement Area system using Bentley WaterCAD V8i. The model is used to perform hydraulic calculations to estimate network pressures, velocities, flows, etc. for various conditions. The corresponding model inputs are described briefly below.

2.1 PIPE NETWORK

Both as-built and design drawings provided by the Township of Adjala-Tosorontio were used to enter the length, material, location, and diameter of each existing pipe located in the Everett Settlement Area into the water distribution system model. Similarly, design drawings were used to enter the pipe information for the proposed FarSight Subdivision. The proposed Barzo subdivision pipe information was entered based on the preliminary street layout presented in Appendix A, which was provided by Pearson Engineering. Pipes in future development areas were entered based on the information presented in the Everett Secondary Plan Master Servicing Plan (Greenland, 2013) mapping, presented in Appendix A.

2.2 C-FACTORS

Pipe friction losses are calculated in the WaterCAD model using the Hazen-Williams equation, which uses an empirical roughness coefficient (C-factor) that is selected based on the pipe material, diameter, and condition. C-factors were assigned to the modelled pipes based on the information presented in *Design Guidelines for Drinking-Water Systems (MOE, 2008)*, as summarized in the following table.

Table 1 – C-Factors from Provincial Guidance

Pipe Diameter (mm)	C-Factor
≥ 150	100
200 – 250	110
300 – 600	120
> 600	130

Since most of the network is comprised of PVC pipe, these C-factors will likely yield conservative estimates of hydraulic losses within the pipe network. The accuracy of the model results could be improved by completing C-factor testing.

2.3 PRODUCTION WELLS

Two production wells supply the Everett water distribution network. The production well and pump house data are summarized in the following table.

Table 2 – Production Well/Pump House Summary

Parameter	Well	
	Ball Park	Grohal
Pump Intake Elevation[1] (m)	195.3	187.6
Water Level[2] (m)	204.7	193.48
Maximum Flow[3] (L/s)	22.7	21.7
Maximum Pressure[4] (psi)	85	106

Notes:
1 From production well log.
2 10-year pumping level from production well log.
3 Regulated by pressure relief valves located in pump house. Maximum flow is based on PTTW, as provided in the correspondence presented in Appendix B.
4 Maximum pressure is regulated by pressure relief valves located in pump house. Maximum pressures provided by Township of Adjala-Tosorontio, as per correspondence presented in Appendix B.

The same pump model is used at both production wells and the corresponding pump curve is presented in Appendix A.

An additional standby well located at the Grohal pump house has a capacity of approximately 950 m^3/day. However, this well has not been used since approximately 1995 and was not included in the hydraulic analysis scenarios.

2.4 DEMANDS

Both the average day and maximum day volumes supplied to the Everett water distribution system from 2015 to 2018 were provided by OCWA, as summarized in the following table.

Table 3 – Supply Volumes (2015-2018)

Year	Average Day (m^3)	Average Day (L/s)	Maximum Day (m^3)	Maximum Day (L/s)
2015	326	3.77	701	8.11
2016	349	4.04	680	7.87
2017	310	3.59	816	9.44
2018	307	3.58	758	8.77
Design	**323**	**3.74**	**816**	**9.44**

The existing condition average day demand was calculated by averaging the annual average day values for the available period of record. The maximum day demand is based on the 2017 recorded maximum day supply volume.

Existing equivalent populations were assigned to each model node based on the number of nearby residential lots which were estimated from recent aerial photography. The total equivalent population, the number of lots, and the population per lot, are identified in the Everett Secondary Plan Master Servicing Plan Addendum #2 (Greenland, 2018). The existing unit demand was calculated by dividing the total average day demand identified in Table 3 by the total equivalent population. The population per lot and the corresponding demand for proposed development were taken from Everett Secondary Plan Master Servicing Plan (Greenland, 2013). The average day demands used in the hydraulic analysis are summarized in the following table.

Table 4 – Base Average Day Unit Demands Summary

Parameter	Existing Development	Proposed Development
Unit Population (capita/lot)	3	2.67
Demand (L/capita/day)	167	275

Existing condition maximum day demands were assigned to the model based on the value identified in Table 3. The existing condition peak hour demand was calculated using a peaking factor is 3.75, which was identified from provincial guidance (MOE, 2008).

2.5 RESERVOIR

Storage within the Everett Settlement Area water distribution system is provided by an existing 1,600 m^3 at-grade reservoir located on Concession Road 6 approximately 600 m south of County Road 5. Water levels in the existing reservoir are controlled by the existing production well pumps, in accordance with the operating levels identified in the following table.

Table 5 – Reservoir Elevation Summary

Overflow Elevation[1] (m)	280.75
Pump Off Elevation[2] (m)	280.45
First Pump On Elevation[2] (m)	280.30
Second Pump On Elevation[2] (m)	279.85
Floor Elevation[1] (m)	277.15

Notes:
1 From as-constructed drawing dated March 1993.
2 From SCADA settings provided by the Township of Adjala-Tosorontio, presented in Appendix A.

2.6 MODEL INPUT UNCERTAINTIES

Stantec identified the following uncertainties in the model input data during development of the hydraulic model:

- The pipe C-factors are based on provincial guidelines and may overestimate the actual friction losses in the pipe network.
- The peaking factor to simulate the existing peak hour demand condition was assigned to the model based on the total equivalent population and provincial guidelines. Actual peak hour demand conditions in the Everett Settlement Area system may differ from the calculated values.
- Demands were assigned to the model based on average residential unit demands that may not be representative of large individual users.

3.0 MODEL VALIDATION

Insufficient field data are available to calibrate the hydraulic model. However, two fire flow measurements were used to check the validity of the model results. The existing conditions hydraulic model was used to calculate the available fire flows with a residual pressure of 20 psi at the test locations. The calculated flows were compared with the field test values, as summarized in the following table.

Table 6 – Fire Flow Test Comparison

Hydrant Location	WaterCAD Hydrant ID	Static Pressure (psi)		Available Fire Flow @ 20 psi (L/min)	
		Measured[1]	Calculated[2]	Measured[1]	Calculated[2]
C.R. 13 at Municipal Offices	H-1060	50	48.9	5,600	5,100
C.R. 5 at C.R. 13	H-1050	50	51.4	9,800	7,500

Notes:
[1] From Fire Flow Tests – Township of Adjala-Tosorontio – October 1994.
[2] From existing conditions hydraulic model, maximum day demand conditions.

The comparison suggests that the hydraulic model provides reasonable estimates of the static pressures, but underestimates the available fire flows at the field test locations. Thus, the hydraulic model likely provides conservative estimates of the actual system pressures under higher demand conditions and the available fire flows. However, the following uncertainties could affect the model validation calculation results:

- The fire flow test data over 20 years old. The hydraulic characteristics of the water distribution system have likely changed since the flow tests were conducted;
- Only two data points were available for the model validation; and
- The pipe friction factors used to calculate the available fire flows are based on published values, rather than field data, and may differ from the actual network friction factors.

4.0 EXISTING CONDITIONS

A review of the existing Everett Settlement Area water distribution system was completed to characterize the existing system performance, identify deficiencies, and to use as a basis for evaluating the effects of future system changes.

4.1 EXISTING CONDITIONS – SUPPLY PUMPS OFF

Existing conditions hydraulic calculations were performed to identify locations within the Everett Settlement Area system with low service pressures, and to establish a baseline to evaluate the effects of future development. The following system conditions were assumed to yield conservative results of the system pressures:

- Both production well pumps are off; and
- The water surface elevation in the reservoir is 280.30 m, which is the lower limit of its operating range.

Steady-state hydraulic calculations were performed to estimate the system pressures under average day, maximum day, and peak hour demand conditions. The corresponding results are summarized in the following table, and the locations of nodes with low calculated pressures are presented in Appendix E.

Table 7 – Existing Conditions Results Summary

Demand	System Demand (L/s)	Minimum Calculated Pressure[1] (psi)	Maximum Calculated Pressure (psi)	No. of Nodes with Pressure <40 psi	No. of Nodes with Pressure >100 psi
Average Day	3.74	38.2	59.2	2	0
Maximum Day	9.44	38.1	59.1	2	0
Peak Hour	14.02	37.9	58.9	2	0

Notes:
[1] Does not include low pressures on Concession Road 6 from County Road 5 to the reservoir.

The model results show that the calculated service pressures near 55 Dekker Street are less than the minimum recommended MECP guideline of 40 psi, but are greater than 20 psi which is the MECP threshold for issuing a boil water advisory. The ground elevation at this location is approximately 253.3 m. Based on the reservoir low operating water level of 280.3 m, the static head on Dekker Street is approximately 27 m, which is equivalent to a static pressure of 38.3 psi. Thus, the low calculated service pressures on Dekker Street are due to the relatively high local ground elevations. Field pressure tests should be performed near 55 Dekker Street to verify the model results.

Opportunities to mitigate the low pressures on Dekker Street in the near-term are limited. The only feasible method of increasing the existing service pressures is to raise the local hydraulic grade line, likely through booster pumping and the creation of a new pressure zone. Addressing the low pressures on

Dekker Street can likely be deferred until a solution can be developed concurrent with future development since:

- the area of concern is relatively small,
- few users are affected,
- the calculated pressures are greater than the MECP boil water advisory threshold, and
- a substantial investment will likely be required to implement an effective solution.

Since the existing reservoir is located at-grade and supplies the system by gravity, low pressures also occur near the southern limit of the reservoir supply line located on Concession Road 6. However, since there are no known service connections along this pipe, low pressures in this area are unlikely to affect existing system users.

4.2 EXISTING CONDITIONS – SUPPLY PUMP ON

Steady-state hydraulic calculations were performed to evaluate the system conditions when the reservoir is being filled by the production wells. The following system conditions were assumed:

- The Grohal production well pump is on; and
- The water surface elevation in the reservoir is 280.45 m, which is the upper limit of its operating range.

The calculated system conditions when the reservoir is filling are summarized in the following table.

Table 8 – Existing Conditions when Reservoir is Filling

Parameter	Average Day Demand	Maximum Day Demand
Minimum Calculated Pressure[1] (psi)	39.0	38.7
Maximum Calculated Pressure (psi)	60.5	59.9
No. of Nodes with Pressure <40 psi	2	2
Flow into Reservoir (L/s)	17.96	12.26

Notes:
[1] Does not include low pressures on Concession Road 6 from County Road 5 to the reservoir.

Similar to the calculation results when the supply pump is turned off, the minimum calculated pressures occur near 55 Dekker Street and the southern limit of the reservoir supply line located on Concession Road 6.

4.3 FIRE FLOWS

Steady state hydraulic calculations were performed using the hydraulic model to estimate the available fire flows at each hydrant for the following system conditions:

- Minimum allowable residual pressure of 20 psi;
- Maximum day demand conditions;
- The production well pumps are turned off; and
- The water level in the reservoir is 280.3 m, which is the lower limit of its typical operating range.

The hydraulic model was used to calculate the available fire flow at each hydrant in the Everett Settlement Area. The calculated available fire flows range from approximately 51 L/s to 165 L/s. The corresponding NFPA hydrant colour codes were estimated at each hydrant based on the fire flow calculation results and the criteria presented in the following table. The resulting hydrant colour codes are presented in Appendix E.

Table 9 – NFPA Hydrant Colour Codes

Colour	Fire Flow (gpm)	Fire Flow (L/s)
Red	<500	<31.5
Orange	500 - <1000	31.5 - <63.0
Green	1000 - <1500	63.0 - <94.6
Blue	>1500	>94.6

5.0 PROPOSED CONDITIONS

Steady-state hydraulic calculations were performed to evaluate the proposed conditions.

5.1 SCENARIOS

Three future development scenarios were evaluated to identify the proposed system improvements required to service future growth:

Scenario 1 – This scenario includes the proposed FarSight Subdivision and the proposed wastewater treatment plant, as shown on Figure 2. Based on the information provided in the Master Servicing Plan, additional storage will be required at the reservoir prior to full build out of Scenario 1.

Scenario 2 – As shown on Figure 3, this future development phase includes the proposed Barzo Subdivision and Cumac Subdivision. A new production well will be required to service this additional development. In accordance with the Master Servicing Plan recommendations, the diameter of the Concession Road 6 watermain from County Road 5 to the reservoir will be increased to 450 mm.

Scenario 3 – This scenario includes full build out of the Secondary Plan area. As shown on Figure 4, a skeletonized network was used to represent the future water distribution network in locations where no future draft plan information is available. In accordance with the Master Servicing Plan recommendations, a booster pumping station located at the existing reservoir provides an HGL elevation of 292.2 m at the reservoir outlet. The purpose of this scenario is to verify that the system improvements proposed to service the FarSight and Barzo Subdivisions have sufficient capacity to accommodate future development.

The anticipated equivalent populations used in the hydraulic analysis for each of the evaluated development scenarios are summarized in the following table.

Table 10 – Future Growth Summary

Scenario	Description	Additional Equivalent Population[1]	Total Equivalent Population
1	FarSight Subdivision1[2]	1,905	3,834
2	FarSight, Barzo, and Cumac Subdivisions[3]	3,324	7,158
3	Future Development Areas, FarSight & Barzo Subdivisions[4]	5,135	12,293

Notes:

1 Incremental additional equivalent population for the corresponding scenario.

2 Equivalent population estimated based on 644 proposed residential lots, and a population equivalent of 186 for the proposed commercial block, as per correspondence from Pearson Engineering presented in Appendix B.

3 Barzo Subdivision equivalent population estimated based on 1,200 proposed residential lots, as per correspondence from Pearson Engineering presented in Appendix B. Cumac Subdivision population calculated based on 45 residential lots, as per information provided by the Township.

4 Equivalent population from information presented in the Master Servicing Plan Addendum #2 for Parcels F1, F2, F3 and F4, and the proposed Walton Subdivision.

5.2 FUTURE CONDITION PEAKING FACTORS

The maximum day demand and peak hour demand peaking factors were estimated for each of the future development scenarios based on the available MECP guidance, as summarized in the following table.

Table 11 – Future Condition Peaking Factors

Scenario	Maximum Day Demand	Peak Hour Demand
1	2.00	3.00
2	2.00	3.00
3	1.90	2.85

Notes:

Peaking factors assigned based on the guidance presented in Design Guidelines for Drinking Water Systems (MOE, 2008).

5.3 TYPICAL OPERATIONS RESULTS

Proposed conditions hydraulic calculations were performed to identify locations within the Everett Settlement Area system with potentially low service pressures, and to evaluate the effects of future development.

WATER DISTRIBUTION SYSTEM HYDRAULIC ANALYSIS

Proposed Conditions
April 8, 2019

The following system conditions were assumed to yield conservative results of the system pressures:

- All production well pumps are off; and
- The water surface elevation in the reservoir is 280.30 m, which is the lower limit of its operating range.

The design flows used in each scenario are summarized in the following table and the corresponding calculations are presented in Appendix C.

Table 12 – Calculated Design Flows

Scenario	Average Day Demand (m^3/day)	Maximum Day Demand (m^3/day)	Peak Hour Demand (m^3/day)
1	846	1,692	2,538
2	1,760	3,520	5,280
3	3,381	6,423	9,635

Notes:
Design flows calculated based on the corresponding peaking factors and the following unit demands:

- Existing Development – 167 L/capita/day (Scenarios 1 & 2)
- Existing Development – 275 L/capita/day (Scenario 3)
- Proposed Development – 275 L/capita/day

Steady-state hydraulic calculations were performed to estimate the system pressures under average day, maximum day, and peak hour demand conditions, and the corresponding results are summarized in the following table.

Table 13 – Proposed Conditions Results Summary

Scenario	Demand	Minimum Calculated Pressure[2] (psi)	Maximum Calculated Pressure (psi)	No. of Nodes with Pressure <40 psi	No. of Nodes with Pressure >100 psi
1	Average Day[1]	38.1	61.5	2	0
	Maximum Day[1]	37.8	61.1	2	0
	Peak Hour[1]	37.2	60.5	2	0
2	Average Day	38.1	62.0	2	0
	Maximum Day	37.7	61.1	2	0
	Peak Hour	37.1	59.6	2	0
3	Average Day	54.6	78.5	1	0
	Maximum Day	53.3	77.0	1	0
	Peak Hour	51.3	74.4	1	0

Notes:
1 The Scenario 1 calculation results represent full build out of the proposed FarSight Subdivision and completion of the proposed 300 mm diameter watermain on Concession Road 6 from County Road 5 to the proposed subdivision connection.
2 Does not include low pressures on Concession Road 6 from County Road 5 to the reservoir.

5.3.1 Scenario 1 Results

The range of calculated service pressures is similar to the existing condition analysis results. The minimum calculated pressures are located near 55 Dekker Street and near the southern limit of the reservoir supply line located on Concession Road 6.

Scenario 1 includes approximately 2,700 m of new 300 mm diameter watermain to service the proposed FarSight Subdivision. Occasional watermain flushing will likely be required during the early phases of the subdivision construction when local demands are low. Once the FarSight Subdivision is fully developed, the model results suggest that the travel time in the proposed 300 mm diameter pipe from the reservoir to the new development is approximately 24 hours under average day demand conditions. While the deterioration rate of water quality is dependent on local water chemistry, 72 hours is generally considered a reasonable maximum residence time in water distribution systems. Thus, flushing will probably not be necessary in the FarSight Subdivision once the development is substantially occupied.

5.3.2 Scenario 2 Results

Scenario 2 includes replacement of the existing 300 mm diameter Concession Road 6 watermain located south of County Road 5 with a 450 mm diameter pipe. The proposed pipe replacement mitigates the reduction in service pressures that would otherwise occur with the addition of the proposed Barzo Subdivision and Cumac Subdivisions. Low service pressures will likely continue to occur near 55 Dekker Street and near the southern limit of the reservoir supply line located on Concession Road 6.

5.3.3 Scenario 3 Results

In accordance with the recommendations of the Master Servicing Plan, a proposed booster pumping station raises the maximum system HGL elevation to 292.2 m. The proposed booster pumping station is necessary to provide adequate local service pressures in Parcels F1 and F2 under typical operating conditions. The proposed booster pumping in this scenario mitigates the existing low service pressures near 55 Dekker Street. Under peak hour demand conditions, the calculated service pressure at this location is approximately 51 psi.

5.4 FIRE FLOWS

Fire flow calculations were performed to evaluate whether Fire Underwriters Survey (FUS) fire flows can be met throughout the network following construction of the 300 mm diameter Concession Road 6 watermain. A brief summary of the fire flow analysis is provided below, and further details and documentation are presented in Appendix D.

The available fire flows were calculated at each evaluated hydrant and junction under existing conditions and for each of the future development scenarios based on a minimum allowable residual pressure of 20 psi. The resulting calculated fire flows were compared with the FUS target value at each of the evaluated hydrants and junctions. The corresponding results are summarized in the following table.

Table 14 – Fire Flow Results Summary

Scenario	Number of Evaluated Hydrants & Junctions		Minimum Calculated Fire Flow (L/s)	Maximum Calculated Fire Flow (L/s)
	Total	Fire Flow Target Met		
Existing	93	39	51	165
Scenario 1	138	95	57	155
Scenario 2	200	174	64	>300
Scenario 3	217	217	85	>300

The fire flow calculation results suggest the following:

- Under existing conditions, most of the existing hydrants do not meet the corresponding fire flow targets;
- The additional looping provided by the proposed Concession Road 6 and FarSight Subdivision watermains in Scenario 1 reduce the number of evaluated nodes that do not meet the fire flow targets;
- The proposed Concession Road 6 450 mm replacement watermain in Scenario 2 further reduces the number of evaluated nodes that do not meet the fire flow targets; and
- The proposed booster pumping in Scenario 3 results in calculated fire flows that meet the corresponding fire flow targets at all evaluated nodes.

While the calculated fire flows are greater than the target fire flows at all evaluated nodes in Scenario 3, interim system improvements are necessary if the target fire flows must be met prior to full buildout. Since booster pumping will be required to service the future developments anticipated in Scenario 3,

Stantec evaluated the possibility installing a fire pump at the reservoir to meet the Scenario 1 and 2 fire flow requirements.

Preliminary hydraulic calculations were performed using the water distribution system model to estimate the pumping requirements to meet the target fire flows. The pump design heads were estimated by adjusting the modelled reservoir elevation until all fire flow targets were met. The pump design flows were estimated by adding the maximum target fire flow to the maximum day demand. The corresponding results are summarized in the following table.

Table 15 – Preliminary Fire Pump Results

Scenario	Estimated Design Head (m)	Estimated Design Flow (L/s)
Scenario 1	18	137
Scenario 2	18	158

A fire pump could be installed at the existing reservoir to meet the fire flow targets throughout the system during the interim development period. The proposed fire pump would require the construction of a new pumphouse at the existing reservoir, adequate electrical supply to meet the future power requirements, and the necessary controls required for pump operation. The proposed pumphouse should be designed with sufficient space to accommodate the Scenario 3 pumping requirements and fittings sized to accommodate the future 450 mm diameter watermain.

5.5 FIRE FLOWS AT PROPOSED WWTP

The proposed wastewater treatment plant (WWTP) is located on Concession Road 6 approximately 1,500 m north of County Road 5. As per the correspondence presented in Appendix B, the following fire flow criteria were developed for the proposed WWTP in consultation with the local Fire Chief:

1. Provide a hydrant at the intersection of Street C and Concession Rd 6, as an interim measure, until the ultimate watermain is extended in the future along Concession Rd 6;
2. Provide sufficient fire flow to meet Ontario Building Code (OBC) design targets prior to completion of the proposed Concession Road 6 watermain; and

Provide sufficient fire flow to meet Fire Underwriters Survey (FUS) design targets following completion of the proposed Concession Road 6 watermain.

5.5.1 Design Fire Flows

Target fire flows at the proposed WWTP were calculated using both OBC and FUS guidance. The calculation results presented in Appendix C show that the OBC fire flow target is approximately 44 L/s and the FUS fire flow target is approximately 104 L/s.

5.5.2 Concession Road 6 Watermain Sizing

Large diameter pipes are required to meet the design fire flow on Concession Road 6 at the proposed WWTP connection. However, the proposed connection is located approximately 260 m downstream from the nearest lateral. Since water use at the WWTP will be negligible, residence times in the proposed Concession Road 6 watermain will be relatively long, which can result in impaired water quality and chlorine decay below minimum regulatory concentrations.

To mitigate water quality issues at the WWTP during development of the FarSight Subdivision, the following strategy was developed through discussions between Pearson Engineering and the Township, as documented in Appendix B:

- Domestic water needs at the proposed WWTP will be supplied by a dedicated 50 mm watermain on Concession Road 6 to reduce the need for system flushing; and
- A proposed hydrant at the Concession Road 6/FarSight Subdivision Street C intersection will provide interim fire protection to the WWTP. The calculated maximum available fire flow at this hydrant prior to construction of the proposed 300 mm diameter Concession Road 6 watermain from County Road 5 is approximately 73 L/s.

Following completion of the FarSight Subdivision, the proposed Concession Road 6 watermain will be extended northward to provide fire flows directly to the WWTP. The following alternatives were evaluated for providing fire flow at the WWTP:

Alternative 1 – Construct a 200 mm diameter watermain on Concession Road 6 from the proposed FarSight Subdivision connection to the proposed WWTP connection.

Alternative 2 – Construct a 200 mm diameter watermain on Concession Road 6 from the proposed FarSight Subdivision connection to the proposed WWTP connection and provide a 150 mm diameter connection to the future Barzo Subdivision.

Alternative 3 – Construct a 150 mm diameter watermain on Concession Road 6 from the proposed FarSight Subdivision connection to the proposed WWTP connection and provide a 150 mm diameter connection to the future Barzo Subdivision.

The fire flows on Concession Road 6 at the proposed WWTP were calculated for each of the evaluated alternatives. The results are summarized in the following table.

Table 16 – Calculated Available Fire Flow at WWTP

Scenario	Available Fire Flow[1] (L/s)		
	Alternative 1	Alternative 2	Alternative 3
Scenario 2	108	146	109
Scenario 3	134	187	136

Notes:
[1] Fire flows calculated based on a residual pressure of 20 psi.

The calculation results show that all the evaluated alternatives can meet the FUS flow target of 104 L/s at the WWTP for Scenarios 2 and 3. However, Alternative 3 uses the smallest pipe diameters and will likely result in the highest local water turnover.

A proposed 150 mm watermain will be constructed on Concession Road 6 north of the FarSight Subdivision Street C intersection concurrent with development of the Barzo Subdivision to meet the target fire flow at the proposed WWTP. As noted in the Alternative 3 description, looping will be provided through the proposed Barzo Subdivision. This arrangement meets the design fire flow criteria for both the Scenario 2 and Scenario 3 development conditions.

5.5.3 Concession Road 6 Watermain Construction Timing

Additional hydraulic calculations were completed to identify the portion of the Scenario 1 development that can proceed prior to construction of the proposed 300 mm diameter Concession Road 6 watermain from County Road 5 to the proposed FarSight Subdivision connection. In this scenario, the proposed FarSight Subdivision is connected to the existing water distribution system at County Road 13 and Pine Park Boulevard. Based on direction provided by the Fire Chief, all hydrants must meet OBC fire flow requirements prior to construction of the proposed 300 mm diameter Concession Road 6 watermain. Hydraulic calculations were performed to estimate the available fire flow at the proposed hydrants and the effects of the proposed subdivision on fire flows in the existing developed area.

The design demands were estimated for each of the four proposed FarSight Subdivision phases using the phasing plan presented Appendix A. The hydraulic model was then used to calculate the fire flows in the proposed FarSight Subdivision and the existing developed area when the supply pumps are turned off and the water surface elevation in the reservoir is at its low operating level. The fire flow calculations were performed based on a minimum allowable residual pressure of 20 psi, in accordance with provincial guidelines. A summary of the fire flow calculation results is presented in the following table.

Table 17 – Effects of Proposed FarSight Subdivision on Fire Flows

Scenario	FarSight Subdivision Total Homes [1]	Existing Development		FarSight Subdivision	
		Minimum Fire Flow (L/s)	Minimum Static Pressure[2] (psi)	Minimum Fire Flow (L/s)	Minimum Static Pressure (psi)
Existing	0	50	38.4	-	-
FarSight Subdivision – Phase 1	297	54	38.0	50	50.7
FarSight Subdivision – Phase 2	409	54	38.0	49	50.7
FarSight Subdivision – Phase 3	529	54	37.9	48	50.4
FarSight Subdivision – Phase 4	644	52	37.7	46	49.9
FarSight Subdivision – Phase 4 With Concession Road 6 WM	644	56	37.9	63	50.8

Notes:
[1] Number of homes based on FarSight Subdivision Servicing Plan presented in Appendix A.
[2] Does not include low pressures on Concession Road 6 from County Road 5 to the reservoir.

The following conclusions were developed based on the model results:

- The minimum calculated fire flows in both the existing developed areas and the FarSight Subdivision are greater than the minimum OBC fire flow requirement of 45 L/s throughout the project phasing;
- The additional looping provided by the FarSight Subdivision results in higher minimum fire flows within the existing developed area;
- The calculated fire flows at the proposed WWTP prior to completion of the Concession Road 6 watermain are greater than the OBC fire flow target for each of the evaluated phases of the FarSight Development; and
- The proposed Concession Road 6 watermain increases the minimum calculated fire flows in the existing development area.

Based on these results, the proposed 300 mm diameter Concession Road 6 watermain is not required to meet the OBC fire flow target during development of the FarSight Subdivision. Construction of the proposed watermain could occur concurrent with Phase 4 without reducing the fire flows in the existing development area below the existing calculated values or significantly reducing the minimum calculated static pressures.

6.0 PROPOSED WORKS

The Master Servicing Plan identifies the water distribution system improvements required to service future development. Stantec reviewed the proposed improvements and revised the future system requirements based on the updated future population and the design unit demands.

6.1 WATER SUPPLY AND STORAGE VOLUMES

A comparison of the available water supply and storage with the future requirements is presented in the following table.

Table 18 – Future Water Supply and Storage Volume Requirements

System Component	Existing Capacity	Required Capacity		
		Scenario 1	Scenario 2	Scenario 3
Aquifer[1]	2,500 m^3/day	846 m^3/day	1,760 m^3/day	3,381 m^3/day
Supply[2]	2,825 m^3/day	1,692 m^3/day	3,520 m^3/day	6,423 m^3/day
Storage[3]	1,600 m^3	1,700 m^3	3,500 m^3	4,900 m^3

Notes:

1. Existing aquifer capacity from Master Servicing Plan. Required capacities based on calculated future average day demands.
2. Existing supply capacity is the firm capacity of the existing production wells. Required capacities based on calculated future maximum day demands.
3. Existing reservoir storage from Master Servicing Plan. Required storage volumes calculated using provincial design criteria, and rounded up to the nearest 100 m^3

The information presented in the Master Servicing Plan suggests that the local aquifer can supply an average daily demand of approximately 2,500 m^3/day. While the calculated average day demands based on the updated forecast populations and anticipated unit demands are less than the aquifer capacity for both Scenarios 1 and 2, the Scenario 3 calculated average day demand is approximately 3,381 m^3/day. A hydrogeological assessment should be completed to evaluate whether the local aquifer can supply the anticipated Scenario 3 future demands. Otherwise, either an alternate water source will need to be identified to supply full development of the Secondary Plan area, or future development within the Secondary Plan area will need to be capped based on the aquifer capacity.

The existing production wells provide sufficient capacity to supply Scenario 1. However, as noted in the Master Servicing Plan, a new production well will need to be constructed to permit full development of Scenario 2. The minimum additional well capacity required to service Scenario 2 is approximately 695 m^3/day. The Master Servicing Plan recommends locating the proposed well in the FarSight Subdivision park block. Additional production wells will be required to service the Scenario 3 development, provided that the results a hydrogeological assessment suggest that the aquifer has sufficient capacity to supply the future average day demands.

Storage volume calculations were performed to evaluate how much development can be accommodated by the existing reservoir capacity, and to estimate the volumes of future upgrades. The corresponding results are summarized in the following table.

Table 19 – Future Storage Volumes

Scenario	Required Storage Volume [1] (m^3)
Scenario 1 – FarSight Phase 1	1,300
Scenario 1 – FarSight Phase 2	1,400
Scenario 1 – FarSight Phase 3	1,500
Scenario 1 – FarSight Phase 4	1,700
Scenario 2	3,500
Scenario 3	4,900

Notes:
[1] Required storage volume calculations presented in Appendix C.

The calculation results show that a reservoir expansion is required prior to development of Phase 4 of the proposed FarSight Subdivision. An additional storage volume of approximately 1,900 m^3 would provide sufficient capacity to accommodate both Scenarios 1 and 2.

A comparison of the maximum populations identified in the Master Servicing Plan that can be serviced by the existing aquifer, storage, and well with populations estimated by Stantec is presented in Appendix C.

6.2 CONCESSION ROAD 6 IMPROVEMENTS

The hydraulic analysis results suggest that the minimum existing service pressures are not significantly reduced in Scenario 1. Consequently, replacement of the Concession Road 6 watermain from the existing reservoir to County Road 5 with the proposed 450 mm diameter pipe can be delayed until construction of the Barzo Subdivision proceeds in Scenario 2.

6.3 BOOSTER PUMPING

The Master Servicing Plan recommendations include booster pumping to service full build out of the Secondary Plan Area. The hydraulic analysis results suggest that both Scenarios 1 and 2 provide adequate service pressures and fire flows without booster pumping. However, without booster pumping, the calculated service pressures are less than 40 psi in the western portions of Parcels F1 and F2 under the Scenario 3 development condition.

The Master Servicing Plan implies that the proposed booster pump would raise the hydraulic gradeline (HGL) of the entire network. However, this may require new dedicated transmission pipes from the production wells to the reservoir. Consequently, creation of separate pressure zones serviced by dedicated booster stations should be considered for servicing the portions of the Scenario 3 development where the ground elevations are higher than approximately 248 m. Any future elevated pressure zones should include the portion of Dekker Street with existing low service pressures.

7.0 CONCLUSIONS

The following conclusions were developed based on the hydraulic analysis results:

- Low service pressures likely occur near 55 Dekker Street due to the local ground elevations. The evaluated development scenarios do not substantially exacerbate the low pressures at this location;
- The proposed FarSight Subdivision pipe diameters result in calculated service pressures within the proposed development area greater than the minimum MECP guideline of 40 psi;
- The proposed Concession Road 6 300 mm diameter watermain should provide adequate capacity to service the evaluated future development scenarios;
- As discussed with the Township, fire flows at the WWTP will be provided by an interim servicing strategy until development of the Barzo Subdivision proceeds;
- The evaluated Alternative 2 WWTP ultimate servicing strategy meets the fire flow target at the proposed WWTP; and
- Expansion of the existing reservoir will be required prior to development of Phase 4 of the proposed FarSight Subdivision. An additional storage volume of approximately 1,900 m^3 would accommodate full development of Scenarios 1 and 2.

Furthermore, Stantec offers the following recommendations:

- Field tests should be performed on Dekker Street to verify the calculated static pressures;
- Both fire flow tests and C-factor tests should be performed, and the hydraulic model should be calibrated based on the measured field data;
- The proposed Concession Road 6 300 mm diameter watermain could be constructed following completion of Phase 4 of the proposed FarSight Subdivision to provide the ultimate design fire flow at the proposed WWTP and to mitigate potential reductions in existing fire flows caused by the proposed development;
- Watermain flushing should be performed in the proposed FarSight Subdivision prior to substantial occupation to mitigate water quality issues caused by low turnover;
- If Fire Underwriters Survey (FUS) fire flows must be met throughout the entire system following construction of the proposed Concession Road 6 300 mm diameter watermain, a fire pump will be required at the existing reservoir.
- A 150 mm diameter connection from the northern limit of the proposed Concession Road 6 watermain to the proposed Barzo Subdivision should be provided to mitigate the risk of water quality deterioration due to low turnover;
- Periodic water quality monitoring should be performed on the proposed WWTP dedicated watermain to mitigate the risk of water quality deterioration due to low turnover;
- A detailed hydrogeological investigation will be required to determine the location and capacity of future wells;
- Future water sources to service future development within the secondary plan area should be investigated in further detail; and
- The future booster pumping strategy should be investigated in further detail.

8.0 REFERENCES

Greenland, 2013. Everett Secondary Plan, Master Servicing Plan. Prepared for the Township of Adjala-Tosorontio

Greenland, 2018. Everett Secondary Plan, Master Servicing Plan, Addendum #2. Prepared for the Township of Adjala-Tosorontio

Ministry of the Environment, 2008. Design Guidelines for Drinking Water Systems.

FIGURES

Stantec

Legend

- Settlement Boundary
- Development Area
- Existing Well
- Existing Reservoir
- Proposed Well
- Proposed WWTP

Watermain

Existing		Proposed
	450 mm	
	300 mm	
	250 mm	
	200 mm	
	150 mm	
	100 mm	
	50 mm	

0 200 400 metres

1:15,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2016.
3. 2016 orthoimagery via Simcoe County WMS.

Project Location
Municipality of
Adjala-Tosorontio.

165630123 REVA
Prepared by KDB on 2018-02-22

Client/Project
FARSIGHT HOMES
EVERETT WATER MODELING EXERCISE

Figure No.
1

Title
Existing Conditions

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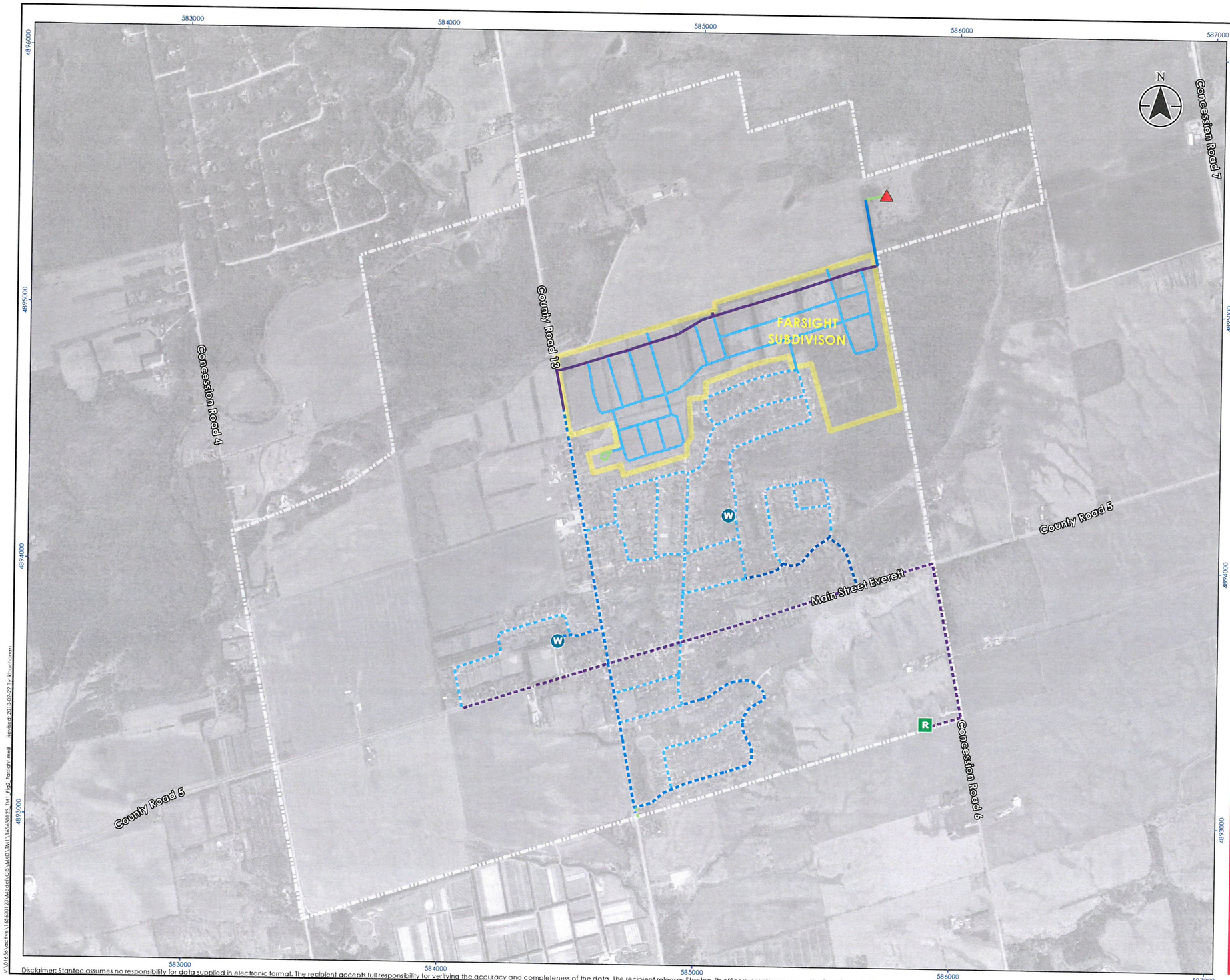

Stantec

Legend

- Settlement Boundary
- Development Area
- Existing Well
- Existing Reservoir
- Proposed Well
- Proposed WWTP

Watermain

Existing		Proposed
	450 mm	
	300 mm	
	250 mm	
	200 mm	
	150 mm	
	100 mm	
	50 mm	

0 200 400 metres

1:15,000 (At original document size of 11x17)

Notes

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3. 2016 orthoimagery via Simcoe County WMS.

Project Location
Municipality of Adjala-Tosorontio.

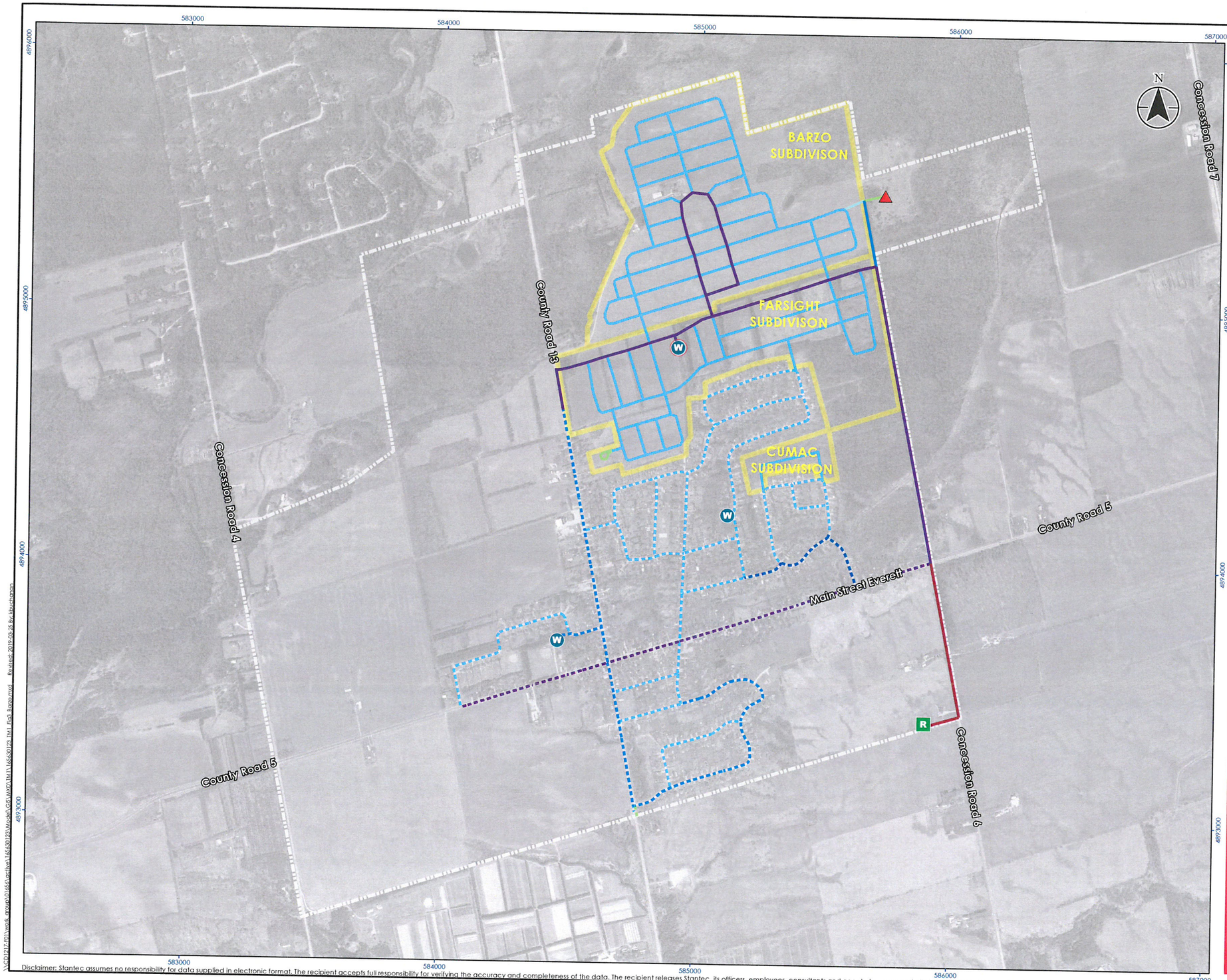
165630123 REVA
Prepared by KDB on 2018-02-22

Client/Project
FARSIGHT HOMES
EVERETT WATER MODELING EXERCISE

Figure No.
2

Title
Scenario 1

V:\01656\active\165630123\Models\GIS\MXD\TM1\165630123_TM1_Fig2_Farsight.mxd Revised: 2018-02-22 By: kbuchanan



Stantec

Legend

- Settlement Boundary
- Development Area
- Existing Well
- Existing Reservoir
- Proposed Well
- Proposed WWTP

Watermain

Existing		Proposed
	450 mm	
	300 mm	
	250 mm	
	200 mm	
	150 mm	
	100 mm	
	50 mm	

0 200 400 metres

1:15,000 (At original document size of 11x17)

Notes

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3. 2016 orthoimagery via Simcoe County WMS.

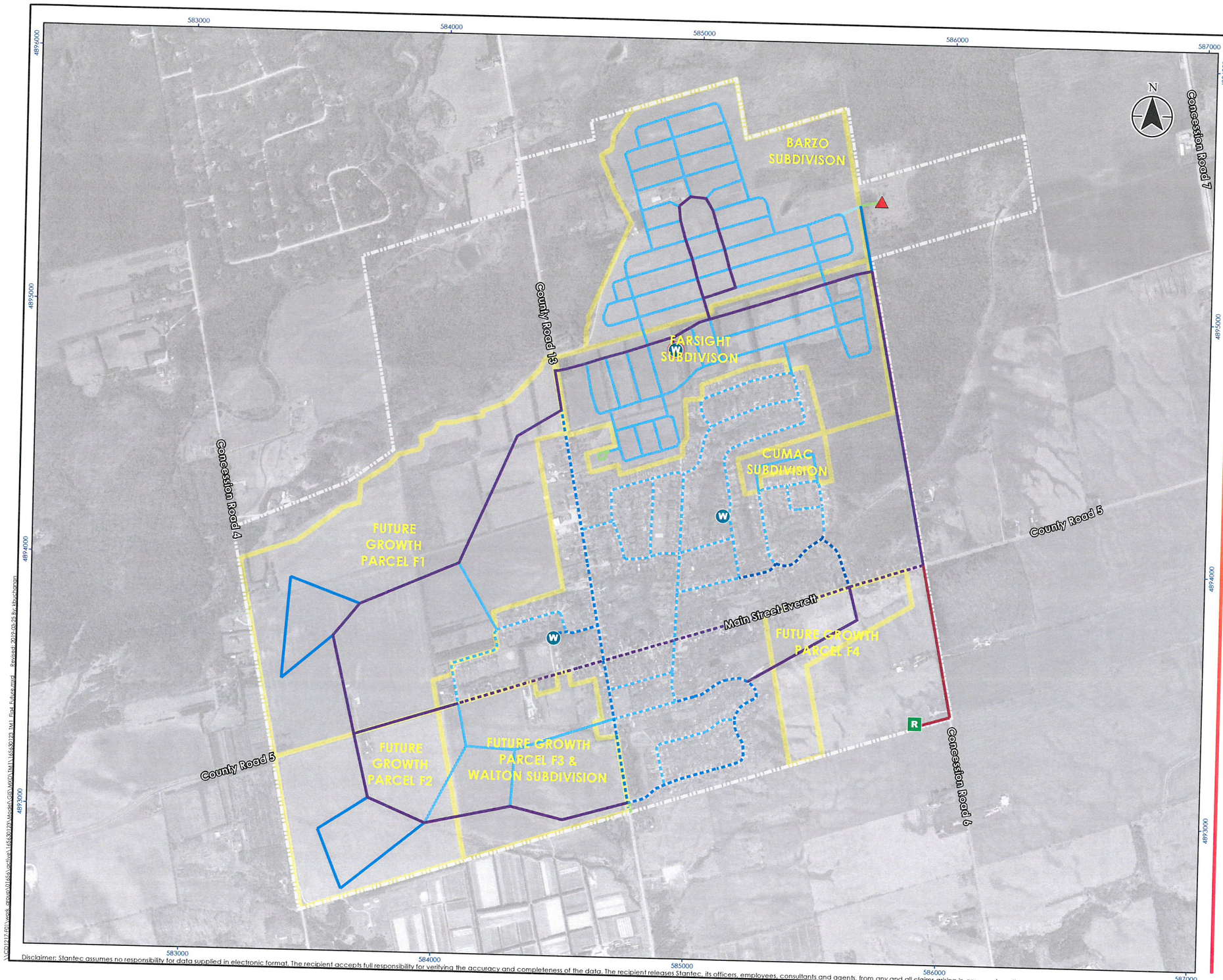
Project Location
Municipality of Adjala-Tosorontio.

165630123 REVA
Prepared by KDB on 2019-03-25

Client/Project
FARSIGHT HOMES
EVERETT WATER MODELING EXERCISE

Figure No.
3

Title
Scenario 2



Stantec

Legend

- Settlement Boundary
- Development Area
- Existing Well
- Existing Reservoir
- Proposed Well
- Proposed WWTP

Watermain

Existing	Proposed
450 mm	
300 mm	
250 mm	
200 mm	
150 mm	
100 mm	
50 mm	

0 200 400 metres

1:15,000 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2016.
3. 2016 orthoimagery via Simcoe County WMS.

Project Location
Municipality of Adjala-Tosorontio.

165630123 REVA
Prepared by KDB on 2019-03-25

Client/Project
FARSIGHT HOMES
EVERETT WATER MODELING EXERCISE

Figure No.
4

Title
Scenario 3

Appendix C

Sanitary Calculations and Supporting Documents

PEARSON ENGINEERING

Farsight Homes - Barzo Lands Development, Everett
Sanitary Flow Calculations

Design Criteria

Flow per Capita (Q): 340 L/cap/day

Peak Flow: $Q_p = P * Q * M / 86400$

Peaking Factor (Harmon Formula): $M = 1 + (14 / (4 + (P / 1000) ^ 0.5))$ Where: $2 \leq "M" \leq 4$

Site Data

Description	Density		Units		Flow Rate	
Single-Detached	2.67	people/unit	823	units	340	L/cap/d
Townhouse	2.67	people/unit	415	units	340	L/cap/d

Prop. Barzo Population:

Prop. Barzo Pop. Total	=	Prop. Single-Detached		+	Prop. Townhouse			
Prop. Barzo Pop. Total	=	2.67	x	823	+	2.67	x	415
Prop. Barzo Pop. Total	**=**	**3,306**	**people**					

Ex. Population	=	1,929	people
Previous Barzo Population	=	1,357	people
Proposed Barzo Population	=	3,306	people
Ex. Population + Farsight Project Development	=	3,884	people
Total Proposed Population	=	7,190	people

Development Phase	Population Serviced	Average Flows		Min. Day Flow		Max. Day Flow		Peak Instantaneous Flow		
		(L/c/d)	(m^3/d)	Peaking Factor	(m^3/d)	Peaking Factor	(m^3/d)	Inflow & Infiltration Allowance (L/cap/d)	Peaking Factor	(m^3/d)
Ex. New Horizon Subdivision	267	300	80	0.3	24	2.5	200	90	4.00	344
Ex. Unserviced Areas	1,662	340	565	0.3	170	2.5	1,413	90	3.65	2,210
Farsight Everett	1,955	340	665	0.3	199	2.5	1,662	90	3.59	2,565
Barzo Lands Development	3,306	340	1124	0.3	337	2.5	2,810	91	3.41	4,129
Combined Phases										
Ex. + Farsight Everett	3,884	340	1,321	0.3	396	2.5	3,301	90	3.34	4,767
Ex. + Farsight Everett + Barzo	7,190	340	2,444	0.3	733	2.5	6,111	90	3.10	8,214
Ultimate Build-out	12,293	340	4,180	0.3	1,254	2.5	10,449	90	2.87	13,082

Note:

-The Peak Flow for the Ultimate Build-out Population calculated in ESPMSP Volume 3 Part 2 Appendix SS-C Option B is 14,860 m^3/d. This is due to the more conservative use of flow per capita value of 450 L/c/d.

-The Everett Schedule C Class EA uses the above calculated approach based on a flow per capita value of 340 L/c/d derived from existing sanitary discharge data, resulting in a Peak Flow of 11,577 m^3/d.

Pine River

County Road 13

County Road 4

R&M WWTP
& Tile Bed

BZ

RM

EG-N

CR
13-N

TS-2

EG-S

MA-N

MA-S

GH-N

EMT

CR
13-S

GH-S

CM-E

F1

TS-1

CR
5-W

BL

MS

Main Street

County Road 5

CM-W

CR
5-E

VZ

F2

F3

F4

WN

W-TS

NH

LEGEND

- Development Parcel
- Stream
- Gravity Sewer
- Main Trunk Sewer (Wales Ave.)
- Western Trunk Sewer
- Southern Trunk Sewer
- Forcemain
- Direction of Flow
- Existing Infrastructure
- Development Parcel Label

N

No.	REVISION	DATE	INIT.
3.			
2.			
1.			

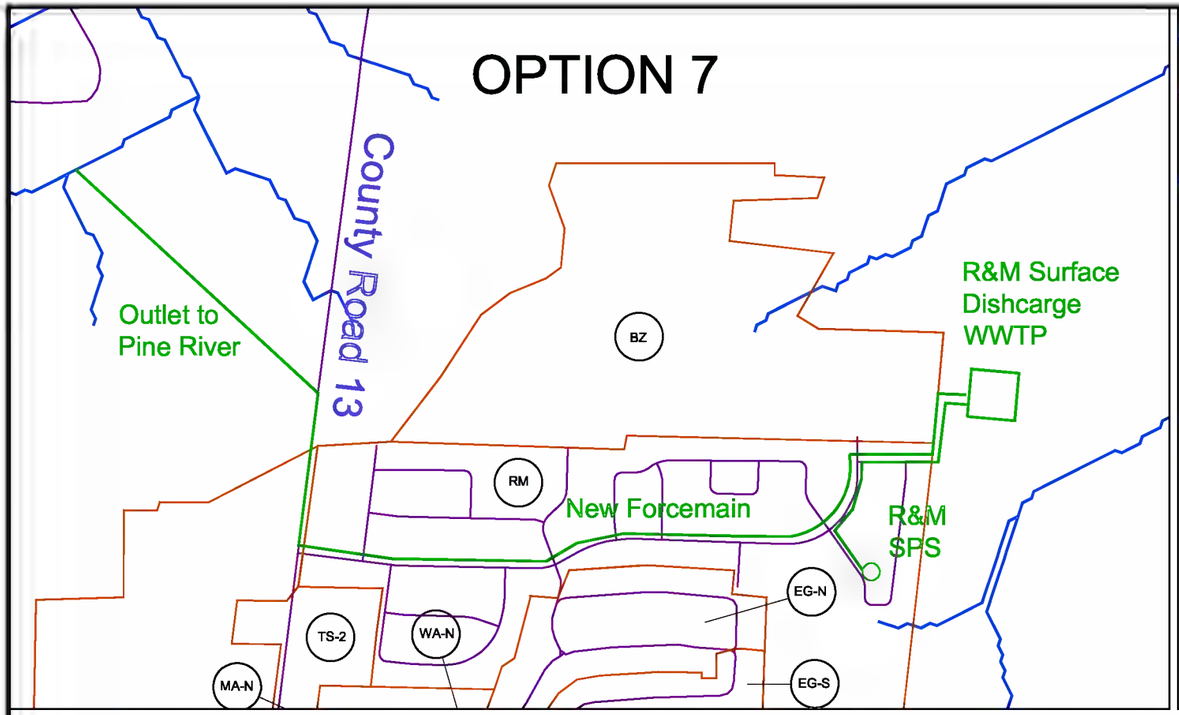
EVERETT SECONDARY PLAN

Sewage Collection Option B

GREENLAND® Consulting Engineers
120 Hume Street
Collingwood, Ontario, L9Y 1V5
Tel: (705) 444-8505
Fax: (705) 444-5492
E-mail: greenland@gmland.com
Website: www.gmland.com

DWG No. FIGURE A-4

OPTION 7



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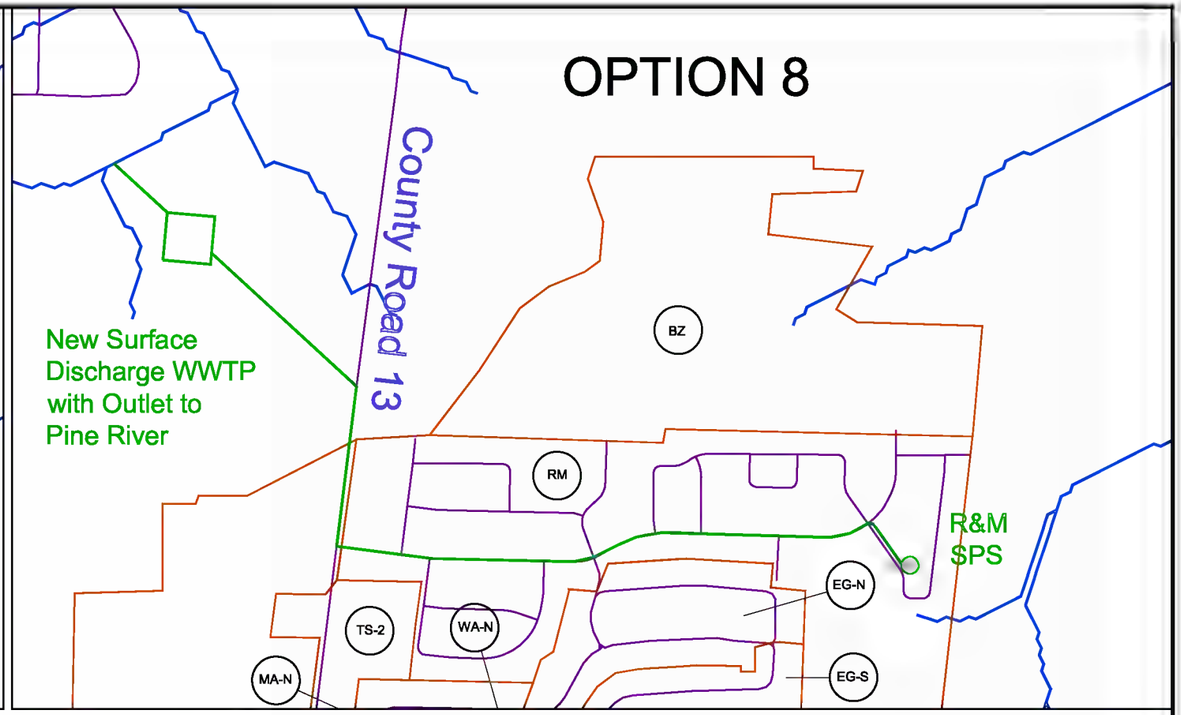

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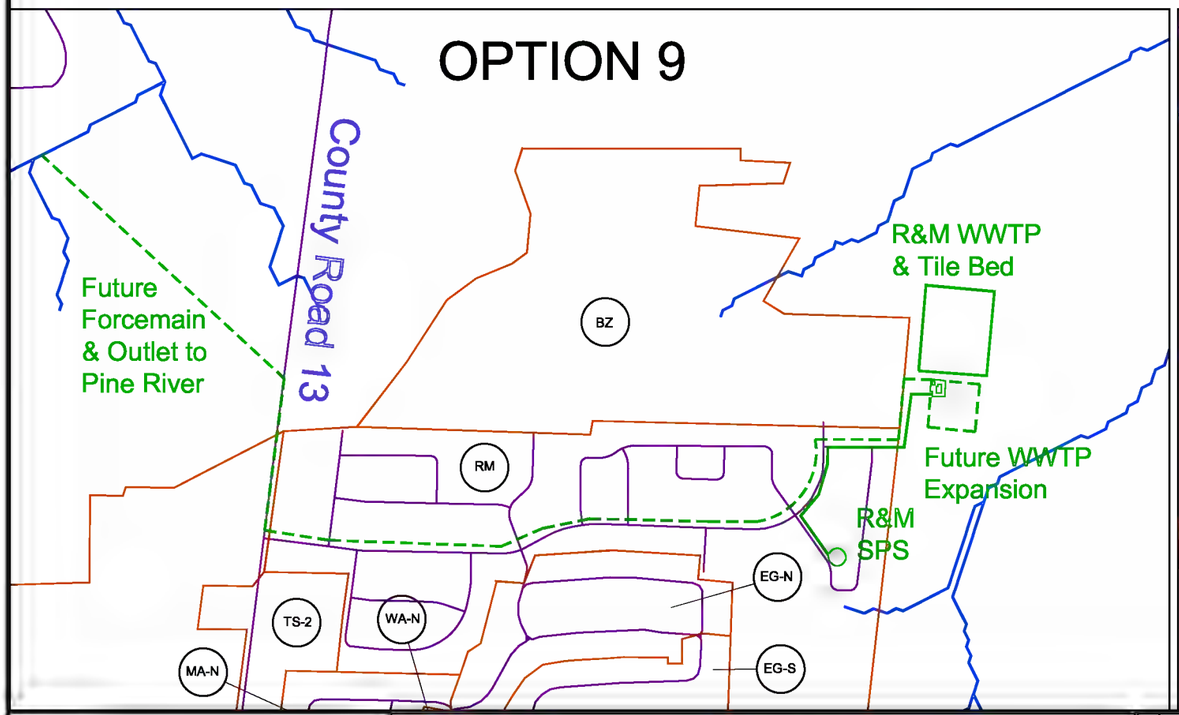
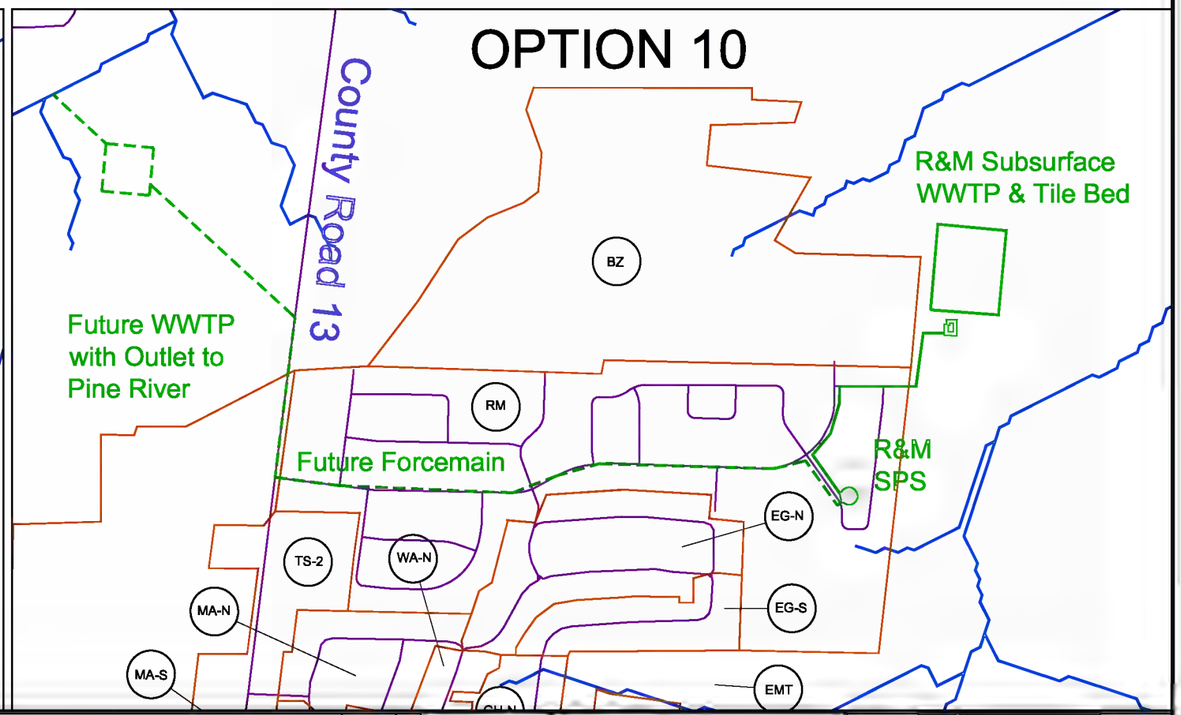


OPTION 10



LEGEND

- Development Parcel
- Stream
- (ABC) Development Parcel Label
- Proposed Treatment Infrastructure
- Direction of Flow
- Existing Infrastructure

N

No.	REVISION	DATE	INIT.
3.			
2.			
1.			

EVERETT SECONDARY PLAN

WASTEWATER TREATMENT OPTIONS

GREENLAND® Consulting Engineers
120 Hume Street
Collingwood, Ontario, L9Y 1V5
Tel: (705) 444-8805
Fax: (705) 444-5492
E-mail: greenland@gmland.com
Website: www.gmland.com

DWG No. FIGURE A-2

Everett WWTP – Design Brief

Prepared for:
Far Sight Homes

Prepared by:
Stantec Consulting Ltd.

December 21, 2017

Revision	Description	Author		Quality Check		Independent Review	
0	Draft 1	Olav Natvik		E. Zaghi	30Aug 2017		
1	Draft 2	Kevin Vitone	Oct20/17	O.Natvik	Oct24/17		
2	Draft 3	Kevin Vitone	Dec21/17				

Sign-off Sheet

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December 21, 2017

1.0 INTRODUCTION

1.1 BACKGROUND

Stantec Consulting Ltd. (Stantec) was retained by Farsight Homes (Client) in order to complete the detailed design and construction administration for a new mechanical wastewater treatment plant (WWTP) to service existing and planned growth within the community of Everett located in the Township of Adjala-Tosorontio.

Prior planning activities to date include:

1. Everett Wastewater Treatment Plant & Surface water Outfall Expansion; Schedule 'C' Class Environmental Assessment Environmental Study Report (September 2014) - Greenland Consulting Engineers completed the Class EA and ESR to determine the preferred sanitary treatment process to serve planned growth for the community of Everett. The preferred wastewater servicing included a new membrane bioreactor treatment plant to provide tertiary quality effluent with a forcemain discharge to Pine River.

2. Request for Proposals for a Design, Build, Finance, Operate & Maintain (DBFOM) Project for Everett Sanitary Servicing & Wastewater Treatment Plant Project (April 2016) – Stantec participated in a RFP for a DBFOM contract for a new wastewater treatment facility and completed a wastewater conceptual design consistent with the Class EA and RFP terms of Reference. Ultimately, the Township decided not to proceed with a DBFOM contract for sanitary servicing for various reasons.

The wastewater treatment processes defined in the Class EA and subsequent RFP are the basis for the wastewater treatment plant concept presented herein.

Refer to the glossary of terms for descriptions of acronyms.

1.2 PURPOSE

The purpose of the Preliminary Design Report is to:

1. Define the design basis and treatment concepts upon which detailed design will be based.

2. Provide a written narrative description to accompany the design drawings that will ultimately form part of the Environmental Compliance Approval (ECA) application to the MOECC.

1.3 SCOPE OF WORK

The Preliminary Design Report will include:

1. Design basis information.
2. Descriptions of the major unit processes that will comprise the treatment facilities.
3. Design drawings such as: piping and instrumentation drawings, hydraulic profile, and site layout.

The Preliminary Design Report is intended to be read in conjunction with the conceptual drawings in order to gain a full appreciation for the proposed design and operation for the new WWTP.

2.0 OVERALL DESIGN CONCEPT

2.1 DESIGN PHILOSOPHY & APPROACH

Stantec has reviewed the Class EA and DBFOM documents and developed a wastewater treatment design concept consistent with these documents, including:

1. Using proven design methodologies and approaches that have successfully delivered numerous WWTP projects within Ontario.
2. Using a proven and experienced MBR Design Team that has designed the largest MBR facilities in Ontario:
    a. 13,700 m3/d Oxford Pollution Control Plant in the City of London – completed in 2006,
    b. 30,000 m3/d Barrie WWTP MBR retrofit – on-going with completion planned for 2020.
3. Using proven cold wastewater MBR treatment strategies including:
    a. Longer day sludge age of +12 days to ensure winter nitrification, and excellent membrane sludge filterability are maintained at all times.
    b. Membrane area selection based on a minimum wastewater temperature of 10 C in order to ensure excellent membrane permeability for all wastewater temperatures.
    c. Teaming with GE Water who has 15+ years MBR experience including demonstrated cold weather, biological nutrient removal performing plants like Everett.
    d. Providing emergency flow diversion volume to assist membrane operation should unexpected situations arise such as: 1) extremely low wastewater temperature that may reduce membrane permeability, 2) extremely high peak flows develop greater than membrane capacity, 3) to allow for partial flow diversion should unexpected equipment failure occur, 4) etc.
4. Using proven, equipment vendor packages including: 1) screening and degritting (Huber), 2) ultra-filtration membrane system (GE Water), 3) UV disinfection (Calgon) – all with excellent after-market technical support.
5. Providing right level of equipment redundancy that is consistent with MOECC Design guidelines and will ensure interrupted treatment at all times. This includes all essential

pumping systems, screens, grit removal equipment, MBR equipment components, UV, as well as flow diversion capability to assist should an emergency situation arise.

6. Providing the right level of automation to allow for alarming, data collection, and ease of operation.

7. Providing a phased construction plan to allow for cost efficient, capacity expansion to better match growth projections in future.

8. Providing a cost efficient and flexible solids handling system that can be easily adapted to respond to future changes in end disposal. This includes flexibility to add mechanical sludge thickening, or dewatering, additional storage whether liquid or cake forms, etc.

9. Using proven and cost effective odour control strategies such as: 1) separate venting for covered screen/grit units, 2) providing surface aeration on the sludge stabilization/storage basin.

Complete technical details for the proposed wastewater treatment system follow in Section 3.

2.2 DESIGN CRITERIA

The design criteria for the Stage 1 construction and estimated future ultimate construction are summarized in this section.

2.2.1 Development Growth Projections and WWTP Capacity Staging

The range in wastewater flow projections vs time and proposed WWTP construction staging are presented in figure1. Figure 1 has been prepared based on the following assumptions:

- New Horizon flows (NH) will be immediately diverted to the new Everett WWTP upon start-up expected early 2019.

- Stage 1 development assumes NH flows and Farsight full build-out with maximum 800 residential housing units.

- Stage 2 development to serve Barzo development will occur following Stage 1 with a maximum 1200 additional residential housing units, for total equivalent capacity of 2,000 residential housing units

- Stage 1 WWTP treatment capacity will be 850 m3/d annual average flow to service initially NH and Farsight development with a second future Stage 2 WWTP capacity increase to 1700 m3/d to match the maximum filtration treatment capacity of a 4 cassette membrane installation.

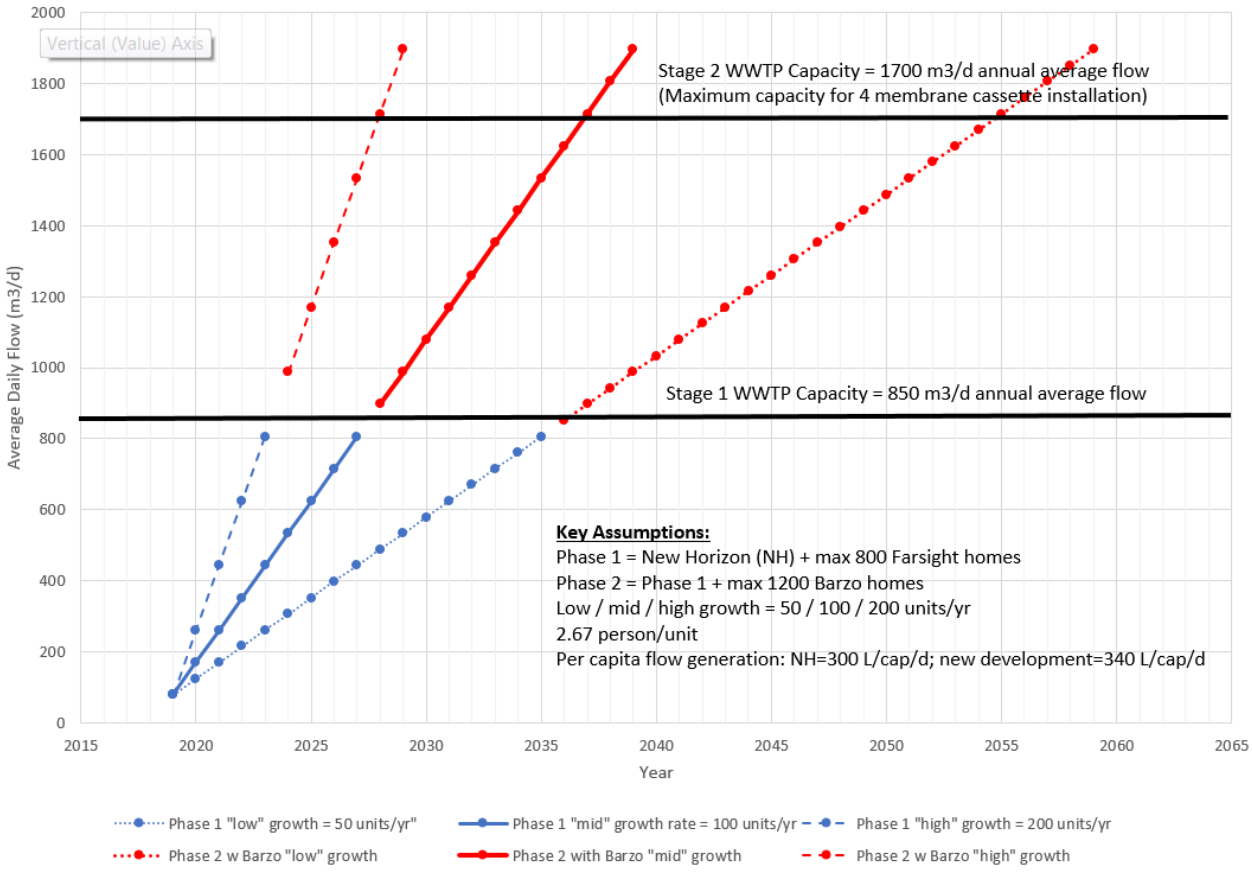
- The future rate of unit housing sales will depend upon many housing market factors. Therefore wastewater flow projection estimates are provided assuming continuous "low", "mid", and "high" rates of unit sales of 50, 100, and 200 units per year respectively. Actual rate of unit sales will depend upon market forces at the time of sale.

- Average daily flow estimates are based on key per capita information including:

Table 1 - Wastewater Flow Projection Assumptions

Development	Max Units	Pop. Equivalent/unit	Per Capita flow	Comments
New Horizon	100	2.67 persons/unit	300 L/capita/d	300 L/capita/d is per existing conditions.
Farsight	800	2.67 persons/unit	340 L/capita/d	2.67 PE/unit and 340 L/cap/d is "conservative" basis used in Class EA and DBFOM RFP.
Barzo	1200	2.67 persons/unit	340 L/capita/day	2.67 PE/unit and 340 L/cap/d is "conservative" basis used in Class EA and DBFOM RFP.

Figure 1- Everett WWTP - Development Average Daily Flow Projection Ranges & Proposed WWTP Capacity Staging



2.2.2 Wastewater Flows

The design basis flows are presented in table 2 and were developed based on the growth projections, average daily flows, and proposed treatment capacity staging presented in figure 1.

Table 2 - Everett WWTP - Design Basis Flows

Design Parameter	Stage 1 Construction (Year 2019)		Stage 2 Construction (future)	
	Flow (m3/d)	Peak factor	Flow (m3/d)	Peak factor
Year 2019 start-up flow	**80** (6)	-	-	-
Min. Month Flow (MinMF)	**600** (2)	~0.7	1,200	~0.7

Annual Average Flow (AAF)	**850** (1)	1.0	1,700	1.0
Max. Month Flow (MMF)	**1,100** (3)	~1.3	2,200	~1.3
Max Day Flow (MDF)	**2,100** (4)	~2.5	4,200	~2.5
Peak Hour Flow (PHF)	**3,000** (5)	~3.5	6,000	~3.5

Stage 1 Construction (Year 2019) Notes:

1. Annual average flow design capacity selected per table 1 and figure 1 to meet development growth projections for NH, Farsight, and Barzo developments and match maximum treatment capacity for 4 membrane cassette installation.
2. Minimum month flow during "drier" periods of the year when I/I contribution is lower. Typical smaller community PF of 0.7xAAF was assumed.
3. Maximum month flow during "wetter" periods of the year when I/I contribution is higher. Typical smaller community PF of 1.3xAAF was assumed.
4. Max day flow PF of 2.5xAAF was assumed per ESR data and consistent with MDF observed in other smaller community collection systems.
5. Stage 1 and stage 2 construction Harmon peak flow factors of 3.5 and 3.2x AAF respectively were estimated based on service population equivalents of 2531 and 5032. A Harmon factor of 3.5x AAF was used to define the peak hour flow for stage 1 and 2 constructions.
6. Flows received at the plant upon start-up may be as low as 80 m^3/d annual average flow originating from the NH development.

2.2.3 Wastewater Characteristics and Design Loadings

The proposed design concentrations for the Stage 1 construction are shown in table 3 along with key notes.

Table 3 - Everett WWTP – Stage 1 Construction (Year 2019) Design Loads

Parameter	Design Concentrations	Average Month Loading (8)	Max. Month Loading (9)
BOD5	194 mg/L (1)	165 kg/d	214 kg/d
TSS	223 mg/L (2)	190 kg/d	247 kg/d
TKN	45 mg/L (3)	38 kg/d	49 kg/d
TAN	30 mg/L (4)	25 kg/d	39 kg/d
TP	6.0 mg/L (5)	5.1 kg/d	7.0 kg/d
Alkalinity	250 – 350 mg/L (6)	-	-
Temperature	10 – 23 degree C (7)	-	-

Notes:

1. BOD5 concentration conservatively estimated using per capita generation rate of **(65 g/cap/d)** x (2531 service population) / (850 m3/d flow) vs MOECC design guideline typical residential generation rate of 35-65 g/cap/d (pg 22-24, table 22-2).
2. TSS concentration conservatively estimated using per capita generation rate of **(75 g/cap/d)** x (2531 service population) / (850 m3/d flow) vs MOECC design guideline typical residential generation rate of 35-75 g/cap/d (pg 22-24, table 22-2).
3. TKN concentration conservatively estimated using per capita generation rate of **(15 g/cap/d)** x (2531 service population) / (850 m3/d flow) vs MOECC design guideline typical residential generation rate of 6-17 g/cap/d (pg 22-24, table 22-2).
4. TAN concentration estimated at 0.67xTKN.
5. TP concentration conservatively estimated using per capita generation rate of **(2 g/cap/d)** x (2531 service population) / (850 m3/d flow) vs MOECC design guideline typical residential generation rate of 1-2 g/cap/d (pg 22-24, table 22-2).
6. Alkalinity information is unavailable. Typical limestone-based groundwater alkalinity of 250-350 has been assumed.
7. Wastewater temperature range is unknown. Typical wastewater temperature variation for southern Ontario has been assumed.
8. Average month loadings calculated as: (design concentration) x (850 m3/d flow).
9. Maximum month loadings calculated as: (average month loading) x 1.3 peak factor

2.2.4 Effluent Limits

The effluent limits as defined in the 2014 ESR and presented in the DBFOM RFP are presented in Table 4 and are the basis for the Stage 1 construction design.

Table 4 – Stage 1 Construction Design Effluent Limits

Parameter	Compliance Limit	Design Objective
TP (mg/L)	0.1	0.05 [1]
Total Ammonia (mg/L)	1.8	1.8 [2]
TSS (mg/L)	10	5 [3]
BOD	10	5 [3]
Total Fecal Coliforms (CFU/100 mL)	200	200 [4]

Notes:

1. Recommended by the Everett Secondary Plan Master Servicing Plan (November 2012).

2. Used by the Pine River Assimilative Capacity Study (December 2012)
3. Proposed by for the former R&M in-process WWTP.
4. ECA limit at the nearby Angus WWTP.

2.3 OVERALL PROCESS DESCRIPTION

The process design presented herein maintains the same process elements as defined in the 2014 ESR preferred wastewater treatment concept except with modifications to improve operational performance, allow for construction phasing, and reduce construction/operational costs. The key process elements proposed are:

1. Raw sewage pumping station – The raw sewage pumping station has been located adjacent to the WWTP in order to capitalize on key benefits including: 1) centralized facility for ease of operation and maintenance, 2) allow use of common standby generator for both raw sewage pumping and WWTP operations, 3) improve security and access control, 4) allow PLC/MCC placement inside an electrical room, 5) allow combined pumping of site sanitary drainage, 6) etc. Three VFD driven submersible pumps on rails will be installed including a smaller capacity jockey pump intended to operate most of the time to handle typical daily flow variation and two larger peak flow pumps (duty/standby) to operate occasionally during peak flow events..

2. Emergency flow diversion –Excessive peak flows could occur that exceed the treatment plant design peak flow of 3.5x annual average. Flexibility has been provided to divert excess wet weather flows >3.5x annual average to the sludge digestion/storage basin as an emergency measure. Diverted excess flow supernatant will be pumped back to the headworks of the new WWTF once excessive peak flows subside and there is available capacity to receive and treat this excess flow.

3. Screening/degrit system – Two mechanical screen/aerated grit tanks will be placed in the upper level of the process building with space provision for future third unit. Flows will be pumped directly from the raw sewage pumping station into the elevated contained units for screening and degritting. Screenings will drop by gravity into collection bins located at grade. Settled/captured grit in the aerated tanks will be removed via inclined augers and also drop into bins at grade.

4. MBR treatment trains – Two (2) fully independent MBR trains will be designed for the first Stage. The MBR system will be comprised of: two (2) aeration tanks, two (2) ultra-filtration membrane filtration cells, permeate pumps, RAS/WAS pumps, blowers for aeration tanks and MBR air scour, citric acid and NaOCl membrane cleaning systems, and associated controls. The membrane associated equipment and controls will be supplied by industry leader GE Water, located here in Ontario. The MBR permeate pumps will also function as

the effluent pumps to transfer treated flows through the forcemain to the outfall at Pine River.

5. UV disinfection – Two in-pipe UV modules provided by Calgon will be provided to ensure effluent *E.coli* limits are achieved.

6. Chemical dosing systems – Various chemical dosing systems will be needed and will be located in a chemical room within the administration building. The chemical dosing systems needed include: 1) aluminum sulphate (alum) for phosphorus removal, 2) sodium hydroxide (NaOH) for alkalinity addition, 3) and MBR cleaning systems (citric acid and NaOCl).

7. Sludge digestion and storage– Excess waste activated sludge (WAS) will be pumped to a two cell EPDM lined earth-berm basin for aerobic digestion and storage. WAS will enter the first cell and undergo aerobic digestion and overflow to the second cell where it will be stored. The two cells will be sized to ensure: 1) minimum 45 days aerobic sludge age, 2) minimum 6 month sludge storage time, 3) volume allowance for emergency flow diversion, and 4) volume contingencies for decanting, freeboard, etc. Solids handling process equipment will include: 1) floating aerator/mixer for VSS destruction and odour mitigation, and 2) decant pump to recycle supernatant originating for rainwater/gravity thickening operations.

Detailed descriptions for each of these unit processes follows under separate headings of this report.

2.4 PROCESS REDUNDANCY

Consideration has been given to providing sufficient redundancy of design to allow equipment or sections of the process to go offline for either scheduled maintenance or emergency condition. The level of redundancy proposed is consistent with the *MOE Design Guidelines for Sewage Works, 2008 – Table 3-1: Example of Reliability Analysis of Sewage Treatment Components*. Table 5 provides the Process Redundancy Plan.

Table 5 - Process Redundancy Plan

Process	Redundancy Plan
Raw Sewage Pumping Station	• Provide 3 pumps (Lead/ lag/ standby) • Should any "duty" pump fail, the "standby" pump will automatically assume duty operation.
Emergency Flow Diversion	• Provide duty decant pump and backup gravity drain to return emergency diverted flows from sludge digestion/storage basin to the raw sewage pump station for treatment.

Process	Redundancy Plan
Package Screening/Grit Removal	• Provide 2 package screen/grit removal units, each containing a mechanical screen and aerated grit tank with removal augers and collection bins. • Each package is sized for 100% of peak flow and allows for duty/standby operation at all times. • Provide piped emergency bypass to the sludge digestion/storage basin.
Bioreactors	• Provide 2 aeration trains, each sized for 50% maximum month loading. • Provide 2 PD blowers on VFD (duty/standby shared with MBR air scour). • Use piped emergency bypass to the sludge digestion/storage basin as contingency.
Ultra-filtration (UF)	• Provide 2 UF cells with membrane area sized for peak hour flow. • Provide 3 permeate/effluent transfer pumps (duty/duty/standby) • Provide 3 RAS/WAS pumps (duty/duty/standby) • Provide 1 PD MBR air scour blower on VFD (duty/standby shared with bioreactor blower) • Use piped emergency bypass to the sludge digestion/storage basin as contingency.
UV disinfection	• Provide 2 units (duty/standby), each sized for 100% peak flow.

Chemical Dosing	• For phosphorus removal provide: floor space for 2 storage totes, duty/shelf spare dose pump, sized for 100% peak dosing need.
	• For alkalinity dosing provide: floor space for 2 storage totes, duty/shelf spare dose pump, sized for 100% peak dosing need.
	• For MBR cleaning:
	  ○ NaOCl; - floor space for 2 storage totes, duty/standby pumps, sized for 100% peak dosing need.
	  ○ Citric acid – floor space for 2 storage totes, duty/shelf spare dose pump, sized for 100% peak dosing need.

Sludge Digestion and Storage	• Provide 2 cells to allow for continuous stabilization and controlled sludge removal • Provide floating surface aerator in Cell #1 to meet VSS destruction needs and control odours. • Provide suspended decant pump in Cell #2 to allow decanting and return of supernatant to the WWTF headworks; use gravity drain as backup for decanting.

Process	Redundancy Plan
Standby Generator	• Provide new generator sized to provide 100% backup power for the essential systems.

2.5 ALLOWANCE FOR FUTURE CAPACITY INCREASE

Consideration has been given to allow future capacity increases beyond the current Stage 1 construction design requirement of 850 m^3/d annual average flow (AAF) in an orderly and cost effective manner as noted in Table 6.

Table 6 - Future Capacity Expansion Plan

Process	Stage 2 Capacity Increase Plan (1,700 m3/d AAF)	Stage 3 Capacity Increase Plan (3,400 m3/d AAF)
Raw Sewage Pumps	• Pumps are sized for Stage 1 and will be replaced with larger capacity units to suit the new Stage 2 peak flow requirement of 6000 m3/d.	• Replace pumps to suit increase in flows. • If advantageous, add forcemains to suit increase in flows.
Emergency Flow Diversion	• Emergency flow diversion is sized for Stage 2 so no changes anticipated.	• Consider modifying the sludge digestion/storage basin to increase dedicated flow equalization volume.
Package Screening/Grit Removal	• Add additional new unit(s) to suit the new peak flow requirement.	• Depending on equipment condition (remaining life) either: • Continue with existing units operating in parallel to treat design peak flow and bypass with greater frequency/volumes to the sludge digestion/storage basin. The bypass frequency/volume will depend upon the increase in peak flows associated with the annual average capacity increase being contemplated. • **OR** replace with 2 new units to suit the new peak flow requirement.

Process	Stage 2 Capacity Increase Plan (1,700 m3/d AAF)	Stage 3 Capacity Increase Plan (3,400 m3/d AAF)
		• **OR** add additional new units to suit the new peak flow requirement.
Bioreactors	• Re-rate existing two units to account for potential opportunities such as: weaker wastewater strength, lower max month loading, lower winter operating sludge age, etc. • **AND** add more bioreactor volume by extending the length of the existing aeration tanks.	• Add two (2) similar sized treatment tanks in parallel with the existing two (2) tanks.
Aeration	• Add two (2) 1600 sm3/hr blowers to serve as process duty/standby. Previous common standby will assume second duty position for MBR air. Total number of blowers increases to four with one removed. • **OR** Add one (1) 980 sm3/hr and one(1) 800 sm3/hr blower such that each MBR and each Bioreactor have their own dedicated duty blower while sharing a common standby. Total number of blowers increases to 5.	• Increase blower size for process air and MBR air as needed.
Ultra-filtration	• Add membrane area (ie modules) to maximize 4 cassette train UF capacity to 1700 m3/d annual flow equivalent.	• Add more UF cells in new parallel trains with the existing trains; add new pumps and aeration tank volume to suit UF capacity.
UV Disinfection	• Add 3rd similar sized unit to make duty/duty/standby configuration sized for 6000 m3/d PHF.	• Replace UV units with higher capacity units to suit the new peak flow requirement. • **OR** add new UV units to suit the increase in peak flow requirement.

Process	Stage 2 Capacity Increase Plan (1,700 m3/d AAF)	Stage 3 Capacity Increase Plan (3,400 m3/d AAF)
Chemical dosing	• For alum, NaOH, NaOCl, and citric acid dose systems; either continue with storage totes.	• For alum, NaOH, NaOCl, and citric acid dose systems; either continue with storage totes **OR** replace with larger storage tank(s) and dosing pumps to suit the new plant rating.
Sludge Digestion and Storage	• Sludge digestion and storage are sized for Stage 2	• Increase digestion and storage volumes to suit treatment capacity increase. • **OR** modify/replace with a mechanical solids handling process that may feature: aerobic digestion process (eg tank with diffusers), liquid biosolids storage in a tank, biosolids dewatering process (eg centrifuge, geotextile dewatering), etc.
Standby Generator	• Generator sized for Stage 2 so no changes anticipated.	• Continue with existing generator or replace as necessary.

2.6 DRAWINGS

Engineering drawings were produced to illustrate key design information for plant configuration, treatment process areas, and to allow for construction costing. Drawings are provided as part of this Preliminary Design Report.

3.0 CONCEPTUAL DESIGN

3.1 RAW SEWAGE PUMPING STATION

3.1.1 General Description

All sanitary wastewater will be conveyed to the raw sewage pumping station to be located on the WWTP property. Locating the raw sewage pumping station adjacent to the WWTP has many advantages including: 1) centralized facility for ease of operation and maintenance, 2) allow use of common standby generator for both raw sewage pumping and WWTP operations, 3) improve security and access control, 4) allow PLC/MCC placement inside an electrical room, 5) allow combined pumping of site sanitary drainage, 6) etc. Three VFD driven submersible pumps on rails will be installed in a lead/lag/standby configuration to operate one pump during low flow events and a second pump occasionally whenever wet weather flow occurs. The three pumps will rotate in position as lead/lag/standby with each cycle of the pumping station.

3.1.2 Raw Sewage Pumping Station Equipment

Pumps will START/STOP and be speed controlled using VFDs and liquid levels within the pumping well. The lead pump will operate based on "lower" setpoint liquid levels while the lag pump will operate whenever liquid levels rise to trigger their operation. Should either pump fail, the standby unit will automatically assume operation. Should the liquid level sensor fail, backup float switches will assume control for the pump operation.

The raw sewage pumping station system details are presented in Table 7.

Table 7 - Raw Sewage Pumping System Details

Emergency Flow Diversion System Details
Design conditions: • Average annual flow =850 m^3/d • Maximum day flow = 2,100 m^3/d • Peak hour flow = 3,000 m^3/d • Peak instantaneous flows > 3,000 m^3/d will be diverted to the sludge digestion and storage basin.
Raw Sewage Pumps: • Type = submersible pumps • Manufacturers = Xylem or approved equal • Number = 3 (1 lead / 1 lag / 1 standby)

Emergency Flow Diversion System Details
• Stage 1 Lead/Lag/Standby Pump Capacity = 320 - 1,500 m3/d @ 15.1 - 19.2m TDH; motor horsepower=11.2 kW • Stage 2 Lead/Lag/Standby pump capacity =150 - 3,200 m3/d @ 20.7 m TDH; motor horsepower = 14.9 kW • Pump speeds modulated using VFD and liquid level sensor
Control Equipment: • Duty pressure transducer to monitor wet well liquid level and control pump selection and VFD speed. • Backup float switches will control pumps should the pressure transducer fault/fail. • Pumps include VFDs to regulate speed and flow. • One (1) Isolation knife gate and check valve per pump. • Magnetic flowmeters in the pump room to control pumped flow into the headworks and bypass to the sludge stabilization/storage basin.
Operating philosophy: • Sanitary wastewater will enter the raw sewage station well. • The duty pump selection will depend upon the liquid levels maintained within the wet well. The VFD will normally operate with lower liquid levels with lead operation only switching to the lag pump when liquid levels rise above its START elevation. • Should a pump fail then the lag pump will automatically assume lead operation. • Should the pressure transducers fail, then backup float switches will assume pump control. • A magnetic flow meter and automated flow control valve will open/modulate on the emergency bypass line to regulate the flow split between the WWTF and the sludge stabilization/storage basin.
Controls: • The pump PLC and MCC components will be located in the electrical room of the administration building.

3.2 EMERGENCY FLOW DIVERSION

3.2.1 General Description

The intent will be to use the sludge digestion/storage basins for emergency flow diversion. This may include diverting extreme peak wet weather flows that exceed the design peak flow of 3.5x annual average or providing flexibility to divert flows for maintenance or emergency

reasons. Diverted flows will be pumped back into the new WWTP headworks via the raw sewage pumping station once the wet weather flows have subsided.

The 2 cell sludge digestion and storage basin will designed to include minimum 600 m^3 dedicated emergency storage volume in addition to the volume needs for sludge stabilization and storage. The 600 m^3 storage volume equates to approximately 17 hours diversion time at the Stage 1 average flow of 850 m^3/d and 5 hours diversion time at a peak hour flow of 3,000 m^3/d.

3.2.2 Emergency Flow Diversion Equipment

Pumped flows will enter into a common header located in the process building. A flow control valve on the inlet header will open should flows exceed a process setpoint (either max flow of 3,000 m^3/d into the headworks or high aeration tank water level) and modulate to maintain a maximum flow of 3,000 m^3/d through the headworks. Flows >3,000 m^3/d will be diverted to the sludge digestion and storage basin.

Diverted flows will be returned to the plant via a decant pump located in cell #2 of the sludge stabilization/storage basin which will lift decant into a manhole that gravity drains back to the raw sewage pumping station.

The emergency flow diversion system details are presented in Table 8.

Table 8 - Emergency Flow Diversion System Details

Emergency Flow Diversion System Details
Design conditions: • Average annual flow =850 m^3/d • Maximum day flow = 2,100 m^3/d • Peak hour flow = 3,000 m^3/d • Peak instantaneous flows > 3,000 m^3/d will be diverted to the sludge digestion and storage basin.
Within Headwork Room: • Magmeters to measure flows entering the WWTP • Flow control valve to regulate the flow split between the WWTP and sludge digestion and storage basin. • Forcemain to direct emergency diversion flows to the sludge digestion and storage basin. At sludge stabilization/storage basin: • Decant pump to lift clarified effluent into an adjacent manhole structure; gravity drain will be used as backup when decant pump is offline.

Emergency Flow Diversion System Details
• Manhole drains to raw sewage pumping station to allow for pumping of diverted flow back into the WWTP.
Operating philosophy: • All pumped flow to the WWTP will enter the headworks room. • A magnetic flow meter and automated flow control valve will open/modulate on the emergency bypass line to regulate the flow split between the WWTP and the sludge stabilization/storage basin. • The operator will visually monitor the sludge stabilization/storage basin level and select through SCADA runtimes for the submersible decant pump that will return flows back to the WWTP, via the raw sewage pumping station, once flows subside.
Controls: • The flow splitting and return pump control will be automated through SCADA set points.

3.3 SCREENING/GRIT REMOVAL SYSTEM

3.3.1 General Description

Because all flows are pumped into the plant, this offers the opportunity to use elevated and enclosed package screening and degriting equipment at significantly reduced construction cost versus gravity flow concrete channel designs. Given the significant cost savings and proven performance of elevated designs, this concept has been selected as the basis for the screening and grit removal designs for the new WWTF.

Fine screens with 2mm openings will be used in order to meet MBR vendor requirements and control membrane fouling risks.

3.3.2 Screening/Grit Removal Equipment

Two (2) new elevated package screen/grit removal systems will be placed in the process building. Each package will be sized for 100% of the Stage 1 peak flow (ie 3,000 m^3/d each) and normally operate duty/standby. Collected screenings and grit from each unit will drop into collection bins located at grade. Operators will periodically empty bin contents as necessary.

The package screening/grit removal equipment details are presented in Table 9.

Table 9 - Screening/Grit Removal System Details

Screening/Grit Removal System Details
Design conditions: • Average annual flow = 850 m^3/d • Maximum month flow = 1,100 m^3/d • Maximum day flow = 2,100 m^3/d • Peak hour flow = 3,000 m^3/d • Municipal wastewater characteristics as defined in Table 3.
Screen/Grit Removal Design: • Package number = 2 units (each package with screen & aerated grit tank eqmt.) • Screen/grit capacity = each sized for 100% of peak flow or 3,000 m^3/d per unit • Screen type = 2mm mechanical auger screen; fully enclosed stainless steel units • Grit removal type = aerated grit tank with inclined auger; fully enclosed stainless steel tank • Manufacturer= Huber (design drawing standard) • Package includes: 2 mm screen/motor, washwater system, PD blowers, local control panels.
Screen/Grit System Bypass: • Flows >3,000 m3/d will bypass to the sludge stabilization/storage basin.
Operating philosophy: • The duty screen/grit system will normally operate fully automatically based on timer control. • Solids will be removed from the screen surface via brushes and inclined auger and drop into collection bins located at grade. • Settled/captured grit will be removed via inclined auger and drop into collection bins also located at grade. • The collection bins will be visually monitored by plant staff and periodically emptied as necessary. Collected screenings and grit will be disposed of at a sanitary landfill. • Periodically the operator will alternate the duty/standby units by opening/closing inlet/outlet isolation valves. • Should a fault be detected an alarm will annunciate and through automated inlet valves will switch the standby unit to duty service.
Controls: • The package screen/grit removal systems will normally operate fully automatically through the equipment vendor supplied PLC control panel and selected setpoints.

Screening/Grit Removal System Details
• MCC/PLC components for the package screen/grit removal systems will be located within vendor control panels located in the Pump Room below. • Alternating duty/standby service will be done through SCADA/PLC by opening/closing inlet/outlet isolation valves.

3.4 MEMBRANE BIOREACTOR (MBR) TREATMENT

3.4.1 General Description

Screened and degritted wastewater will flow by gravity and split equally into two membrane bioreactor (MBR) trains, each featuring an aeration tank followed by a solids/liquid separation cell containing UF membranes.

Process modeling using a wastewater treatment simulator called Biowin™ was used to confirm the bioreactor size and effluent treatment performance for the Stage 1flows/loadings at 850 m^3/d AAF. The most challenging and critical operating condition of maximum month loading coinciding with minimum wastewater temperature of 10 C was used to size the bioreactor volume. The Biowin™ model representation for the Everett WWTP along with maximum month concentrations/loadings is shown in figure 2 and table 10, and 11.

Figure 2 - Everett WWTP - Biowin™ Model Representation

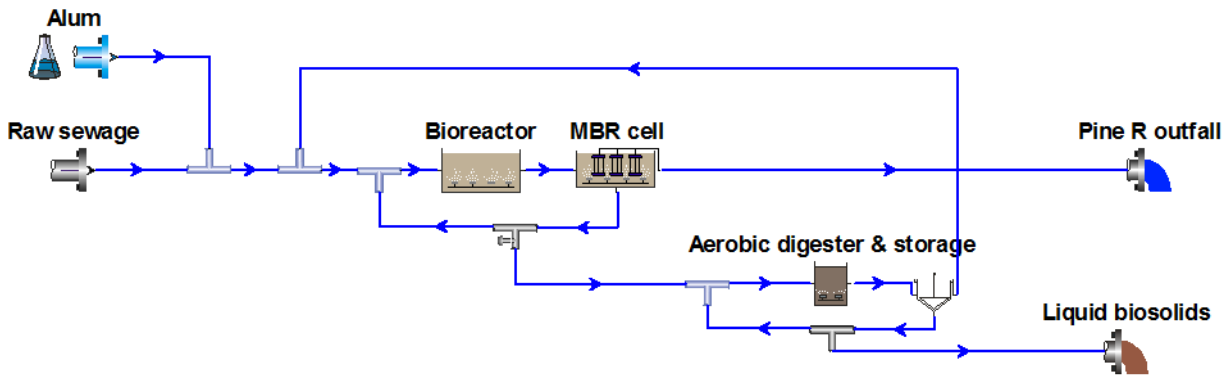


Table 10 – Stage 1 Maximum Month Load Condition - Concentrations (mg/L)

Elements	Flow [m3/d]	TCBOD [mg/L]	TSS [mg/L]	VSS [mg/L]	TKN [mgN/L]	S_NHx [mgN/L]	S_NO3 [mgN/L]	SPO4 [mgP/L]	TP [mgP/L]
Raw sewage	1100.00	196.64	218.73	158.21	45.00	29.70	0	3.00	6.00
Alum	0.09	0	0	0	0	0	0	0	0
Bioreactor	5495.23	1346.60	9238.90	4723.86	398.67	0.83	33.84	0.02	310.35
MBR cell	1095.23	0.93	0	0	2.47	0.28	34.75	0.01	0.01
Pine R outfall	1095.23	0.93	0.00	0	2.47	0.28	34.75	0.01	0.01
MBR cell (U)	4400.00	1675.08	11533.24	5894.06	496.28	0.28	34.75	0.01	387.60
MBR WAS splitter	4381.65	1675.08	11533.24	5894.06	496.28	0.28	34.75	0.01	387.60
MBR WAS splitter (U)	18.35	1675.08	11533.24	5894.06	496.28	0.28	34.75	0.01	387.60
Aerobic digester & storage	25.64	91.67	16911.26	7323.46	628.43	54.47	120.53	1.39	662.74
Digester decant	13.50	5.94	963.72	417.44	89.00	54.47	120.53	1.43	39.08
Liquid biosolids	4.86	186.93	34630.50	14996.81	1227.79	54.47	120.53	1.39	1355.69

Table 11 – Stage 1 Maximum Month Load Condition - Loadings (kg/d)

Elements	TCBOD [kg /d]	TSS [kg /d]	VSS [kg /d]	TKN [kg N/d]	S_NHx [kg N/d]	S_NO3 [kg N/d]	SPO4 [kg P/d]	TP [kg P/d]
Raw sewage	216.31	240.60	174.03	49.50	32.67	0	3.30	6.60
Alum	0	0	0	0	0	0	0	0
Bioreactor	7399.85	50769.85	25958.68	2190.76	4.57	185.94	0.08	1705.47
MBR cell	1.02	0	0	2.70	0.31	38.06	0.01	0.01
Pine R outfall	1.02	0.00	0	2.70	0.31	38.06	0.01	0.01
MBR cell (U)	7370.34	50746.26	25933.85	2183.63	1.24	152.92	0.05	1705.45
MBR WAS splitter	7339.59	50534.58	25825.66	2174.52	1.23	152.28	0.05	1698.34
MBR WAS splitter (U)	30.75	211.69	108.18	9.11	0.01	0.64	0.00	7.11
Aerobic digester & storage	2.35	433.64	187.79	16.11	1.40	3.09	0.04	16.99
Digester decant	0.08	13.01	5.63	1.20	0.74	1.63	0.02	0.53
Liquid biosolids	0.91	168.25	72.86	5.97	0.26	0.59	0.01	6.59

The key MBR treatment model findings and their impact on bioreactor and UF system sizing are summarized in the following sections.

3.4.2 Bioreactor Design

A combined stage 1 aerobic volume of 480 m3 (400 m3 within aeration tanks + 80 m3 within UF cells) will provide sufficient treatment volume to allow nitrification, organics degradation, and phosphorus precipitation to occur; and, keep bioreactor biomass concentration <10,000 mg/L at all times needed for effective UF membrane operation.

Process air delivery will be provided by a duty positive displacement (PD) blower sized for Stage 1 "max day" biological oxygen demand with a VFD/motor configuration to allow for 10:1 speed turndown, essential to meeting initial start-up airflow demands that will be significantly less than the design "max day" requirement. Air will be diffused into the bottom of the tanks using fine-bubble EPDM diffusers to maximize the oxygen transfer and electrical efficiency of the system. Dissolved oxygen (DO) sensors will continuously monitor DO and control blower VFD speed to match air delivery with biological oxygen demands in real-time.

A standby PD blower is provided to ensure uninterrupted air supply should the duty blower fail. It is the same size as the duty MBR air blower and will also be used as standby service for the duty MBR air scour blower.

Stage 2 sizing strategy will include a fourth PD blower. The MBR Blower will remain the same and the common standby will act as a second duty blower for the MBR air scour. The process air blower will be increased in size to meet the stage 2 "max day" requirement and a second blower of the same size will assume the common standby position.

Key details of the bioreactor tank design are provided in Table 12.

Table 12 - Bioreactor System Details

Aeration Tank System Details
Design conditions (both tanks): • Average annual flow = 850 m^3/d • Maximum month flow = 1,100 m^3/d • Maximum day flow = 2,100 m^3/d • Peak hour flow = 3,000 m^3/d • Municipal wastewater characteristics as defined in Table 3.
Blowers: • Type = positive displacement with VFD speed control. • Manufacturer = Aerzen (design standard) • Number = 1 duty + 1 common standby (shared with MBR air scour) sized for Stage 1. • Initial biological airflow demands upon plant start-up with Qavg=80 m^3/d from New Horizon) is estimated at only 20 sm3/hr at 52 kPa gauge pressure (based on 4.3 m diffuser depth + 1m losses). • Minimum air requirement for mixing is estimated at 75-100 sm3/hr per aeration tank per MOECC design guidelines. Assuming only 1 tank is initially operated, then minimum airflow for mixing will be approx. 75 sm3/hr – ie much higher than the start-up biological airflow demand of 20 sm3/hr. • The design Stage 1 airflow demands (with Qavg=850 m3/d) is estimated at 360 sm3/hr for "average day" loading and as high as 800 sm3/hr for "max day" loading. Blower backpressure is estimated at 52 kPa gauge pressure (based on 4.3 diffuser depth + 1m losses) • Motor Horsepower = 22.5 kW (sized to meet the design Stage 1 of 800 m3/hr airflow demand); actual operating draw will be much less depending upon the minimum air required for mixing required in the field and plant influent flow/load condition.

Aeration Tank System Details
Diffuser System: • Type = 220 mm (9") diameter fine-bubble flexible membrane diffusers • Manufacturer = Sanitaire or approved equal • Two droplegs/isolation valves/overlapping diffuser grids for each aeration tank. • Water purge on each dropleg
Bioreactor Dimensional Information: • Number of units = 2 • Side water depth = 4.5 m • Length = 9.5 m • Width = 4.7 m • Bioreactor volume = 480 m3 (total for 2 units; includes 80 m3 contained in UF cells)
Aeration Tank Design Loading Rates: • Average Hydraulic Retention Time (HRT) = 11.3 hours • Organic Loading Rate (OLR) = 0.41 kg cBOD5/d per m3 • Food: Micro-organism (F:M) Ratio = 0.11 kg cBOD5/d per kg MLVSS • MLSS = 5,000–10,000 mg/L range depending upon loading and operating SRT (design SRT>12 days)
Operating philosophy: <u>Normal Mode (2 modules in operation)</u> • The operator will waste MLSS to maintain MLSS setpoint within the aeration tanks of 5,000-10,000 mg/L – typically higher MLSS will be maintained in winter to ensure complete nitrification. • The bioreactor will see fluctuating air depending upon biological oxygen demand and minimum needs for mixing. <u>Initial Start-up Low Flow/Loading Mode (one module in operation)</u> • The operator will initially operate with 1 bioreactor and 2 UF membrane cells in order to better match bioreactor volume with anticipated low initial start-up flows/loads of 80 m3/d originating from the New Horizon development.

Aeration Tank System Details
• This will involve taking one bioreactor offline and redirecting flows (sewage and RAS) in the remaining module. • Taking one module offline will entail wasting of the MLSS to the sludge digestion/storage basin as needed.
Controls: • The duty blower will modulate on VFD based on DO setpoint down to a minimum flow rate based on mixing requirements. • Should the duty blower fault, the standby unit will automatically start and enter service. • Blowers, MCC's and related RPU equipment for the blowers will be located in the administration building.

3.4.3 UF Membranes

An ultra-filtration (UF) membrane system will provide solids/liquid separation and effluent pumping through UV disinfection and forcemain to the Pine River outfall.

The UF membrane system will be provided by GE Water and is based on its industry leading ZeeWeed 500 module cassettes featuring 0.045 micron pore-size membranes. Two UF cells will be provided to match the two aeration tanks. Each UF cell will be fitted with 1 membrane cassette initially with spare space to add the second cassette once plant flows increase above approximately 500 m3/d annual average.

The GE water scope of supply for the membrane package of equipment and key system design information are summarized in table 13.

Table 13 - UF Membrane System Details

UF Membrane System Details
Design conditions (both tanks): • Average annual flow = 850 m^3/d • Maximum month flow = 1,100 m^3/d • Maximum day flow = 2,100 m^3/d

UF Membrane System Details
• Peak hour flow = 3,000 m^3/d • Municipal wastewater characteristics as defined in Table 3.
UF System Design: • Number of membrane trains = 2 • Number of cassettes per train = 2, (initially 1 per train installed with 2nd unit installed when Qavg>500 m^3/d) • Number of installed modules per train = 68 • Maximum number of modules per train = 104 • Spare module space = 35% • Membrane tank dimensions = per drawings
Process/Effluent Discharge Pumps (GE supply): • Type=reversible rotary lobe displacement pumps • Manufacturer = Borger, model FL518 • Number = 2 duty + 1 common standby – one pump per train. • Pump capacity = 3,850 m3/d each (44.5 L/s each) • Motor horsepower = 22.3 kW (forcemain duty governs motor size)
Membrane Air Scour Blowers (GE supply): • Type = rotary lobe positive displacement blowers • Manufacturer = Aerzen • Number = 1 duty + 1 common standby (shared with Process Air blower) • Capacity = 980 sm3/hr at 34 kPa gauge pressure (per GE design) • Motor Horsepower = 22.3 kW (per GE design).
RAS/WAS Pumps (GE supply): • Type = centrifugal pumps • Manufacturer = GE scope of supply • Number = 2 duty + 1 common standby

UF Membrane System Details
• RAS/WAS pump capacity = 6,000 m3/d each (68.8 L/s each) @ 4.5 - 6.1m TDH • Motor horsepower = 5.6 kW (per GE design) • Flow control valve and magmeter regulate how much flow is wasted (WAS) to the sludge digestion/storage basin.
Membrane chemical cleaning systems (GE supply): • One citric acid cleaning system comprised of: tote, 1 panel mount pump & controls. • One NaOCl cleaning system comprised of: tote, duty/standby panel mounted pumps & controls.
Membrane System Electrical and Control Equipment (GE supply): • PLC complete with touch screen HMI to control MBR related equipment including operation of the 3 positive displacement blowers.
Miscellaneous MBR equipment (GE supply) • Electrically actuated valves throughout (no pneumatic valve operations). • Instrumentation including: membrane tank level transmitters and level switches, pressure gauges and flow meters, transmembrane pressure transmitters, turbidity meter. • Electrically actuated blower isolation valves.
Operating philosophy: • The UF membrane system operates entirely based on PLC control. This includes: process/discharge pump rate based on UF cell liquid level, RAS rate, membrane backpulse and maintenance clean frequencies, air scour settings, process blower settings, etc. • The operator will perform membrane clean-in-place (CIP) once per year to chemically soak and clean the membranes using citric acid and NaOCl when fouling levels and transmembrane pressures rise. • The MLSS will be recycled continuously through the duty RAS pumps to the bioreactor at a setpoint adjustable rate equivalent to 300-500% of the influent flow. Should a duty RAS pump fail, the standby RAS pump will be automatically switched ON.

UF Membrane System Details
• WAS will be wasted using PLC control through a flow control valve and magmeter. Wastage will be directed to the sludge digestion/storage basin and is operator determined based on either timer setting or flowmeter volume setting.
Controls: • RAS pump speed will be VFD controlled per GE setpoint selection. • Daily wasted WAS volumes will be per operator setpoint "time" or "volume" selection. • MCC's and related RPU equipment for the UF membrane related equipment (including aeration) will be located in the administration building.

3.5 UV DISINFECTION

3.5.1 General Description

The primary purpose of UV disinfection is to kill pathogenic organisms that may affect downstream water users. UV light is emitted at 254 nm wavelength which disrupts bacterial DNA thus limiting regrowth and the potential to infect exposed persons. UV light intensity is normally regulated according to flow rate and the wastewater UV transmissivity in order to regulate the light exposure dose to kill microorganisms and conserve electricity. UV systems are proprietary systems and purchased through speciality vendors.

3.5.2 UV Equipment

The proposed UV disinfection approach will include two (2) UV modules (duty/standby), each sized for 100% of peak flow (i.e.3,000 m^3/d peak flow each). These units will be located in the lower level Pump Room adjacent to the MBR related pumps and have flow piped in and out of the units.

The UV disinfection equipment will be provided by Calgon and its design is summarized in Table 14.

Table 14 - UV Disinfection System Details

UV Disinfection System Details
Design conditions (both units): • Average annual flow = 850 m^3/d • Maximum month flow = 1,100 m^3/d

UV Disinfection System Details
• Maximum day flow = 2,500 m^3/d • Peak hour flow = 3,000 m^3/d • MBR effluent characteristics with TSS= 0 mg/L and min 70% UV transmissivity.
UV Performance Targets • E.coli limit = 200 CFU/100 mL compliance limit as monthly geometric mean
UV Equipment Design: • Number of units = 2 (duty/standby) with each sized for peak flow of 3,000 m3/d. • Lamp type = medium intensity, low pressure • Manufacturer/model = Calgon, model: Sentinel 3x4 kW • Package includes: bulbs/housing, local control panels, and spare components.
Operating philosophy: • The duty/standby UV modules will operate automatically through vender local control panels. Basic operating philosophy is to modulate the light intensity based on flow and UV transmissivity (UVT) so that bacterial inactivation and electrical efficiency is maintained for all flows. • Duty unit will periodically alternate to balance operating times through use of motorized isolation valves. • Should the duty unit fault, then the standby unit will automatically start and flow be re-directed by opening/closing appropriate motorized isolation valves.
Controls: • The UV system will be controlled through two vendor local control panels. The light intensity of the duty UV bank will modulate based on a continuous input flow signal and operator setpoint UVT. • Alarms will be supplied as part of the vendor package and annunciate per SCADA system. • MCC's and related RPU equipment for the UV equipment will be located in the Pump Room.

3.6 CHEMICAL DOSING SYSTEMS

Two dosing systems are proposed for the new Everett WWTF:

1. Liquid aluminum sulphate (alum) dose system for phosphorus precipitation into the activated sludge system. Addition of alum will precipitate the bulk of soluble phosphorus needed to meet effluent TP limits.

2. Liquid sodium hydroxide (NaOH) dose system for alkalinity addition and improved nitrification.

Typically, 50-80% of the raw wastewater phosphorus is in the soluble form and would pass through the treatment system unless it is precipitated using a coagulant such as alum. Therefore an alum dose system is needed in order to precipitate soluble phosphorus and achieve the low phosphorus effluent limit of 0.1 mg/L.

Nitrification (biological conversion of toxic ammonia to non-toxic nitrate) requires substantial alkalinity to proceed uninhibited (~ 7.5 mg of alkalinity is consumed per mg of ammonia that is nitrified). Insufficient raw wastewater alkalinity information is available to confirm whether supplemental alkalinity addition is necessary at this stage. Stantec expects that some supplemental alkalinity may be necessary and therefore have included a sodium hydroxide (NaOH) dose system should the need arise.

3.6.1 Alum Dosing Design

Preliminary calculations suggest approx. 70-100 L/d of 48% alum solution dosing may be required for phosphorus removal for plant operation at Stage 1 design of 850 m3/d. This is based on an assumed alum demand of 50-75 mg/L. Actual alum demand will vary and is dependent on many factors including: degree of mixing, stoichiometric needs to achieve low soluble phosphorus < 0.1 mg/L, competing precipitation reactions, etc.

Key details of the phosphorus removal dosing system are provided in Table 15.

Table 15 Phosphorus Removal Dosing System Details

Alum Dosing System Details
Design conditions (both tanks): • Average annual flow = 850 m^3/d • Maximum month flow = 1,100 m^3/d • Maximum day flow = 2,100 m^3/d • Peak hour flow = 3,000 m^3/d • Municipal wastewater characteristics as defined in Table 3.
Chemical selection and storage design: • Coagulant = 48% liquid alum • Chemical storage using 1000 L totes. • Floor space for 2 totes (1 in service + 1 spare)
New chemical dosing pump design: • Type = positive displacement

Alum Dosing System Details
• Manufacturer = ProMinent or approved equal • Number = 2 pumps (1 duty + 1 shelf spare shared with NaOH service), each rated for ~20 L/h @ 450 kPa • Duty pump feeds the duty screen/grit unit, directly into the aerated grit tank where vigorous aeration/mixing will enhance phosphorus precipitation and reduce alum usage.
Operating philosophy: • The operator will control dosing based on setpoint – either fixed flow rate or flow-proportional rate. • The duty alum pump will feed directly into the duty screen/grit unit based on setpoint dosing control. Whenever the duty/standby screen/grit units are alternated, the operator will redirect alum flow to the duty unit by opening/closing alum isolation valves connected to the screen/grit units. • Dosing rates will be determined by monitoring effluent soluble phosphorus concentration.
Controls: • The dosing pump will operate automatically based on operator setpoint for either fixed speed dosing or variable speed dosing based on plant flow. • Alarms will indicate should a chemical leak be detected or a pump fault occur. • MCC's and related RPU equipment for the dosing system will be located in the administration building.

3.6.2 Sodium Hydroxide (NaOH) Dosing Design

Preliminary calculations suggest 35-60 L/d of 50% NaOH solution dosing may be required for supplemental alkalinity addition for plant operation at 850 m3/d. This is based on an assumed alkalinity deficiency of approximately 50 mg/L. Actual alkalinity demand will vary and is dependent on many factors including: actual wastewater alkalinity, TAN loading and alkalinity demand, degree of simultaneous denitrification and alkalinity recovery, etc.

Key details of the NaOH dosing system are provided in Table 16.

Table 16 NaOH Dosing System Details

NaOH Dosing System Details
Design conditions: • Average annual flow = 850 m^3/d

NaOH Dosing System Details
• Maximum month flow = 1,100 m^3/d • Maximum day flow = 2,100 m^3/d • Peak hour flow = 3,000 m^3/d • Municipal wastewater characteristics as defined in Table 3.
Chemical selection and storage design: • Coagulant = 50% liquid NaOH • Chemical storage using 1000 L totes. • Floor space for 2 totes (1 in service + 1 spare)
New chemical dosing pump design: • Type = positive displacement • Manufacturer = ProMinent or approved equal • Number = 2 pumps (1 duty + 1 shelf spare shared with Alum service), each rated for ~20 L/h @ 450 kPa • Duty pump feeds equal volume to aeration tanks 1 and 2
Operating philosophy: • The operator will control dosing based on setpoint – either fixed flow rate or flow-proportional rate. • The duty pump will feed NaOH to both tanks via two valve outlets – one per aeration tank. • Dosing rates will be determined by monitoring effluent alkalinity and pH.
Controls: • The dosing pumps will operate automatically based on operator setpoint for either fixed speed dosing or variable speed dosing based on plant flow. • Alarms will indicate should a chemical leak be detected or a pump fault occur. • MCC's and related RPU equipment for the dosing system will be located in the administration building.

3.7 PROCESS WATER SYSTEM

3.7.1 General Description

Final plant effluent will be used to provide a source of non-potable water for various uses throughout the plant including: screening washwater, yard hydrants and hose bibs for wash stations.

The process water system design is summarized in table 17,

Table 17 - Process Water System Details

Process Water System Details
Stage 1 Design condition: • Wash station demand = 154 L/min (34 gpm) • Screen wash minimum demand = 154 L/min (34 gpm) • Peak wash water demand = 308 L/min (68 gpm) • Screen minimum operating pressure = 500 kPa (75 psi)
Pump: • Number of pumps = 1 duty + potable water supply backup • Pump type = multistage centrifugal • Manufacturer = Grunfoss (or approved equal) • Pump capacity = 6 L/s @ 42 m TDH (assuming process water pump TDH=~20m)
Pressure tank: • Pressure tank diameter = 559 mm • Tank height = 752 mm • Tank volume = 129 L
Operating philosophy: • Operators will set the pressure switch high and low ON/OFF settings to meet the screen pressure needs. • The duty pump will turn ON/OFF according to water demand and pressure changes. • Should the process water pump fault, a motorized valve will automatically OPEN to allow potable water to flow into the process water system pressure tank.
Controls: • The process water pump will turn ON/OFF according to the low/high pressure switch settings in response to water demand downstream of the pressure tank. • Should the process water pump fault, then potable water will flow into the process water system via a backflow preventer and a motorized valve.

3.8 SLUDGE DIGESTION AND STORAGE BASIN

3.8.1 General Description

A sludge digestion and stabilization basin containing 2 equal volume cells is proposed for: 1) aerobic sludge stabilization of WAS, 2) digested sludge storage, and 3) to allow for emergency

flow diversion 4) Septage receiving. A supernatant pump station will be provided to allow periodic return of supernatant to the headworks and maintain sufficient WAS/emergency diversion volume. The basin has been sized for Stage 2 plant capacity of 1700 m3/d annual average flow and includes volumes for: minimum 45 days aerobic digestion, minimum 6 month sludge storage, plus volume contingencies for:

1. freeboard to allow for sludge thickening/decanting,
2. emergency flow diversion volume equivalent of 17 hours (@ 850 m3/d flow),
3. freeboard to hold continuous 2 months of winter WAS flow assuming 0 decant,
4. freeboard to prevent overtopping and berm breach.

The volume calculations and allowances are summarized in table 18.

Table 18 – Stage 2 Sludge Digestion and Storage Basin Volume Calculations

					settled	days	total settled	Comments
Parameter	Flow	TSS	mixed	settled	volume	storage	volume	
	m3/d	kg/d	%TSS	%TSS	m3/d	d	m3	
WAS	40	340	1.00%					per Biowin simulation pro-rated to 1700 m3/d operation
Digested WAS		260	1.00%	3.50%	7.43	180	1337	per Biowin simulation pro-rated to 1700 m3/d operation
Septage (warm period)	0	0	1.50%	3.50%	0.00	180	0	no septage receiving
Subtotal 1							**1337**	
+ contingency freeboard for decanting (min 25%) =							334	need freeboard above storage blanket for decanting
Subtotal 2							**1671**	
+ contingency flow EQ volume =							600	selected for 17 hrs HRT at Qavg=850 m3/d
Subtotal 3							**2271**	
+ contingency freeboard to hold 2 months winter flow without decant =							2400	assuming continuous 2 months 0 decant during winter
Subtotal 4							**4671**	
+ contingency safety overflow freeboard (10% of liquid depth/volume) =							467	need freeboard to prevent berm breach
Grand Total =							**5139**	estimated net interior berm volume of cell 1 + 2

Twice per year, the accumulated biosolids will need to be removed from the basin. Approximately 1200-1500 m3/d would be removed and hauled to offsite disposal per desludging event (assuming sludge is removed at 3-4% TSS). Sludge removal would be completed by a contract hauler at that time.

The sludge digestion and storage system design is summarized in Table 19.

Table 19 - Sludge Digestion and Storage System Details

Lagoon Sludge Digestion and Storage System Details
<u>Stage 2 Design condition:</u> • Average day flow = 1,700 m3/d • WAS mass = 340 kg/d (average day), 440 kg/d (max month) • Digested sludge mass = 260 kg/d (average)
Sludge Basin Dimensions: • Number of cells = 2 (equal size)

Lagoon Sludge Digestion and Storage System Details
• Each cell: L=35 m, W= 35 m, liquid depth = 2.5 m (refer to drawings for dimensions) • Total basin storage volume = 5,200 m3 (including volume contingencies as noted in table 18)
Sludge Storage: • Sludge removal interval = 180 days • Estimated sludge storage volume = 1,200-1500 m3 stored sludge @ 3.5% settled sludge blanket thickness. • Estimated sludge storage mass = approx. 40 dry tonnes
Cell #1 - Basin Aerator/mixer: • Number = 1 duty unit • Type = floating surface aspirating aerator/mixer • Manufacturer/model = Aqua-Lator SS • Motor horsepower = 11.2 kW
Cell #2 - Basin decant pump: • Number = 1 duty unit • Type = submersible pump suspended from surface on adjustable length cable • Manufacturer = Xylem or approved equal • Pump capacity = 400 m3/d (~5 L/s) • Motor horsepower = 0.74 kW • Pump will draw from near the basin surface and discharge decant to a manhole gravity draining to the raw sewage pumping station. Should the decant pump need to go offline, then backup decant gravity drain lines will be used as necessary.
Operating philosophy: • Operators will waste WAS on a daily basis from each of the aeration tanks and transfer to the sludge to surface aerated cell #1 in order to maintain setpoint MLSS. • Cell #1 will receive WAS and will be aerated continuously using the surface aerator to maintain aerobic conditions needed for stabilization and odour minimization. • Cell #1 contents will flow into Cell #2 which will contain the suspended supernating pump that will periodically operate based on PLC timer control to return clarified flow to the headworks for treatment. The operator will operate this pump in order to balance decant loads with influent raw sewage flows, and manage basin liquid levels/volumes to allow for contingencies as noted in table 18. • The operator will visually monitor sludge blanket level and periodically vary the suspended pump elevation to pump clarified decant to the headworks. • The operator will monitor sludge blanket levels and schedule desludging operations on minimum 180 day intervals in order to keep sufficient table 18 volume at all times.

Lagoon Sludge Digestion and Storage System Details
• Sludge removal will involve contracting with a local sludge hauler to remove and dispose of the accumulated sludge. The hauler will provide the necessary equipment to remove the sludge including: tractor mounted PTO driven pumps/mixers as required.
Controls: • The floating aerator/mixer will be controlled either locally through a control panel (start/stop push buttons) or remotely through SCADA. • The basin decant pump will be controlled either locally through a control panel (start/stop push buttons) or remotely through SCADA.

3.8.2 Septage Receiving

The Storage Cells are capable of receiving up to 8000 L /day of septage (one tanker/day). This equates to roughly 1% of the stage 1 average daily flow 850m^3/d. The septage will be accepted into a man hole next to the sludge storage lagoon.

3.9 STORMWATER MANAGEMENT STRATEGY

The storm water runoff generated by the development of this site is allowed to flow overland toward the storm water management pond to the south of the property. The site plan in the contract drawings will show the overland flow. There will be no underground storm water management system for the WWTP site.

3.10 NFPA 820 AREA CLASSIFICATION

Under NFPA 820 Standard for Fire Protection in Wastewater Treatment and Collection Facilities, Table 20 below lists the area classification for all rooms and tanks at the Everett WWTP. Ventilation systems serving spaces governed by this standard shall be designed in accordance with NFPA 91 and shall receive power from electrical equipment that receives power from a primary power source and that also has the means to accept power from alternate power sources.

Area	NFPA 820 Classification	Ventilation Design	Electrical Design
Raw Sewage Pumping Station	• Class 1, Division 1	• <12 ACH, Meet intermittent occupancy requirements.	• Explosion Proof Throughout
Upper Level Headworks Room	• Class 1, Division 1	• Design for 6 ACH when unoccupied	• Explosion proof equipment throughout or

		• Increase to 12 ACH when occupied	LEL sensor to break circuit with any non-explosion proof equipment when gas is detected.
Lower Level Pump Room	• Unclassified	• Designed for continuous 6 ACH.	• Provide back-up power to ventilation system to allow area to remain unclassified.
Aeration Tanks	• Class 1, Division 2	• N/A	• Keep all electrical equipment outside of the NFPA classified area, (18in. above tank, and 10 ft. horizontally beside tanks.)
Admin Building	• Unclassified	• Meet occupancy requirements	• No requirements
Sludge Storage Basin & Return Pumping Station	• Class 1, Division 2	• N/A	• Equipment in the lagoons shall be explosion proof. (MIX-1, DP-1) Area extends 18in. above the surface and 10 ft. horizontally from the wetted walls.

4.0 CLOSING

Thank you for review of this preliminary design report. Your comments are critical to the success of this project and you are encouraged to provide feedback to the undersigned at your earliest convenience.

Regards,

STANTEC CONSULTING LTD.

Olav Natvik, M. Eng, P. Eng, ENV.SP
Wastewater Treatment Specialist
Stantec
600-171 Queens Avenue London ON N6A 5J7
Phone: 519-675-6632
Cell: 519-281-0456
olav.natvik@stantec.com

Kevin Vitone, EIT
Engineering Intern
Stantec
600-171 Queens Avenue London ON N6A 5J7
Phone: 519-675-6664
Fax: 519-645-6575
kevin.vitone@stantec.com

Elvio Zaghi, MBA, P.Eng.
Principal, Water
Stantec
600-171 Queens Avenue, London ON N6A 5J7
Phone: (519)-675-6607
Cell: (519)-319-4420
elvio.zaghi@stantec.com

Appendix D

Stormwater Management Calculations and Supporting Documents

Farsight Homes - Barzo Lands Development, Everett
Pre-Development OTTHYMO Parameters

Drainage ID = 100

Terraprobe Inc. Preliminary Geoenvironmental Assessment Report dated January 2016 indicates Loose to Compact Sand.
Hydrologic Soil Group = A

Pasture/Lawn	=	65.06	ha.
Forest	=	0.12	ha.
Total Area	**=**	**65.18**	**ha.**

CN Value is as follows:

CN	=	49	(Pasture/lawn as per NVCA Guidelines, Hydrologic Soil Group A)
CN	=	32	(Woods as per NVCA Guidelines, Hydrologic Soil Group A)
CN	=	$\frac{49 \times 65.06 + 32 \times 0.12}{65.18}$	
CN	=	49.0	

IA Value is as follows:

IA	=	5	(Pasture/lawn as per NVCA Guidelines)
IA	=	10	(Woods per NVCA Guidelines)
IA	=	$\frac{5 \times 65.06 + 10 \times 0.12}{65.18}$	
IA	=	5.0	

Runoff Coefficient Value is as follows:

C	=	0.1	(Pasture/lawn as per NVCA Guidelines, Hydrologic Soil Group A)
C	=	0.08	(Woodland as per NVCA Guidelines, Hydrologic Soil Group A)
C	=	$\frac{0.1 \times 65.06 + 0.08 \times 0.12}{65.18}$	
C	=	0.10	

Find Time to Peak using Airport Equation and Uplands Method

Airport Equation $T_c = 3.26(1.1 - c)L^{0.5}S_w^{-0.33}$

Length (L)	=	1035	m
Elevation 1 (El_1)	=	243.61	m
Elevation 2 (El_2)	=	236.32	m
Slope (S)	=	0.007	m/m
Time of Concentration (T_c)	=	117.87	mins.
Total Time of Concentration (T_c)	=	117.87	mins.
T_c	=	1.96	hrs.
Time to Peak (T_p = 2/3 T_c)	=	1.31	hrs.

Uplands Method

Section	=	1		2	
Land Cover	=	Pasture/Lawn		Forest	
Length	=	1035	m	164	m
Slope	=	0.007	m/m	0.007	m/m
Velocity	=	0.24	m/s	0.24	m/s
Time	=	1.20	hrs.	0.19	hrs.

Total Time of Concentration (T_c)	=	1.39	hrs.
Time to Peak (T_p = 2/3 T_c)	=	0.93	hrs.

Governing Time to Peak

Airport Equation

T_c	=	1.96	hrs.
T_p	=	1.31	hrs.
D_T (1/5 T_p)	=	16	mins.

PEARSON ENGINEERING

Farsight Homes - Barzo Lands Development, Everett
Post-Development OTTHYMO Parameters

Drainage ID	**=**	**200**	
Roads - 20.0 m R.O.W.			
Length of Roads	=	9,438	m
Width of Road & Gutter	=	8.50	m
Area of Road	=	80,220	m^2
Length of Sidewalk	=	9,438	m
Width of Sidewalk	=	1.50	m
Area of Sidewalk	=	14,157	m^2
Number of Townhouse Driveways	=	415	
Length of Driveways	=	5.25	m
Width of Driveway	=	3.00	m
Area of Driveways	=	6,536	m^2
Number of Detached Driveways	=	811	
Length of Driveways	=	5.25	m
Width of Driveway	=	6.00	m
Area of Driveways	=	25,547	m^2
Townhouse Lot Coverage			
Total Area of Townhouse Lots	=	54,466	m^2
Maximum Coverage	=	60%	
Impervious Area	=	32,680	m^2
Number of Driveways	=	415	
Length of Driveways	=	6.00	m
Width of Driveway	=	3.00	m
Area of Driveways	=	7,097	m^2
Number of Walkways	=	415	
Length of Walkway	=	5.00	m
Width of Walkway	=	2.00	m
Area of Walkways	=	2,905	m^2
Detached Lot Coverage			
Total Area of Detached Lots	=	329,916	m^2
Maximum Coverage	=	40%	
Impervious Area	=	131,966	m^2
Number of Driveways	=	811	
Length of Driveways	=	6.00	m
Width of Driveway	=	6.00	m
Area of Driveways	=	28,223	m^2
Number of Walkways	=	811	
Length of Walkway	=	5.00	m
Width of Walkway	=	2.00	m
Area of Walkways	=	3,244	m^2

SWM Pond Lot Coverage

Pond Area	=	8,612	m^2
Pond Imperviousness	=	50%	
Impervious Area	=	4,306	m^2

Total Impervious Area

Total Impervious Area	=	336,880	m^2
Total Impervious Area	=	33.69	ha.
Total Catchment Area	=	553,600	m^2
Total Catchment Area	=	55.36	ha
Total % Impervious	=	33.69	ha
		55.36	ha
Total % Impervious	**=**	**61%**	

Drainage ID = **201**

Terraprobe Inc. Geotechnical Investigation Report dated January 2011 indicates Sand
Hydrologic Soil Group = A

Pasture/Lawn	=	8.24	ha
Impervious areas	=	1.45	ha
Forest	=	0.12	ha
Total Area	=	9.82	ha

CN Value is as follows:

CN	=	49	(Pasture/Lawn as per NVCA Guidelines, Hydrologic Soil Group A)
CN	=	100	(Impervious areas as per NVCA Guidelines, Hydrologic Soil Group A)
CN	=	32	(Woods as per NVCA Guidelines, Hydrologic Soil Group A)
CN	=	$\frac{8.24 \times 49 + 1.45 \times 100 + 0.12 \times 32}{9.82}$	
CN	=	56.3	

IA Value is as follows:

IA	=	5	(Pasture/Lawn as per NVCA Guidelines)
IA	=	2	(Impervious areas as per NVCA Guidelines)
IA	=	10	(Woods as per NVCA Guidelines, Hydrologic Soil Group A)
IA	=	$\frac{6.07x5 + 2.26x2 + 0.12x10}{9.82}$	
IA	=	4.6	

Runoff Coefficient Value is as follows:

C	=	0.1	(Pasture/Lawn as per NVCA Guidelines, Hydrologic Soil Group A)
C	=	0.95	(Impervious areas as per NVCA Guidelines, Hydrologic Soil Group A)
C	=	0.08	(Woods as per NVCA Guidelines, Hydrologic Soil Group A)
C	=	$\frac{6.07x0.1 + 2.26x0.4 + 0.12x0.08}{9.82}$	
C	=	0.23	

Find Time to Peak using Airport Equation and Uplands Method

Airport Equation $T_c = 3.26(1.1 - c)L^{0.5}S_w^{-0.33}$

Length (L)	=	169	m
Elevation 1 (El_1)	=	245.50	m
Elevation 2 (El_2)	=	243.75	m
Slope (S)	=	0.010	m/m
Time of Concentration (T_c)	=	41.89	minutes
Total Time of Concentration (T_c)	=	41.89	minutes
T_c	=	0.70	hrs.
Time to Peak ($T_p = 2/3\ T_c$)	=	0.47	hrs.

Uplands Method

Section	=	1	
Land Cover	=	Pasture	
Length	=	169	m
Slope	=	0.01	m/m
Velocity	=	0.24	m/s
Time	=	0.20	hrs.
Total Time of Concentration (T_c)	=	0.20	hrs.
Time to Peak ($T_p = 2/3\ T_c$)	=	0.13	hrs.

Governing Time to Peak

Airport Equation

T_c	=	0.70	hrs.
T_p	=	0.47	hrs.
D_T ($1/5\ T_p$)	=	6	mins.

PEARSON ENGINEERING

Farsight Homes - Barzo Lands Development, Everett
Stage Storage Discharge Table

Elevation	Forebay 1 Area	Main Cell Area	Quality Control Volume	Quantity Control Volume	Orifice 1		Orifice 2		Overflow Ditch Inlet		Overflow Weir - 12 m		Total Flow
					Head	Flow	Head	Flow	Head	Flow	Depth	Flow	
(m)	(m^2)	(m^2)	(m^3)	(m^3)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m^3/s)
233.75	2113	4494	0										
233.80	2190	4610	335										
233.85	2267	4727	680										
233.90	2345	4845	1035										
233.95	2424	4962	1399										
234.00	2502	5081	1773										
234.05	2581	5199	2157										
234.10	2661	5319	2551										
234.15	2740	5438	2955										
234.20	2820	5558	3369										
234.25	2901	5679	3793										
234.30	2981	5800	4227										
234.35	3063	5963	4672										
234.40	3144	6126	5130										
234.45	3226	6290	5599										
234.50	3308	6455	6081										
234.55	3391	6620	6576										
234.60	3473	6786	7082										
234.65	3557	6952	7602										
234.70	3640	7120	8133										
234.75	3724	7287	8678										
234.80	3811	7456		557	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
234.85	3896	7625		1127	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000
234.90	3981	7795		1709	0.05	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.021
234.95	4066	7966		2304	0.09	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.030
235.00	4152	8136		2912	0.15	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.037
235.05	4238	8308		3533	0.20	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.043
235.10	4324	8480		4167	0.25	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.048
235.15	4411	8652		4814	0.30	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.052
235.20	4498	8825		5473	0.34	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.057
235.25	4585	8957		6145	0.40	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.061
235.30	4673	9089		6827	0.45	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.064
235.35	4761	9221		7521	0.50	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.068
235.40	4849	9354		8226	0.55	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.071
235.45	4937	9487		8941	0.59	0.07	0.05	0.04	0.00	0.00	0.00	0.00	0.119
235.50	5026	9621		9668	0.65	0.08	0.10	0.06	0.00	0.00	0.00	0.00	0.140
235.55	5116	9755		10406	0.70	0.08	0.15	0.08	0.00	0.00	0.00	0.00	0.157
235.60	5205	9889		11155	0.75	0.08	0.20	0.09	0.00	0.00	0.00	0.00	0.172
235.65	5295	10023		11915	0.80	0.09	0.25	0.10	0.00	0.00	0.00	0.00	0.185
235.70	5385	10158		12687	0.84	0.09	0.30	0.11	0.00	0.00	0.00	0.00	0.197
235.75	5476	10293		13470	0.90	0.09	0.35	0.12	0.00	0.00	0.00	0.00	0.208
235.80	5566	10428		14264	0.95	0.09	0.40	0.12	0.00	0.00	0.00	0.00	0.219
235.85	5658	10564		15069	1.00	0.10	0.45	0.13	0.00	0.00	0.00	0.00	0.229
235.90	5749	10700		15886	1.05	0.10	0.50	0.14	0.00	0.00	0.00	0.00	0.238
235.95	5841	10836		16714	1.10	0.10	0.55	0.15	0.00	0.00	0.00	0.00	0.247
236.00	5933	10973		17554	1.15	0.10	0.60	0.15	0.00	0.00	0.00	0.00	0.256
236.05	6025	11110		18405	1.20	0.11	0.65	0.16	0.00	0.00	0.00	0.00	0.265
236.10	6118	11247		19267	1.25	0.11	0.70	0.17	0.00	0.00	0.00	0.00	0.273
236.15	6211	11384		20141	1.30	0.11	0.75	0.17	0.00	0.00	0.00	0.00	0.281
236.20	6304	11522		21027	1.35	0.11	0.80	0.18	0.00	0.00	0.00	0.00	0.289
236.25	6398	11660		21924	1.40	0.11	0.85	0.18	0.00	0.00	0.00	0.00	0.296
236.30	6492	11799		22833	1.45	0.12	0.90	0.19	0.03	0.30	0.00	0.00	0.606
236.35	6586	11938		23753	1.50	0.12	0.95	0.19	0.08	0.52	0.00	0.00	0.834
236.40	6681	12077		24685	1.55	0.12	1.00	0.20	0.13	0.68	0.00	0.00	0.994
236.45	6776	12216		25629	1.60	0.12	1.05	0.20	0.18	0.80	0.00	0.00	1.125
236.50	6871	12356		26584	1.65	0.12	1.10	0.21	0.23	0.91	0.00	0.00	1.239
236.55	6967	12496		27552	1.70	0.13	1.15	0.21	0.28	1.00	0.05	0.59	1.928
236.60	7063	12636		28531	1.75	0.13	1.20	0.22	0.33	1.09	0.10	2.36	3.794
236.65	7159	12777		29521	1.80	0.13	1.25	0.22	0.38	1.17	0.15	4.77	6.292
236.70	7255	12918		30524	1.85	0.13	1.30	0.22	0.43	1.25	0.20	7.69	9.291
236.75	7352	13059		31539	1.90	0.13	1.35	0.23	0.48	1.32	0.25	11.04	12.721

Orifice 1	
Diameter	210 mm
Elevation	234.75 m
Orifice Constant	0.63
Orifice Centroid	234.86 m

Orifice 2	
Diameter	300 mm
Elevation	235.25 m
Orifice Constant	0.63
Orifice Centroid	235.40 m

Ditch Inlet Catchbasin	
Width	1200 mm
Elevation	236.20 m
Orifice Constant	0.60
Orifice Centroid	236.28 m

Over Flow Weir	
Width	60.00 m
Side Slopes	10 : 1
Bottom Elevation	236.50 m

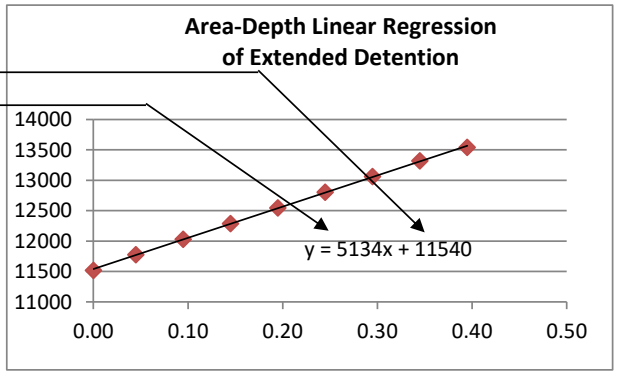
Notes:
1. Highlighted rows are used in the Stage-Storage-Discharge Table for the Route Reservoir command in Visual OTTHYMO.
2. Forebay 1 is the northern forebay treating stormwater from the proposed Farsight development. Forebay 2 is the western forebay treating the existing Everett Glen development.
3. Weir flow values taken from Emergency Overflow Weir Calculations page.

Farsight Homes - Barzo Lands Development, Everett
Extended Detention Drawdown Time

Orifice Invert Elevation	=	234.75	m
Size of Orifice	=	210	mm
Orifice Centroid	=	234.86	m
Orifice Constant	=	0.63	

Elevation (m)	Area (m^2)	Volume (m^3)	Cum. Volume (m^3)	Depth over Orifice (m)	Head (m)	Flow (m^3/s)
234.75	11012			0.00	0.00	0.0000
234.80	11267	557	557	0.05	0.00	0.0000
234.85	11521	570	1127	0.10	0.00	0.0000
234.90	11776	582	1709	0.15	0.05	0.0205
234.95	12032	595	2304	0.20	0.09	0.0298
235.00	12288	608	2912	0.25	0.15	0.0368
235.05	12546	621	3533	0.30	0.20	0.0427
235.10	12804	634	4167	0.35	0.25	0.0478
235.15	13063	647	4814	0.40	0.30	0.0525
235.20	13323	660	5473	0.45	0.34	0.0568
235.25	13542	672	6145	0.50	0.40	0.0607

Elevation of Perm. Pool	234.75	m
Intercept of Regression	11540	C_3
Slope of Regression	5134.0	C_2
Elevation of 25mm Storm	235.22	m
Depth over Orifice Centroid	0.37	m
Orifice Area	0.035	sq.m
Drawdown Time	42.8	hrs.



Pre-Development Visual OTTHYMO Schematic

```
       V    V   I    SSSSS  U   U    A    L              (v 6.0.2001)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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DATE: 05-06-2021 TIME: 02:02:07

USER:

COMMENTS: _____

****
** SIMULATION : Run 01 **
****

W/E	COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
	START @ 0.00 hrs								
	CHIC STORM		10.0						
	[Ptot= 32.86 mm]								
*									
**	CALIB NASHYD	0100	1 16.0	65.18	0.14	3.20	2.66	0.08	0.000
	[CN=49.0]								
	[N = 3.0:Tp 1.31]								
*									
	FINISH								

```
       V    V   I    SSSSS  U   U    A    L              (v 6.0.2001)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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DATE: 05-06-2021 TIME: 02:03:33

USER:

COMMENTS: _____

********** SIMULATION : Run 02 **********

W/E	COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
	START @ 0.00 hrs								
	CHIC STORM		10.0						
	[Ptot= 43.57 mm]								
*									
**	CALIB NASHYD	0100	1 16.0	65.18	0.26	3.20	4.91	0.11	0.000
	[CN=49.0]								
	[N = 3.0:Tp 1.31]								
*									
	FINISH								

```
       V    V   I    SSSSS  U   U    A    L              (v 6.0.2001)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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***** S U M M A R Y O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat
Output filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\5f46202f-
Summary filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\5f46202f-

DATE: 05-06-2021 TIME: 02:04:40

USER:

COMMENTS: _____

********** SIMULATION : Run 03 **********

W/E	COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
	START @ 0.00 hrs								
	CHIC STORM		10.0						
	[Ptot= 50.46 mm]								
*									
**	CALIB NASHYD	0100	1 16.0	65.18	0.35	3.20	6.67	0.13	0.000
	[CN=49.0]								
	[N = 3.0:Tp 1.31]								
*									
	FINISH								

```
       V    V   I    SSSSS  U   U    A    L             (v 6.0.2001)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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```

***** S U M M A R Y O U T P U T *****

```
  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat
  Output  filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\5c13d7d5-
  Summary filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\5c13d7d5-

DATE: 05-06-2021                          TIME: 02:05:51

USER:

COMMENTS: _____________________________________________________________

  ************************************************
  ** SIMULATION : Run 04                         **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    CHIC STORM                10.0
    [ Ptot= 59.34 mm ]
*
 ** CALIB NASHYD         0100  1 16.0   65.18    0.49  2.93   9.26 0.16   0.000
    [CN=49.0        ]
    [ N = 3.0:Tp 1.31]
*
 FINISH
```

```
       V    V   I    SSSSS  U   U    A    L              (v 6.0.2001)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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```

***** S U M M A R Y O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat
Output filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\8882fb76-
Summary filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\8882fb76-

DATE: 05-06-2021 TIME: 02:06:44

USER:

COMMENTS: _____

```
  ************************************************
  ** SIMULATION : Run 05                        **
  ************************************************
```

W/E	COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
	START @ 0.00 hrs								
	CHIC STORM		10.0						
	[Ptot= 65.42 mm]								
*									
**	CALIB NASHYD	0100	1 16.0	65.18	0.60	2.93	11.24	0.17	0.000
	[CN=49.0]								
	[N = 3.0:Tp 1.31]								
*									
	FINISH								

```
       V    V   I    SSSSS  U   U    A    L             (v 6.0.2001)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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```

***** S U M M A R Y O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat
Output filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\906f4f4a-
Summary filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\906f4f4a-

DATE: 05-06-2021 TIME: 02:07:26

USER:

COMMENTS: _____

```
  ************************************************
  ** SIMULATION : Run 06                         **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    CHIC STORM                10.0
    [ Ptot= 72.28 mm ]
*
 ** CALIB NASHYD         0100  1 16.0   65.18    0.72  2.93  13.65 0.19   0.000
    [CN=49.0        ]
    [ N = 3.0:Tp 1.31]
*
 FINISH
```

```
================================================================================================================

       V    V   I    SSSSS  U   U    A    L              (v 6.0.2001)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat
  Output  filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\ca28230a-
  Summary filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\ca28230a-


DATE: 05-06-2021                          TIME: 02:08:08

USER:


COMMENTS: _____________________________________________________________


  ************************************************
  ** SIMULATION : Run 07                         **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    READ STORM                15.0
    [ Ptot= 56.00 mm ]
    fname : C:\Users\avarghese\AppData\Local\Temp\0e27f2c0-0f98-4dd4-abcf-bdaa555e1b30\a7628cb1-9ade-4406-b279
    remark: 2yr 24hr 15min SCS
*
 ** CALIB NASHYD         0100  1 16.0   65.18    0.33 13.60   8.25 0.15   0.000
    [CN=49.0         ]
    [ N = 3.0:Tp 1.31]
*
```

```
================================================================================================================

       V    V   I    SSSSS  U   U    A    L              (v 6.0.2001)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat
  Output  filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\a73819c2-
  Summary filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\a73819c2-


DATE: 05-06-2021                          TIME: 02:09:08

USER:


COMMENTS: _____________________________________________________________


  ************************************************
  ** SIMULATION : Run 08                         **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    READ STORM                15.0
    [ Ptot= 73.70 mm ]
    fname : C:\Users\avarghese\AppData\Local\Temp\83b1aaf0-3d78-47e5-807b-321490c6b281\1d586ea4-8473-400b-b74d
    remark: 5yr 24hr 15min SCS
*
 ** CALIB NASHYD         0100  1 16.0   65.18    0.57 13.60  14.17 0.19   0.000
    [CN=49.0         ]
    [ N = 3.0:Tp 1.31]
*
```

```
================================================================================================================

       V    V   I    SSSSS  U   U    A    L              (v 6.0.2001)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat
  Output  filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\737f04e2-
  Summary filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\737f04e2-


DATE: 05-06-2021                          TIME: 02:09:08

USER:


COMMENTS: _____________________________________________________________


  ************************************************
  ** SIMULATION : Run 09                         **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    READ STORM                15.0
    [ Ptot= 85.40 mm ]
    fname : C:\Users\avarghese\AppData\Local\Temp\83b1aaf0-3d78-47e5-807b-321490c6b281\7a45ace2-b0d4-4aa1-a46b
    remark: 10yr 24hr 15min SCS
*
 ** CALIB NASHYD         0100  1 16.0   65.18    0.76 13.60  18.75 0.22   0.000
    [CN=49.0         ]
    [ N = 3.0:Tp 1.31]
*
```

```
================================================================================================================

       V    V   I    SSSSS  U   U    A    L              (v 6.0.2001)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat
  Output  filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\07baed87-
  Summary filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\07baed87-


DATE: 05-06-2021                          TIME: 02:09:08

USER:


COMMENTS: _____________________________________________________________


  ************************************************
  ** SIMULATION : Run 10                         **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    READ STORM                15.0
    [ Ptot=100.50 mm ]
    fname : C:\Users\avarghese\AppData\Local\Temp\83b1aaf0-3d78-47e5-807b-321490c6b281\bfa22513-48a6-47f7-97ad
    remark: 25yr 24hr 15min SCS
*
 ** CALIB NASHYD         0100  1 16.0   65.18    1.03 13.60  25.34 0.25   0.000
    [CN=49.0         ]
    [ N = 3.0:Tp 1.31]
*
```

```
==========================================================================================================

       V    V   I    SSSSS  U   U    A    L             (v 6.0.2001)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat
  Output  filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\820cc960-
  Summary filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\820cc960-


DATE: 05-06-2021                          TIME: 02:09:08

USER:


COMMENTS: _____________________________________________________________


  ************************************************
  ** SIMULATION : Run 11                         **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    READ STORM                15.0
    [ Ptot=111.40 mm ]
    fname : C:\Users\avarghese\AppData\Local\Temp\83b1aaf0-3d78-47e5-807b-321490c6b281\72c208fd-9f75-4900-bceb
    remark: 50yr 24hr 15min SCS
*
 ** CALIB NASHYD         0100  1 16.0   65.18    1.25 13.60  30.53 0.27   0.000
    [CN=49.0         ]
    [ N = 3.0:Tp 1.31]
*
```

```
       V    V   I    SSSSS  U   U    A    L             (v 6.0.2001)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
```


***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat
Output filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\fdc42dee-
Summary filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\fdc42dee-

DATE: 05-06-2021 TIME: 02:09:08

USER:

COMMENTS: _____

****
** SIMULATION : Run 12 **
****

READ STORM	Filename: C:\Users\avarghese\AppD ata\Local\Temp\ 83b1aaf0-3d78-47e5-807b-321490c6b281\300aac8d
Ptotal=122.30 mm	Comments: 100yr 24hr 15min SCS

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.00	6.50	2.20	12.75	17.61	19.00	2.20
0.50	1.35	6.75	2.20	13.00	9.05	19.25	2.20
0.75	1.35	7.00	2.20	13.25	9.05	19.50	2.20
1.00	1.35	7.25	2.20	13.50	6.60	19.75	2.20
1.25	1.35	7.50	2.69	13.75	6.60	20.00	2.20
1.50	1.35	7.75	2.69	14.00	5.14	20.25	2.20
1.75	1.35	8.00	2.69	14.25	5.14	20.50	1.47
2.00	1.35	8.25	2.69	14.50	3.67	20.75	1.47
2.25	1.35	8.50	3.18	14.75	3.67	21.00	1.47
2.50	1.59	8.75	3.18	15.00	3.67	21.25	1.47
2.75	1.59	9.00	3.42	15.25	3.67	21.50	1.47
3.00	1.59	9.25	3.42	15.50	3.67	21.75	1.47
3.25	1.59	9.50	3.91	15.75	3.67	22.00	1.47
3.50	1.59	9.75	3.91	16.00	3.67	22.25	1.47
3.75	1.59	10.00	4.40	16.25	3.67	22.50	1.47
4.00	1.59	10.25	4.40	16.50	2.20	22.75	1.47
4.25	1.59	10.50	5.63	16.75	2.20	23.00	1.47
4.50	1.96	10.75	5.63	17.00	2.20	23.25	1.47
4.75	1.96	11.00	7.58	17.25	2.20	23.50	1.47
5.00	1.96	11.25	7.58	17.50	2.20	23.75	1.47
5.25	1.96	11.50	11.74	17.75	2.20	24.00	1.47
5.50	1.96	11.75	11.74	18.00	2.20	24.25	1.47
5.75	1.96	12.00	36.20	18.25	2.20		
6.00	1.96	12.25	149.70	18.50	2.20		
6.25	1.96	12.50	17.61	18.75	2.20		

CALIB NASHYD (0100) ID= 1 DT=16.0 min	Area (ha)= 65.18 Curve Number (CN)= 49.0 Ia (mm)= 5.00 # of Linear Res.(N)= 3.00 U.H. Tp(hrs)= 1.31

NOTE: RAINFALL WAS TRANSFORMED TO 16.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.267	0.08	6.400	2.09	12.533	17.61	18.67	2.20
0.533	1.35	6.667	2.20	12.800	16.01	18.93	2.20
0.800	1.35	6.933	2.20	13.067	9.05	19.20	2.20
1.067	1.35	7.200	2.20	13.333	8.29	19.47	2.20
1.333	1.35	7.467	2.60	13.600	6.60	19.73	2.20
1.600	1.35	7.733	2.69	13.867	5.96	20.00	2.20
1.867	1.35	8.000	2.69	14.133	5.14	20.27	2.16
2.133	1.35	8.267	2.72	14.400	4.31	20.53	1.47
2.400	1.48	8.533	3.18	14.667	3.67	20.80	1.47
2.667	1.59	8.800	3.23	14.933	3.67	21.07	1.47
2.933	1.59	9.067	3.42	15.200	3.67	21.33	1.47
3.200	1.59	9.333	3.58	15.467	3.67	21.60	1.47
3.467	1.59	9.600	3.91	15.733	3.67	21.87	1.47
3.733	1.59	9.867	4.13	16.000	3.67	22.13	1.47
4.000	1.59	10.133	4.40	16.267	3.58	22.40	1.47
4.267	1.61	10.400	5.09	16.533	2.20	22.67	1.47
4.533	1.96	10.667	5.63	16.800	2.20	22.93	1.47
4.800	1.96	10.933	6.97	17.067	2.20	23.20	1.47
5.067	1.96	11.200	7.58	17.333	2.20	23.47	1.47
5.333	1.96	11.467	10.96	17.600	2.20	23.73	1.47
5.600	1.96	11.733	11.74	17.867	2.20	24.00	1.47
5.867	1.96	12.000	34.67	18.133	2.20	24.27	1.38
6.133	1.96	12.267	141.44	18.400	2.20		

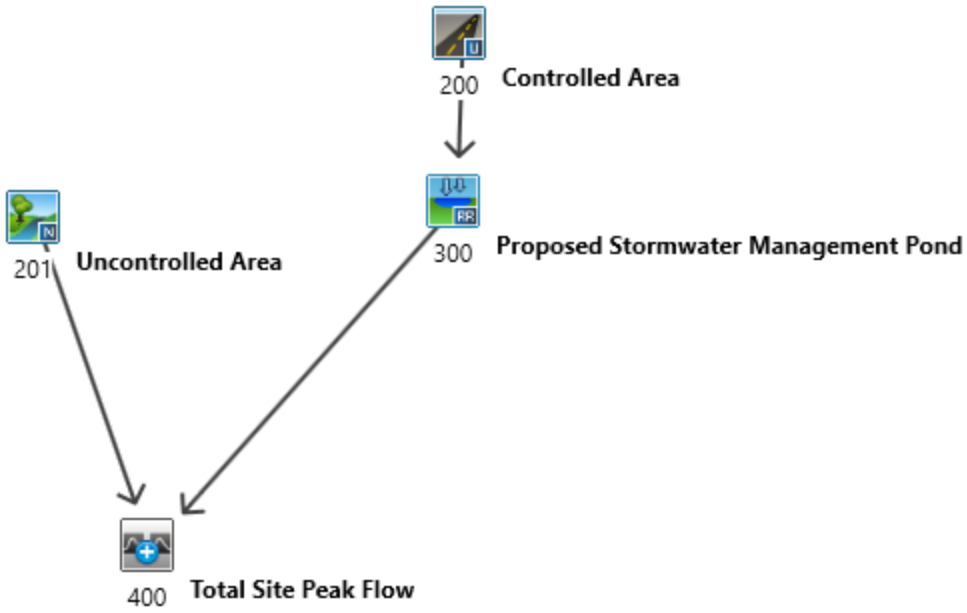
Unit Hyd Qpeak (cms)= 1.900

PEAK FLOW (cms)= 1.478 (i)
TIME TO PEAK (hrs)= 13.600
RUNOFF VOLUME (mm)= 36.046
TOTAL RAINFALL (mm)= 122.300
RUNOFF COEFFICIENT = 0.295

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

FINISH

==========



Post-Development Visual OTTHYMO Schematic

```
       V    V   I    SSSSS  U   U    A    L              (v 6.0.2001)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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```


***** S U M M A R Y O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat
Output filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\b879ac7a-
Summary filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\b879ac7a-

DATE: 05-06-2021 TIME: 02:11:25

USER:

COMMENTS: _____

********** SIMULATION : Run 01 **********

W/E	COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
	START @ 0.00 hrs								
	CHIC STORM		10.0						
	[Ptot= 32.86 mm]								
*									
**	CALIB NASHYD	0201	1 6.0	8.45	0.09	1.40	3.47	0.11	0.000
	[CN=56.3]								
	[N = 3.0:Tp 0.13]								
*									
**	CALIB STANDHYD	0200	1 5.0	55.36	3.36	1.42	16.06	0.49	0.000
	[I%=45.0:S%= 2.00]								
*									
**	Reservoir								
	OUTFLOW:	0300	1 5.0	55.36	0.07	4.33	15.04	n/a	0.000
*									
	ADD [0201+ 0300]	0400	3 5.0	63.81	0.13	1.50	13.51	n/a	0.000
*									

```
================================================================================================================

       V    V   I    SSSSS  U   U    A    L             (v 6.0.2001)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat
  Output  filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\5459c62e-
  Summary filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\5459c62e-


DATE: 05-06-2021                          TIME: 02:11:25

USER:


COMMENTS: _____________________________________________________________


  ************************************************
  ** SIMULATION : Run 02                         **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    CHIC STORM                10.0
    [ Ptot= 43.57 mm ]
*
 ** CALIB NASHYD         0201  1  6.0    8.45    0.18  1.40   6.31 0.14   0.000
    [CN=56.3         ]
    [ N = 3.0:Tp 0.13]
*
 ** CALIB STANDHYD       0200  1  5.0   55.36    4.67  1.42  22.58 0.52   0.000
    [I%=45.0:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0300  1  5.0   55.36    0.17  4.17  21.56  n/a   0.000
*
    ADD [  0201+  0300]  0400  3  5.0   63.81    0.22  1.42  19.54  n/a   0.000
*
```

```
       V    V   I    SSSSS  U   U    A    L              (v 6.0.2001)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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```

***** S U M M A R Y O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat
Output filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\72edac35-
Summary filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\72edac35-

DATE: 05-06-2021 TIME: 02:11:25

USER:

COMMENTS: _____

********** SIMULATION : Run 03 **********

W/E	COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
	START @ 0.00 hrs								
	CHIC STORM		10.0						
	[Ptot= 50.46 mm]								
*									
**	CALIB NASHYD	0201	1 6.0	8.45	0.24	1.40	8.49	0.17	0.000
	[CN=56.3]								
	[N = 3.0:Tp 0.13]								
*									
**	CALIB STANDHYD	0200	1 5.0	55.36	5.56	1.42	26.97	0.53	0.000
	[I%=45.0:S%= 2.00]								
*									
**	Reservoir								
	OUTFLOW:	0300	1 5.0	55.36	0.20	4.17	25.95	n/a	0.000
*									
	ADD [0201+ 0300]	0400	3 5.0	63.81	0.29	1.42	23.64	n/a	0.000
*									

```
       V    V   I    SSSSS  U   U    A    L              (v 6.0.2001)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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```

***** S U M M A R Y O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat
Output filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\ca4658ef-
Summary filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\ca4658ef-

DATE: 05-06-2021 TIME: 02:11:25

USER:

COMMENTS: _____

********** SIMULATION : Run 04 **********

W/E	COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
	START @ 0.00 hrs								
	CHIC STORM		10.0						
	[Ptot= 59.34 mm]								
*									
**	CALIB NASHYD	0201	1 6.0	8.45	0.34	1.40	11.66	0.20	0.000
	[CN=56.3]								
	[N = 3.0:Tp 0.13]								
*									
**	CALIB STANDHYD	0200	1 5.0	55.36	7.70	1.33	32.84	0.55	0.000
	[I%=45.0:S%= 2.00]								
*									
**	Reservoir								
	OUTFLOW:	0300	1 5.0	55.36	0.24	4.17	31.82	n/a	0.000
*									
	ADD [0201+ 0300]	0400	3 5.0	63.81	0.40	1.42	29.15	n/a	0.000
*									

```
       V    V   I    SSSSS  U   U    A    L              (v 6.0.2001)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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```

***** S U M M A R Y O U T P U T *****

```
  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat
  Output  filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\771ced27-
  Summary filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\771ced27-

DATE: 05-06-2021                          TIME: 02:11:25

USER:

COMMENTS: _____________________________________________________________
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```
  ************************************************
  ** SIMULATION : Run 05                        **
  ************************************************
```

W/E	COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
	START @ 0.00 hrs								
	CHIC STORM		10.0						
	[Ptot= 65.42 mm]								
*									
**	CALIB NASHYD	0201	1 6.0	8.45	0.42	1.40	14.06	0.21	0.000
	[CN=56.3]								
	[N = 3.0:Tp 0.13]								
*									
**	CALIB STANDHYD	0200	1 5.0	55.36	8.71	1.33	36.99	0.57	0.000
	[I%=45.0:S%= 2.00]								
*									
**	Reservoir								
	OUTFLOW:	0300	1 5.0	55.36	0.26	4.17	35.96	n/a	0.000
*									
	ADD [0201+ 0300]	0400	3 5.0	63.81	0.48	1.50	33.07	n/a	0.000
*									

```
       V    V   I    SSSSS  U   U    A    L              (v 6.0.2001)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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```


***** S U M M A R Y O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat
Output filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\36ab597a-
Summary filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\36ab597a-

DATE: 05-06-2021 TIME: 02:11:25

USER:

COMMENTS: _____

********** ** SIMULATION : Run 06 ** **********

W/E	COMMAND	HYD ID	DT min	AREA ha	Qpeak cms	Tpeak hrs	R.V. mm	R.C.	Qbase cms
	START @ 0.00 hrs								
	CHIC STORM		10.0						
	[Ptot= 72.28 mm]								
*									
**	CALIB NASHYD	0201	1 6.0	8.45	0.51	1.40	16.96	0.23	0.000
	[CN=56.3]								
	[N = 3.0:Tp 0.13]								
*									
**	CALIB STANDHYD	0200	1 5.0	55.36	9.78	1.33	41.77	0.58	0.000
	[I%=45.0:S%= 2.00]								
*									
**	Reservoir								
	OUTFLOW:	0300	1 5.0	55.36	0.28	4.17	40.74	n/a	0.000
*									
	ADD [0201+ 0300]	0400	3 5.0	63.81	0.59	1.50	37.60	n/a	0.000
*									

```
================================================================================================================

       V    V   I    SSSSS  U   U    A    L              (v 6.0.2001)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat
  Output  filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\9d86b8dc-
  Summary filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\9d86b8dc-


DATE: 05-06-2021                          TIME: 02:11:25

USER:


COMMENTS: _____________________________________________________________


  ************************************************
  ** SIMULATION : Run 07                         **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    READ STORM                10.0
    [ Ptot= 24.99 mm ]
    fname : C:\Users\avarghese\AppData\Local\Temp\8802d3ac-5fe9-4462-b50c-2e69992f7d5b\61e80959-7725-4c5d-8ca4
    remark: 25mm - 4hr CHICAGO STORM - OWEN SOUND RAINFALL
*
 ** CALIB NASHYD         0201  1  6.0    8.45    0.05  1.50   1.87 0.08   0.000
    [CN=56.3         ]
    [ N = 3.0:Tp 0.13]
*
 ** CALIB STANDHYD       0200  1  5.0   55.36    2.47  1.42  11.56 0.46   0.000
    [I%=45.0:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:              0300  1  5.0   55.36    0.06  4.25  10.54  n/a   0.000
*
    ADD [  0201+  0300]   0400  3  5.0   63.81    0.08  1.50   9.39  n/a   0.000
*
```

```
================================================================================================================

       V    V   I    SSSSS  U   U    A    L              (v 6.0.2001)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat
  Output  filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\5680c0bd-
  Summary filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\5680c0bd-


DATE: 05-06-2021                          TIME: 02:11:26

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COMMENTS: _____________________________________________________________


  ************************************************
  ** SIMULATION : Run 08                         **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    READ STORM                15.0
    [ Ptot= 56.00 mm ]
    fname : C:\Users\avarghese\AppData\Local\Temp\8802d3ac-5fe9-4462-b50c-2e69992f7d5b\a7628cb1-9ade-4406-b279
    remark: 2yr 24hr 15min SCS
*
 ** CALIB NASHYD         0201  1  6.0    8.45    0.25 12.30  10.42 0.19   0.000
    [CN=56.3         ]
    [ N = 3.0:Tp 0.13]
*
 ** CALIB STANDHYD       0200  1  5.0   55.36    3.97 12.25  30.61 0.55   0.000
    [I%=45.0:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0300  1  5.0   55.36    0.18 14.75  29.59  n/a   0.000
*
    ADD [  0201+  0300]  0400  3  5.0   63.81    0.30 12.25  27.04  n/a   0.000
*
```

```
================================================================================================================

       V    V   I    SSSSS  U   U    A    L              (v 6.0.2001)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat
  Output  filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\1fe5dc9c-
  Summary filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\1fe5dc9c-


DATE: 05-06-2021                          TIME: 02:11:26

USER:


COMMENTS: _____________________________________________________________


  ************************************************
  ** SIMULATION : Run 09                         **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    READ STORM                15.0
    [ Ptot= 73.70 mm ]
    fname : C:\Users\avarghese\AppData\Local\Temp\8802d3ac-5fe9-4462-b50c-2e69992f7d5b\1d586ea4-8473-400b-b74d
    remark: 5yr 24hr 15min SCS
*
 ** CALIB NASHYD         0201  1  6.0    8.45    0.43 12.30  17.58 0.24   0.000
    [CN=56.3         ]
    [ N = 3.0:Tp 0.13]
*
 ** CALIB STANDHYD       0200  1  5.0   55.36    5.71 12.25  42.77 0.58   0.000
    [I%=45.0:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0300  1  5.0   55.36    0.24 14.83  41.75  n/a   0.000
*
    ADD [  0201+  0300]  0400  3  5.0   63.81    0.53 12.33  38.54  n/a   0.000
*
```

```
================================================================================================================

       V    V   I    SSSSS  U   U    A    L              (v 6.0.2001)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat
  Output  filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\11e89129-
  Summary filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\11e89129-


DATE: 05-06-2021                          TIME: 02:11:26

USER:


COMMENTS: _____________________________________________________________


  ************************************************
  ** SIMULATION : Run 10                         **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    READ STORM                15.0
    [ Ptot= 85.40 mm ]
    fname : C:\Users\avarghese\AppData\Local\Temp\8802d3ac-5fe9-4462-b50c-2e69992f7d5b\7a45ace2-b0d4-4aa1-a46b
    remark: 10yr 24hr 15min SCS
*
 ** CALIB NASHYD         0201  1  6.0    8.45    0.57 12.30  23.03 0.27   0.000
    [CN=56.3         ]
    [ N = 3.0:Tp 0.13]
*
 ** CALIB STANDHYD       0200  1  5.0   55.36    6.89 12.25  51.21 0.60   0.000
    [I%=45.0:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0300  1  5.0   55.36    0.27 16.25  50.19  n/a   0.000
*
    ADD [  0201+  0300]  0400  3  5.0   63.81    0.70 12.25  46.58  n/a   0.000
*
```

```
================================================================================================================

       V    V   I    SSSSS  U   U    A    L             (v 6.0.2001)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat
  Output  filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\e612ffb4-
  Summary filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\e612ffb4-


DATE: 05-06-2021                          TIME: 02:11:26

USER:


COMMENTS: _____________________________________________________________


  ************************************************
  ** SIMULATION : Run 11                         **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    READ STORM                15.0
    [ Ptot=100.50 mm ]
    fname : C:\Users\avarghese\AppData\Local\Temp\8802d3ac-5fe9-4462-b50c-2e69992f7d5b\bfa22513-48a6-47f7-97ad
    remark: 25yr 24hr 15min SCS
*
 ** CALIB NASHYD         0201  1  6.0    8.45    0.76 12.30  30.77 0.31   0.000
    [CN=56.3         ]
    [ N = 3.0:Tp 0.13]
*
 ** CALIB STANDHYD       0200  1  5.0   55.36    8.99 12.25  62.50 0.62   0.000
    [I%=45.0:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0300  1  5.0   55.36    0.58 13.83  61.48  n/a   0.000
*
    ADD [  0201+  0300]  0400  3  5.0   63.81    0.95 12.25  57.39  n/a   0.000
*
 FINISH

================================================================================================================
```

```
================================================================================================================

       V    V   I    SSSSS  U   U    A    L              (v 6.0.2001)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat
  Output  filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\00ea61e9-
  Summary filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\00ea61e9-


DATE: 05-06-2021                          TIME: 02:11:26

USER:


COMMENTS: _____________________________________________________________


  ************************************************
  ** SIMULATION : Run 12                         **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    READ STORM                15.0
    [ Ptot=111.40 mm ]
    fname : C:\Users\avarghese\AppData\Local\Temp\8802d3ac-5fe9-4462-b50c-2e69992f7d5b\72c208fd-9f75-4900-bceb
    remark: 50yr 24hr 15min SCS
*
 ** CALIB NASHYD         0201  1  6.0    8.45    0.91 12.30  36.80 0.33   0.000
    [CN=56.3         ]
    [ N = 3.0:Tp 0.13]
*
 ** CALIB STANDHYD       0200  1  5.0   55.36   10.76 12.25  70.89 0.64   0.000
    [I%=45.0:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0300  1  5.0   55.36    0.94 13.33  69.87  n/a   0.000
*
    ADD [  0201+  0300]  0400  3  5.0   63.81    1.13 12.25  65.47  n/a   0.000
*
```

```
================================================================================================================

       V    V   I    SSSSS  U   U    A    L              (v 6.0.2001)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  S U M M A R Y   O U T P U T  *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat
  Output  filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\2f0e5473-
  Summary filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\2f0e5473-


DATE: 05-06-2021                          TIME: 02:11:26

USER:


COMMENTS: _____________________________________________________________


  ************************************************
  ** SIMULATION : Run 13                         **
  ************************************************

  W/E COMMAND             HYD ID   DT    AREA  ' Qpeak Tpeak   R.V. R.C.   Qbase
                                  min     ha   '  cms   hrs     mm          cms

      START @  0.00 hrs
      --------------------
    READ STORM                15.0
    [ Ptot=122.30 mm ]
    fname : C:\Users\avarghese\AppData\Local\Temp\8802d3ac-5fe9-4462-b50c-2e69992f7d5b\300aac8d-8c73-464d-a34a
    remark: 100yr 24hr 15min SCS
*
 ** CALIB NASHYD         0201  1  6.0    8.45    1.07 12.30  43.14 0.35   0.000
    [CN=56.3         ]
    [ N = 3.0:Tp 0.13]
*
 ** CALIB STANDHYD       0200  1  5.0   55.36   12.14 12.25  79.47 0.65   0.000
    [I%=45.0:S%= 2.00]
*
 ** Reservoir
    OUTFLOW:             0300  1  5.0   55.36    1.23 13.17  78.44  n/a   0.000
*
    ADD [  0201+  0300]  0400  3  5.0   63.81    1.35 12.83  73.74  n/a   0.000
*
```

```
       V    V   I    SSSSS  U   U    A    L              (v 6.0.2001)
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
```


***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\Visual OTTHYMO 6.0\VO2\voin.dat
Output filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\a6d0d481-
Summary filename: C:\Users\avarghese\AppData\Local\Civica\VH5\4ece9c7e-9608-41a6-9b21-8e303bec9c63\a6d0d481-

DATE: 05-06-2021 TIME: 02:11:26

USER:

COMMENTS: _____

** SIMULATION : Run 14 **

| READ STORM | Ptotal=193.00 mm | Filename: C:\Users\avarghese\AppData\Local\Temp\8802d3ac-5fe9-4462-b50c-2e69992f7d5b\ef88f8a7 Comments: REGIONAL STORM TIMMINS - 12 hour storm

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
1.00	15.00	4.00	3.00	7.00	43.00	10.00	13.00
2.00	20.00	5.00	5.00	8.00	20.00	11.00	13.00
3.00	10.00	6.00	20.00	9.00	23.00	12.00	8.00

CALIB NASHYD (0201) ID= 1 DT= 6.0 min	Area (ha)= 8.45	Curve Number (CN)= 56.3	Ia (mm)= 4.60	# of Linear Res.(N)= 3.00	U.H. Tp(hrs)= 0.13

NOTE: RAINFALL WAS TRANSFORMED TO 6.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.100	15.00	3.100	3.00	6.100	43.00	9.10	13.00
0.200	15.00	3.200	3.00	6.200	43.00	9.20	13.00
0.300	15.00	3.300	3.00	6.300	43.00	9.30	13.00
0.400	15.00	3.400	3.00	6.400	43.00	9.40	13.00
0.500	15.00	3.500	3.00	6.500	43.00	9.50	13.00
0.600	15.00	3.600	3.00	6.600	43.00	9.60	13.00
0.700	15.00	3.700	3.00	6.700	43.00	9.70	13.00
0.800	15.00	3.800	3.00	6.800	43.00	9.80	13.00
0.900	15.00	3.900	3.00	6.900	43.00	9.90	13.00
1.000	15.00	4.000	3.00	7.000	43.00	10.00	13.00
1.100	20.00	4.100	5.00	7.100	20.00	10.10	13.00
1.200	20.00	4.200	5.00	7.200	20.00	10.20	13.00
1.300	20.00	4.300	5.00	7.300	20.00	10.30	13.00
1.400	20.00	4.400	5.00	7.400	20.00	10.40	13.00
1.500	20.00	4.500	5.00	7.500	20.00	10.50	13.00
1.600	20.00	4.600	5.00	7.600	20.00	10.60	13.00
1.700	20.00	4.700	5.00	7.700	20.00	10.70	13.00
1.800	20.00	4.800	5.00	7.800	20.00	10.80	13.00

1.900	20.00	4.900	5.00	7.900	20.00	10.90	13.00
2.000	20.00	5.000	5.00	8.000	20.00	11.00	13.00
2.100	10.00	5.100	20.00	8.100	23.00	11.10	8.00
2.200	10.00	5.200	20.00	8.200	23.00	11.20	8.00
2.300	10.00	5.300	20.00	8.300	23.00	11.30	8.00
2.400	10.00	5.400	20.00	8.400	23.00	11.40	8.00
2.500	10.00	5.500	20.00	8.500	23.00	11.50	8.00
2.600	10.00	5.600	20.00	8.600	23.00	11.60	8.00
2.700	10.00	5.700	20.00	8.700	23.00	11.70	8.00
2.800	10.00	5.800	20.00	8.800	23.00	11.80	8.00
2.900	10.00	5.900	20.00	8.900	23.00	11.90	8.00
3.000	10.00	6.000	20.00	9.000	23.00	12.00	8.00

Unit Hyd Qpeak (cms)= 2.483

PEAK FLOW (cms)= 0.568 (i)
TIME TO PEAK (hrs)= 7.000
RUNOFF VOLUME (mm)= 90.270
TOTAL RAINFALL (mm)= 193.000
RUNOFF COEFFICIENT = 0.468

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (0200)	Area (ha)= 55.36
ID= 1 DT= 5.0 min	Total Imp(%)= 61.00 Dir. Conn.(%)= 45.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	33.77	21.59
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	0.80	2.00
Length	(m)=	607.51	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	15.00	3.083	3.00	6.083	43.00	9.08	13.00
0.167	15.00	3.167	3.00	6.167	43.00	9.17	13.00
0.250	15.00	3.250	3.00	6.250	43.00	9.25	13.00
0.333	15.00	3.333	3.00	6.333	43.00	9.33	13.00
0.417	15.00	3.417	3.00	6.417	43.00	9.42	13.00
0.500	15.00	3.500	3.00	6.500	43.00	9.50	13.00
0.583	15.00	3.583	3.00	6.583	43.00	9.58	13.00
0.667	15.00	3.667	3.00	6.667	43.00	9.67	13.00
0.750	15.00	3.750	3.00	6.750	43.00	9.75	13.00
0.833	15.00	3.833	3.00	6.833	43.00	9.83	13.00
0.917	15.00	3.917	3.00	6.917	43.00	9.92	13.00
1.000	15.00	4.000	3.00	7.000	43.00	10.00	13.00
1.083	20.00	4.083	5.00	7.083	20.00	10.08	13.00
1.167	20.00	4.167	5.00	7.167	20.00	10.17	13.00
1.250	20.00	4.250	5.00	7.250	20.00	10.25	13.00
1.333	20.00	4.333	5.00	7.333	20.00	10.33	13.00
1.417	20.00	4.417	5.00	7.417	20.00	10.42	13.00
1.500	20.00	4.500	5.00	7.500	20.00	10.50	13.00
1.583	20.00	4.583	5.00	7.583	20.00	10.58	13.00
1.667	20.00	4.667	5.00	7.667	20.00	10.67	13.00
1.750	20.00	4.750	5.00	7.750	20.00	10.75	13.00
1.833	20.00	4.833	5.00	7.833	20.00	10.83	13.00
1.917	20.00	4.917	5.00	7.917	20.00	10.92	13.00
2.000	20.00	5.000	5.00	8.000	20.00	11.00	13.00
2.083	10.00	5.083	20.00	8.083	23.00	11.08	8.00
2.167	10.00	5.167	20.00	8.167	23.00	11.17	8.00
2.250	10.00	5.250	20.00	8.250	23.00	11.25	8.00
2.333	10.00	5.333	20.00	8.333	23.00	11.33	8.00
2.417	10.00	5.417	20.00	8.417	23.00	11.42	8.00
2.500	10.00	5.500	20.00	8.500	23.00	11.50	8.00
2.583	10.00	5.583	20.00	8.583	23.00	11.58	8.00
2.667	10.00	5.667	20.00	8.667	23.00	11.67	8.00
2.750	10.00	5.750	20.00	8.750	23.00	11.75	8.00
2.833	10.00	5.833	20.00	8.833	23.00	11.83	8.00
2.917	10.00	5.917	20.00	8.917	23.00	11.92	8.00
3.000	10.00	6.000	20.00	9.000	23.00	12.00	8.00

Max.Eff.Inten.(mm/hr)=		43.00	36.07
	over (min)	10.00	25.00
Storage Coeff. (min)=		11.30 (ii)	21.91 (ii)
Unit Hyd. Tpeak (min)=		10.00	25.00
Unit Hyd. peak (cms)=		0.10	0.05

				TOTALS
PEAK FLOW	(cms)=	2.97	1.88	4.822 (iii)
TIME TO PEAK	(hrs)=	7.00	7.08	7.00
RUNOFF VOLUME	(mm)=	191.00	95.23	138.33
TOTAL RAINFALL	(mm)=	193.00	193.00	193.00
RUNOFF COEFFICIENT	=	0.99	0.49	0.72

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 49.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0300)	OVERFLOW IS OFF			
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.1970	1.2687
	0.0001	0.0557	0.2190	1.4264
	0.0210	0.1709	0.2380	1.5886
	0.0370	0.2912	0.2560	1.7554
	0.0480	0.4167	0.2730	1.9267
	0.0570	0.5473	0.2890	2.1027
	0.0640	0.6827	0.6060	2.2833
	0.0710	0.8226	0.9940	2.4685
	0.1400	0.9668	1.2390	2.6584
	0.1720	1.1155	10.0000	3.1000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0200)	55.360	4.822	7.00	138.33
OUTFLOW: ID= 1 (0300)	55.360	4.345	7.17	137.30

PEAK FLOW REDUCTION [Qout/Qin](%)= 90.09
TIME SHIFT OF PEAK FLOW (min)= 10.00
MAXIMUM STORAGE USED (ha.m.)= 2.8184

ADD HYD (0400)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0201):	8.45	0.568	7.00	90.27
+ ID2= 2 (0300):	55.36	4.345	7.17	137.30
ID = 3 (0400):	63.81	4.802	7.08	131.08

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

Appendix E

Letters to Secondary Utilities

PEARSON ENGINEERING

May 06, 2021 File: 10063.02

Attention: Lorraine Cibirka

Ms. Lorraine Cibirka
Access Network Design (Bell Canada)
2nd Floor, 136 Bayfield Street
Barrie, Ontario
L4M 3B1

Dear Lorraine,

Re: Proposed Farsight Residential Development
Part of Lots 13 & 14, Conc. 5, Everett
Request for Confirmation – Bell Servicing

We are currently preparing a Functional Servicing Report to examine the infrastructure requirements for a 1238 residential lot development on Part of Lots 13 & 14, Concession 5 in Everett, Township of Adjala-Tosorontio.

The site is located north of County Road 5, immediately east of County Road 13. A copy of the Concept Plan has been attached for your reference.

We request that, if available, you provide to us your existing servicing plan in this area and we would appreciate any comments you could provide on the serviceability of the proposed development.

We thank you in advance for your assistance and co-operation in providing the background data. If you have any questions regarding the enclosed or require any additional information, please feel free to give me a call at (705) 719-4785, ext. 223 or email me at tarkell@pearsoneng.com.

Regards,

PEARSON ENGINEERING LTD.

Taylor Arkell, P.Eng.
Project Engineer

May 06, 2021 File: 10063.02

Attention: Don Jelly, Enbridge Gas

Don Jelly
Enbridge Gas
10 Churchhill Drive
Barrie, Ontario
L4N 8Z5

Dear Don,

Re: Proposed Farsight Residential Development
Part of Lot 13 & 14, Conc. 5, Everett
Request for Confirmation – Enbridge Servicing

We are currently preparing a Functional Servicing Report to examine the infrastructure requirements for a 1238 residential lot development on Part of Lots 13 & 14, Concession 5 in Everett, Township of Adjala-Tosorontio.

The site is located north of County Road 5, immediately east of County Road 13. A copy of the Concept Plan has been attached for your reference.

We request that, if available, you provide to us your existing servicing plan in this area and we would appreciate any comments you could provide on the serviceability of the proposed development.

We thank you in advance for your assistance and co-operation in providing the background data. If you have any questions regarding the enclosed or require any additional information, please feel free to give me a call at (705) 719-4785, ext. 223 or email me at tarkell@pearsoneng.com.

Regards,
PEARSON ENGINEERING LTD.

Taylor Arkell, P.Eng.
Project Engineer

May 06. 2021 File: 10063.02

Attention: To whom it may concern

Hydro One Networks Inc.
420 Welham Road
Barrie, Ontario
L4N 8Z2

To Whom it may concern,

Re: Proposed Farsight Residential Development
Part of Lots 13 & 14, Conc. 5, Everett
Request for Confirmation – Hydro One Servicing

We are currently preparing a Functional Servicing Report to examine the infrastructure requirements for a 1238 residential lot development on Part of Lots 13 & 14, Concession 5 in Everett, Township of Adjala-Tosorontio.

The site is located north of County Road 5, immediately east of County Road 13. A copy of the Concept Plan has been attached for your reference.

We request that, if available, you provide to us your existing servicing plan in this area and we would appreciate any comments you could provide on the serviceability of the proposed development.

We thank you in advance for your assistance and co-operation in providing the background data. If you have any questions regarding the enclosed or require any additional information, please feel free to give me a call at (705) 719-4785, ext. 223 or email me at tarkell@pearsoneng.com.

Regards,
PEARSON ENGINEERING LTD.

Taylor Arkell, P.Eng.
Project Engineer

May 06, 2021 File: 10063.02

Attention: Neill Kennerney

Neill Kennerney
Rogers Cable
1 Sperling Drive
Barrie, Ontario
L4M 6B8

Dear Neill,

Re: Proposed Farsight Residential Development
Part of Lots 13 & 14, Conc. 5, Everett
Request for Confirmation – Rogers Cable Servicing

We are currently preparing a Functional Servicing Report to examine the infrastructure requirements for a 1238 residential lot development on Part of Lots 13 & 14, Concession 5 in Everett, Township of Adjala-Tosorontio.

The site is located north of County Road 5, immediately east of County Road 13. A copy of the Concept Plan has been attached for your reference.

We request that, if available, you provide to us your existing servicing plan in this area and we would appreciate any comments you could provide on the serviceability of the proposed development.

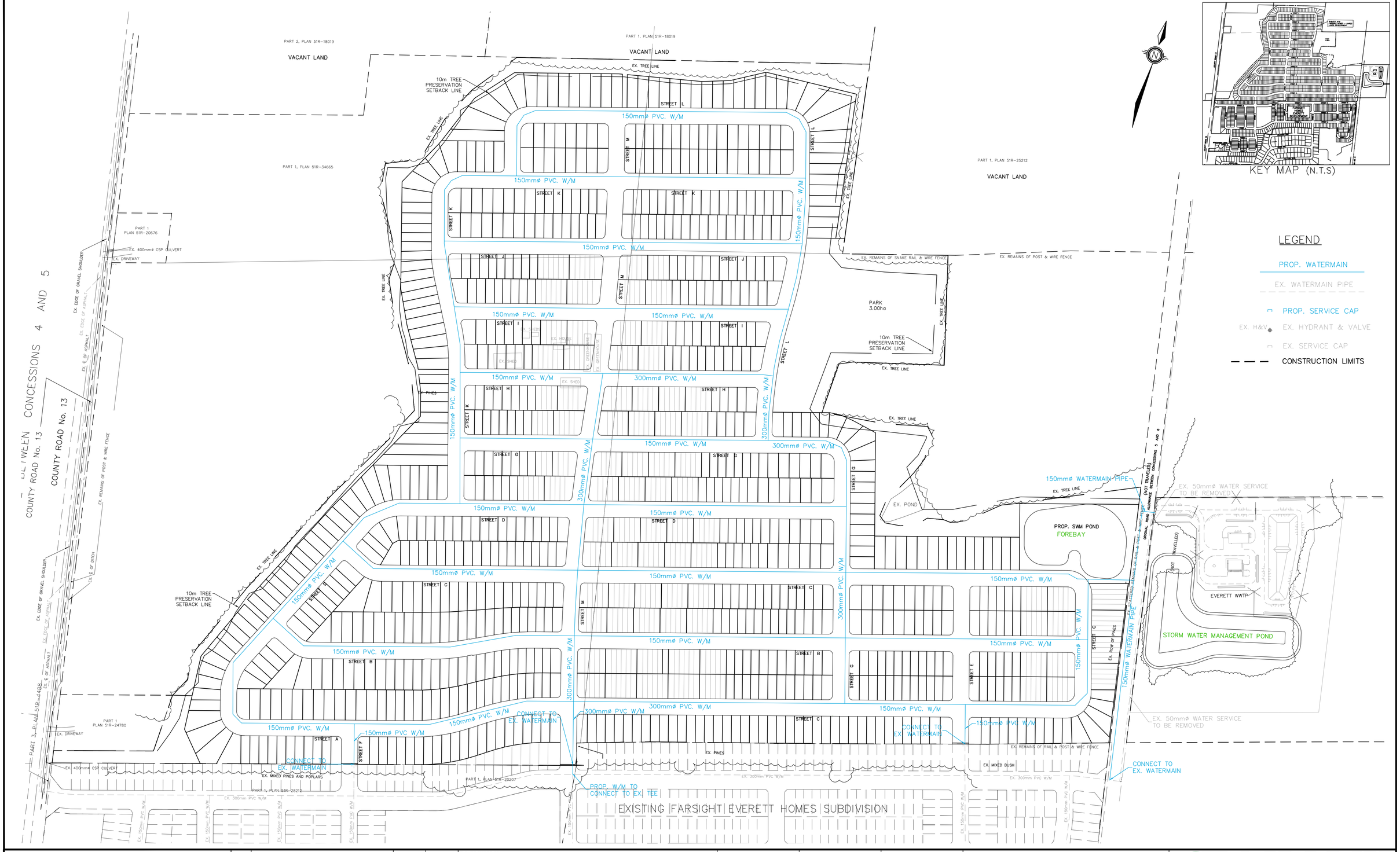
We thank you in advance for your assistance and co-operation in providing the background data. If you have any questions regarding the enclosed or require any additional information, please feel free to give me a call at (705) 719-4785, ext. 223 or email me at tarkell@pearsoneng.com.

Regards,
PEARSON ENGINEERING LTD.

Taylor Arkell, P.Eng.
Project Engineer

Appendix F

Pearson Engineering Drawings



LEGEND

- PROP. WATERMAIN
- EX. WATERMAIN PIPE
- PROP. SERVICE CAP
- EX. H&V — EX. HYDRANT & VALVE
- EX. SERVICE CAP
- CONSTRUCTION LIMITS

NO.	REVISION NOTE	DATE	BY

BENCHMARK:

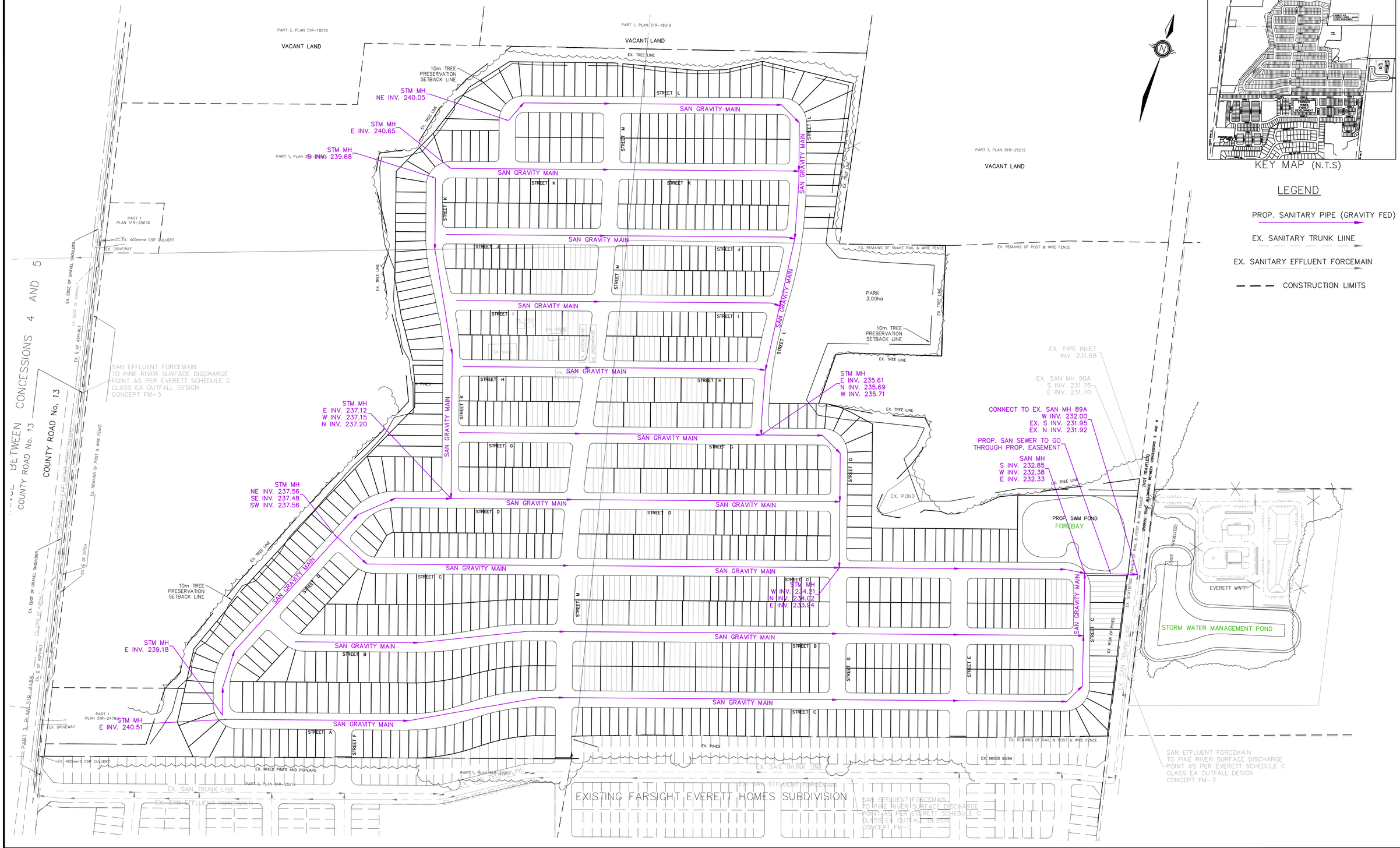
FARSIGHT HOMES SUBDIVISION, BARZO

WATER SERVICING PLAN

PEARSON ENGINEERING
PEARSONENG.COM PH. 705.719.4785

DESIGNED BY	MRB/PCO	HORIZ SCALE	1: 2000
DRAWN BY	PCO/IR	VERT SCALE	N/A
CHECKED BY	GMP	DATE	JULY 2019

PROJECT # 10063.02
DRAWING # WM-1
REVISION # 0



NO.	REVISION NOTE	DATE	BY

BENCHMARK:

FARSIGHT HOMES SUBDIVISION, BARZO

SANITARY SERVICING PLAN

PEARSON ENGINEERING
PEARSONENG.COM PH. 705.719.4785

DESIGNED BY	MRB/PCO	HORIZ SCALE	1:2000
DRAWN BY	PCO/IR	VERT SCALE	N/A
CHECKED BY	GMP	DATE	JULY 2019

PROJECT # 10063.20
DRAWING # SAN-1
REVISION # 0

NO.	REVISION NOTE	DATE	BY

BENCHMARK:

FARSIGHT HOMES SUBDIVISION, BARZO

STORM SERVICING PLAN

PEARSON ENGINEERING
PEARSONENG.COM PH. 705.719.4785

DESIGNED BY	MRB/PCO	HORIZ SCALE	1: 2000
DRAWN BY	PCO/IR	VERT SCALE	N/A
CHECKED BY	GMP	DATE	JULY 2019

PROJECT # 10063.02
DRAWING # STM-1
REVISION # 0

NO.	REVISION NOTE	DATE	BY

BENCHMARK:

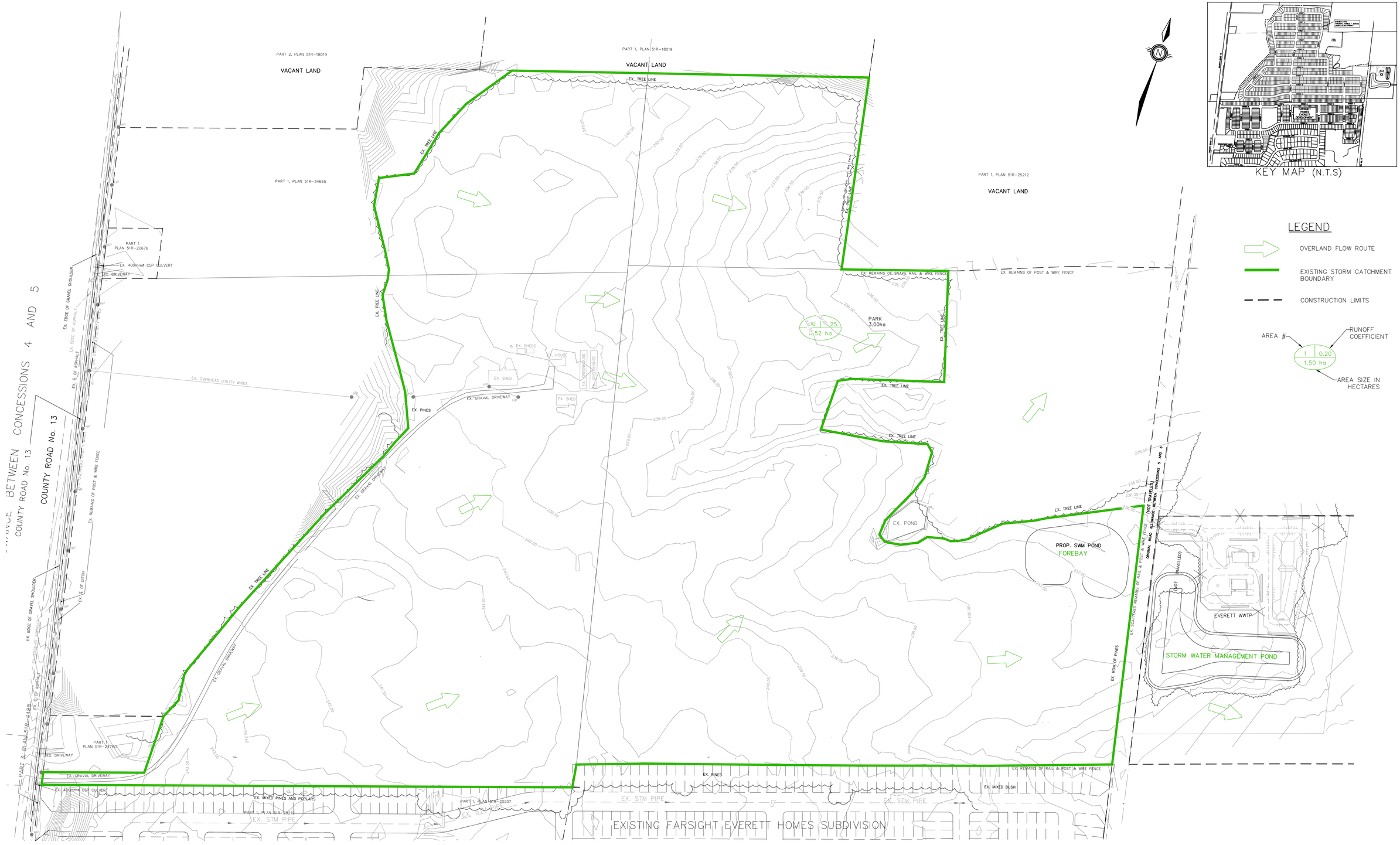
FARSIGHT HOMES SUBDIVISION, BARZO

PRELIMINARY SITE GRADING PLAN

PEARSON ENGINEERING
PEARSONENG.COM PH. 705.719.4785

DESIGNED BY MRB/PCO	HORIZ SCALE 1:2000	PROJECT #	10063.02
DRAWN BY PCO/IR	VERT SCALE N/A	DRAWING #	GRD-1
CHECKED BY GMP	DATE JULY 2019	REVISION #	0

P:\Autodesk Vault\Working Folders\10063.02 - Barzo\Engineering\FSR DRAWINGS\10063.02 - BASE (FSR).dwg Layout: GRD-1 Plotted: Apr 26, 2021 @ 10:17am by tchute @ PEARSON ENGINEERING LTD.



NO.	REVISION NOTE	DATE	BY

BENCHMARK:

FARSIGHT HOMES SUBDIVISION, BARZO

PRE-DEVELOPMENT STORM CATCHMENT PLAN

PEARSON ENGINEERING
PEARSONENG.COM PH. 705.719.4785

DESIGNED BY	MRB/PCO	HORIZ SCALE	1: 2000
DRAWN BY	TJCA/IR	VERT SCALE	N/A
CHECKED BY	GMP	DATE	JULY 2019
PROJECT #	10063.02		
DRAWING #	STM-2		
REVISION #	0		

KEY MAP (N.T.S)

LEGEND

- OVERLAND FLOW ROUTE
- PROPOSED STORM CATCHMENT BOUNDARY
- CONSTRUCTION LIMITS

AREA # — CN# — 204 | 48.8 — 6.22 ha — AREA SIZE IN HECTARES

NO.	REVISION NOTE	DATE	BY

BENCHMARK:

FARSIGHT HOMES SUBDIVISION, BARZO

POST-DEVELOPMENT STORM CATCHMENT PLAN

PEARSON ENGINEERING
PEARSONENG.COM PH. 705.719.4785

DESIGNED BY	MRB/PCO	HORIZ SCALE	1: 2000
DRAWN BY	TJCA/IR	VERT SCALE	N/A
CHECKED BY	GMP	DATE	JULY 2019
PROJECT #	10063.02		
DRAWING #	STM-3		
REVISION #	0		

EX. POND

10.0m TREE PRESERVATION SETBACK LINE

EX. TREE LINE

FOREBAY

PROP. SWM POND

STM INV. 234.75
1350mmø STM PIPE @ 0.50%

STM MH
E INV. 235.38
W INV. 235.01
N INV. 234.93

SAN MH
S INV. 232.85
W INV. 232.38
E INV. 232.33

525mmø SAN PIPE @ 0.50%

900mmø STM PIPE @ 0.50%

525mmø SAN PIPE @ 0.50%

PROP. 2 – 1500mm X 1800mm CONC. BOX CULVERT
W INV. 234.75
E INV. 234.75

SERVICE CROSSING
STM INV. 234.75
W/M OBV. 232.65

SERVICE CROSSING
STM INV. 234.75
SAN OBV. 232.47

CONNECT TO EX. SAN MH 89A
PROP. W INV. 232.00
EX. S INV. 231.95
EX. N INV. 231.92

EX. 8.70m – 600mmø SAN PIPE @ 0.20%

EX. SAN MH 90A
EX. S INV. 231.76
EX. E INV. 231.70

EX. 300mmø SANITARY FORCEMAIN

EX. PIPE INLET
INV. 231.68

EX. 50mmø WATER SERVICE TO BE REMOVED

SERVICE CROSSING
STM INV. 234.75
SAN OBV. 232.47

ORIGINAL ROAD ALLOWANCE (NOT TRAVELLED)

EVERETT WASTE WATER TREATMENT FACILITY

STORM WATER MANAGEMENT POND

150mmø WATERMAIN PIPE
525mmø SAN PIPE @ 0.50%
1350mmø STM PIPE @ 0.50%

150mmø WATERMAIN PIPE
525mmø SAN PIPE @ 0.50%
1350mmø STM PIPE @ 0.50%

150mmø WATERMAIN PIPE
525mmø SAN PIPE @ 0.50%

900mmø STM PIPE @ 0.50%

900mmø STM PIPE @ 0.50%

600mmø SAN PIPE

900mmø STM PIPE @ 0.50%

250mmø SAN PIPE @ 0.50%

150mmø WATERMAIN PIPE

STREET C

EX. ROW OF PINES

EX. SCATTERED REMAINS OF RAIL & POST & WIRE FENCE

EX. 82.5m – 1500mmø SAN PIPE @ 0.20%

EX. 68.4m – 600mmø SAN PIPE @ 0.20%

EX. 300mmø SANITARY FORCEMAIN

150mmø WATERMAIN PIPE

150mmø WATERMAIN PIPE
250mmø SAN PIPE @ 0.50%
600mmø STM PIPE @ 0.50%

150mmø WATERMAIN PIPE
250mmø SAN PIPE @ 0.50%

600mmø SAN PIPE

STREET G

STREET E

900mmø STM PIPE @ 0.50%

250mmø SAN PIPE @ 0.50%

150mmø WATERMAIN PIPE

250mmø SAN PIPE @ 0.50%

150mmø WATERMAIN PIPE

250mmø SAN PIPE @ 0.50%
600mmø STM PIPE @ 0.50%

150mmø WATERMAIN PIPE

CONNECT TO EX. 150mmø WATERMAIN

EX. 68.4m – 600mmø SAN PIPE @ 0.20%

EX. 300mmø SANITARY FORCEMAIN

EX. 50mmø WATER SERVICE TO BE REMOVED

EX. REMAINS OF RAIL & POST & WIRE FENCE

EXISTING FARSIGHT EVERETT HOMES SUBDIVISION

EX. 150mmø WATERMAIN

EX. MIXED BUSH

CONNECT TO EX. WATERMAIN

EX. 110.0m – 600mmø SAN PIPE @ 0.20%

EX. 300mmø SANITARY FORCEMAIN

EX. WATERMAIN

EX. WATERMAIN

EX. SAN PIPE
EX. STM PIPE

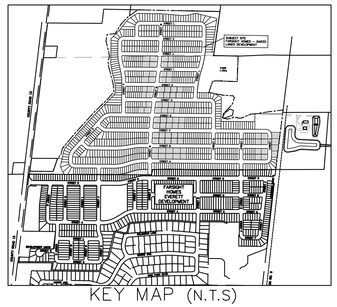
EX. SAN PIPE
EX. STM PIPE

EX. SAN PIPE

EX. SAN FORCEMAIN

EX. SAN FORCEMAIN

EX. WATERMAIN



KEY MAP (N.T.S)

LEGEND

- PROP. WATERMAIN PIPE
- EX. WATERMAIN PIPE
- PROP. SERVICE CAP
- EX. H&V EX. HYDRANT & VALVE
- EX. SERVICE CAP
- PROP. STORM PIPE
- EX. STORM PIPE
- PROP. SANITARY PIPE (GRAVITY FED)
- EX. SANITARY TRUNK LIINE
- EX. SANITARY EFFLUENT FORCEMAIN
- CONSTRUCTION LIMITS

NO.	REVISION NOTE	DATE	BY

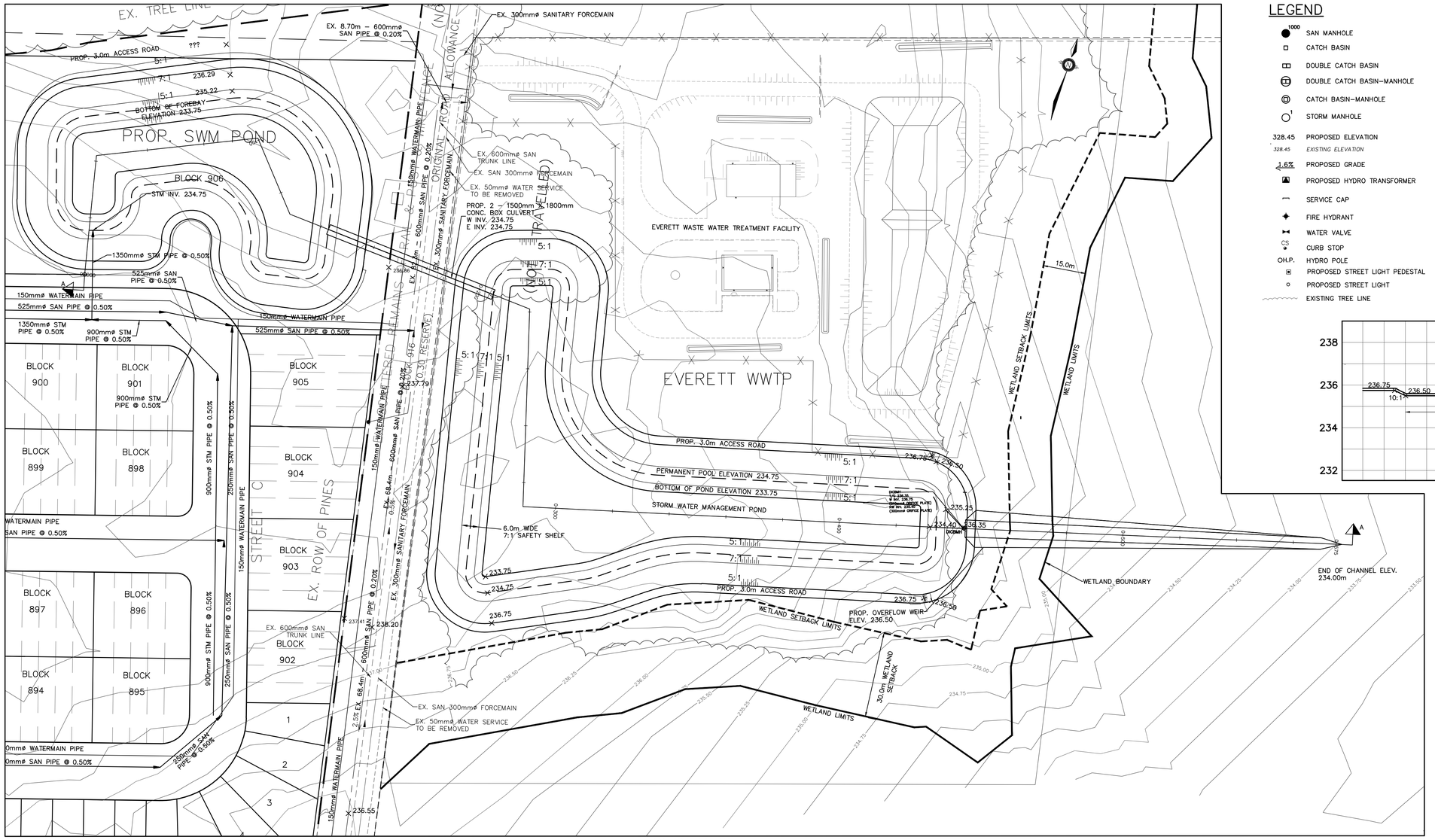
BENCHMARK:

FARSIGHT HOMES SUBDIVISION, BARZO

DETAILED SERVICING PLAN

PEARSON ENGINEERING
PEARSONENG.COM PH. 705.719.4785

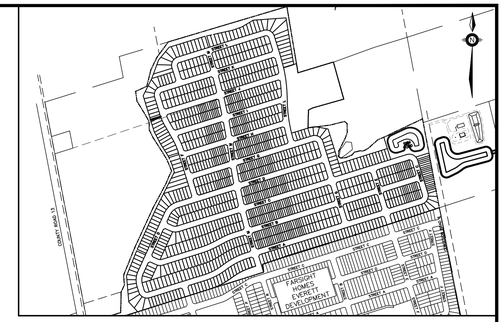
DESIGNED BY	MRB/PCO	HORIZ SCALE	1:750
DRAWN BY	TJCA/IR	VERT SCALE	N/A
CHECKED BY	GMP	DATE	JULY 2019
PROJECT #	10063.02		
DRAWING #	DS-1		
REVISION #	0		



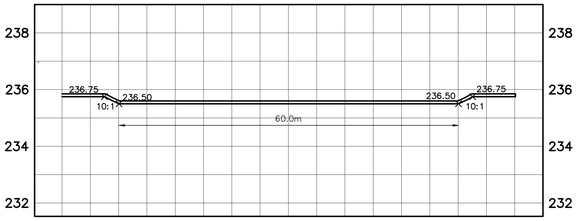
PLAN VIEW
SCALE 1:750

LEGEND

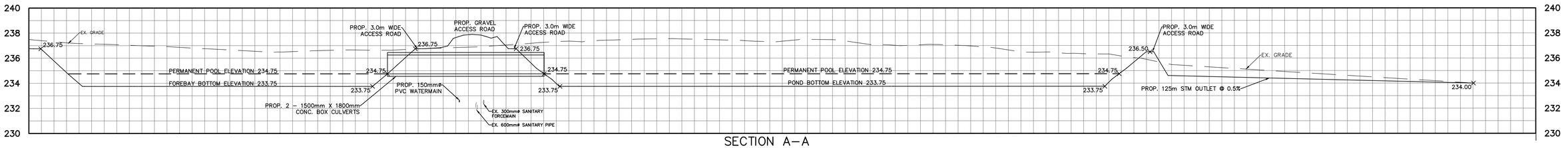
- SAN MANHOLE (1000)
- CATCH BASIN
- DOUBLE CATCH BASIN
- DOUBLE CATCH BASIN–MANHOLE
- CATCH BASIN–MANHOLE
- STORM MANHOLE (1)
- 328.45 PROPOSED ELEVATION
- *328.45 EXISTING ELEVATION*
- 1.6% PROPOSED GRADE
- PROPOSED HYDRO TRANSFORMER
- SERVICE CAP
- FIRE HYDRANT
- WATER VALVE
- CS CURB STOP
- OH.P. HYDRO POLE
- PROPOSED STREET LIGHT PEDESTAL
- PROPOSED STREET LIGHT
- EXISTING TREE LINE



KEY MAP
NTS



PROP. OVERFLOW WEIR DETAIL
SCALE 1:500



SECTION A–A
SCALE
H: 1:750
V: 1:150

NO.	REVISION NOTE	DATE	BY

BENCHMARK:

FARSIGHT HOMES SUBDIVISION,
BARZO
TOWNSHIP OF ADJALA–TOSORONTIO

STORMWATER MANAGEMENT POND

PEARSON ENGINEERING
PEARSONENG.COM PH. 705.719.4785

DESIGNED BY TJCA	HORIZ SCALE 1:750	PROJECT #	10063.02
DRAWN BY IR	VERT SCALE 1:150	DRAWING #	PND–1
CHECKED BY GMP/MWD	DATE SEPT. 2020	REVISION #	0